Ian Falk
Ruth Wallace
Marthen L. Ndoen *Editors*

Managing Biosecurity Across Borders

Springer

Managing Biosecurity Across Borders


South China Sea
Thailand
Vietnam
Cambodia
Phnom Penh
Andaman Sea
Manila
Catanduanes Island
Busuanga
Philippines
Panay
Leyte Island
Negros
Palawan
Sulu Sea
Mindanao
Basilan Island
Malaysia
Medan
Kuala Lumpur
Singapore
Celebes Sea
Gulf of Tomini
Kota Balikpapan
Molucca Sea
Palembang
Indonesia
Bismarck Sea
Java Sea
Jakarta
Kota Bekasi
Semarang
Bandung
Banda Sea
Papua New Guinea
Arafura Sea
Timor Sea
Darwin
Cairns
Townsville
Northern Territory
LEGEND:
PHASE 1
PHASE 2

Ian Falk • Ruth Wallace • Marthen L. Ndoen
Editors

Managing Biosecurity Across Borders

Springer

Editors
Ian Falk
Charles Darwin University
School of Education
Ellengowan Drive
0909 Darwin Northern Territory
Australia
Ian.Falk@cdu.edu.au

Ruth Wallace
Charles Darwin University
School of Education
Ellengowan Drive
0909 Darwin Northern Territory
Australia
Ruth.Wallace@cdu.edu.au

Marthen L. Ndoen
Satya Wacana Christian University
Economic Department and Post Graduate
Development Studies
Jl. Diponegoro 52–60, Salatiga 50711
Indonesia
mndoen@yahoo.com

ISBN 978-94-007-1411-3 e-ISBN 978-94-007-1412-0
DOI 10.1007/978-94-007-1412-0
Springer Dordrecht Heidelberg London New York

Library of Congress Control Number: 2011932494

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Foreword

In this era of globalization, the prefix ‘bio’ is widely used in words such as *biotechnology, biodiversity, biosafety, biosecurity, bioimperialism, biopiracy, biodemocracy, biocide and bioterrorism*. New terms will no doubt continue to emerge. The emergence of these ‘bio’ words is a sign of the importance of biological resources in national development and in competition between nations. Nations that can effectively control and manage biological resources in a sustainable manner will survive and develop in this era of globalization. These terms appear in response to emerging issues facing people and nations who seek to maximize their control, use and management of natural resources.

Biosecurity: The Reality

The definitions of these ‘bio’ terms overlap and are interrelated. Before we can discuss the issue of ‘biosecurity’ in this book, we must first agree on what this term encompasses so that our discussion can be based on a common understanding. According to the Food and Agriculture Organization of the United Nations (FAO), biosecurity itself can be defined as a strategic and integrated approach, covering policy and regulatory frameworks, to analyze and manage risks on food safety as well as environmental risk associated with the life and health of human being, animal and plant. Therefore, we can say that biosecurity is actually a holistic concept that is related to the sustainability of agriculture, food safety, and the protection of the environment, including biodiversity.

The issue of biosecurity has actually been evolving for some time and has been the subject of analysis since agricultural products began flowing between countries more than 100 years ago. Agricultural quarantine systems were established and implemented by many countries before 1900. The aim of agricultural quarantine programs is to prevent the introduction of new plant and animal pests and diseases to countries through the import or export of fresh or processed agricultural products. International regulations and agreements were made within the *International*

Plant Protection Convention (IPPC) forum which was established by FAO during the 1950s.

Standards, guidelines, recommendations and procedures for the protection of human health, food security and mitigation of risk (negative side effects) resulting from the movement of food and agricultural products have long been analyzed and developed by the *Codex Alimentarius Commission (CAC)* which was formed by FAO and the World Health Organization (WHO) in the 1950s. The International Office of Epizootics (IOE) regulates international trade of animals to reduce risks towards the life and health of animals in the countries involved in the import and export of animals.

The integration of various issues relating to the protection of human, animal, plant and environmental health has brought *biosafety* into the spotlight since the World Trade Organization (WTO) adopted standards, guidelines, recommendations and procedures that were established by the IPPC, CAC, IOE and other international organizations such as the OECD and IFOAM as conditions of global trade, particularly for food and agriculture products. Infestation by genetically modified organisms (GMO) or Invasive Alien Species (IAS) pose a threat to biodiversity, food security and the environment and they are therefore discussed as part of biosecurity. FAO conclude that '*biosecurity*' is the management of biological threats to food and agriculture.

However, regardless of their humanitarian campaigns, developed countries often use the issue of biosecurity through the international standards, regulations, laws and policies to prevent the introduction of agricultural products from outside and to improve their own exports. In the era of globalization, biosecurity which is actually a part of applied biology has been politicized as it relates to industrialized and developing countries competing for international trade. In international discussions, this competition is often described as competition between the North (developed countries) and the South (developing countries).

For example, Indonesia as a developing country has no comprehensive or integrated national policy regarding biosecurity. This is because it is only relatively recently (in 2003) that the FAO established a standard definition for the terms *biodiversity* and *biosecurity*. Furthermore, the main biosecurity issue that continues to cause problems for Indonesia is in fact the increasing difficulty in exporting agricultural, livestock, forestry and fisheries products to the United States, the European Union and Japan. These countries have good infrastructure with strict regulations and enforcement of biosecurity measures in accordance with the applicable international standards and regulations mentioned previously. Many agricultural, fisheries and forestry products are prohibited from entering these countries in the name of biosecurity and with good scientific reasons. Rejection can take the form of fines/sanctions, reduced prices or total prohibition of goods entering the country.

Many of Indonesia's food product exports contain residual amounts of dangerous substances such as pesticides, heavy metals, dyes and antibiotics that exceed Maximum Residue Limits of the target countries. Many products have also not been certified with a Plant Health Certificate, or contain the remains of insects or signs of infestation by diseases and infections, or they originate from areas that are known to have specific diseases or pests. Indonesian farmers are not yet able to meet the criteria of the strict food safety standards within the *EuropeGAP (Europe Good Agriculture Practices)* which have been in place in the European Union since 2005.

Indonesia is also unfortunate because it can't apply the same criteria set by those developed countries above. Indonesia's regulations and infrastructure are not sufficient or accredited and the quality of professional human resources for monitoring and enforcement of regulations is extremely lax. The majority of the Indonesian population lives in rural areas, deriving their livelihood from traditional agricultural activities. Furthermore, most of Indonesia's rural areas are isolated where most of their populations are generally subsistence farmers and therefore do not produce food and agricultural products for export or even for local markets, but commonly only for their own consumption. Even worse, in euphoria with decentralization, many autonomous provincial and district/municipality governments deliver policies that in one way or another in conflict with the principles of biosecurity. These types of communities are not ready to enter the era of global free trade and are not yet ready to face issues of biosecurity. Additionally, the movement of Indonesian agricultural products has resulted in many bad experiences due to the accidental introduction of dangerous and invasive plant and animal diseases, which have destroyed farming and livestock industries. Consequently, Indonesia until now has not been able to make proper use of the various agreements and regulations relating to biosecurity, biosafety and food safety to limit the flow and domination of international agricultural products into domestic markets.

In short, it can be concluded that overall Indonesia is not ready and not capable of becoming part of the era of biosecurity to any significant extent. Compared to developed countries, and several of its neighbors such as Thailand and Malaysia, Indonesia is far behind on these issues and needs cooperation between the relevant parties to help overcome deficiencies in the implementation of global biosecurity measures.

The Book and Its Contribution

It is then the role of higher education institutions to explore the local indigenous practices and knowledge, and develop it to overcome all biosecurity related issues. We use the term, biosecurity, since we are not only tackling the shortage of appropriate food for the people but culturally we empower the local people to fulfill their need properly using local indigenous practices. The mission of Indonesian higher education institutions are namely education, research, and community development. Following these missions, higher education institutions should be able to foster the government in providing an effective strategy, while at the same time, conducting a community development program by educating the people, of both the young and older generation, in how to sustain the national food resilience through plant biosecurity measures. This book has stood as evidence on how higher education institutions accomplish those missions stated before.

There are nine dimensions discussed in the book namely governance, leadership, policy, gender, entrepreneurship or enterprise, knowledge transfer, local knowledge, institutional knowledge, and ecology. They are observed closely on each of the chapters although not in one to one correspondence and also the weighing factor of each dimension is not the same. The book describes comprehensively the engagement of local knowledge with Western sciences in dealing with various biosecurity related issues and how to transform it through to an effective strategy in generating an effective policy as well as in developing appropriate community development schemes.

Bandung Institute of Technology
Formerly Director General of Higher
Education Republic of Indonesia

Satryo Sumantri Brodjonegoro
Adjunct Professor

Acknowledgements

We would like to acknowledge many people who have been involved in the preparation both of this book and the research on which it is based. Particularly, we acknowledge the hundreds and hundreds of participants who were keenly involved in the research, from the Northern Australian and Indonesian regions shown on the map in the front of the book. These participants came from all walks of life, as the various chapters illustrate, including farmers, community members and policy personnel (national, provincial and community). Each team member worked with their own networks of participants and those who assisted with their research at their home institutions and communities, and while these are too numerous to list, they are remembered and acknowledged here. A special thanks therefore to the local community members with whom the team connected over many years. Our team of researchers works across Northern Australia and Indonesia, but all have particular interests in the ways in which biosecurity links with cultural, biodiversity and food security concerns in the local communities in which, under often extremely difficult circumstances, must come to grips with the reality of managing their food security, standard of living, health and cultural heritage on a day-to-day basis. In many cases there is no clear dividing line that allows 'biosecurity' to be separated from 'food security' or indeed issues related to bio- and cultural diversity.

Our book reviewers came from both countries, and represented senior national and international figures, both researchers and policy personnel, from those two countries. We thank them for the considerable time and effort they put into their most valuable suggestions, which have made this book a much better one. Similarly, to those who wrote the forewords, one from each country, we thank you both sincerely for the effort and time that you have contributed to the work. There are, of course, those who have helped more behind the scenes, and we would like particularly to thanks Putu Tirta Agung for his support to the project, the team members, and especially in the preparation of the manuscript stages of this book. His thoroughness and rigour are both noted and appreciated, as is the work of Winarto in the establishment and maintenance of the AusIndoBIOCOM website and his general support and background work. Both Agung and Winarto are working for and supporting the non-government organisation called Jangkang, and the contribution of this organisation is both noted and appreciated.

Finally, we acknowledge the support in many ways of the Australian Cooperative Research Centre for National Plant Biosecurity (CRCNPB) and its staff. It is this body, through the vision initially of Dr. David Eagling, who supported the need for biosecurity work that looked more closely at issues related to borders and risk management. Support has been forthcoming from the CRC more recently through the active participation of Professor John Lovett, the Chair of the Board, who has assisted in a number of key ways with the international component of the project, and the CEO, Dr. Simon McKirdy who has always been willing and positive in his support. All project team members have noted and expressed their appreciation for the CRC's support at different times and in different ways.

Contents

Part I Introduction

1 **Managing Plant Biosecurity Across Borders** 3
Ian Falk and Ruth Wallace

Part II Overarching Issues

2 **Policy and Legal Framework for Managing Biosecurity** 23
Theofransus Litaay

3 **Adoption of Local Knowledge in Regional Biosecurity Development: Papua Case Study** 45
Theofransus Litaay

4 **Crossing the Community-Government Border: The Case of Citrus Biosecurity Management in West Timor, Indonesia** 65
I Wayan Mudita

5 **Using a Community Approach to Foster Effective Biosecurity Practices Across Social Borders** 93
Paul Royce

6 **Social Partnerships in Learning: Engaging Local, Regional and National Partners in Plant Biosecurity Management** 109
Ruth Wallace

Part III Specific Enablers

7 **Bridging Cross-Cultural Knowledge Through a Bilingual Biosecurity Glossary** 129
Sang Putu Kaler Surata

8 Knowledge Transfer Through Bilingual Publications on Food Security and Biosecurity 145
I. Gusti Agung Sri Rwa Jayantini

9 Gender Issues in the Community Management of Biosecurity in Eastern Indonesia 163
Ni Gusti Agung Gede Eka Martiningsih

10 Accessing Local Knowledge to Achieve Economic and Social Sustainability 183
Marthen L. Ndoen, Ruth Wallace, and Helti Lygia Mampouw

11 Engaging Biosecurity Workforces Through Mobile Learning and Technologies in Community Management of Biosecurity Research 199
Ruth Wallace, I Wayan Mudita, and Remi L. Natonis

Part IV Conclusion

12 A Strategy for Managing Biosecurity Across Borders 215
Ian Falk, Ruth Wallace, Marthen L. Ndoen, Sang Putu Kaler Surata, Paul Royce, I Wayan Mudita, Ni Gusti Agung Gede Eka Martiningsih, Theofransus Litaay, Helti Lygia Mampouw, I. Gusti Agung Sri Rwa Jayantini, and Remi L. Natonis

Glossary of Biosecurity Management 237

Index 291

About the Authors

The authors would like to acknowledge the support the Australian Government's Cooperative Research Centres Program.

Professor Ian Falk is the Chair of Rural and Remote Education at Charles Darwin University. Currently he is also the Project Leader of the Cooperative Research Centre for National Plant Biosecurity's project titled 'Australian and Indonesian Community-based Management Systems'. Professor Falk graduated from Melbourne University/State College (1968) with a Bachelor of Arts/TSTC degree in Arts/Education/Teaching and his Bachelor of Education at the University of South Australia in 1988. Professor Falk continued his studies in sociology of adult learning and literacy, completing a Masters in Education at James Cook University in Northern Queensland (1992), and Ph.D. in Sociology of Adult Learning and Literacy from Griffith University in 1994. Professor Falk's more than 200 books, chapters and journal articles are in the fields of community and regional development and well-being, social capital, leadership, policy, formal and informal learning and adult literacy.

Marthen L. Ndoen was born in Rote Island, East Nusa Tenggara. He is an economist, specializing in entrepreneurship and regional development studies. He has produced a large number of research materials on the issues of entrepreneurship, poverty alleviation, and household economy. He took part in many consultation activities to local government and international organizations. He is a lecturer in the Faculty of Economics and Post Graduate Development Studies at *Universitas Kristen Satya Wacana* (SWCU). He is also a former Head of the Economics Department in the Faculty of Economics at SWCU. He studied at SWCU for his undergraduate award, continued to Cornell University (New York) for his Masters degree, and gained his Ph.D. from Vrije Universiteit, Amsterdam. He was the former Chairperson of CEIS-SWCU and currently is the Chairperson of Centre for Interdisciplinary Development Studies (CIDS) at SWCU. Dr. Ndoen is a researcher with the Australian and Indonesian Community-based Management Systems project through the Cooperative Research Centre for National Plant Biosecurity.

Ruth Wallace is the Director of the Social Partnerships in Learning Research Consortium (SPIL) at the Charles Darwin University and the lead researcher with Australian sites of the Australian and Indonesian Community-based Management Systems project through the Cooperative Research Centre for National Plant Biosecurity. She has worked in early childhood, primary and adult education sectors across Northern Australia over the past 25 years and her Ph.D. examined the learner identities of disenfranchised regional learners. Ruth's research interests are related to undertaking engaged research that improves outcomes for stakeholders in regional and remote Australia. Ruth has extensive experience in innovative delivery of compulsory, post school and Vocational Education and Training programs in regional and remote areas across Northern Australia. Her current research is focused on understanding educational related identities, training frameworks in Indigenous contexts and partnerships across industry, communities and training institutions.

Professor Sang Putu Kaler Surata was born in Bangli, Bali and graduated from *Universitas Mahasaraswati* Denpasar (S1 Degree) in 1986 and continued his study in Institut Pertanian Bogor (S2 degree) on Natural and Environmental Management in 1993. He finished his S3 degree from Institut Pertanian Bogor (2000) in Biology. He has extensive experience working in partnership research projects with John Stephen Lansing (Santa Fe Institute USA) and his students in areas of social-ecology. Currently, he is a professor on Ecology at Department of Biology Education (undergraduate degree) and Environmental Management and Regional Planning (postgraduate degree) at *Universitas Mahasaraswati*, Denpasar. He is a researcher with the Australian and Indonesian Community-based Management Systems project through the Cooperative Research Centre for National Plant Biosecurity.

Paul Royce, born into a farming family in the mid-west region of WA, has 15 years experience in the community services sector holding a number of grass roots and senior management positions in social and community planning programme development and community service delivery. Most of his work was undertaken in local government settings and resulted in the implementation of many community based projects, particularly with Indigenous and non-Indigenous young people and their families. Paul has a Bachelor of Social Science (Youth Work) from Edith Cowan University, a Masters in International and Community Development from Deakin University and was the Chairperson of the Local Government Community Services Association of WA between 2000 and 2004. Paul is currently undertaking his Ph.D. at Charles Darwin University and the Cooperative Research Centre for National Plant Biosecurity.

I Wayan Mudita is an academic responsible for teaching, research, and community service in the Department of Crop Protection, *Universitas Nusa Cendana*, Kupang, East Nusa Tenggara, Indonesia. He obtained his undergraduate degree in plant science (major in crop protection) from the Faculty of Agriculture, Mataram University, Mataram, West Nusa Tenggara, Indonesia, in 1984 and his graduate degree in plant science (major in crop protection) from Faculty of Agricultural and Environmental Sciences, McGill University, Montreal, Canada, in 1991. Currently he is a Ph.D. student in biosecurity management at Charles Darwin University, Australia, with a scholarship from Cooperative Research Centre for National Plant Biosecurity, and a research with their Australian and Indonesian Community-based Management Systems project. His research is on biosecurity management of citrus in the highlands of West Timor, East Nusa Tenggara, Indonesia. Before commencing his Ph.D. research, he had more than 20 years of experience in teaching, research, and community service in the area of crop protection, especially dealing with issues related to governance and community participation.

Theofransus Litaay is a lecturer in the faculty of law, *Satya Wacana Christian University* (SWCU) and a member of SWCU's Centre of Eastern Indonesia Studies, Salatiga, Central Java, Indonesia. Currently he is a Ph.D. student in biosecurity management at Charles Darwin University, Australia, with funding from Cooperative Research Centre for National Plant Biosecurity. His interests include research activities related to the issues of law and public policy, especially on the areas of indigenous knowledge protection, biosecurity, and conflict resolution. He has conducted research activities in three provinces of Indonesia, namely Papua province, Papua Barat province and East Nusa Tenggara province. He also provided consultation for undergraduate student research regarding traditional knowledge and biosecurity in Moluccas province of Indonesia. Theo is a researcher with the Australian and Indonesian Community-based Management Systems project through the Cooperative Research Centre for National Plant Biosecurity.

Ni Gusti Agung Gede Eka Martiningsih was born in Tabanan and graduated with a Bachelor of Science in Agronomy Agriculture from the Bogor Agriculture Institute in 1985 and finished her Master of Science in Dry Field Cultivation at Udayana University in 2003. Currently, she works as a lecturer and as a researcher at the Women Study Centre in *Universitas Mahasaraswati*, Denpasar Bali. She is also a Ph.D. candidate in *Universitas Kristen Satya Wacana* Salatiga, Central Java. Eka is a researcher with the Australian and Indonesian Community-based Management Systems project through the Cooperative Research Centre for National Plant Biosecurity.

Helti Lygia Mampouw was born in Tomohon, North Sulawesi. She is currently a Lecturer in the Department of Mathematics Education at *Universitas Kristen Satya Wacana* (SWCU). Her field of expertise is econometrics and its application in other fields especially food security. She is the former head of Economics Department at the Faculty of Economics in SWCU. She is the Secretary of CEIS-SWCU. She did her undergraduate study on math education through the Math Education program of SWCU. She graduated from Bandung Technology Institute with her Masters Degree in Actuarial Science. Helti is a researcher with the Australian and Indonesian Community-based Management Systems project through the Cooperative Research Centre for National Plant Biosecurity.

I. Gusti Agung Sri Rwa Jayantini was born in Denpasar, and graduated with a Bachelor of Arts in English Language and Literature, from the Udayana University in 2000. She has completed a Master of Arts in Applied Linguistics majoring in translation studies at Udayana University. She is working as a Lecturer in Foreign

Language College Saraswati and *Universitas Mahasaraswati*, Denpasar, Bali. Indonesia. She has also provided several English-Indonesian and Indonesian-English translations, particularly for scientific papers. Sri is a researcher with the Australian and Indonesian Community-based Management Systems project through the Cooperative Research Centre for National Plant Biosecurity.

Remi L. Natonis was born in Kupang, graduated with a Bachelor of Science in Horticulture from *Universitas Nusa Cendana* in 2005 and is currently studying for his Master of Science also at *Universitas Nusa Cendana*. He is working as a researcher at the East Nusa Tenggara Agriculture Department (Dinas Pertanian Tanaman Pangan Provinsi Nusa Tenggara Timur). Remi is a researcher with the Australian and Indonesian Community-based Management Systems project through the Cooperative Research Centre for National Plant Biosecurity.

Profile of Eastern Indonesia

This profile has been developed to provide an overview of the region in which the Indonesian component of the research takes place. This information is not as readily obtainable in English language form as information on Northern Australia. Of particular interest are the final two columns where the existing languages and different ethnic groups are listed. There are 598 different languages listed below. Of these, 346 are still actively used, making this region one of the most ethnically and linguistically diverse in the world.

Profile of Eastern Indonesia

		Area	Municipalities & Regencies	Population
Nusa Tenggara Provinces (States)				
1.	Nusa Tenggara Barat[a, b]	20,153.15 km² (Wiki)	**2 municipalities and 9 regencies:** West Lombok, Central Lombok, East Lombok, Sumbawa, Dompu, Bima, West Sumbawa, **The Municipality of Mataram (Capital City)** & The Municipality of Bima (Wiki)	**Total:** 4,169,695 **Male:** 2,014,744 **Female:** 2,154,951 (2005)[c]
2.	Nusa Tenggara Timur[g,h]	48,718.10 km² (Wiki)	**1 municipality and 15 regencies:** RoteNdao, Kupang, South Timor Tengah, North Timor Tengah, Belu, Alor, East Flores, Lembata, Sikka, Ende, Ngada, Nagekeo, Manggarai, West Manggarai, East Manggarai, East Sumba, West Sumba, South West Sumba, Central Sumba & **The Municipality of Kupang (Capital City)** (Wiki)	**Total:** 4,243,182 **Male:** 2,125,959 **Female:** 2,117,223 (2005)[i]
Sulawesi Islands Provinces (States)				
1.	Gorontalo[j,k]	12,215 km² (Wiki)	**1 municipality and 5 regencies:** Boalemo, Bone Bolango, Gorontalo, North Gorontalo, Pohuwato & **The Municipality of Gorontalo (Capital City)** (Wiki)	**Total:** 920,015 **Male:** 463,073 **Female:** 456,942 (2005)[l]
2.	Sulawesi Barat[o,p]	16,796.19 km² (Wiki)	**5 regencies:** Majene, Mamasa, **Mamuju (Capital City)**, North Mamuju & Polewali Mandar (Wiki)	**Total:** 968,449 **Male:** 483,556 **Female:** 484,893 (2005)[q]
3.	Sulawesi Selatan[r,s]	62,482.54 km² (Wiki)	**3 municipalities and 21 regencies:** Barru, Bone, Bulukumba, Enrekang, Gowa, Jeneponto, Kepulauan Selayar, Luwu, East Luwu, North Luwu, Maros, Pangkajene dan Kepulauan, Pinrang, Sidenreng Rappang, Sinjai, Soppeng, Takalar, Tana Toraja, North Toraja, Wajo, **The Municipality of Makassar (Capital City)**, The Municipality of Palopo & The Municipality of Parepare (Wiki)	**Total:** 7,488,674 **Male:** 3,631,738 **Female:** 3,856,936 (2005)[t]
4.	Sulawesi Tengah[v,w]	68,089.83 km² (Wiki)	**1 municipality and 9 regencies:** Banggai, Banggai Kepulauan, Buol, Donggala, Morowali, Parigi Moutong, Poso, Tojo Una-Una, Toli-Toli, Sigi & **The Municipality of Palu (Capital City)** (Wiki)	**Total:** 2,290,969 **Male:** 1,174,656 **Female:** 1,116,313 (2005)[x]
5.	Sulawesi Tenggara[z,aa]	38,140 km² (Wiki)	**2 municipalities and 8 regencies:** Buton, Muna, Konawe, Kolaka, South Konawe, Wakatobi, Bombana, North Kolaka, **The Municipality of Kendari (Capital City)** & The Municipality of Bau-Bau (Wiki)	**Total:** 1,960,697 **Male:** 988,121 **Female:** 972,576 (2005)[ab]

Religion	Languages plus stillactive	Indigenous Ethnic Groups
Islam (95.06%), Protestant (0.25%), Catholic (0.23%), Hindu (3.21%), Buddha (1.24%) (2005)[d] Catholic (53.9%), Protestant (33.8%), Islam (8.8%), Others (3.5%) (Wiki)	**Indigenous Language (76 languages)[e]:** Abui, Adang, Adonara, Alor, Amarasi, Anakalanggu, Bilba, Bima, Blagar, Bunak, Dela/Oenale, Dengka. Dhao, Ende, Hamap, Helong, Ile Ape, Kabola, Kafoa, Kamang, Kambera, Kedang, Kelon, Kemak, Ke'o, Kepo', Kodi, Komodo, Kui, Kula, Lamaholot, Lamalera, Lamatuka, Lamboya, Lamma, Laora, South Lembata, West Lembata, Lefuka, Lewo Eleng, Lewotobi, Li'o, Lole, Kupang Malai, Larantuka Malai, Mamboru, Manggarai, Nage, Nasal, Nedebang, Ngad'a, Eastern Ngad'a, Palu'e, Portugis, Rajong, Rembong, Retta, Ringgou, Riung, Rongga, Sabu, Sasak, Sawila, Sikka, So'a, Sumbawa, Tereweng, Termanu, Tetun, Tewa, Tee, Uab Meto, Wae Rana, Wanukaka, Wejewa, Wersing **Still Active[f]:** Sasak, Sumba, Sumbawa, Tetun, Timor	Abui, Adang, Adonara, Alor, Amarasi, Anakalanggu, Bilba, Bima, Blagar, Bunak, Dela/Oenale, Dengka. Dhao, Ende, Hamap, Helong, Ile Ape, Kabola, Kafoa, Kamang, Kambera, Kedang, Kelon, Kemak, Ke'o, Kepo', Kodi, Komodo, Kui, Kula, Lamaholot, Lamalera, Lamatuka, Lamboya, Lamma, Laora, Lembata, Lefuka, Lewo Eleng, Lewotobi, Li'o, Lole, Kupang, Larantuka, Mamboru, Manggarai, Nage, Nasal, Nedebang, Ngad'a, Palu'e, Rajong, Rembong, Retta, Ringgou, Riung, Rongga, Sabu, Sasak, Sawila, Sikka, So'a, Sumbawa, Tereweng, Termanu, Tetun, Tewa, Tee, Uab Meto, Wae Rana, Wanukaka, Wejewa, Wersing
Islam (96.85%), Protestant (2.07%), Catholic (0.36%), Hindu (0.48%), Buddha (0.23%) (2005)[m] Islam (83.1%), Protestant (14.36%), Hindu (1.88%), Buddha (0.04%), Others (0.62%) (Wiki) Islam (88.54%), Protestant (7.21%), Catholic (2.53%), Hindu (1.29%), Buddha (0.41%) (2008)[u] Islam (63.64%), Protestant (27.47%), Catholic (2.62%), Hindu (4.35%), Buddha (1.92%) (2002)[y] Islam (95.27%), Protestant (1.82%), Catholic (0.83%), Hindu (1.99%), Buddha (0.09%) (2005)[ac]	**Indigenous Language (114 Languages)[n]:** Andio, Aralle-Tabulahan, Bada, Bahonsuai, Bajau, Balaesang, Balantak, Bambam, Banggai, Bantik, Baras, Batui, Behoa, Bentong, Binatauana, Boano, Bobongko, Bolango, Bonerate, Budong-budong, Bugis, Bungku, Buol, Busoa, Campalagian, Ciak-Ciak, Dakka, Dampelas, Dondo, Duri, Enrekang, Gorontalo, Kaidipang, Da'a Kaili, Ledo Kaili, Unde Kaili, Kain Bulawa, Kalao, Kalumpang, Kamaru, Kioko, Kodeoha, Coastal Konjo, Highland Konjo, Koroni, Kuli Susu, Kumbewaha, Laiyolo, Lasalimu, Lauje, Lemolang, Liabuku, Lindu, Lolak, Maiwa, Makasar, Makasar Malay, Manado Malay, Malimpung, Mamasa, Mamuju, Mandar, Moma, Mongondow, Mori Atas, Mori Bawah, Moronene, Muna, Napu, Padoe, Pamona, Panasuan, Pancana, Paennei, Pendau, Ponosakan, Rahembuu, Rampi, Ratahan, Saluan, Sangir, Sarudu, Sedoa, Seko Padang, Seko Tengah, Selayar, Suwawa, Tae', Taje, Tajlo, Talaud, Taloki, Talondo, Toala, Tolaki,Tomadino, Tombelala, Tombuku, Tomini, Tondano, Tonsawang, Tonsea, Tontemboan, Topoiyo, Toraja/Sa'dan, Totoli, Tukang Besi North, Ulumanda, Uma, Waru, Wawonii, Wolio, Wotu **Still Active:** Bungku Mori, Laki, Landawe, Mapute, Buol, Gorontalo, Kaidipan, Bulanga, Balantak, Banggai, Bobongko, Loinan, Bonerate, Putung, Kalaotoa, Karompa, Layolo, Walio, Bugis, Luwu, Makasar, Mandar, Pitu, Sak'dan, Salu, Seko, Uluna, Mongondow, Sangir, Talaud, Tambulu, Tombatu, Tompakewa, Tondano, Totembun, Tomini, Bada' Besona, Kailo, Leboni, Napu, Pipi Koro, Toraja, Wotu	Andio, Aralle-Tabulahan, Bada, Bahonsuai, Bajau, Balaesang, Balantak, Bambam, Banggai, Bantik, Baras, Batui, Behoa, Bentong, Binatauana, Boano, Bobongko, Bolango, Bonerate, Budong-budong, Bugis, Bungku, Buol, Busoa, Campalagian, Ciak-Ciak, Dakka, Dampelas, Dondo, Duri, Enrekang, Gorontalo, Kaidipang, Da'a Kaili, Ledo Kaili, Unde Kaili, Kain Bulawa, Kalao, Kalumpang, Kamaru, Kioko, Kodeoha, Coastal Konjo, Highland Konjo, Koroni, Kuli Susu, Kumbewaha, Laiyolo, Lasalimu, Lauje, Lemolang, Liabuku, Lindu, Lolak, Maiwa, Makasar, Manado, Malimpung, Mamasa, Mamuju, Mandar, Moma, Mongondow, Mori, Moronene, Muna, Napu, Padoe, Pamona, Panasuan, Pancana, Paennei, Pendau, Ponosakan, Rahembuu, Rampi, Ratahan, Saluan, Sangir, Sarudu, Sedoa, Seko, Selayar, Suwawa, Tae', Taje, Tajlo, Talaud, Taloki, Talondo, Toala, Tolaki,Tomadino, Tombelala, Tombuku, Tomini, Tondano, Tonsawang, Tonsea, Tontemboan, Topoiyo, Toraja/Sa'dan, Totoli, Tukang Besi, Ulumanda, Uma, Waru, Wawonii, Wolio, Wotu

(continued)

Profile of Eastern Indonesia (continued)

		Area	Municipalities & Regencies	Population
6.	Sulawesi Utara[ad,ae]	15,364.08 km² (Wiki)	**4 municipalities and 11 regencies:** Bolaang Mongondow, South Bolaang Mongondow, East Bolaang Mongondow, North Bolaang Mongondow, Kepulauan Sangihe, Kepulauan Siau Tagulandang Biaro, Kepulauan Talaud, Minahasa, South Minahasa, South East Minahasa, North Minahasa, The Municipality of Bitung, The Municipality of Kotamobagu, **The Municipality of Manado (Capital City)** & The City of Tomohon (Wiki)	**Total:** 2,121,017 **Male:** 1,080,528 **Female:** 1,040,489 (2005)[af]
Maluku Provinces (States)				
1.	Maluku[ag,ah]	705,645 km² (Wiki)	**2 municipalities and 9 regencies:** Buru, South Buru, Kepulauan Aru, South West Maluku, Central Maluku, South East Maluku, West South East Maluku, West Part of Seram East Part of Seram Bagian, **The Municipality of Ambon (Capital City)** & The Municipality of Tual (Wiki)	**Total:** 1,249,212 **Male:** 634,107 **Female:** 615,105 (2005)[ai]
2.	Maluku Utara[ak,al]	97.024,27 km² (Wiki)	**4 municipalities and 11 regencies:** West Halmahera, Central Halmahera, North Halmahera, South Halmahera, Kepulauan Sula, East Halmahera, Pulau Morotai, **The Municipality of Ternate (Capital City)** & The Municipality of Tidore Kepulauan (Wiki)	**Total:** 881,867 **Male:** 452,127 **Female:** 429,740 (2006)[am]
Greater Papua Provinces (States)				
1	Papua[an,ao]	309,934.4 km² (Wiki)	**1 municipality and 28 regencies:** Asmat, Biak Numfor, Boven Digoel, Deiyai, Dogiyai, Intan Jaya, Jayapura, Jayawijaya, Keerom, Kepulauan Yapen, Lanny Jaya, Mamberamo Raya, Central Mamberamo, Mappi, Merauke, Mimika, Nabire, Nduga, Paniai, Pegunungan Bintang, Puncak, Puncak Jaya, Sarmi, Supiori, Tolikara, Waropen, Yahukimo, Yalimo, **The Municipality of Jayapura (Capital City)** (Wiki)	**Total:** 1,844,519 **Male:** 978,612 **Female:** 865,907 (2005)[ap]

Religion	Languages plus stillactive	Indigenous Ethnic Groups
Protestant (65%), Islam (28.4%), Catholic (6%), Others (0.6%) (Wiki)		
Protestant (59.5), Islam (23.3), Catholic (14.7%), Others (0.7%) (Wiki) Islam (76.1%), Protestant (23.1%), Others (0.8%) (Wiki)	**Indigenous Language (132)**[aj]**:** Alune, Amahai, Ambelau, Aputai, Asilulu, North Babar, Southeast Babar, Banda, Barakai, Bati, Batuley, Benggoi, Boano, Bobot, Buli, Buru, Dai, East Damar, West Damar, Dawera-Daweloor, Dobel, Elpaputih, Emplawas, Fordata, Galela, Gamkonora, Gane, Gebe, Geser-Gorom, Gorap, Haruku, Hitu, Horuru, Hoti, Huaulu, Hukumina, Hulung, Ibu, Ili'uun, Imroing, Kadai, Kaibobo, Kamarian, Kao, Karey, Kayeli, Kei, Kisar, Koba, Kola, Kompane, Kur, Laba, Laha, Larike-Wakasihu, Latu, Leti, Liana-Seti, Lisabata-Nuniali, Lisela, Lola, Loloda, Lorang, Loun, Luang, Luhu, Maba, East Makian, West Makian, Ambonese Malay, Bacanese Malay, Banda Malay, North Moluccan Malay, Mangole, Manipa, Manombai, Manusela, Mariri, Central Masela, East Masela, West Masela, Masiwang, Modole, Moksela, Naka'ela, Nila, North Nuaulu, South Nuaulu, Nusa Laut, Oirata, Pagu, Palumata, Patani, Paulohi, Perai, Piru, Roma, Sahu, Salas, Saleman, Saparua, Sawai, Seit-Kaitetu, Selaru, Seluwasan, Sepa, Serili, Serua, Sula, Tabaru, Taliabu, Talur, East Tarangan, West Tarangan, Tela-Masbuar, Teluti, Teor, Ternate, Ternateño, Te'un, Tidore, Tobelo, Tugun, Tugutil, Tulehu, Ujir, Waioli, Watubela, North Wemale, South Wemale, Yalahatan, Yamdena **Still Active:** Alor, Ambelan, Aru, Banda, Belu, Buru, Geloli, Goram, Helo, Kadang, Ka'I, Kaisar, Kroe, Lain, Leti, Pantar, Roma, Rote, Solor, Tanibar, Tetun, Timor, Wetar	Alune, Amahai, Ambelau, Aputai, Asilulu, Babar, Banda, Barakai, Bati, Batuley, Benggoi, Boano, Bobot, Buli, Buru, Dai, Damar, Dawera-Daweloor, Dobel, Elpaputih, Emplawas, Fordata, Galela, Gamkonora, Gane, Gebe, Geser-Gorom, Gorap, Haruku, Hitu, Horuru, Hoti, Huaulu, Hukumina, Hulung, Ibu, Ili'uun, Imroing, Kadai, Kaibobo, Kamarian, Kao, Karey, Kayeli, Kei, Kisar, Koba, Kola, Kompane, Kur, Laba, Laha, Larike-Wakasihu, Latu, Leti, Liana-Seti, Lisabata-Nuniali, Lisela, Lola, Loloda, Lorang, Loun, Luang, Luhu, Maba, Makian, Mangole, Manipa, Manombai, Manusela, Mariri, Central Masela, East Masela, West Masela, Masiwang, Modole, Moksela, Naka'ela, Nila, Nuaulu, Nusa Laut, Oirata, Pagu, Palumata, Patani, Paulohi, Perai, Piru, Roma, Sahu, Salas, Saleman, Saparua, Sawai, Seit-Kaitetu, Selaru, Seluwasan, Sepa, Serili, Serua, Sula, Tabaru, Taliabu, Talur, Tarangan, Tarangan, Tela-Masbuar, Teluti, Teor, Ternate, Ternateño, Te'un, Tidore, Tobelo, Tugun, Tugutil, Tulehu, Ujir, Waioli, Watubela, Wemale, Yalahatan, Yamdena
Protestant (51.2%), Catholic (25.42%), Islam (23%), Buddha (0.13%), Hindu (0.25%), Others (1%) (Wiki)	**Indigenous Language and Still Active (276 Languages)**[aq]**:** Abinomn, Abun, Aghu, Airoran, Ambai, Anasi, Ansus, Anus, Arandai, Arguni, As, Casuarina Coast Asmat, Central Asmat, North Asmat, Yaosakor Asmat, Atohwaim, Auye, Awbono, Awera, Awyi, Asue Awyu, Central Awyu, Edera Awyu, Jair Awyu, North Awyu, South Awyu, Bagusa, Baham, Barapasi, Bauzi, Bayono, Bedoanas, Beneraf, Berik, Betaf, Biak, Biga, Biritai, Bonggo, Burate,	Abinomn, Abun, Aghu, Airoran, Ambai, Anasi, Ansus, Anus, Arandai, Arguni, As, Asmat, Atohwaim, Auye, Awbono, Awera, Awyi, Asue Awyu, Awyu, Bagusa, Baham, Barapasi, Bauzi, Bayono, Bedoanas, Beneraf, Berik, Betaf, Biak, Biga, Biritai, Bonggo, Burate, Burmeso, Burumakok, Buruwai, Busami, Citak, Tamnim, Dabe, Damal, Dani, Dao, Dem,

(continued)

Profile of Eastern Indonesia (continued)

		Area	Municipalities & Regencies	Population
2	West Papua[ar,as]	97,024.27 km² (Wiki)	**1 municipality and 11 regencies:** Fak-fak, Kaimana, **Manokwari (Capital City)**, Raja Ampat, Sorong, South Sorong, Bintuni Bay, Wondama Bay, The Municipality of Sorong (Wiki)	**Total:** 622,275 **Male:** 326,413 **Female:** 295,862 (2005)[at]

[a] http://www.ntb.go.id/
[b] http://id.wikipedia.org/wiki/Nusa_Tenggara_Barat
[c] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[d] http://sipd.bangda.depdagri.go.id/sipd/profil.php?kd_propinsi=74&kd_dati2=&kategori_id=7&param= 1&tahun=2005&act=add&form2=proses
[e] http://ethnologue.com/show_country.asp?name=idn
[f] http://saptawan.multiply.com/journal/item/45/daftar_bahasa_daerah_yang_masih_digunakan
[g] http://www.nttprov.go.id/

Religion	Languages plus stillactive	Indigenous Ethnic Groups
Christian (49.03%), Islam (41.5%), Catholic (9.13%), Hindu (0.15%), Buddha (0.09%), Kong Fu Chu (0.0009%), Others (0.07%) (2008)[au]	Burmeso, Burumakok, Buruwai, Busami, Citak, Citak, Tamnim, Dabe, Damal, Lower Grand Valley Dani, Mid Grand Valley Dani, Upper Grand Valley Dani, Western Dani, Dao, Dem, Demisa, Dera, Diebroud, Dineor, Diuwe, Doutai, Duriankere, Dusner, Duvle, Edopi, Eipomek, Ekari, Elseng, Emem, Eritai, Erokwanas, Fayu, Fedan, Foau, Gresi, Hatam, Hupla, Iau, Iha, Iha Based Pidgin, Irarutu, Iresim, Isirawa, Itik, Iwur, Jofotek-Bromnya, Kaburi, Kais, Kaiy, Kalabra, Kamberau, Kamoro, Bädi Kanum, Ngkâlmpw Kanum, Smärky Kanum, Sota Kanum, Kapauri, Kaptiau, Karas, Karon Dori, Kaure, Kauwera, Kawe, Kayagar, Kayupulau, Kehu, Keijar, Kemberano, Kembra, Kemtuik, Ketengban, Ketum, Kimaghima, Kimki, Kirikiri, Kofei, Kokoda, Kombai, Komyandaret, Konda, Koneraw, Kopkaka, Korowai, Korupun-Sela, Kosare, Kowiai, Kuri, Kurudu, Kwer, Kwerba, Kwerba Mamberamo, Kwesten, Kwinsu, Legenyem, Lepki, Liki, Maden, Mai Brat, Mairasi, Maklew, Papuan Malay, Mander, Mandobo Atas, Mandobo Bawah, Manem, Manikion, Mapia, Marau, Marind, Marind, Bian, Masimasi, Massep, Matbat, Mawes, Ma'ya, Mekwei, Meoswar, Mer, Meyah, Mlap, Mo, Moi, Molof, Mombum, Momina, Momuna, Moni, Mor, Mor, Moraid, Morori, Moskona, Mpur, Munggui, Murkim, North Muyu, South Muyu, Nafri, Nakai, Nalca, Namla, Narau, Ndom, Nduga, Ngalum, Nggem, Nimboran, Ninggerum, Nipsan, Nisa, Obokuitai, Onin, Onin Based Pidgin, Ormu, Orya, Papasena, Papuma, Pom, Puragi, Rasawa, Riantana, Roon, Samarokena, Saponi, Sauri, Sause, Saweru, Sawi, Seget, Sekar, Semimi, Sempan, Sentani, Serui-Laut, Sikaritai, Silimo, Skou, Sobei, Sowanda, Sowari, Suabo, Sunum, Tabla, Taikat, Tamagario, Tanahmerah, Tandia, Tangko, Tarpia, Tause, Tebi, Tefaro, Tehit, Tobati, Tofanma, Towei, Trimuris, Tunggare, Una, Uruangnirin, Usku, Viid, Vitou, Wabo, Waigeo, Walak, Wambon, Wandamen, Wanggom, Wano, Warembori, Wares, Waris, Waritai, Warkay-Bipim, Waropen, Wauyai, Woi, Wolani, Woria, Yahadian, Kosarek Yale, Angguruk Yali, Ninia Yali, Pass Valley Yali, Yaqay, Yarsun, Yaur, Yawa, Yei, Yelmek, Yeretuar, Yeretuar Bay, Yetfa, Yoke, Zorop	Demisa, Dera, Diebroud, Dineor, Diuwe, Doutai, Duriankere, Dusner, Duvle, Edopi, Eipomek, Ekari, Elseng, Emem, Eritai, Erokwanas, Fayu, Fedan, Foau, Gresi, Hatam, Hupla, Iau, Iha, Irarutu, Iresim, Isirawa, Itik, Iwur, Jofotek-Bromnya, Kaburi, Kais, Kaiy, Kalabra, Kamberau, Kamoro, Kanum, Kapauri, Kaptiau, Karas, Karon Dori, Kaure, Kauwera, Kawe, Kayagar, Kayupulau, Kehu, Keijar, Kemberano, Kembra, Kemtuik, Ketengban, Ketum, Kimaghima, Kimki, Kirikiri, Kofei, Kokoda, Kombai, Komyandaret, Konda, Koneraw, Kopkaka, Korowai, Korupun-Sela, Kosare, Kowiai, Kuri, Kurudu, Kwer, Kwerba, Kwerba Mamberamo, Kwesten, Kwinsu, Legenyem, Lepki, Liki, Maden, Mai Brat, Mairasi, Maklew, Mander, Mandobo, Manem, Manikion, Mapia, Marau, Marind, Bian, Masimasi, Massep, Matbat, Mawes, Ma'ya, Mekwei, Meoswar, Mer, Meyah, Mlap, Mo, Moi, Molof, Mombum, Momina, Momuna, Moni, Mor, Moraid, Morori, Moskona, Mpur, Munggui, Murkim, Muyu, Nafri, Nakai, Nalca, Namla, Narau, Ndom, Nduga, Ngalum, Nggem, Nimboran, Ninggerum, Nipsan, Nisa, Obokuitai, Onin, Ormu, Orya, Papasena, Papuma, Pom, Puragi, Rasawa, Riantana, Roon, Samarokena, Saponi, Sauri, Sause, Saweru, Sawi, Seget, Sekar, Semimi, Sempan, Sentani, Serui-Laut, Sikaritai, Silimo, Skou, Sobei, Sowanda, Sowari, Suabo, Sunum, Tabla, Taikat, Tamagario, Tanahmerah, Tandia, Tangko, Tarpia, Tause, Tebi, Tefaro, Tehit, Tobati, Tofanma, Towei, Trimuris, Tunggare, Una, Uruangnirin, Usku, Viid, Vitou, Wabo, Waigeo, Walak, Wambon, Wandamen, Wanggom, Wano, Warembori, Wares, Waris, Waritai, Warkay-Bipim, Waropen, Wauyai, Woi, Wolani, Woria, Yahadian, Kosarek Yale, Yali, Yaqay, Yarsun, Yaur, Yawa, Yei, Yelmek, Yeretuar, Yetfa, Yoke, Zorop

(continued)

Profile of Eastern Indonesia (continued)

[h] http://id.wikipedia.org/wiki/Nusa_Tenggara_Timur
[i] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[j] http://www.gorontaloprov.go.id/
[k] http://id.wikipedia.org/wiki/Gorontalo
[l] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[m] http://sipd.bangda.depdagri.go.id/sipd/profil.php?kd_propinsi=74&kd_dati2=&kategori_id=7&param= 1&tahun=2005&act=add&form2=proses
[n] http://ethnologue.com/show_country.asp?name=idn
[o] http://www.sulbar.com/
[p] http://id.wikipedia.org/wiki/Sulawesi_Barat
[q] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[r] http://www.sulsel.go.id/
[s] http://id.wikipedia.org/wiki/Sulawesi_Selatan
[t] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[u] Laporan Perkembangan Bidang Agama Dan Keagamaan Kantor Wilayah Departemen Agama Propinsi Sulawesi Selatan Tahun 2009, http://www.sulsel.depag.go.id/pengumuman/Laporan%20Keagamaan%20Kanwil.doc
[v] http://www.sulteng.go.id/
[w] http://id.wikipedia.org/wiki/Sulawesi_Tengah
[x] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[y] Laporan Penelitian Bisnis Militer di Poso Sulawesi Tengah, http://www.kontras.org/buku/Laporan_Poso.pdf
[z] http://www.sultra.go.id/
[aa] http://id.wikipedia.org/wiki/Sulawesi_Tenggara
[ab] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[ac] http://sipd.bangda.depdagri.go.id/sipd/profil.php?kd_propinsi=74&kd_dati2=&kategori_id=7&param= 1&tahun=2005&act=add&form2=proses
[ad] http://www.sulut.go.id/
[ae] http://id.wikipedia.org/wiki/Sulawesi_Utara
[af] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[ag] http://www.malukuprov.go.id/
[ah] http://id.wikipedia.org/wiki/Maluku
[ai] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[aj] http://ethnologue.com/show_country.asp?name=idn
[ak] http://www.malukuutaraprov.go.id/
[al] http://id.wikipedia.org/wiki/Maluku_Utara
[am] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[an] http://www.papua.go.id/
[ao] http://id.wikipedia.org/wiki/Papua
[ap] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[aq] http://ethnologue.com/show_country.asp?name=idn
[ar] http://www.papuabaratprov.go.id/
[as] http://id.wikipedia.org/wiki/Papua_Barat
[at] http://www.datastatistik-indonesia.com/component/option,com_tabel/task,/Itemid,165/
[au] Potret Bimas Islam Di Manokwari, http://www.bimasislam.depag.go.id/?mod=kabar&op=detail&id=3

Part I
Introduction

Chapter 1
Managing Plant Biosecurity Across Borders

Ian Falk and Ruth Wallace

In the rugged highlands outside a very small village in Indonesia's province of West Timor, a small-holder farmer and his family grow mixed crops, mainly citrus, to bring in their subsistence livelihood. The farmer is talking with us about a disease affecting his family's citrus trees. The family farm is located only two hundred kilometres from Australia's border, and a little over one hour's flight to Darwin, the nearest Australian city, which is a mere 820 km away. Putting that into other contexts, the farm is much closer to Australia than Indonesia's capital city, Jakarta, and the same distance as London is to Italy or Sydney is to Melbourne. The farmer is concerned about his failing citrus production. Each year, he explains, a particular disease takes its toll on the productivity of the crop, and each year his income falls as a result. The disease has a treatment supported by the authorities. Every year, the farmer treats his trees according to the authorized recommendations.

Unfortunately for everyone, the authorized treatment is not the right one for this particular disease. Even though many in the region know that the treatment is designed for a different disease, and is clearly not working, there are structural governance issues preventing the 'official recognition' of the correct disease. What's more, the 'real' disease is one of the major threats to citrus production in countries such as Australia, with geographical and trade borders. At stake for the authorities is a loss of central resources and control over them. At stake for bordering regions and countries is a major infestation of calamitous economic proportions. His trees are diseased and near worthless, the farmer is now casting around

I. Falk (✉)
Rural and Remote Education, Charles Darwin University, Darwin, Australia

Cooperative Research Centre for National Plant Biosecurity, Canberra, Australia
e-mail: Ian.Falk@cdu.edu.au

R. Wallace
Social Partnerships in Learning Research Consortium (SPIL), Charles Darwin University, Darwin, Australia
e-mail: Ruth.Wallace@cdu.edu.au

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_1,

for alternate cash crops such as strawberries, as soon the citrus trees will be gone or rot away.[1]

About the Book

Managing the risks that pests and diseases pose to plants of all kinds is a highly complex issue. Anomalies in incidence of pests and diseases arise naturally causing havoc, but in times of global warming, they are even more unpredictable in their types and range. Science is generally given the task by governments of keeping pace with new knowledge, and, for the most part, science does this task admirably. In the two countries this research has looked at, issues relating to gaps in the implementation of scientific approaches to biosecurity management that impact on community practices have been relatively unimportant. In the past, adoption of science as a solution to biosecurity threats without consideration of the whole social and environmental context, has sometimes been a problem (consider the experience related to the *Green Revolution* as explained later in this chapter. However, the impacts of people not or incorrectly adopting the science have been enormous. Given the fairly complete scientific knowledge of plant pests, diseases and patterns of distribution and activity, the concern of this book is to show how science can better impact at the community level where pests and diseases are both encountered and managed. In the sites for this research, these impacts manifest themselves in loss of traditional country (for Indigenous Australians and some Indonesian groups), in food scarcity and loss of income.

Practical concerns about what we have recently come to call biosecurity are not new. For millennia, generations have battled the impacts of plant pests and diseases. The plagues of locusts have marked but one such event in human history's span that was presumed to occur on a large scale. In the current era, our earth contains a great deal more people with many more mouths to feed. The issue of plant pests and diseases in many parts of the globe, including those less 'developed' zones included in this study, relates to people's everyday lives as one of securing their food supply or maintaining the traditional country that feeds and cares for people and has an important role in cultural, social and economic life. If you can do that through wise maintenance, observation, planting, reaping, storage and usage, you can pass on the country intact, eat at the next meal, and so can your children. For many, this means if you are lucky, there may be some left to sell, and so ensure a little income for the likes of clothing and education. In northern Australia land is central to Aboriginal people's lives Securing food supplies is also connected to securing the health of the traditional country, a tradition that is preserved in the local culture as a special relationship that brings generations and provides identity to every portion of the landscape including its people. This was also evident in other sites. So 'on the ground', in communities studied here, the term 'biosecurity' is simply old wine in

[1]Refer to Chap. 4 for the background and full description of this situation.

new bottles. It is a modern science name for basic concerns that people have had for millennia. But, as we will see, there is a new need and a new urgency that makes a political and public heightening of the term's awareness a vital matter.

The preceding paragraphs beg a question: if people have had to contend and manage their food and plant-related income throughout human history, what is it that makes old wine in new bottles such as 'biosecurity' important? One answer lies in the fact that biosecurity is a single and convenient term for a cluster of activities conducted for the course of our history. Whether 'biosecurity' is seen in food security terms, in economic terms, national terms or regional and community terms, it is equally appropriate. Another answer is that, in these times of rapid change, and intense pressure on population and resources, things are really different, and need to be dealt with in a new way. The pressure of populations and speed of transport and travel (of people, goods and diseases) puts pressure on borders. Borders between countries are more permeable these days, and trade and travel more often occur region-to-region, island to island, and where family to family trade still occurs, across all sorts of borders.

Having identified a number of gaps, including that posed by, on the one hand, good science knowledge, and the other, poor uptake of this science, this book asks the deceptively simple question as to how science knowledge can be better implemented to respond to contemporary conditions of faster transmission of pests and diseases? This research has, in fact, not been accomplished before on the scale reported in this book as far as we can determine. In stepping into other people's lives, asking about their agricultural and related social practices so as to understand their local knowledge of what *they* think and know about what we now call 'plant biosecurity', the researchers involved have found some interesting and important riddles related to the very meanings of terms, the way those concepts get translated in cultural practices, and how those cultural practices assist and resist so-called modern science knowledge. Of course, stepping into people's lives demands a different kind of research methodology, one which is non-threatening, inclusive and ethical yet achieves outcomes for both researchers and the participants themselves. For these reasons, a participative methodology was selected, and team members adopted the principles of participative research methodology whenever appropriate.

As the research plan rolled out (see later section this chapter *How the research is organised*) the team members encountered a bewildering variety of issues and topics that held potential for later use in managing biosecurity more effectively. These were issues such as hand-held technology (Chap. 11), the entrenched, cultured roles of gender in the labour markets (Chap. 9) and the crucial roles of existing local knowledge (Chaps. 3 and 6). The need for translation arose early on and continued throughout the project (Chap. 8) and a related need for a comprehensive glossary of terms (Chap. 7). Policy was of course known to be important, but the fact that it had so many manifestations, twists and turns proved new (Chaps. 2 and 4). The final aim of the research was to develop a strategy for managing biosecurity, and the achievement of this aim proved elusive as the preceding issues were exposed and discussed, but eventually the strategy took shape through a process of collective and participatory research methods and through developing ways of analyzing the data obtained from different data sets. So we have had to take a few steps back in this book and describe the sites and people in more comprehensive detail than at first we thought was required. And as a lead-into these various chapters, we will start with a discussion about how 'biosecurity' has come about.

The 'Rise and Rise' of Biosecurity

Biosecurity, the protection from the spread of harmful pests and diseases,[2] has become an important reality in times of the rapid spread of products, diseases and information across distances, and within and between nations. Episodic outbreaks of pandemics such as swine flu serve to bring the issue of biosecurity to global attention, especially as inter-country coordination of responses to such matters relies on enhanced cooperation and coordination. Other examples are the Influenza A virus epidemics of 2006 (avian influenza) and 2007 equine influenza, together with the swine flu pandemic of 2009. In the field of plant biosecurity there is the potential impact of the wheat stem rust strain Ug99 about which Nobel Laureate, Dr. Norman Borlaug said, "If we fail to contain Ug99 it could bring calamity to tens of millions of farmers and hundreds of millions of consumers". Risk management of plant and animal pests and diseases is enhanced if we can ameliorate the risks before incursions or outbreaks occur. Risk management involves a program of many strategies for different tasks. Such a program will minimize risk and impact to industry livelihoods, food security and ultimately national socio-economic well-being.

Australia's proximity to Southeast Asia, particularly Eastern Indonesia,[3] which lies along much of Australia's northern coastline, places strategic importance on Northern Australia in terms of plant biosecurity. The considerable traffic of people, goods and invasive species across the Australian-Indonesian borders is facilitated by trade, tourism, family connections, illegal fishing vessels, refugees, changing patterns of pathogens caused by eastern migration of communities and the impacts of climate change.[4] An example of plant biosecurity issues across Northern Australian and Indonesian borders is the invasive weed *Mimosa pigra* (Mimosa) which, while native to tropical America, has spread across large distances in both countries impacting on water access, reduction of biodiversity and pasture production or traditional land use. The case of mimosa is complex as it has successfully invaded difficult terrains in remote areas, has an aggressive nature and a slow response to biological control agents. Further complicating its management is that the control

[2]Refer also to 'Biosecurity: What is it?' (later section of this chapter), as well as Chap. 7 for the glossary development.

[3]The area of Indonesia from Bali eastwards up to the border between Papua New Guinea. Eastern Indonesia includes major islands of Lombok, Sumbawa, Sulawesi, Maluku, Flores, Sumba, the Greater Papua, West Timor and a range of equally important but smaller islands. See frontispiece map and information page preceding Chap. 1.

[4]http://www.savanna.org.au/all/biosecurity.html.

agents that are available need to increase their availability and coverage significantly to impact on its spread.[5] Other examples of biosecurity incursions include mosquito borne diseases such as dengue, malaria, Ross River virus and agricultural pests such as fruit fly and termites.

In Australia, issues concerning biosecurity and pre-border management are under the auspices of relevant federal authorities such as quarantine services. Local communities also have an essential role in biosecurity management, and their support is recognized as crucial to achieving success in managing plant biosecurity, which in turn is enabled by effective policy and governance structures. In recognition of these issues, The Australian Cooperative Research Centre for National Plant Biosecurity (CRC NPB Ltd.) commissioned a 5 year research project to investigate how a partnership between two countries could assist with managing border security. The areas that are our concern are shown in the map at the front of the book.

The research began with a pilot in 2006. A key achievement of the pilot stage was the development of a model focused on the role of local communities in the identification and management of harmful pests and diseases (Falk et al. 2008). In addition, the project attracted international interest from both research and government agencies including the Director General of Higher Education in the central Indonesian Government, who has since authorized resources and financial support to establish new post graduate training opportunities in the field of community management of biosecurity. During the latter phase of the first year of the project, international bodies such as agencies of the World Bank (e.g. SOfEI, BaKTI and the IFC) and of the Australian Government agencies (e.g. AusAid) have partnered with the CRC NPB in international forums and conferences, to the extent that a new entity has emerged, called the AusIndoBIOCOM network (www.AusIndoBIOCOM.net). AusIndoBIOCOM consists of partners from universities, government, semi-government instrumentalities and NGOs, research centers.

According to conventional knowledge, successful eradication of an exotic plant pest incursion depends to a great extent on early detection – the length of time between the initial incursion and its subsequent identification. Early detection is key to successful management. We wish to both acknowledge this fact and at the same time show how, while early detection is vital, by itself it is insufficient, as Chap. 4 particularly so clearly demonstrates. There are numerous other factors involved, from policy to farming practices. In the countries which share physical borders, local community participation is a key driver in the identification process, particularly as early detection and reporting are important strategies in reducing the time taken to identify an incursion and thereby minimising impacts. However, as we suggest here, early detection and reporting are only one part of a complex pattern of factors impacting on successful biosecurity management. As a result of the pilot project, more fundamental factors that are critical to risk amelioration and the presence of the risk in the first place emerged. These factors include policy (at all levels), governance structures, leadership issues, knowledge transfer across policy and

[5] http://www.weeds.gov.au/publications/brochures/pubs/success-m-pigra.pdf.

community structures and, as we will see, a host of ‘border’ issues. To come to grips with the possible role of these significant and different factors involved, the subsequent stages of the research were divided between research teams, each focusing on one or two important issues. Also built into the research design was a cross-cutting component, whereby the complete set of research data and findings were considered again by the group, and additional findings established. As time has passed, these factors have formed into a pattern that can be best made sense of by thinking of them as forming a comprehensive strategy for managing biosecurity across all kinds of physical and social borders. There will be further discussion on these matters later in the chapter. First, we have already touched on why biosecurity is so important, and next we will overview what the international bodies have already set in place by way of policy and programs, foreshadowing Chap. 2.

International Context for ‘Borders’

As Litaay (Chap. 2) notes, there are a number of international organizations that administer and promote international instruments on biosecurity. Most notably these include FAO (Food and Agriculture Organization) in the food and agricultural sectors, WHO (World Health Organization) in the health sector and UNEP (United Nations for Environmental Protection) in the environmental sector. There are other related instruments in the international arena, such as the International Plant Protection Convention (IPPC) part of the FAO, UN Convention on Biodiversity (UN-CBD), and international NGOs initiatives that affect the policy making process in international organizations.

Of high relevance to this work is the UN Convention on Biodiversity which provides some principles of engagement for policy sectors at all levels to work with local communities and their local knowledge in the biosecurity areas. In other words, the superficially clear words ‘Community Management’ are underlain by complexities related to Indigenous culture and languages. The depth and complexity of local knowledge is always an influence when policies such as those related to biosecurity become operative. In addition, Western science’s notions of what constitutes ‘knowledge’, ‘findings’ and even ‘science’ itself, do not necessarily mesh with the meanings of these terms across the different cultures we are concerned with here. So the central question for the book is: *What are effective strategies for managing biosecurity across borders?* In light of the preceding issues, this apparently simple question must account for a complex set of factors in its answering.

The book describes aspects of research that have developed from collaborative research efforts to develop new risk mitigation models that function across the borders of Australia and Indonesia in the field of plant biosecurity. Nine dimensions of managing biosecurity across international and domestic borders form the backbone of the various chapters all written by researchers in the project. These nine dimensions are: Governance, leadership, policy, gender, entrepreneurship or enterprise, knowledge transfer, local knowledge, institutional knowledge, and ecology.

Each chapter ends with the implications for international, national and local policy, along with the elements from that chapter that contribute towards a comprehensive strategy.

Working Across Knowledge Borders

Borders between countries are indeed important for managing biosecurity effectively, for a number of reasons. The simple geographic division between two countries signals politico-economic and socio-cultural differences that in many cases run deep. As it turns out, no one of these aspects – the political, economic, social or cultural – is more significant than the other in terms of managing biosecurity effectively. Our research and the ensuing practicalities of managing biosecurity conceive of borders as possessing many dimensions. That the research is concerned with borders between two independent countries with quite different histories and cultures is interesting and challenging enough in terms of managing biosecurity. However, other borders are equally as significant, within and across countries, in explaining how effective management can be implemented. In Australia, a border related to biosecurity is evident in the recognition of different types of expertise, or lack thereof, and the ways each of these groups represent, record, manage and communicate knowledge. Consider the ways knowledge about the best ways to address a particular disease is treated by the scientific community, government agencies, long time residents and land managers and Indigenous traditional owners.

In an example from the Eastern Indonesian part of the project, the question of gender roles in managing biosecurity is reported. From a Western observers' point of view, gender is most visible in the different roles men and women have in their respective cultures in managing agriculture and food supply chains. For example, women more often work in the rice paddies tending the seedlings and processing the ripened grain, while men more often till the fields, applying fertilizer and insecticides. However, while the 'problem' might be conceived as one of gender, we found that the causes of the problem lay in the communication *across the borders* of the two genders, as explained more fully in Chap. 9. Societal structures and daily social practices supported and reinforced practices did not provide opportunities for communication across the gender borders. The range of essential issues related to identifying and managing plant pests and diseases, so assisting address issues of food security and ultimately, it is hoped, poverty.

Three hundred kilometres away on the other side of the border between these two countries, a similar scenario plays itself out. As Wallace describes it (Chap. 6), in Northern Australia, community management of biosecurity is connected to the recognition and development of the Indigenous workforce across remote, regional and urban areas interested in land management and biosecurity. For Australian Indigenous people who have considerable knowledge of country and are keen to learn about Western perspectives of native and introduced species and diagnostic tools, plant biosecurity management is more than environmental management; it is also about managing agriculture and cultural heritage sites. It is related to economic, cultural and social sustainability and livelihoods. Biosecurity engagement work is about more than having a job or developing a workforce: it is also concerned with organising the business of land management; managing government contracts and personal finances; utilising a range of technologies to record and share knowledge; recognising existing knowledge; integrating training and learning on the job; and working with the cultural and political governance structures in a region and the relevant local, state or territory and federal governments.

The issue about borders is that our focus must be both on what happens on each side of the border, *and* on the interactions that happen *across* the border. When the multi-disciplinary and participatory research, upon which this book is based, began the focus was to be on the word ‘border’. The research team had formed a strong belief, to be elaborated through the years of the research that the key to successful management of biosecurity depends on maintaining the focus on the broad idea of border. Considerable pressures detract from this focus. It is important to retain a focus on the borders across countries and participation of groups of people rather than solely studying two countries or disciplines. It is also easy to only focus on issues, on policies, and even just on the role of communities in the management process. The underlying academic focus on the concept of border was maintained.

The tangible instantiations and the important implications arising from the focus on borders have, however, only emerged over time – the period of several years of the research reported here. What emerged quite clearly is that borders preventing effective management of biosecurity can also take other forms. One is the border between priority policy agendas across borders – where biosecurity has been interlinked with food security (in Indonesia) and caring for country (in large parts of Northern Australia). Our research also included the kind of border between new technology and the grassroots users (Chap. 11). Local community members, novices to Global Positioning System (GPS) enabled Personal Digital Assistant (PDA) hand-held technology, used a Geographic Information System (GIS) to develop a database showing location and spread of plant pests and diseases. In some regions the differences between religions is an impediment, preventing the flow of products and information between the two social systems – but even in saying this, we identify again the problem is not with the religions or their differences, but with the management of flow of material and information across the borders.

Indonesia and Australia’s geographical border is not really the main issue and a simplistic focus at this level misses the significance of other borders. Also that the framework elements, described later in this chapter are really the critical influences that can be applied anywhere. That is, we really are proposing a very real and profound shift in the way biosecurity management should be considered. In other words, we are attempting to present the case for the problems or weaknesses inherent in the current restrictive use of the term borders and to lay out the argument for a far more inclusive and far-reaching set of considerations related to biosecurity. It is in this light that the chapters following tackle the issues related to complex and often shifting borders. The final chapter (Chap. 12) pulls together the issue of multiple borders into a suggested set of mechanisms for considering the management of biosecurity.

In the example described at the start of this chapter, we demonstrated how citrus crops in West Timor are infected by a disease that is recognized by some, but not by others. The science is in place. The technology is in place. However, in all the cases of different borders noted in this section, the issue emerges as one of communication *across* the borders.

Participatory Ethos: Science Alone Is Necessary but Not Sufficient

Interventions in, and with, local communities are dependent on the adoption of local communities, agricultural, horticultural or environmental managers and policy makers of the impact of continuing with current behaviour and the value of making a change. Effective intervention design is based on being able to assess and have a sound understanding of individuals' and groups' willingness to act. Royce (Chap. 5) notes that behaviour change in relation to biosecurity is related to the acceptance by community members that the biosecurity issue is their problem too; that they have a vested interest in contributing to biosecurity management. Interventions then are a partnership between people with a common interest, for example managing pest invasions like *xanthium strumarium* (noongoora burr) or *bufo marinus* (cane toads), as they impact on everyone's lives. While growers, traditional owners, town residents, tourists and governments may have different reasons and approaches for participating in the pests' management, together they can contribute to an intervention. These partnerships are not necessarily easy to develop or support, they may be complex, resource poor, lack staff stability and reflect the divisions or inequalities in any society. These community management partnerships are underpinned by having an understanding of ways to build respect, trust and partnership that values and rewards all participants, as well as ways to operate effectively when these features are not present.

This book is constructed around a premise of partnerships related to border issues. Managing borders of any and all kinds is about the two (or more) partners in the border(s) participating in some way over the issues before them. The science relevant to solving the problems, even in remote areas, is often not the issue causing a biosecurity problem. The cure for the 'real' disease(s), cheap and efficient, is in many cases known. However, the instance described at the head of the chapter shows how managing plant pests and diseases requires another component – partnerships, and we have chosen participatory research to explore this element. Participatory research is a way of conducting research that involves the people who are stakeholders. 'Stakeholders' can include those who are interviewed, those who authorize the research at the regional and community level, and those who are likely to benefit in some way from it. Participatory research produces outcomes by promoting discussion and other forms of communication that works across many kinds of borders. The people involved come to appreciate the nature of the enquiry and to have vested interests in its outcomes. The most important outcome of this involvement is that they also come to see how and why change is necessary and it is not simply a case of another program or technology being imposed on them.

Participatory research also accounts for the 'lived lives' of all participants in the management of biosecurity. By this we mean that people do not live their lives in disciplinary or sectoral silos. The complexity of good social science research is multiplied by this fact – that research should never be just about analyzing one aspect or discipline of a set of social actions, because all social activity is integrated. In order to explain certain behaviors, we as researchers have a tendency to focus on one or two aspects (variables) that seem to be involved in some way. As a means of explanation, this is fine. However, as a way of guiding ethical change on the ground, it is insufficient, since one set of actions is influenced by many, many others which have not been the focus of the research. Environmental science and agricultural extension are a good example of putting things together across disciplines and perspectives to address a common issue of importance such as water management in a catchment or making change in the sugar cane industry.

Managing biosecurity, whether by the farmer we talked with in the highlands of West Timor, by a central policy bureaucrat, or by a local head of village, involves sets of actions that draw on and integrate all areas of knowledge simultaneously as people perform their everyday lives. Effective management of biosecurity is achieved through understanding the integrated knowledge management that occurs throughout the lived lives of those who are to be responsible for managing biosecurity. Participatory research promotes the integration of knowledge resources through participatory processes, and allows a comprehensive view of data. It also makes provision for a wide variety of analytic tools to make sense of the data.

We do not mean to portray a picture of an ideal world where all research and participants have been engaged throughout the process. We note that not all of our research has been conducted using participatory methods. The principles of participatory research have been the guiding ethos, and multi-site, multi-methods research have been applied as appropriate to the different focuses and questions in different sites at different times, as reported in individual chapters following.

Biosecurity: What Is It?

Our working definition of biosecurity to this point in the chapter has been protection from the spread of harmful pests and diseases. In Chap. 5, however, we see that definitions are only useful to a point. For the people affected by biosecurity matters in this community, meanings are differential. Different groups and people in the community understand the terms differently, or not at all. It raises questions such as, "who knows about the meaning of the terms?" Once explained, how do they explain it in their own knowledge frameworks? Who is it relevant for? How is it or is it not applied?

Issues of terminology are discussed in many of the chapters, especially in Chaps. 7 and 8 respectively. As Surata (Chap. 7) notes, in the early stages of the research, the Westerners in the team at least found a major surprise: there was no accepted equivalent term in *Bahasa Indonesia* for biosecurity. A web search in early 2006 found there were some uses in relation to Western projects on bird flu (three mentions) but that is all – nothing Indonesian. Investigations revealed that there were no such one-for-one translations of the term. This is not to say the *concept* was foreign to the language, just the terms. However, in the regions and communities, plant pests and diseases only had meaning in relation to a more plentiful and sustainable food and income stream. That is, in one of the world's poorest regions of Eastern Indonesia, it translated as a poverty issue. The World Bank, government and NGO bodies call the management of a food supply food security. So food security became one option. In Indonesia, the policy on 'biodiversity' was the nearest policy area to biosecurity.

Clearly at a country level, there was divergent and overlapping meanings, a situation echoed internationally, and 'officially', where we found approximately 12 definitions of biosecurity with various meanings. The Food and Agriculture Organization has three terms for biosecurity, from a narrow perspective in which biosecurity is protection from spread of disease agents (FAO 2003), to a very wide scope, namely protecting plants, animals, humans and the environment (FAO 2003, 2007). The majority of sources describe biosecurity as being the effort of protection from biological invasions, for example harmful organisms (Hall 2004), exotic pests and diseases (Deverson and Kennedy 2004), malicious use of pathogens (Science Magazine 2004), and infectious diseases (USDA 2008). New Zealand, as a country which has undertaken advanced work in biosecurity management defines biosecurity, for the context of their country (Biosecurity Council 2000).

Belize is a country which has built on the FAO approach to upgrade its whole-of-country legal framework for biosecurity.[6] In view of the above and of the project's emphasis on management as opposed to traditional science, we have adopted the United Nations' (UN) FAO (Food and Agriculture Organization) definition of biosecurity as a strategic and whole-of-jurisdiction policy issue. According to FAO:

> Biosecurity is a strategic and integrated approach that encompasses the policy and regulatory frameworks (including instruments and activities) that analyze and manage risks in the sectors of food safety, animal life and health and plant life and health, including associated environmental risks. Biosecurity covers food safety, zoonoses, animal and plant diseases and pests, the introduction and release of living modified organisms (LMOs) and their products (e.g. genetically modified organisms or GMOs), and the introduction and management of invasive alien species. Thus biosecurity is a holistic concept of direct relevance to the sustainability of agriculture, and wide-ranging aspects of public health and protection of the environment, including biological diversity. (p. 3)

Inherent, as well as explicit in this definition are the facets of management (policy, regulatory frameworks, risk analysis) that we need to attend to in the research, but that raises the issue of the nature of management in its community management context.

---

[6]See *Upgrading Belize's legal framework for biosecurity*. Retrieved 6 August 2009 from http://www.fao.org/capacitybuilding/good_practices.jsp.

Community Management and Governance: What Are They?

The terms community management and governance are very close in meaning. Originally, we took the term community management as the emphasis because it indicated a focus on the community level of managing biosecurity, particularly in the area of what we anticipated to be difficult, namely managing biosecurity across various borders in and between communities of different kinds. We already knew that community is variously defined, yet there is some work (e.g., Pariela 2008) that points to new directions for diverse and conflicted communities working in participation. Many of the definitions of community are discussed in the ensuing chapters, especially Royce's Chap. 5. In summary, community is a broad term, which we took to mean the collection of people and groups – formal and informal – living in a roughly similar location, the latter causing certain shared identities for the residents. Shared identities include those related to place, religion, child-rearing, work, social activities, sport and so on. This is not to neglect the importance of the other communities that place-based community members draw on and contribute to, such as producer groups, agricultural enterprise bodies, product organizations, internet networks of all kinds and many others. Indeed, this early focus on community came to highlight the difficulties associated with the term, and served to demonstrate that good community management was in many respects a question of good governance, when governance is defined as the equitable and effective management of the issues and affairs of people.

The World Bank (1991) defines governance as "… the manner in which power is exercised in the management of a country's economic and social resources for development." (p. *i*). The Worldwide Governance Indicators project of the World Bank (2006) refers to governance specifically as a process, and it is a:

> … process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies and the respect of citizens and the state of the institutions that govern economic and social interactions among them. (World Bank, p. 2006)

The project further divides indicators for good governance into the following five domains: peace and security, rule of law, human rights and participation, sustainable development, and human development. A range of countries, including Indonesia and Australia, have been assessed against these indicators for many years.

In fact it is difficult to distinguish any shades of meaning between the two terms 'community management' and 'governance', and the difference is, perhaps, just a matter of which aspect of 'effective management of biosecurity' one wishes to emphasize at any particular time. It is this very scope of the meanings of community and governance, along with the ambiguity and historically 'top-down' authoritarian, connotations of its companion term 'management' that led to the first part of the research. The task then was to establish a model of effective community management (which is essentially a governance issue) of biosecurity. The model subsequently developed showed two broad areas that need to be incorporated in any such model: *structures* and *processes*. In any community, there are certain governance *structures*, organizations, community groups and associations of various kinds. The pattern of occurrence of these, and the ways they worked together (or didn't) proved to be vital, but only so far as certain characteristic *processes* were also in place. In other words, an effective model of community management of biosecurity involves identifying the community structures and resources, identifying and working with the community to establish awareness and common problems, identify a common purpose, and then work through practical ways to implement the solutions.

Sometimes the term 'management' can be ill-fitting in a community context, where many react negatively to the idea that they, rather than the issue (biosecurity) are being 'managed'. The term often implies, as noted above, a more top-down and authoritarian approach in a context where we are only too aware that such approaches fail with adults who have valuable knowledge and minds of their own. In some cases it has connotations of patronization, underpinned by an assumption that 'we know better than you'. Long-lasting change to people's day-to-day behavior from top-down policy and program initiatives such as these is rarely achieved under such circumstances. Effective management is conceived here in terms of participating and facilitating through effective communication, the common purpose and needs related to agricultural products, focusing on the problem of biosecurity, and the possible shared solutions for action. It is also about working with the participants as local solutions to local issues and concerns are put into action. That is, effective management of biosecurity is about facilitating change in practices surrounding biosecurity through shared knowledge, understandings and resources. One such resource vital to effective change management is *willingness to act*, along with its corollary, *incentives to act*, and this highlights the role of motivation (Chap. 5) and enterprise (Chaps. 6 and 10). Interestingly, one of the incentives to act identified by Royce (Chap. 5) is the fact that the issue must be seen as relevant to *that* person in *those* circumstances. If this is not the case, incentive to change behavior is minimal. This aspect, underpinned by issues of individual and collective socio-politico-cultural identities, proves to be at the core of effective management, and the enabler is of course communication.

In summary to date, all indications are that solutions for effective management of biosecurity lie in the nature of communication of all kinds across borders of several kinds. Language is the key mediator of action across borders, no less important in mediating the potential solutions for our farmer (above) with the authorities about the 'correct' treatment for the citrus disease, than across linguistic borders within and across country borders. Eastern Indonesia alone has 342 distinct language and ethnic groups (Lewis 2009) representing nearly 50% of Indonesia's total diversity. Of further significance, Eastern Indonesia (Sulawesi, Nusa Tenggara, Maluku & Papua) contains 5% of the world's languages and cultures. Northern Australia has similar numbers and diversity. Translation is, therefore, a key issue in cross-border communication (Chap. 8), and translation takes formal and informal guises, not all of them immediately obvious.

At the 'cliff-face' of community discussions, translation is informally conducted to mediate different dialects and languages as a conversation progresses. It is in these discussions and translations that the meanings of terms come to be understood.

For example, biosecurity was an unknown term in Indonesia 3 years ago.[7] It was first understood in terms of existing national policy on biodiversity, and as securing the food supply – food security, as well as broadly being seen as poverty alleviation, since managing pests and diseases results in more and better quality food. Through the research, we now are better placed to formalize these meanings so they can be mutually understood and worked with across borders by all types of scientists, community members, NGOs, and policy personnel. In our research, this has emerged through the development first of bilingual publications[8] (see joint journals) then through the development of a bilingual glossary of 'Managing Biosecurity', reported on fully in Chap. 7.

How the Research Is Organized

The research has and will span many years and includes a large number of people and organizations. It is by necessity multi-disciplinary, multi-perspective, and has multiple stakeholders, both present and potential. An evaluative matrix was developed for checking progress, evaluating achievements and outcomes. The matrix captured the various dimensions of the research activities, emerging research results and also acted as an evaluative device for seeing what had been done and to what degree (Fig. 1.1, page following).

The book describes research designed to develop, then to trial aspects of a strategy to manage biosecurity effectively across the borders of the two countries of Australia and Indonesia in the field of plant biosecurity. On the left hand side of the matrix are the four geographic domains which mark out the governance responsibilities for the areas covered by the research, as well as being those domains which possess resources, physical, economic, human and social, which may be relevant to managing biosecurity. Across the top, there are nine potential dimensions of biosecurity management. The nine dimensions form the backbone of the various chapters, all written by researchers in the project. Each chapter adopts either direct or indirect strategies for addressing these dimensions, and implications for international, national and local policy are raised.

How the Book Is Organized

This opening chapter has put forth the case for a new thinking on biosecurity, which will be supported with detail in the individual chapters following and drawn together as a case for change in the final chapter. There are four sections in the book, as will be

[7] A Google search in 2007 revealed that the Indonesian term "*ketahanan hayati*" (introduced during the CRC NPBS Summit on 24–26 May 2007) did not return any relevant results, whereas "*biosekuriti*" was only referred to in combination with Avian influenza.

[8] Add ref to journals.

Research Emphasis Domain of Capacity & Impact (e.g. education, strategies, etc	Governance	Leadership	Policy	Gender	Enterprise & Entrepreneurship	Knowledge Transfer	Local Knowledge	Organisations	Ecological
National									
Regional									
Local									
Sub-Local									

Fig. 1.1 Matrix showing research dimensions (*columns*) and domains of capacity and impact (*rows*) which guided the research

seen in the Table of Contents. This introductory chapter explains the background, rationale and detail of the research enterprise overall, and the final chapter draws together the elements of the matrix together to compose a holistic strategy for biosecurity management.

Sandwiched between the introduction and conclusion are two discreet sections, each with five chapters. The first section, ‘Overarching issues’, deals with components of the research that are concerned with issues impacting at a whole-of-topic level. Chapters dealing with the international and respective national policy backdrop (Chap. 2), more specific issues of policy overall (Chap. 3) and governance questions in the context of top-down, bottom-up meshing of management issues (Chap. 4, Mudita). Chapter 5 discusses the intricacies of community sectors and how to engage those sectors towards a common purpose, and finally Chap. 6 on the role of social partnerships in inter-systemic activities directed towards biosecurity management.

The second suite of five chapters deals with individual issues contributing to effective biosecurity management, and is titled ‘Specific enablers’. Surata (Chap. 7) has led the team developing a bi-lingual glossary of biosecurity management and explains how effective communication is at the core of good management, while Chap. 8 extends the theme of communication in a chapter devoted to the all-important issues about translation itself. Chapter 10 shows the dimensions of enterprises and their role in biosecurity management and, we note, the potential role of competition between enterprises with possible purposeful introduction of threats, as is found to be the case in Chap. 4. The final Chap. 11 in this section concerns the role of technology, specifically M-learning.

Finally, Chap. 12 integrates and analyzes the significant parts of all the preceding chapters. This process involves especially the contribution each chapter makes to the research on the areas of the matrix that have been its focus, and sets out a way of looking at the complexities in an attempt to provide the beginnings of a holistic strategy for managing biosecurity.

The intent in presenting such a proposed strategy is to provide a starting point – a 'way in' if you like – for all stakeholders in the biosecurity endeavor – policy personnel at all levels of governance, planners and regional developers, non-government organizations, community groups and individuals, to realistically plan localized strategies that 'fit' national constraints and 'fit' the way people live their lives. Stephen Lansing (2006), in a book titled *Perfect Order: A study of Complexity in Bali* reports on multi-disciplinary analysis of several decades of research into the complexities of the social and economic organization of the Balinese irrigation system of rice paddies. He cautions about the limitations of a single analytic approach to solving complex problems where the entire social order is implicated in potential solutions (Lansing 2006, p. 6). We must ensure that we consider the value of all disciplines and cultural perspectives on a problem that is fundamentally a multidisciplinary and global issue. We hope that the following chapters not only show the value of using multiple lenses to secure different perspectives on the same situation, but put the pieces back together in a proposed holistic strategy for managing biosecurity.

Acknowledgement The authors wish to acknowledge the full author team for their editorial input into this chapter. Valuable advice and feedback was also received on this chapter from Dr. David Eagling, Research Leader of the CRC National Plant Biosecurity, and Mr Petra Karetji SPd, Member of Board of Trustees, BaKTI Foundation, Makassar.

References

Council, B. (2000). *Towards a biosecurity strategy for New Zealand*. Wellington: Biosecurity Council.

Deverson, T., & Kennedy, G. (Eds). (2004). *The New Zealand oxford dictionary (2008)*. Retrieved September 1, 2008, from 2008 http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t186.e5443

Falk, I., et al. (2008). Community management of biosecurity: Overview of some Indonesian studies. *Kritis-Learning Communities*, *Special Co-publication*, 1–40.

FAO. (2003). *Biosecurity for highly pathogenic avian influenza* (Issues & options). Retrieved November 3, 2008, from http://www.fao.org/biosecurity

FAO. (2007). *Biosecurity toolkit*. Retrieved August 26, 2009, from www.fao.org/docrep/010/a1140e/a1140e00.htm

Hall, C. M. (2004). *Biosecurity: A significance issue for wine tourism*. Retrieved September 28, 2008, from http://eprints.otago.ac.nz/155/1/Hall%20CAUTHE%20full.pdf

Lansing, S. (2006). *Perfect order*. Princeton: Princeton University Press.

Lewis, M. P. (Ed.). (2009). *Ethnologue: Languages of the World* (16th ed.). Dallas: SIL International.

Pariela, T. D. (2008). Social capital as the basis of biosecurity management systems. *Kritis-Learning Communities*, *Special Co-publication*, 197–205.

Science Magazine. (2004). *A guide to online biotech and medical dictionaries and glossaries here (focusing on genetics and genomics)*. Retrieved May 20, 2009, from http://www.sciencemag.org/feature/plus/sfg/education/glossaries.shtml

USDA. (2008). *Avian influenza glossary terms*. Retrieved November 30, 2008, from http://avg.urlseek.vmn.net/search.php?lg=en&mkt=en&type=dns&tb=ie&tbn=avg&q=www%2Eusda%2Egov

World Bank. (1991). *Managing development – The governance dimension*. Retrieved August 26, 2009, from http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2006/03/07/000090341_20060307104630/Rendered/PDF/34899.pdf

World Bank. (2006). *A decade of measuring quality governance*. Retrieved August 26, 2009, from http://siteresources.worldbank.org/INTWBIGOVANTCOR/Resources/1740479-1150402582357/2661829-1158008871017/booklet_decade_of_measuring_governance.pdf

Part II
Overarching Issues

Chapter 2
Policy and Legal Framework for Managing Biosecurity

Theofransus Litaay

Introduction

The United Nations (UN) FAO (Food and Agriculture Organization) sees biosecurity as a strategic and whole-of-jurisdiction domain. For them, biosecurity is:

> … a strategic and integrated approach that encompasses a policy and regulatory framework for analyzing and managing relevant risks to human, animal and plant life and health, and associated risks to the environment. (FAO 2008, p. 6)

Biosecurity is not a new concept because according to the FAO:

> National programs are already in place to prevent, control and manage sectoral risks to life and health (food safety, animal health, plant health, protection of environment, etc.) [but these programs may lack] … a cross-cutting and strategic approach that takes advantage of linkages and synergies across sectors. (FAO 2008, p.7)

FAO's biosecurity toolkit – as a capacity assessment kit – explains that the biosecurity capacity of any country encompasses many aspects, such as:

1. Policies;
2. Legislation – laws and regulations;
3. Organizational arrangements;
4. Communication and information exchange;
5. Sector organizations with the capability to deliver core biosecurity functions (e.g. inspection, diagnostic services, quarantine, and others.).

In addition, FAO notes that there are two possible approaches to managing biosecurity: integrated or traditional. A traditional approach is the old and sector-oriented

T. Litaay (✉)
Faculty of Law, Satya Wacana Christian University (SWCU), Salatiga, Central Java, Indonesia
e-mail: theolitaay@gmail.com

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_2,

approach, while an integrated approach is a novel approach that makes use of crosscutting biosecurity capacity (FAO 2008, p. 4, 7). Biosecurity capacity is:

> … the ability of relevant organizations to perform functions effectively, efficiently and sustainably in order to: protect human, animal and plant life and health; and, protect associated aspects of the environment and contribute to its sustainable use. (FAO 2008, p. 11)

While these general elements of capacity apply to any country, the research reported here is concerned with Indonesia, which has some specific issues as discussed later in the chapter.

This chapter will also consider how international, national, and local policy frameworks can engage with local knowledge to create a new development paradigm. This is examined in detail through two key questions:

- How can the international instruments of biosecurity be utilized for the benefits of Indonesian development?
- How can traditional culture and wisdom be protected and developed to fill the gap in national biosecurity policy?

In the context of existing international and national policy affecting biosecurity, the research reported here sets out to examine the effectiveness and subsequent implications of the state of biosecurity policy in Indonesia. The chapter examines the problematic background policy issues (regarding development and biosecurity management), issues related to incorporating local knowledge in policy making and a discussion of the relationship between public policy, local knowledge and biosecurity policy. Finally this chapter argues that the interplay of those three concepts influences biosecurity management in Indonesia.

Problematic Background

The world has become 'smaller', as noted earlier, and borders between states are no longer seen as a separator but more as the boundary between the identities of group in order to communicate with people from another group (country). Meanwhile, information and communication technology has brought people closer to each other. Thomas Friedman (2006) has noted this advancement in *The World is Flat*, describing the ten elements (Friedman calls them 'flatteners') that have changed the way people communicate and connect across distance. Prior to Friedman's work, Kenichi Ohmae (1999) envisioned "The Borderless World". In Ohmae's writing, this world is driven by the power of an economic triad (comprised of United States, Europe, and Japan) combined with smaller but aggressive economics. Perhaps China and India are in line to be the next economic powers in place of Europe and Japan. The balance between these powers makes for an inter-linked-economy. Ohmae implies that continents and distances have shrunk.

At the same time, advancement in transportation technology has resulted in more people moving between regions. The number of people who move regionally has also increased due to purchasing power driven by the rise of economic welfare.

The pressure has also increased for anti-protectionism measures created by open markets, and for the free trade system to operate under the World Trade Organization (WTO). This movement of people brings along with it not only positive results such as passengers and goods and services, but also negative consequences such as pests and diseases. The problems arising from the movement of pests and diseases has built a new emerging solidarity in the international sphere to tackle the issues. The need for common action and solidarity rests in the hands of national policy-makers, at least initially. However, the policies are designed for implementation at regional and local levels, so the whole community must be involved if policies are expected to be implemented successfully.

The regional and local levels of societies took centre stage in the international arena when the United Nation's Convention on Biological Diversity (UN-CBD or CBD) was signed. UN-CBD provides a number of principles for policy-making engagement at all levels in relation to local community and their local knowledge in relation to biological diversity. Those principles are, among others:

- Prior informed consent (PIC);
- Equitable sharing of benefits;
- Access and benefit-sharing (ABS) system.

Local communities have their own traditions and knowledge that is available to bring added value and economic benefit to biosecurity management. However in a global economy, with foreign direct investment as the economic growth driving force, local knowledge will not be able to provide added value for local communities without support from the policy and regulatory systems that protect local communities and their knowledge. Local knowledge, furthermore, is able to fill the gap left where the State's role finishes, or simply does not perform its functions. Part of this research is the assessment of the underlying factors that hamper opportunities for holders of local knowledge to benefit from technological advances in development. The latter situation seems to be a product of the old, top-down development paradigm. In this chapter, biosecurity is used as the case for using a policies' framework, through which a new development paradigm might emerge, one that recognizes the potential of local knowledge, evaluates it and uses it in a consultative and participatory manner. First I define the terms public policy and local knowledge.

The idea of a policy framework is conceived as part of a public policy process. Public policy encompasses the matters "which deal with the ordering of public life" (Neuhaus 1977, p. 7). Policy making is a process carried out by government authorities to decide on general courses of action for the common interest and the common good (Agustino 2006, p. 35, translation by author). Neuhaus explains that public policy deals with public issues which are subject to the political process. According to Easton, public policy concerns the impact of government activity (1965, p. 212). Lester and Stewart (2000, p.18) wrote that public policy is: "… a process or a series or pattern of governmental activities or decisions that are design to remedy some public problem, either real or imagined".

Nugroho (2009, p.85) finds that public policy is a: "… decision made by the state, especially the government, as the strategy to realizing the country's objectives" (translated by chapter author). According to Nugroho, public policy is more about strategic facts rather than political or technical facts. This is different from Mariana's position (Agustino 2006, p. vii) that public policy is the output of the work of a political system. To arrive at a final policy product, policy-makers will decide whether to agree, to alter, or to refuse the options or the alternatives of the available policies (Agustino, p. 140).

Local knowledge is the collective experiences and practices that guide decisions at the local and practical level about courses of action in managing community issues. Local knowledge is essential in decision making processes. It also exists in traditional law and practices that govern knowledge use. Kelkar (2007) quotes several definitions of local knowledge, among others:

> Knowledge is local in the sense that it is derived from the direct experience of a labor process which is itself shaped and delimited by the distinctive characteristics of a particular place with a unique social and physical environment. (Kelkar 2007, p. 296)

and

> Indigenous knowledge systems, relative to agriculture, are bodies of knowledge that develop as a certain cultural or ethnic group strives to meet subsistence goals in a particular ecological setting. (Kelkar 2007, p. 296)

Local knowledge, according to Gerke and Evers (2006, p. 5) is "shared by a community of practice or is locally available or shared".

The research reported here covers a wide range of key concepts related to a policy framework from international, national, and local levels that engage with local knowledge to create the case for a new development paradigm. The concepts consist of policy, local knowledge, development and biosecurity management and operate in an environment where international trade policy and bodies play important roles in relation to economic development and therefore biosecurity policy.

Biosecurity Policy

International Law and Policies on Biosecurity

There are a number of international organizations that administer and promote international instruments on biosecurity. Most notable are the International Plant Protection Convention (IPPC) for plant biosecurity, OIE (World Organisation for Animal Health) for animal biosecurity, and Codex Alimentarius for food safety. Those three provide policy framework and serve as international legislation standards for their respective issue.

In the context of plant biosecurity, IPPC is the international convention administered by the Food and Agriculture Organization (FAO) as one of the specialized agencies of the United Nations. IPPC is the international plant health agreement, established in 1952. The aims of the convention are to protect cultivated and wild plants by preventing the introduction and spread of pests.

The purpose of the Convention according to Article I paragraph 1 of IPPC is:

> … securing common and effective action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control, the contracting parties undertake to adopt the legislative, technical and administrative measures specified in this Convention and in supplementary agreements …

It is the matter of 'common and effective action' that this research addresses, since the word 'common' implicates different spheres of involvement on the part of different parties, at all levels of governance, not just national.

At the regional level of governance, there is Regional Plant Protection Organizations (RPPO) which function is the coordinating body for National Plant Protection Organizations (NPPOs) on regional level. According to IPPC secretariat, there are currently nine RPPOs as of 30 November 2009. There is no obligation for the contracting parties to be a member of RPPO and there is no obligation for the RPPO members to be contracting parties to the IPPC. According to IPPC secretariat, some IPPC contracting parties belong to more than one RPPO.

Other United Nations' specialized agencies that encompasses biosecurity issues are the World Health Organization (WHO) in the health sector and the United Nations for Environmental Protection (UNEP) in the environmental sector. There are other related instruments in the international arena, such as the UN Convention on Biodiversity (UN-CBD), and international NGOs' initiatives that affect the policy making process in international organizations. After the World Trade Organization (WTO) was established, it also referred to the IPPC agreements and decisions in its policies, especially through the Sanitary and Phytosanitary agreement (SPS agreement).

As biosecurity policy will affect the economic activities of a country and its international trade, WTO member states are required to observe related provisions, especially international agreements and requirements related to the rules of international trade. One such agreement is the Sanitary and Phytosanitary agreement (SPS agreement). The SPS Agreement is related to the implementation of regulations that deal with issues of phytosanitary, food safety and animal sanitation. The Australian Import Risk Analysis (IRA) Handbook 2007 explains:

> Annex A of the SPS Agreement defines the concept of an appropriate level of protection (ALOP) as the level of protection deemed appropriate by a WTO Member establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory. (Department of Agriculture, Fisheries, and Forestry 2007, p. 8)

It is important also to note that the Codex alimentarius is the global standard for food safety as does the SPS Agreement. According to FAO-WTO:

> Codex standards have become the benchmarks against which national food measures and regulations are evaluated within the legal parameters of the Uruguay Round Agreements. (FAO-WTO 2005, p. iv)

Those regulations guarantee that the consumed food is:

> …safe, while at the same time, states that WTO member will not utilize the regulations as a trade barrier. This is the reason the biosecurity policy of member states needs to observe another agreement of WTO's, which is the Technical Barrier to Trade Agreement or TBT Agreement. (Untung 2007, p. 21)

Based on the SPS Agreement, member states are entitled to take the necessary steps to ensure that the foods are safe for the consumer and to prevent the invasion of pests and diseases from food and animals. Sanitary and phytosanitary regulations require that food originates from disease-free areas, product inspections, limitations on allowed pesticide amounts or other additive substances in food as listed on the WTO website.

National Level Policies

Biosecurity policymaking at the national level is usually intended or established to answer five threats against plant and animal (and also human and marine) health as follows:

- Quarantine pests and diseases;
- Invasive Alien Species (IAS);
- Bioterrorism;
- Genetically Modified Organisms (GMOs) or Living Modified Organisms (LMOs);
- Smuggling of Genetic Resources (Iwantoro 2007, p. 3).

Key national policies in Indonesia are now reviewed. National regulatory frameworks in Indonesia are part of international legislation and standards. For example, to implement the SPS Agreement, there are three groups to implement the agreement:

- Sanitary (Animal and Animal products), the legislation for this sector is in Law No. 16/1992 on Plant, Fish and Animal Quarantine. To implement this law, the government issued Government Regulation No. 82 / 2000 on Animal Quarantine and other Minister of Agriculture's decrees. The provisions in this field are administered by Badan Karantina Pertanian Indonesia (BARANTAN) which is the Agriculture Quarantine Agency of Indonesia (especially the Centre of Plant Quarantine) and the Plant Protection Commission (KPT, *Komisi Perlindungan Tanaman*);
- Phytosanitary (Plant and Plant products), legislation for this sector is also in Law No. 16/1992 on Plant, Fish and Animal Quarantine but also relate to Law No. 12/1992 on Agriculture Cultivation System. To implement the Law No 16/1992, the government issued the Government Regulation No. 14/2002 on Plant Quarantine and other decrees by the Minister of Agriculture. Related institutions to implement the set of regulations in this sub-sector are *Barantan* (especially the Centre of Animal Quarantine) and the General Directorate of Livestock of the Minister of Agriculture;
- Codex Alimentarius (Food safety), legislation in this field is the Law No. 7/1996 on Food. The government implements this law further on by the Government Regulation No. 69/1999 on Food Labels and Advertisement and Government Regulation No. 28/2004 on Food Safety, Quality, and Nutrient. The Minister of Agriculture (MoA) is in the process of providing technical provisions

through several ministerial decrees, such as MoA decree on Food Safety Import Certification and Inspection at Entry Points, and MoA decree on Food Safety Export Certification and Inspection at Exit Points (Iwantoro 2006, p. 22). Tho last two provisions are going through notification procedures to the WTO Secretariat (Interview, Suharto, 2009). The implementation of the related policies is conducted through several institutions including the *Barantan* (the Centre of Information and Biosafety), the Food and Medicine Protection Body (BPOM), and the Council of Food Security (*Dewan Ketahanan Pangan*). (Iwantoro 2006, p. 6)

Besides the policies listed above, there are biosecurity-related policies in the agricultural area that are enacted and implemented. These are found in the following laws:

- Law No. 12/1992 on Agriculture Cultivation System. This law provides an agriculture policy framework. Government Regulation No. 6/1996 on Plant Protection followed this law;
- Law No. 16/1992 on Plant, Fish, and Animal Quarantine. The law provides a legal basis for quarantine policies. The law was an implementation of the International Plant Protection Convention (IPPC). According to Article 3 of the law, the purposes of Animal, Fish, and Plant Quarantine are: To prevent incoming pests and diseases from entering into Indonesian territory or within Indonesian provinces as mandated by Indonesian law and those of destination countries. (Law No. 16/1992 on Plant, Fish, and Animal Quarantine, Article 3)

Based on the law, quarantine measures are conducted in stages as follows (translation by the author): (a) checking (*pemeriksaan*); (b) isolation (*pengasingan*); (c) surveillance (*pengamatan*); (d) treatment (*perlakuan*); (e) custody (*penahanan*); (f) rejection (*penolakan*); (g) eradication (*pemusnahan*); and (h) release (*pembebasan*). The law also provides investigation procedures and criminalization articles for offenders of the law. The enactment of this law also ended the provisions of 14 biosecurity-related ordinances from the Dutch-colonial era. Another issue covered by this law is Invasive Alien Species (IAS). Law No. 16/1992 was followed by Government Regulation No. 14/2002 on Plant Quarantine.

On the issue of food safety, the following policies are enacted and implemented:

> Law No. 7/1996 on Food provides a national policy for food safety. This law prohibits the distribution of any food containing poisonous or hazardous material. The law also prohibits the distribution of polluted food (biologically, physically, and chemically) over the allowed maximum level. (Interview, 2008; Untung 2007, p. 22)

Related to this issue, the government enacted Government Regulation on Food Safety, Quality, and Nutrition (Government Regulation No. 28/2004). There is more than one body in the Agriculture Ministry itself that handles food safety issues. Among others are the Agriculture Quarantine Agency of Indonesia, Food Security Body, Directorate of Quality and Standardization, and all the Directorates of the related-commodities. This situation itself creates a coordination problem. Competing interests among and within agencies has the potential to result in stagnation in policy-making. A breakthrough in reorganizing the decision making processes is indicated, as interview data from this research also supports.

Genetically Modified Organism (GMO) Products

Related to the food safety and biotechnology issues are genetically modified organism (GMO) products. Relevant national policies for cross border GMO products are:

- Law No. 5/1994 on the Ratification of the UN Convention on Biodiversity;
- Law No. 21/2004 on the Ratification of Cartagena Protocol or Cartagena Protocol on Biosafety on the Convention on Biological Diversity;
- Government Regulation No. 21/2005 on Biosafety of GMO products. (Untung 2007, p. 24)

Challenges for Indonesian Biosecurity Policymaking

In Untung's view (2008), there are at least five existing challenges that Indonesia needs to address. These are the small number of field officers compared to the vast Indonesian territory to cover; the quality of human resources; small number and quality of the quarantine laboratories; and the lack of awareness of biosecurity issues by stakeholders (especially producers and consumers of agricultural products) due to uncoordinated relationships between sector and sub-sector at the central and regional offices. At a regional level, sector-centric governance structures also create difficulties for building cooperation inter-departmentally and inter-governmentally. Untung (2007, p. 26) mentions other challenges, namely: weak political support for the Biosecurity Program; a sector-centric approach in government bureaucracies; a discipline-centric approach in agricultural research centres; the absence of one coordinating body that holds national authority to handle biosecurity issues; lack of detailed and integrated regulations; lack of infrastructure including laboratory facilities; limited human resources with sufficient knowledge and skills in biosecurity issues and technology; and, limited support and awareness from the stakeholders on the importance of biosecurity.

These challenges provide justification for considering the benefits of a new development paradigm for Indonesia, one that integrates policy and strategy from government to grassroots' communities. Such an integrated development paradigm would bring together issues of biosecurity with biodiversity, food security and the various food and border protection issues. Clearly, there are various challenges at the national level that could hamper the implementation of sound policies and related strategies. Challenges include understanding the role that local knowledge and local communities play in policy making. This is even more important in an environment where, in both northern Australia and Indonesia, the majority of local communities are represented by a diversity of cultures characterized by diverse local and Indigenous knowledge systems. This is discussed later in this chapter.

Comparison to the National Policy in Australia

For countries that rely heavily on their agricultural industries such as Australia, biosecurity is clearly more than a policy priority, it is a strategic imperative. Biosecurity has become a way of thinking and a way of conduct among agriculture stakeholders. There are two levels of biosecurity policies in Australia, each of which influences the other while at the same time working independently. Those levels of policy are the Federal-level policy and the State-level policy. While the Federal policy maker deals with their counterpart at the international and border control level, the State policy will handle biosecurity issues inside regional boundaries.

At the Federal level, there are at least four offices that tackle biosecurity affairs: Australian Quarantine and Inspection Service (AQIS), Biosecurity Australia (BA), the Product Integrity, Animal and Plant Health (PIAPH) division and the Quarantine and Biosecurity Policy Unit. On 1 July 2009, a new policy regarding the internal structure of the Australian Department of Agriculture, Fisheries and Forestry (DAFF) was established, which relates to biosecurity management (DAFF 2009). Those four divisions were grouped into a newly named Biosecurity Service Group. According to DAFF, this new group integrates the functions and responsibilities of each of the respective divisions. This is in line with FAO's recommendation for an integrated biosecurity approach. It is hoped that the new structure:

> …reinforces a national approach, encompasses the biosecurity continuum (pre-border, border and post-border functions), simplifies internal and external communication and enhances responsiveness under risk return approach. (DAFF 2010, Para 2)

The above reform was also part of client service development. The new structure, according to DAFF:

> … will better support consistent service delivery along the biosecurity continuum (pre-border, border and post border), providing effective biosecurity risk management underpinned by sound science and policy, efficient and responsive operations and strong client relationship. (DAFF 2010, Para 5)

Notably, service delivery is clearly defined as a combination of sound science and policy, another trait of an integrated approach.

The background for these reforms stems from the result of an independent review of Australia's quarantine and biosecurity arrangement in 2008. For any country, the biosecurity system plays an important role in helping to guarantee the competitiveness of farming, fishing and associated industries. As a result, in 2008 the government commissioned an independent review into quarantine and biosecurity:

> … to ensure that the strongest possible quarantine and biosecurity arrangements underpin Australia's favourable animal and plant health status. (DAFF 2009, p. 1)

The Federal Government not only followed up with the above-mentioned restructure, but also provided new legislation, new related supervisory functions and new approaches to quarantine and biosecurity (DAFF 2009). The review also reinforces the partnership arrangement of the Federal government with the states, territories, industry and the community (Grant 2009). With the new approach, Beale sees a broadening of the concept of biosecurity by emphasizing "…managed risk, not zero risk, and from a border preoccupation to encompass fully pre-border and post-border measures" (Beale, p. IX), and "…from barrier prevention to border management, from 'no, unless …' to 'yes, provided …'" (Beale, p. XVII).

The Beale Panel's recommendations are based on three core principles enunciated in the Nairn Report (a previous report produced in 1990), which are:

- The importance of having an integrated biosecurity continuum involving risk assessment and monitoring, surveillance and response pre-border, at the border and post-border;
- Risk assessment reflecting scientific evidence and rigorous analysis;
- Shared responsibility, between the Commonwealth and state governments (note, in this report, 'states' is taken to mean 'states and territories'), and between businesses and the general community (Beale et al. 2008, p. XVI).

According to this panel:

> The aim should be the development of a seamless biosecurity system that fully involves all the appropriate players pre-, border and post-border. The Panel has called this approach One Biosecurity: a working partnership. (Beale, p. XVI)

The comparison with Australia is provided to show how different the policy structure and approach is in the two countries. This difference in itself suggests that no one approach will fit all contexts. A new development paradigm will therefore need to provide a flexible way for different locations, regions and countries with different contextual characteristics to integrate the various tiers of governance involved into a flexible framework for development at the local area where biosecurity is enacted.

Local Knowledge

International Policies on Traditional or Indigenous Knowledge

In 1998–1999, the World Intellectual Property Organization (WIPO) conducted fact-finding missions on intellectual property and traditional knowledge (TK). From this report, the term 'traditional knowledge' refers to:

> … tradition-based literary, artistic or scientific works; performances; inventions; scientific discoveries; designs; marks, names and symbols; undisclosed information; and all other tradition-based innovations and creations resulting from intellectual activity in the industrial, scientific, literary or artistic fields. (WIPO 2001, p. 25)

The meaning of *tradition-based* in this context includes:

> … knowledge systems, creations, innovations and cultural expressions which: have generally been transmitted from generation to generation; are generally regarded as pertaining to a particular people or its territory; and, are constantly evolving in response to a changing environment. (WIPO 2001, p. 25)

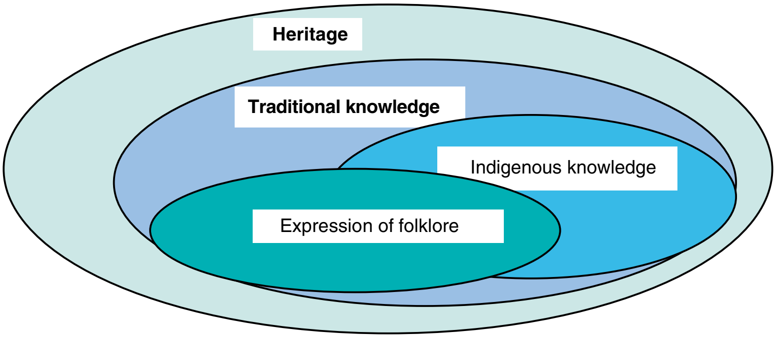

Fig. 2.1 Relationship between terms related to indigenous knowledge (WIPO 2001, p. 68. Publication originally produced by the World Intellectual Property Organization (WIPO), the owner of the copyright)

WIPO continues in the same report above by categorizing traditional knowledge as including:

1. Agricultural knowledge;
2. Scientific knowledge;
3. Technical knowledge;
4. Ecological knowledge;
5. Medicinal knowledge, including related medicines and remedies;
6. Biodiversity-related knowledge;
7. "Expressions of folklore" in the form of music, dance, song, handicrafts, designs, stories and artwork;
8. Elements of languages, such as names, geographical indications and symbols;
9. Movable cultural properties (WIPO, p. 25).

Based on the studies outlined in the report, traditional knowledge is that which is "…created, originated, developed, and practised by traditional knowledge holders…" (WIPO 2001, p. 26).

Explaining the relationship between heritage, traditional knowledge, Indigenous knowledge, and expression of folklore, WIPO provides that:

> (f)rom WIPO's perspective, "expressions of folklore" are a subset of and included within the notion "traditional knowledge." "Traditional knowledge" is, in turn, a subset of the broader concept of "heritage." "Indigenous knowledge," being the traditional knowledge of "indigenous peoples," is also a subset of "traditional knowledge." As some "expressions of folklore" are created by indigenous persons, there is an overlap between "expressions of folklore" and "indigenous knowledge," both of which are forms of "traditional knowledge". (WIPO 2001, p. 26)

This relationship is described in Fig. 2.1 as follows (WIPO 2001, p. 26):

Until recently, there has been no existing or negotiated treaty that specifically addresses issues of traditional or Indigenous knowledge (Suddith 2008, p.1). In the year 2000, WIPO established an intergovernmental committee named WIPO (Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore) known as IGC GRTKF or the IGC (Suddith 2008, p. 2; Widja 2008, p. 1). The IGC was established to respond to WIPO member states' concerns regarding the role of IP in access to, and benefit-sharing in genetic resources (Suddith 2008, p. 3) as mandated by the UN Convention on Biological Diversity (UN-CBD or CBD), that will influence the amendment of intellectual property rights law at a national level.

CBD is the most important international provision in the area of local knowledge, and changes the whole terrain of traditional knowledge and intellectual property rights discussions. Article 8(j) CBD provides the member states to, "… respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity" (Sardjono 2006, p. 2).

It also promotes the wider application of traditional knowledge with approval and involvement of the holders of traditional knowledge. CBD continues with Article 10(c), where it states that the parties shall, "… protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements" (CIEL 2002, pp. 1–2).

Subject matter discussed by the IGC are traditional knowledge (TK), traditional cultural expressions (TCEs) and genetic resources with their associated TK (Suddith 2008, p. 5). IGC has produced two important documents so far, which are the List of Core Issues and the Gap Analysis (Widja 2008, p. 2). The core issues list identifies ten important issues regarding legal aspects of TK and TCEs' protection. The Gap Analysis is divided into two parts: the protection of traditional knowledge and the protection of traditional cultural expressions or expressions of folklore (Widja 2008, p. 2).

National Level Policies

As is the case in the international arena, the Indonesian national arena has no existing law to provide direct protection to traditional or Indigenous knowledge. Nevertheless, there are some key policies important enough to warrant discussion.

Indonesian Constitution, Article 32, Fourth Amendment

Regarding the issue of culture, Article 32 of the Republic of Indonesia Constitution provides that: "The State shall promote Indonesian national culture … by guaranteeing the freedom of the society to preserve and develop their cultural values" (Indonesian Constitution Fourth Amendment, Article 32).

Law No. 5/1994 on Ratification of CBD

The leading sector in the implementation of this law in Indonesia is the Ministry of Environment. Interviews with Ministry personnel show that implementation of this law faces a coordination problem among the related governmental bodies.

Law No. 19/2002 on Copyright

Article 10 of this law directly addresses the issue of traditional knowledge as follows (unofficial translation by the author):

- The State shall hold the Copyright for works from prehistoric remains, historical and other national cultural object;
- The State shall hold the Copyright for folklores and works of popular culture that are commonly owned, such as stories, legends, folk tales, epics, songs, handicrafts, choreography, dances, calligraphies and other artistic works;
- To publish or reproduce the works as referred to in paragraph (2), any person who is not the citizen of Indonesia shall firstly, seek permission from the institution related to the matter;
- Further provisions regarding Copyright that are held by the State, as referred to in this Article, shall be regulated by Government Regulation. (Law No. 19/2002 on copyright, Article 10)

Clearly, these provisions lend strength to the case for building on local knowledge and for incorporating it into the proposed new development paradigm. A range of challenges related to governance, however, must be considered.

Governance – Challenges in Policymaking

According to Marifa (2005), policymaking is the spearhead of government, which defines the journey of the entire nation. A tentative finding of this research, to be confirmed, is that policymaking processes that embrace local Indigenous knowledge or local non-Indigenous knowledge will benefit all of society in long-term development. International experiences demonstrate the potential of working across knowledge systems, in places such as in Australia, especially in the Northern Territory. There, the government collaborates in some way with the 30% of the population who are local Aboriginal people and have obtained some form of land rights, in biosecurity work through the "… sea and land ranger groups" (Christie 2008, p. 66). Similar functions of the ranger group actually exist in many Eastern Indonesia traditional law structures (*adat*), especially the *Sasi* institution. *Sasi* is a traditional institution to preserve a community's natural environment. The norm prohibits people from taking or consuming any agricultural or fishery products for a particular period until the period of limitation is expired. Implementation of this norm is supervised by Indigenous ranger-like personnel called *kewang*. Infringement of the norm is punishable through the community's sanction process, and is still observed by traditional communities in Papua and Moluccas, and in Timor Island, though in the latter they have a different name. Learning from Australia and the FAO guidelines, as examples, an integrated approach may benefit biosecurity related stakeholders.

Nevertheless, four issues emerged from the ongoing research and these issues all point to the underlying challenges associated with producing sound policy-making processes. The issues are:

- Autonomy and dependency;
- Gap between policy and practice;
- Dysfunctional bureaucracy;
- Function, structure and communication.

Each of these is now discussed in turn.

Autonomy and Dependency

Development planning in Indonesia is supposedly based on the participation of the communities through a forum named *Musrenbang*. *Musrenbang* stands for *Musyawarah Perencanaan Pembangunan* (Development Planning Deliberation). For many, *Musrenbang* is often praised as an example of a bottom up planning method.

The *Musrenbang* framework is only part of the planning process inside the *Kabupaten* (Regency level of governance within a Province, between Province and local government district). In fact, the program should be approved in the provincial *Musrenbang* forum and national *Musrenbang* forum before it goes back to district (*Kabupaten*) level. Ideally, the framework should provide greater participation in the planning process. However, the experiences in some provinces show that this ideal is yet to be achieved. The mechanism has been used not only to filter out the unsuitable projects proposed by the bottom-up process but has also been used as an opportunity to assert central government's programs. The outcome of the latter is to weaken regional autonomy. DPRD (local parliament) can do nothing about this issue. In East Nusa Tenggara (*Nusa Tenggara Timur or NTT*), according to a provincial official, local content only comprises around 10–20% of the APBD (Regional Development Budget). Apart from the APBD, there is a 'deconcentration fund', which is much bigger than the APBD itself. All of the deconcentration fund's projects are central government's projects. The results contain some failure and rejection stories during implementation of the project. This situation has led to a relationship of dependency by local government on the national level. Bias against local issues in fact occurs as the planning process moves from lower to higher level of government in the planning process. This jeopardizes local knowledge because at the same time the downward movement from the central government consumes local planning, as a local government planner in Kupang described it. In this context, it is clear that bottom-up planning alone is insufficient while the governance institutions are too weak to manage the local knowledge through the higher levels.

Gap Between Policy and Practice

In addition to illustrating the dynamics between autonomy and dependency, the finding above regarding local versus national influences on development is also an illustration of the gap between government policies on the one hand and community practices on the other. In that case, government programs do not answer the needs of the people, while the community practices could not serve as a source of knowledge for policy-making. It is difficult for grassroots level initiatives and innovations to flourish when there is a lack of government support, however unintentional that lack of support may be. For example, support may take the form of a budgetary subsidy, market access or linkage to other government programs. As a result, although the community is independent enough from government influences to manage its own affairs, the limitation of resources nevertheless causes them to be unable to improve their economic welfare. Government programs that are heavily project oriented become unsustainable when the project is finished. In many cases, the project is abandoned by the community.

Dysfunctional Bureaucracy

There are issues of competence, work ethic, motivation and dedication in the bureaucracy. An example of an ethical problem is when an agriculture service employee utilizes government programs and funding for private purposes. This kind of practice occurs at the expense of the farmers. There is an impression in the research data that people are sitting in their offices more for the salary than because of dedication to their job. Being a government employee is seen as a means to social mobility. A bureaucratic position also contributes to an individual's high regard from the community. As a result, competition to become a government employee is rarely seen as competition to be a better public servant, but to reach a social position or gain greater social status for the family. To be addressed, this issue requires a whole of community change of expectation of bureaucratic roles.

Another issue that often arises in the provinces far from Jakarta, and which is reflected in the data, is a high dependency on the state budget. This arises because the private sector is still weak in many places. As a result, government bureaucracy becomes the dominant power source and acts almost without control. The impact of this situation is a disincentive or lack of motivation for the bureaucrat to perform well, because without performance control, employees do not have to worry about losing their jobs.

Function, Structure and Communication

There is a tendency in Indonesia to slice a piece of international policy framework into different fields and share it proportionally among various government bodies.

Therefore, policy-making disperses rather than focuses the available resources. This is contrary to the economic reality. The United Nation's Convention on Biological Diversity (UN-CBD or CBD) itself is sliced and disbursed among various Ministries – Ministry of Forestry, Ministry of Marine and Fisheries, *Badan Perencanaan Pembangunan Nasional* (the National Development Plan Body/*Bappenas*), even to the Department of Justice and Human Rights. Officially, concerning UN-CBD, the Ministry of Environment is the national focal point and the leading sector in Indonesia. In fact, that role is merely the coordination of the related agenda. As a result, members of parliament, such as the former Minister of Environment, demanded a strengthening of the position of the ministry itself (KOMPAS, 6 June 2009). The issue of divergence is not new. One of the high officials in the Ministry of Agriculture complained that there are too many government bodies in Indonesia to handle one issue and here he was referring only to the agriculture sector. There is a need for a paradigm shift to develop a different government approach.

There are some existing offices in provincial and *kabupaten* levels that serve similar functions, but lack coordination and communication. As a result, duplication of functions still exists. One example is the Research and Development sections of government departments, which exist in all levels of government. They carry out the same work in each section yet their activities are not coordinated.

Another related structure that lacks sufficient reform attention is the university sector whose core business is research. However, the sector is rarely involved in any coordinated action of the government's research and development activities. In many cases found during this research, local universities and local governments work separately. There are complaints from researchers that local government seldom applies research-based policy making, while from the government officials' side the complaint is that university research does not answer the immediate development problems. Clearly, lack of coordination and communication is an issue that needs to be addressed in this situation.

Implications for the National Plant Biosecurity Policies

The central issue for biosecurity policy in Indonesia is the attention mostly paid by government to quarantine pests and diseases or OPTK (*Organisme Pengganggu Tumbuhan Karantina*) which have not yet entered the territory of Indonesia. Emerging findings from this study indicate four issues for further attention and testing (see also: Litaay 2007). They are:

1. Biosecurity needs to be a priority in order to increase Indonesian agricultural development;
2. Indonesian biosecurity needs an interdisciplinary approach;
3. Indonesia needs detailed and integrated regulations on biosecurity;
4. Indonesia needs to improve her biosecurity capacity.

A brief discussion of each of the four points now follows:

1. *Biosecurity needs to be a priority in Indonesian agricultural development*
As noted above, internationally there are two approaches to managing biosecurity, either by an integrated approach or by traditional approaches (FAO 2008). Indonesia – along with many countries in the world – takes a traditional approach. As a finding of this research, quarantine services at Indonesian air and seaports are not as strong as they should be. There is a possibility that policy will need to be strengthened in developing this area. According to FAO (2008), the traditional approach has a lack of strategic focus, inefficient use of scarce resources and a less optimal result. This is also noted in Untung's account above, regarding the strong 'sector-ego' approach in the Indonesian bureaucracy also contributing to the problem (Untung 2007).

    Policy familiarization is a very important process when there are competing interests among various players. When the Head of the Agriculture Quarantine Body issued the instructions to implement the Agriculture Minister's decree regarding the quarantine policy for *Allium*, it met with protest from the business sector while actually the policy was able to cut 30% of import and provide opportunity for the local product demonstrating how important the biosecurity policy is toward the country's economy (Interview, Suharto, 2009). This is not only a matter of development planning but also a matter of the political agenda. In this regard, support for biosecurity requires what Flora et al. (2008) describes as political capital (p. 47). In policy development in Indonesia, it is indicated that effective policy needs to employ political capital that in turn needs to engage the community's access to governance resources and powerful entities, organizations and connection to resources.
2. *Indonesian biosecurity needs an interdisciplinary approach*
According to FAO, a fragmented approach to biosecurity by many countries limits attention to interdisciplinary crosscutting issues (FAO 2008). This is in line with Untung's observation above, which is that academics and research centres in Indonesian universities are still trapped by disciplinary restrictions and lack interest in developing interdisciplinary studies (Untung 2007).

    The problem has no single answer. The identification of incursions and their eradication – as Falk et al. (2008, p. 2) show – needs proactive cooperation between many stakeholders, such as local communities, government agencies and NGOs. This approach also needs to value local knowledge as one source of knowledge that could be developed. Valuing local knowledge provides a powerful mechanism for engaging local people in the biosecurity agenda and assists them evaluate new knowledge against their own. The important additional benefit is that the knowledge they possess often has particular benefits and uses for managing biosecurity in their contexts. According to Untung (2008), farmer experience is a source of knowledge; hence they need to be treated as participants rather than as objects to be 'filled with outsider knowledge'. One of the policies that enhances local knowledge is *Sekolah Lapangan Pengendalian Hama Terpadu* (Field Schools for Integrated Pest Control), where farmers are empowered to develop their experience into a systematic method of plant pest control (Untung 2008).

3. *Indonesia needs detailed and integrated regulations on biosecurity*
According to a World Bank Policy Brief, the existing quarantine and plant protection regulation framework in Indonesia is developing, but there is a need to give more attention to capacity development and maintenance, and integrating the national systems with decentralization (World Bank 2005). The regulation framework has also been tested by crises and proved that capacity to implement the regulations as the controlling instrument for managing biosecurity is still an issue. The widespread epidemic of avian influenza in Indonesia with a toll of hundreds of people's lives is one example of Indonesia's low level of preparedness for crisis. Another major problem is the lack of specialised and standardized procedures across sectors for epidemic control. When the government planned to eliminate ten million chickens in 2005, the poultry business sector responded by suggesting that the urgent need is not killing all the birds but providing vaccinations, improving biosecurity, and enforcing the laws that prohibit the sale of chicken-manure commercially (Tempo Interaktif 2004).

According to the Government Regulation on Plant Protection (Gov. Reg. No. 6/1995), transfer of any carrier of already quarantined pests and diseases regardless of the form (plant or any part of a plant) from one area to another area inside Indonesian territory requires health certification from the original area. The certification must be endorsed by the quarantine officer in the incoming or outgoing places. From the author's observation, this provision is not implemented as rigorously as in other countries and is caused by various technical problems (Interview, 2008).

Compared to other Southeast Asian countries, Indonesia allows great opportunities for the movement of people, plants and animals, both incoming and outgoing, without suitable scrutiny or inspection or precautionary measures. This runs against the recommendations of Falk et al. (2008, p. 2), "Successful eradication of an incursion depends on rapid identification of the initial incursion and rapid subsequent effective eradication procedures".

4. *Indonesia needs to improve her biosecurity capacity*
As mentioned above, institutional and human resource capacity problems have been identified in Indonesia. Firstly, research laboratories are in poor condition for performing appropriate biosecurity functions. Secondly, there is a low human resources capacity. There are simply not enough inspectors, examiners, field officers and researchers. In addition, farmers lack biosecurity knowledge. This is not surprising considering the fact that as the world's biggest archipelagic country, there are only approximately 2,000 quarantine officers in Barantan. Data from the study show that around 65% of these officers are administrators while there are only 35% (around 700) technical function employees. This is the main reason why in many entry-ports of Indonesia, Barantan's service is structured more to respond rather than to address issues proactively.

The World Bank policy brief noted earlier recommends that the Department of Agriculture should support a competent and functional agricultural product regulation system, which is not only important for consumer protection and safety but also for gaining and maintaining international market access. This is especially the case because importing countries will gradually and continuously strengthen their food product quality or safety requirements. This has the potential to leave Indonesia behind. Without special attention to this issue, the World Bank claims, an increased focus on farmer productivity will fail to increase farmer's welfare if there is limitation of access to markets (World Bank 2005).

Conclusion

The research shows that international frameworks play an important role at the national level, especially during the adoption of the international frameworks into national frameworks. At the same time, local knowledge has been proven to provide the most effective and often the most cost-effective measures against a range of biosecurity problems specific to certain districts. Legislation would assist a more cost-effective use of local knowledge, but it takes more than pieces of legislation to strengthen local knowledge in a policy making process. In order to realize the content of legislation, implementation becomes a critical issue. Implementation of any piece of legislation will succeed if other stakeholders – including local communities – all play their part, especially in educating other members of communities regarding the importance of the legislations. At the same time, it takes openness on the government's behalf to recognize that role.

Current Indonesian biosecurity approaches are reminiscent of the fragmented approach identified by FAO (2008, p. 8). In order to tackle these problems, there is a need for a shift in policy approaches toward an integrated one. In order to contribute to policymaking in line with the above characteristics of the integrated approach, the emerging research results indicate that the following issues will need to be brought together to establish a new development paradigm for Indonesia:

- Utilize international instruments on biosecurity for the benefit of Indonesian agriculture development;
- Improve the level of Indonesian compliance to international standards by developing sound policies in biosecurity;
- Protect and develop indigenous norms, knowledge and institutions to fill gaps in national biosecurity policies, providing an environment where the best from both worlds can come together;
- Develop local and indigenous knowledge-based biosecurity in local communities through policymaking and legislation processes in the framework of Indonesia's regional autonomy status;
- Enforce the related policies, laws, and regulations on biosecurity for the benefit of people in local communities.

When there are appropriate connections between people and organizations to facilitate implementation, it is a sign that social capital is present. Social capital can be of three kinds: bonding, bridging or linking. An integrated and new paradigm in biosecurity development policy for Indonesia would need to put into practice a strategy that drew on and supported the development of all three forms of social capital in a cross-cutting, structural and procedural approach. Policy is a multi-tiered series of structures and relationships, and only by making two-way connections upwards, downwards and sideways can such a multi-tiered strategy prove effective and efficient.

References

Agustino, L. (2006). *Politik dan kebijakan publik* [Politics and public policy]. Bandung: Penerbit AIPI.

Beale, R., Fairbrother, J., Inglis, A., & Trebeck, D. (2008). *One biosecurity: A working partnership*. Canberra: Commonwealth of Australia. Retrieved April 10, 2010, from http://www.quarantinebiosecurityreview.gov.au/report_to_the_minister_for_agriculture_fisheries_and_forestry.

Christie, M. (2008). Traditional Aboriginal knowledge practices and North Australian biosecurity. *Kritis-Learning Communities*, *Special Co-publication*, 64–74.

Department of Agriculture, Fisheries, and Forestry. (2007). *Import risk analysis handbook*. Canberra: Commonwealth of Australia.

Department of Agriculture, Fisheries, and Forestry. (2009). *Frequently ask questions: Review of Australia's quarantine and biosecurity arrangements*. Canberra: Commonwealth of Australia. Retrieved April 10, 2010, from http://www.daff.gov.au/__data/assets/pdf_file/0019/1454032/beale-faqs.pdf

Department of Agriculture, Fisheries, and Forestry. (2010). *About Biosecurity Services Group: What are the changes?* Retrieved April 10, 2010, from http://www.daff.gov.au/bsg/biosecurity-services-group

Easton, D. (1965). *A system analysis of political life*. New York: Wiley.

Falk, I., et al. (2008). Community management of biosecurity: Overview of some Indonesian studies. *Kritis-Learning Communities*, *Special Co-publication*, 1–40.

FAO. (2008). *FAO biosecurity toolkit*. Geneva: STDF Workshop on SPS Capacity Evaluation Tools.

FAO-WTO. (2005). *Understanding the Codex Alimentarius.* Rome: FAO-WTO.

Flora, C. B. (2008). Social capital and community problem solving combining local and scientific knowledge to fight invasive species. *Kritis-Learning Communities*, *Special Co-publication*, 41–54.

Friedman, T. L. (2006). *The world is flat: A brief history of the twenty-first century*. New York: Farrar, Straus and Giroux.

Gerke, S., & Evers, H. D. (2006). Globalizing local knowledge: Social science research on Southeast Asia, 1970–2000. *Journal of Social Issues in Southeast Asia, 1*(1), 1–21.

Grant, C. (2009, September 30). *The Beale review: Implementing one biosecurity.* Society for Risk Analysis Conference, Australian Government, Department of Agriculture, Fisheries and Forestry.

Iwantoro, S. (2006, November 2). *The role of agriculture quarantine agency of Indonesia (AQAI) as a trade instrument in global trade liberalization.* PowerPoint presentation in Nanning, China, Director General of Agriculture Quarantine Agency of Indonesia, Jakarta

Iwantoro, S. (2007). *Issues and concerns affecting biosecurity in Indonesia*. PowerPoint presentation, Director General of Agriculture Quarantine Agency of Indonesia, Jakarta.

Kelkar, M. (2007). Local knowledge and natural resource management: A gender perspective. *Indian Journal of Gender Studies, 14*(2), 295–306.
Lester, J. P., & Stewart, J., Jr. (2000). *Public policy: An evolutionary approach*. Belmont: Wadsworth.
Litaay, T. (2007). Kemendesakan perlindungan pengetahuan tradisional di Indonesia [Urgency of protecting Indonesian traditional knowledge]. In D. Louhenapessy et al. (Eds.), *Workshop proceeding: Biosecurity and indigenous knowledge*. Salatiga: PSKTI, UKSW.
Mariana, D. (2006). *Menyingkap tabir segitiga politik – kebijakan publik – administrasi publik* [Unfolding the triangle screen of politics, public policy, and public administration]. In L. Agustino (Ed.), *Politik dan kebijakan publik* [Politics and public policy]. Bandung: Penerbit AIPI.
Marifa, I. (2005). Institutional transformation for better policy implementation and enforcement. In B. P. Resosudarmo (Ed.), *The politics and economics of Indonesia's natural resources*. Singapore: ISEAS.
Muchtadi, D. N. D. (2007). *Keamanan pangan produk hasil rekayasa genetik* [Food safety of genetic modified products]. Powerpoint presentation presented at Departement Ilmu dan Teknologi Pangan FATETA, Institut Pertanian Bogor, Bogor.
Neuhaus, R. J. (1977). *Christian faith and public policy*. Minneapolis: Augsburg.
Nugroho, R. (2009). *Public policy*. Jakarta: Elex Media Komputindo.
Ohmae, K. (1999). *The borderless world: Power and strategy in the interlinked economy*. London: HarperCollins.
Resosudarmo, B. P., & Jotzo, F. (2009). Development, resources, and environment in Eastern Indonesia. In B. P. Resosudarmo & F. Jotzo (Eds.), *Working with nature against poverty: Development, resources and the environment in eastern Indonesia*. Singapore: ISEAS.
Resosudarmo, B. P., Napitupulu, L., Manning, C. H., & Wanggai, V. (2009). Papua I: Challenges of economic development in an era of political and economic change. In B. P. Resosudarmo & F. Jotzo (Eds.), *Working with nature against poverty: Development, resources and the environment in eastern Indonesia*. Singapore: ISEAS.
Sardjono, A. (2006). *Hak kekayaan intelektual dan pengetahuan tradisional* [Intellectual property rights and traditional knowledge]. Bandung: Penerbit Alumni.
Suddith, P. (2008, December 2–3). *Protecting traditional creativity and cultural expressions through IP*. Powerpoint presentation presented in the second WIPO international conference on intellectual property and the creative industries, Bali
Tempo Interaktif. (2004). Pengusaha: Pemusnahan Ayam Tak Selesaikan Masalah [Businessman: Chicken eradication will not solve the problem]. Retrieved June 8, 2009, from http://www.tempointeractive.com/hg/ekbis/2004/02/02/brk,20040202-17,id.html
Untung, K. (2007). Kebijakan nasional ketahanan hayati [National biosecurity policy]. In D. Louhenapessy et al. (Eds.), *Workshop proceeding: Biosecurity and indigenous knowledge*. Salatiga: PSKTI, UKSW.
Untung, K. (2008). National policy on biological diversity. *Kritis-Learning Communities*, *Special Co-publication*, 228–238.
Widja, I. G. N. (2008, December 4). *Upaya perlindungan pengetahuan tradisional dan ekspresi budaya tradisional* [Efforts in protecting traditional knowledge and traditional culture expression]. Paper presented in National seminar on protection of traditional knowledge and traditional cultural expressions in creative industry, Bali.
WIPO. (2001). *Intellectual property needs and expectations of traditional knowledge holders – WIPO report on fact-finding missions on intellectual property and traditional knowledge (1998–1999)*. Geneva: WIPO.
World Bank. (2005). Prioritas masalah pertanian di Indonesia [Indonesian agriculture priorities]. In *Policy brief – ide-ide program 100 hari*, 2 Jan 2005. Retrieved June 8, 2009, from http://siteresources.worldbank.org/INDONESIA/Resources/Publication/280016-1106130305439/617331-1110769011447/810296-1110769073153/agriculture.pdf
WTO. (2006). *Article 27.3(B), Relationship between the TRIPs agreement and the CBD, and the protection of traditional knowledge and folklore*. Paper presented at the TRIPs (trade-related aspects of intellectual property rights) Council, World Trade Organization, Geneva.

Chapter 3
Adoption of Local Knowledge in Regional Biosecurity Development: Papua Case Study

Theofransus Litaay

Introduction

Papua has one of the world's greatest proportions of agricultural workers. For centuries, local people have practised their complex traditional rituals through traditional customary and efficient farming system. The system is more ecological-friendly with regard to biosecurity control than the modern chemical-based system. According to Muller (2008, p. 7), the history of farming in Papua started around 7000 BC, before banana, sugar cane and root crop plantations had been introduced to Java. Besides its location as the eastern province of Indonesia, Papua's uniqueness both ecologically and anthropologically means it is a place with a special meaning for Indonesia. Politically speaking, the region's history is also different from other regions in Indonesia. The province was integrated into Indonesia through a political process that is still being debated today. After a long period of political uncertainty and demand for independence, in 2001 a special autonomy status was granted for the province as a form of a political compromise. Later on, the Papua province was divided into two provinces – the Papua Province and Papua Barat (West Papua) Province (see Fig. 3.1).

The region is dominated by tropical forest and inhabited by Indigenous tribes that continue practising their Indigenous knowledge in farming and other aspects of life. In the northern part, Papua is bordered by the Pacific Ocean. This, in fact, influences the cultural development and products of the coastal communities of the northern coast. The southern border of mainland Papua is the Arafura Sea. This particular area consists mostly of swamps and the population lives by fishing and related activities. One of the communities with a strong sea tradition is the Kamoros. Most of their ornaments and rituals are related to the sea. The western border is with the Moluccas province, namely the Banda Sea and Seram Sea. In the past, some

T. Litaay (✉)
Faculty of Law, Satya Wacana Christian University (SWCU), Salatiga, Central Java, Indonesia
e-mail: theolitaay@gmail.com

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_3,

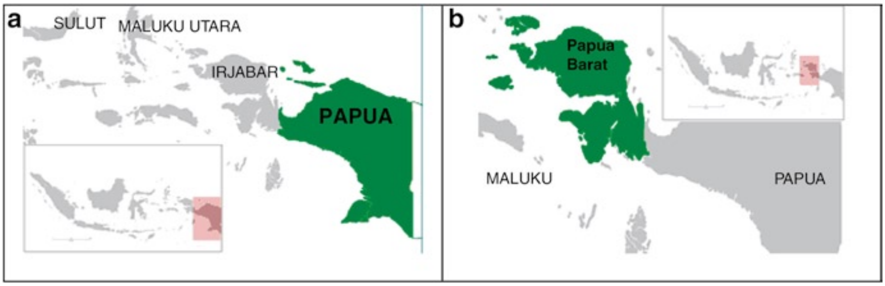

Fig. 3.1 Map of Papua (**a**) and West Papua (*Papua Barat*) (**b**) (http://id.wikipedia.org/wiki/Papua and http://id.wikipedia.org/wiki/Papua_Barat)

areas in the 'bird's head' of mainland Papua were in close contact with the traditional kingdoms of North Moluccas.

The eastern border of Papua is shared with Papua New Guinea. Although separated by different countries, the native people are from the same cultural group. Merauke is noted as the eastern-most city of Indonesia. The *Kabupaten* Merauke is also the biggest county in Papua with 43,979 ha. Jayapura city is the city covering the biggest area at 940 km^2. The highest town in Papua is Mulia. This town is the capital of Puncak Jaya County. This is also the highest city in Indonesia. The lowest city in Papua is Merauke, which is 3.5 m above sea level (BPS, 2008).

As Indonesia entered the political reform era, when regional autonomy started to emerge as an issue in 1998, discussions regarding the recognition of the rights of Indigenous communities were still rare. At the same time, there was also a need to address many issues concerning Indigenous communities. Some studies mentioned technology, conservation, traditional wisdom and culture. Such issues are relevant to the implementation of global and national policy on Biodiversity as they relate to local knowledge as found in Article 1, Article 8 and Article 15 of UN Convention on Biological Diversity (CBD).

This chapter will discuss the main challenge related to the issue of governance and local knowledge. The challenge flows from the second chapter of this book which discussed the engagement of international, national and local policy frameworks with local knowledge to create a new development paradigm. Here, I use the particular case of Papuan biosecurity management to show the issues involved as local regions intermesh with national and international policy frameworks.

In the Papua context, the questions above could be represented by the five issues below:

- utilization of the international instruments on biosecurity for the benefit of Indonesian development;
- protection and development of traditional culture and wisdom to fill the gap in biosecurity policy;
- the implementation of the status of special regional autonomy of Papua and Papua Barat provinces to facilitate the integration of local knowledge with wider policy frameworks;

- local policy making and legislation processes of Papua and Papua Barat that take into account the issue of local knowledge-based biosecurity;
- the government's handling on the issues of enforceability of the policies, laws and regulations on biosecurity for the benefit of people in Papua and Papua Barat.

The chapter reports on the emerging findings of a study on biosecurity and local knowledge. The methodology for the overall research in Papua, on which this paper reports, utilizes qualitative research approaches to analyze how these policy frameworks actually engage with local knowledge. Data was collected through the conduct of interviews, observational visits and document study. Over one hundred interviews across the two provinces in Papua were targeted, with participants selected to represent a range of governance tiers and communities, in accordance with their direct policy or practical engagement with biosecurity concerns. This chapter commences by describing Papua's background and explaining the issues in Papua, especially in Jayapura, Timika, Manokwari and Merauke. Further, it will discuss the challenges and opportunities for governance and economic issues of the regions.

Biosecurity Issues of Papua

This introduction to biosecurity issues in Papua is based on four different locations that present different biosecurity issues. Those four areas are Jayapura, Timika, Manokwari and Merauke. Jayapura is the biggest city in Papua. The issue for Jayapura is the biosecurity threat caused by the fluidity and movement of the culturally diverse population, as people come into the region from a number of different outside areas. This, of course, brings with it the risk of importing plant pests. This represents a need for a locally-based development strategy. As already noted, the province is equipped with special autonomy status. Timika has issues of agricultural quarantine pest and disease control by the local quarantine office, especially on imported commodities. Manokwari is one of the most important rice producing districts of Papua Barat province. In the Manokwari area there are four examples of the complex and interrelated biosecurity management issues present in this one region. Merauke is another important rice producing district, and is a planned special food product region for Indonesia, representing the issue of conflict between economic development and other, especially local traditional farmers' interests who traditionally are not rice growers.

Jayapura

The population fluidity for Jayapura raises the issue of management and control of exit and entry points. In itself, this is a delicate issue that requires balance between vibrant economic activities and the need for increasing the quality of agricultural products. Jayapura is a relatively large city and a cultural melting pot. It comprises various groups from other parts of Indonesia, including Javanese, Bugisnese, Torajan,

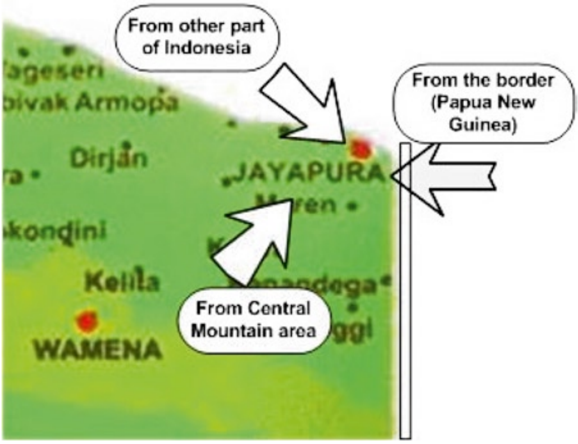

Fig. 3.2 Map of competing cultural influences in Jayapura adapted from a whiteboard prepared by Mr. Arnold Lopolalan from the BaKTI organization in Papua 26 September 2008

Moluccan, people from other parts of Papua, especially the central mountain areas and from other countries, namely Papua New Guinea. At one end, this cultural influx poses a threat for the existing local knowledge of the native Jayapurans. Due to this situation, local knowledge in Jayapura does not solely belong to the native Jayapuran culture, but is the result of the blend of interactions with other cultures. There has been tension between the original and non-original residents but in the longer term, there has been an adaptation to new cultural influences, which are being absorbed as new local knowledge (see Fig. 3.2).

The influx of people and goods from other regions to Jayapura poses a source of biosecurity threats and to the management of these threats due to the lack of strong control at the entry points to the city or province. Currently, there are nine provincial gates at five cities in Papua and Papua Barat: first, there is the Sorong seaport; second the airport in Papua Barat; third, Manokwari airport; fourth and fifth are the Biak seaport and airport; sixth and seventh are the Timika airport and seaport; and finally as eighth and ninth are the Jayapura seaport and airport. Jayapura is also in a strategic position because as the province capital city, being around 2.5 h drive from the border of Papua New Guinea. The area played an important role during some political upheavals in the past. There is a large quarantine facility at the border, including a vehicle quarantine check facility; however it is closed most of the time due to lack of human resources and skills.

Timika

According to Ministry of Agriculture Regulation (MoA Reg. No. 37/2006), there are eight entry gates for the control of the import of fresh fruits and vegetables into Indonesia, and Timika is one of these gates. The regulation requires only up to seven entry gates, which consists of those at Jakarta and other main seaports and airports in Java, Sumatra and Sulawesi. However the regulation also provides that other provinces may apply to be import entry gates based on a proposal to Jakarta being made by the provincial governor.

Following the path provided by the regulation, the Governor of Papua submitted a proposal to the Minister of Agriculture asking the minister to appoint Timika as the entrance city of imported fruit and vegetables. Based on the proposal, the Minister of Agriculture enacted Timika as the entrance city for importing fruits and vegetables. The appointment of Timika as the import entrance city is also influenced by the significance of PT Freeport Indonesia's giant mining operation in Tembagapura which is located in the upper area of Timika (Interview, 27 January 2009).

Fruit and vegetables imported to Timika are mainly for the consumption of PT Freeport's employees. There are two transportation tracks, the air transport from Cairns, Northern Australia to Mozes Kilangin airport twice a month (the airport belongs to PT Freeport) and sea transport originating also from Australia to the Port Side area twice or three times a month (the seaport also belongs to PT Freeport). According to the agriculture quarantine office in Timika, for all incoming fruits and vegetables, international standardized quarantine procedures apply, especially quarantine control for commodities for maintaining Timika's Fruit Fly (*Bactrocera*) free status. Document control is conducted at the seaport, while physical checking is conducted in the container depot. The local quarantine office faces fewer problems related to imported fruits and vegetables by PT Freeport Indonesia, as the company always tries to obey the regulations. Since 2006, there have been several eradications conducted by the local agriculture quarantine office. The stock in ten containers was destroyed in 2006 and the load in two containers was also destroyed in 2007 (Interview, 2009).

Beside imported-commodities, the local agriculture quarantine office also deals with domestic business, especially fruits and vegetables supplied to Timika, such as onions and potatoes, fruit and peanuts. The office places a quarantine officer in the airport and seaport terminals. Due to the limitations of the office facility at the seaport, the quarantine officer only appears when the import commodities arrive. The airport has a quarantine station. Eradication of domestic agriculture products has never been imposed on incoming citrus seedlings, which may have *CPVD* (*citrus phloem vein degeneration*) without proper quarantine documents. The local agriculture quarantine office also works with other related services of local government such as the agriculture service, animal husbandry service, police and port authorities. The quarantine office also works to enforce local regulations such as the Governor of Papua's regulation prohibiting the import of birds into Papua in order to prevent the proliferation of avian influenza. The destruction of chickens infected with avian influenza has been conducted since 2008 (Interview, 2009).

Manokwari

This section examines and outlines four examples concerning food security and biosecurity issues in relation to poverty alleviation in Manokwari, The first example relates to the local rice production and marketing. The farmers in the transmigration areas in Papua Barat province grow a local product called Manokwari Rice. While many people in the province know the name of the product the local rice is not able to compete in price with rice from outside Papua which makes marketing the product difficult.

One of the Papuan farmers in Jalur Sembilan in the Manokwari district indicated that his September to October 2008 harvest is still in his storage silo. He couldn't sell it or he would suffer a huge financial loss. Not only that, but some of the previous harvest was still stored at his farm in high piles openly without any special treatment to prevent any grain storage pests (Interview, 2008). According to the farmer, the market is a cartel market controlled by big rice-traders who also import rice from outside Manokwari and he has no power to control the situation (Interview, 2008). This situation is influenced by the market control by the rice traders in the city who, for a long time, maintained close business relationships with the inter-island rice traders. According to the head of Manokwari Agriculture Office, despite the motivations and suggestions from local government, they have been unable to increase local rice trading, and as a result, imported rice from other countries and other provinces continues to flood the local market. This has resulted in the local product being undermined (Interview, 9 October 2008). From a biosecurity perspective, imported goods without sufficient pre-border and border treatment will pose new risks for the region.

The second example relates to one of the current *prima donna* products of Papua, cocoa. Cocoa plantations are spread widely across Papua. Of these plantations, 24% of planting area is composed of smallholders' estates and according to the Papua Province Estate Crop Service, it is an important estate (plantation) crop priority for the northern part of Papua (Interview, 30 January 2009). Most of the small stakeholders use traditional farming developed by villages and their communities. In Papua Barat province, in order to utilize the potential for the benefit of provincial economy, the government is willing to sponsor mass production of this commodity in consideration of its international price. The resources to assist this program are available through the Estate Crop Service (Interview, 9 October 2008).

The third example is related to the special autonomy implementation. It concerns the organization and personnel arrangement of the local agriculture service. When Manokwari was separated from Papua to become the capital city of Papua Barat, some employees of Papua province were left with unclear employment arrangements. The old province continues to pay their salary, their employment status is permanent (so their employment cannot be terminated) but their offices have been occupied by newly recruited employees (Interview, 2008). The problem is that the newly recruited employees are young and have less experience, which impedes the functioning of the office.

The fourth example relates to the use of pesticides. Pesticides and insecticides have played instrumental roles in plant protection processes, especially in relation to the extension of transmigration areas (Interview, 2008). These technologies are mostly connected to rice farming and rarely related to the local farmers' products.

Meanwhile, the government's focus is on maintaining plant and rootstock security as part of the food security strategy. That is why pest control technology is more widely known and used by the technologically advanced farmers than by the more traditional farmers. For the traditional farmers, the use of chemical substances is restricted by the local Agriculture Service Office. This policy aims to prevent pest resistance due to extended pesticide use. In addition, the policy restricts the experimental use of these chemicals on traditional products. Although this biosecurity policy is environmentally sound, the situation results in a greater market control by the rice growers using chemicals, and disadvantages more traditional farmers, which in turn precludes the use of indigenous knowledge practices which have been shown to be more effective managers of sustainable biosecurity measures.

National policymakers introduced the policy to shift to the use of organic fertilizers. This is called the 'Go-organic' program. The policy was also introduced at the local level in Papua. Although such a policy requires technology, local policymakers accepted it without having sufficient human resources or systems to operate and manage the technology. As a result, the program has not been particularly well run. It is clear that programs such as the Go-organic program are good, however they still require effective implementation strategies so that they can be 'cheap' and 'easy to handle' for the communities at the village level.

Merauke

According to the Indonesian Ministry of State Secretariat (Setneg 2010), Merauke with its 45,071 km^2 area and population of 183,945 has several advantages both geo-economically and geo-strategically to serve the purpose of being a national centre of international food production and renewable energy. In Jakarta's view, Merauke is able to provide support for national food security through its potential farmland area of 2.5 million hectares, which is comprised of 1.93 million hectares of wet land and 0.55 million hectares of dry land. The central government wants to replicate the old Dutch-era Kumbe Kurik project from the era that lasted from 1939 to 1958 (Setneg 2010). Through this program, the Central government will treat Merauke as a Special Economic Region called the 'Merauke Integrated Food and Energy Estate' (MIFEE) (WALHI 2010).

The Legal basis for this program is Government Regulation on Crop Cultivation or Government Regulation No. 18/2010 (WALHI 2010; Kementerian Pertanian 2010). This regulation was developed to implement Law on Sustainable Farming Land Protection or Law No. 41/2009, which is perceived as a market friendly law. However it also has the potential to be environmentally unfriendly (WALHI 2010). In order to realize the plan, the Ministry of Agriculture has developed a plan for a 1.6 million hectares Food Estate region of MIFEE in Merauke. In this program, the Ministry of Agriculture and the Merauke government are working to utilise land

and convert it into farmland. Agribusinesses that will be developed include rice, corn, soybean, sugarcane and cattle (Setneg 2010). There are some corporations that will invest their capital into this business. In addition, according to the government, attention will also be paid to small farmers, however there is no clear plan for the latter yet.

There are some issues related to this program (WALHI 2010; Tabloid 2010; Kompas news, 17 February 2010; Simamora 2010, Jakarta Post, 3 April 2010; Creagh 2010, Reuters, 25 March 2010):

- the size of the land open for the estates will create change to the ecosystem and ecological balance issues;
- considering the height of Merauke and the elevation of sea water, large scale farming will take over green areas and trigger erosion and sea water intrusion;
- forest conversion – as wide as 700,000 ha or 10 times the size of Singapore – will increase the land temperature and contribute to global warming, which is against the government's pledge to cut emissions;
- the forest is the source of livelihoods for local people. The loss of forest and widespread food-related business will create new poverty and new food security problems;
- anthropologically speaking, the loss of forest as the source of values on which lives are based will threaten traditional values and traditions;
- the influx of migrants into Merauke will potentially displace local communities or local ethnics: the number of Indigenous Meraukeans only numbers 174,710 people compared to the prospect of thousands of incoming workers;
- high usage of agricultural technology will marginalize local farmers and will displace them from their livelihoods as farm laborers;
- unilateral decision making processes by the Central government without consultation with local community groups, especially with the Marind tribe as the owner of Indigenous land rights, has insulted the tribe;
- this program was prepared without proper environmental legal steps, without a provincial proposal on forest conversion and without any environmental impact assessments.

From biosecurity point of view, the above mentioned are likely to increase the possibility of new pests and diseases being brought in through the introduction of non-indigenous plants into Papua as well as the influx of people into and out of the area expected. In reverse, plant pests and diseases that do occur in the area will have more avenues for spreading beyond the area. What is required is a biosecurity plan to anticipate future biosecurity problems.

Of course, this is not to say that all the changes would be detrimental. Undoubtedly some of the changes could result in better living and working conditions for some local people, but this has not been assessed, nor any balance been negotiated in terms of benefits and drawbacks. This situation presents an important challenge for biosecurity management, since without local support, that task is extremely difficult, if not impossible to carry out effectively.

Challenges and Opportunities

The ongoing research in Papua shows that there are several challenges and opportunities in implementing an integrated biosecurity policy at provincial level. If the different opportunities, strengths, weaknesses and challenges that are all part of a complex strategy are incorporated, and they can be, then the elements of a new development strategy can be identified. These are divided into two main areas for discussion. One is governance issues, the other is economic issues.

Governance Issues

As already mentioned in Chap. 2, the biosecurity issues discussed are predominantly governance issues rather than technical or scientific issues. In the context of Papua, the governance topic is foremost in the implementation of special autonomy. Discussion of this topic will show that the two provinces in Papua, in fact, should be able to enjoy greater benefits from autonomy compared with other provinces in Indonesia, however the reality somehow indicates the reverse. Another topic related to governance issues is the quality of the public service. Papua and Papua Barat provinces are similar to other provinces in Indonesia, in that the economy is driven mostly by government projects rather than by the private sector. The public service is so central to the community that it will influence the welfare of the whole community. The challenge is how to provide good public servants with sufficient capacity in service delivery. It will also question leadership in the policymaking process. These two topics – special autonomy implementation and public service quality – will be discussed in the following sections.

Special Autonomy Implementation

As mentioned previously, the data from the research indicates a need to address many issues (including technology conservation, traditional wisdom and culture) at the level of global and national policies on biosecurity as stipulated in the International Plant Protection Convention (IPPC). The related field of biodiversity, as found in Article 1, Article 8 and Article 15 of the UN Convention on Biological Diversity (CBD), is also important to biosecurity considerations as a strong biodiversity impacts positively on a strong and sustainable biosecurity system in areas such as Papua. Meanwhile, a majority of Indonesian farmers still farm using traditional methods, including those in Papua. From trade and economic perspectives, the farmers need to improve their knowledge and technology, as well as their management capabilities so that they can produce the products that meet the standard of quality and safety of destination countries. The challenge for the government is how to empower the farmers and transform the process to more modern farming methods without forcing abandonment of what may prove to be traditional and local knowledge of foods, how to grow and use them, which might provide invaluable for biosecurity in the longer term.

Policymaking processes that embrace sound local Indigenous knowledge or local non-Indigenous knowledge will benefit all of society in long-term development. International experiences demonstrate the potential of working across knowledge systems, in places such as Australia, especially in the Northern Territory where the government collaborates with local Aboriginal people in biosecurity work through the "…sea and land ranger groups" (Christie 2008, p. 66). Similar functions of these ranger groups actually exist in many eastern Indonesia traditional law structures (*adat*), especially the *Sasi* institution that is still observed by traditional communities in Papua and Moluccas and in Timor Island, though they are called by different names in different areas. Learning from Australia, using local knowledge – once again – needs an integrated approach from all biosecurity related offices and stakeholders, and evaluation processes in hand to assess the merits of local knowledge for biosecurity management.

One of the foci in my research is the implementation of Special Autonomy Law for Papua Province (Law No. 21/2001). This law was enacted to accelerate the development process in all Papua regions. The special autonomy for Papua province, as stated by Agus Sumule, is a:

> … political breakthrough, … as contained in Decree No. 4 of the Indonesian People's Consultative Party (Majelis Permusyawaratan Rakyat Republik Indonesia, or MPR) [after a long] … antagonistic relationship between the majority of the people of Papua and the central government of Indonesia. (Sumule 2003, p. 353)

Following 2001, Papua province was divided into two provinces, as noted earlier, and Papua Barat also enjoyed the same autonomy benefits as her mother province. In order to smooth the transition process, many affairs regarding special autonomy policy of Papua Barat are still coordinated by Papua province.

Based on the special status, there are several special institutional features that differentiate Papua and Papua Barat from other provinces of Indonesia. According to the statute, the main features of special autonomy are the legislative branch called Papua Peoples Representative Council or *Dewan Perwakilan Rakyat Papua* (*DPRP*) and the quasi-legislative body which is the Papua People's Assembly or *Majelis Rakyat Papua* (*MRP*). *MRP* is:

> … the cultural representative of the Papua natives, which has a certain authority in protecting the rights of the Papua natives, based on respect of the customs and culture, the enforcement of human rights and stabilization of harmony of religious life as stipulated in this Law. (Article 1, translation by Sullivan, 2003)

Tasks and authorities of *MRP* are (Article 20, translation by Sullivan, 2003):

(a) To give consideration and approval to the candidate Governor and Deputy Governor proposed by the DPRP;
(b) To give consideration and approval to the candidate members of the People's Consultative Assembly of the Republic of Indonesia, regional representatives of the Papua Province proposed by the DPRP;

(c) To give consideration and approval to the Bill of Perdasus submitted by the DPRP together with the Governor;
(d) To give suggestions, consideration and approval to the planned cooperation agreement drawn up by the Government as well as the Provincial Government with third parties applicable in the Papua Province, in particular related to the protection of the rights of the Papua natives;
(e) To observe and convey the aspiration, complaints of the *adat* (traditional) community, the religious people, women and the public in general in relation with the rights of the Papua natives and to facilitate the follow-up settlement;
(f) To give consideration to the DPRP, Governor, Regency or City DPRP and the Regent or Mayor on matters related to the protection of the rights of the Papua natives.

The leadership of *MRP* defines the function of *MRP* as a "consultative function toward legislation making" and "cultural control function toward budgeting process" in order to guarantee that native Papuans' are respected in any decision- making and to preserve Papuan culture (Interview, 2009).

The provincial legislative body had decided on a group of special local legislative agenda whose purpose was to protect and preserve local cultural heritage. The legal form of the legislation is known as a Special Regional Regulation or SRR (*Peraturan Daerah Khusus* or *Perdasus* as quoted from Article 20 above). SRR is a special regulation produced by Papua House of Representative (*Dewan Perwakilan Rakyat Papua* or *DPRP*) and approved by Papua People's Assembly (*Majelis Rakyat Papua* or *MRP*). Nevertheless, due to technical and institutional reasons, both bodies took about 5 years to conclude the traditional or Indigenous knowledge related-SRR drafts. These follow:

- SRR draft on Papua *Ulayat* Right. *Ulayat* right is the communal right over common property belong to an indigenous community, similar to the ancestral' domain land right;
- SRR draft on Papuan's Intellectual Property Right;
- SRR draft on *Adat* Law Community Forest. *Adat* law is the traditional law;
- SRR draft on *Adat* Law Community and Papua Natural Resources;
- SRR draft on Papua Forest Management;
- SRR draft on Task and Authority of *MRP*.

Interviews with the legislature and leader of *MRP* showed that they are not satisfied with the draft but for the time being this is the best outcome that they can achieve. Enactment of the above six Special Provincial Regulations asserts that the call for empowering and strengthening traditional or Indigenous community as the Indigenous or traditional knowledge holder is urgent. The influence of those six SRR will impact on many aspects of policymaking. They not only deal with the issue of intellectual property rights of Indigenous communities but also touch on the issues of food security, land rights, forest management, natural resource management (including mining activities) and the institutional framework of *MRP*.

Public Service Quality

There are some concerns emerging from the research that the government structure is too uniformly based on national regulation on local government structure. The principle of uniformity will not work effectively and creates a new burden. There is a need for adopting two principles according to Wospakrik, which are the gradual and availability principles (Interview, 2009). The 'gradual' principle was interpreted by this interviewee as the establishment of government service structure which should be related to local potentiality in order to focus and optimize the result. One interesting example from him is:

> … if one district (kecamatan) or town (kota) contains no significant minerals underground then there is no need to establish the mining service. Otherwise the bureaucrat will look into other kind of mining which is the above ground mines, excavate sands and stones that in the end will only destroy our environment. (Interview, 2009).

Another principle is the 'availability' principle which deals with the issue of human resource availability to be placed in any location. Filling all positions at one time creates an employee scarcity problem. For example, when the number of government employees is so low, local teachers and agricultural extension officers were recruited to fill in the positions. This policy created a shortage on the teacher and agriculture extension officer supply-side. In the Manokwari example above, the newly recruited personnel were assigned to specialist positions that they had not mastered yet. This results in an absorption of budget by the local government sector that impoverishes other technical sectors such as the agriculture service, the plant estate service and the forestry service.

In order to improve Papua's governance quality, another challenge that needs to be addressed is the quality of the public service. This was started in June 2007 by the policy of Governor Barnabas Suebu of Papua in order to increase the communication of government officers with villagers through the *Turkam* program (*Turun ke Kampung* or visiting the village) and to address the challenges faced by the villagers living in extreme poverty. He required the head of services to spend more time with people at the village rather than in Jakarta (an old habit from the post-autonomy era). He equipped the bureaucracy with reward and punishment mechanisms and improved the recruitment process using the fit and proper test system. He also established a new provincial body to improve the capacity of local bureaucrats. This is an example of a blend between the modernization of bureaucracy and the local knowledge issues that has potentially positive outcomes for all.

One of the problems of development in the Papua province is heightened by bureaucracy's underperformance in implementing the vision of the governor (personal communication, September 2008). Some bureaucrats had enjoyed the *status quo* of the old organizational culture. Under the old administration, budget control was not imposed strictly in the spending of the huge special autonomy budget. The merit-based system is not yet applied. This situation creates a climate of unaccountability. Under this situation, the governor has no choice but to ask for assistance from the international organizations to provide technical assistance through capacity building programs while at the same time supporting the provincial service at the village level (Interviews, 2008 and 2009).

The provincial government is aware of this situation. In order to handle it, they run the bureaucracy reform program. This program started from the service centers' structures. The program managed to lean towards the provincial government organization and forms a reverse pyramid organizational structure. However, financial analysis shows that upper echelon spending is still disproportionately high. The analysis found that the structure is leaner but still there are many offices that spend considerable amounts of money without achieving outcomes. This is a further target of governance reform in the provincial government of Papua. The main principle of this reform is 'less organizational structure, more function' (Interview, 2008).

Economic Issues

Now we turn to the second of the two main issues, namely economic issues related to biosecurity management, and this section has three sub-sections. These sub-sections are: (a) Local food versus big business, (b) Poverty alleviation, and (c) Knowledge availability for capacity building.

Local Food Versus Big Business

The opportunity for global markets for traditional products is still a challenge to be realized in Indonesia. This is especially the case for the urban poor segment of Papua and Papua Barat. Three examples from the data are used to illustrate economic issues:

1. Imbi and Gelael. People vs Corporation;
2. Outside Rice vs Manokwari Rice;
3. Cocoa for export vs Papuan subsistence farmer.

In the **first case**, a Jakarta-based modern chain-supermarket, the Gelael, has been operating in downtown Jayapura, or the so called Imbi area. The landmark of this area is the small Imbi park with the provincial legislative building on one side, the Papuan church office on the third side and a shopping area on the fourth side. In the middle of the shopping area there is the Papuan Art Council building where local artists perform periodically. The supermarket provides various modern food and drinks for people of Jayapura and in its upper floor, there is a Kentucky Fried Chicken outlet. Besides providing take-away food or drink, the supermarket also provides fresh products. All transactions are conducted through modern technology including the use of credit cards. Everything in this supermarket symbolizes modernization.

Meanwhile, right in front of the big supermarket, there is an asphalt space filled with traditional vendors that is known as the Imbi market. In juxtaposition to the modern market, Imbi market is an open roof area, where the vendors (all Papuan women) spread their products on the ground and they sit down on the ground waiting for the buyers. They are exposed to the sun during sunny days and the rain during the rainy times.

In October 2008, there was a plan from the Mayor of Jayapura to 'clean up' the area from traditional traders. The traders held a demonstration outside the Mayor's office. They demanded a proper market facility and that it should remain within close to the proximity of their current location in order to avoid the loss of buyers. One important issue arises if this plan is implemented, in that Indigenous Papuan traders would be vanquished from the centre of Jayapura. Now, facing the local election, the government has announced plans to build a market for the Indigenous Papuan women. Meanwhile, the civil society groups are actively campaigning for this issue. In terms of a biosecurity strategy, both the monopolies and the locals would need to be involved for success.

The **second case** relates to the example mentioned earlier, concerning Manokwari rice versus the rice grown in that area which does not originate from the district. The product is not able to compete with the rice from outside Papua. As we know, this situation is monopolized by the big-business rice traders from the city who for a long time have maintained close business relationships with the inter-island rice traders. Again, a successful biosecurity strategy would need to involve both monopolies and the traditional farmers.

The **third case** has also been discussed in an earlier section. It relates to one of the current popular products of Papua and Papua Barat, cocoa. Based on the interview data, the Estate Crop Service is using a number of means to try to shift the planters' practices to embrace plantation style growing techniques for cocoa. As mentioned earlier, in the modern method, pruning of the cocoa tree is needed to control the volume of leaves. This is different from the perception of the traditional planter that the thicker the leaves, the better. The traditional farmers think that thick leaves are a sign of fertile soil and good seed. One other challenge in cocoa production is pest prevention. When the Cocoa pod borer (CPB) infects the tree, a particular treatment and rapid response are needed to prevent its spread. However, in the local tradition, the planter would leave that tree alone until the pest ceases to be a problem and they also avoid the use of chemical products. During the period of that disease the planter will carry out other plantation work (Interviews, 2008 and 2009).

One main problem to solve lies with the policymakers themselves, especially in their attitudes toward the farmers. If policymakers understand the farmers' roles as subsistence players then they should treat them as such based on an understanding of the bigger ecological benefit of subsistence farming. Papuan farmers have a long history of farming, appropriate for their environments, and they have managed to build a strong and sustainable farming system. Their farming system is labelled as 'subsistence' and the common view is that they are therefore not 'real' farmers. Ironically, the ones modelled as the 'real' farmers are the rice padi field migrant farmers from outside Papua.

Poverty Alleviation

Poverty is the main problem in Papua. Based on 2007 data, more than 50% of Papuans in rural areas are living in poverty. A combination of urban-rural data shows the number is 40.78%, the highest in Indonesia. Influenced by high urbanization from the rural surroundings and by its position as the capital city of the province, Jayapura holds the record with 52.11% of poverty. To tackle the issue, since 2006 the governor of Papua initiated a new program name *Rencana Strategis Pembangunan Kampung* (Village Development Strategic Plan) or *RESPEK* which is now the flagship program of the provincial government both in Papua province and Papua Barat province. Under this program, the government provides one hundred million rupiah in direct funding for each village. Through this fund, the government expects to revitalize village economic activities. Villages can access the funds through their economic activity groups by proposing projects which are assessed on a competitive basis.

The *RESPEK* program is in many ways similar to the World Bank's *Kecamatan Development Program* or the *PPK* (*Program Pembangunan Kecamatan*), which had been implemented in other provinces of Indonesia since 1998. The distinguishing characteristic is that *RESPEK* is village-based management while *PPK* is *kecamatan*-based management (Interview, 2008). *RESPEK* also provides more resources for the village than *PPK*, because, being *kecamatan*- based, not all funds will reach the villages. *RESPEK* is implemented in all villages in both the Papua province and Papua Barat province. The program is controlled by its management office in Jayapura and by the Papuan provincial government as the original province. In Papua Barat province there is a provincial facilitator office for this program (Interview, 2008).

Since 2006, the World Bank has facilitated the central government to provide additional funds for the Papua province. Later, the World Bank helped the central government to review the *PPK* program so as to become the *RESPEK* program, to fit with Governor Barnabas Suebu's vision of village-based development and *RESPEK* continues until the present time (Interview, 2008).

The stages of the *RESPEK* program commenced from the Village Database-development, and continued with familiarization meetings at the district level (*musyawarah distrik sosialisasi*) attended by the village chief, representatives from the Three Stones or *tiga tungku* (government, religious leader and *adat* leader), women and youth. The *tiga tungku* functions as motivator for the community in development processes. Those who attend the district meetings will relay the information at meetings at the village level during a familiarization process, *Musyawarah Kampung Sosialisasi* (Interview, 2008).

The core stage of the *RESPEK* program is in the community planning stage (*Perencanaan Bersama Masyarakat* or *PBM*). *PBM*'s target is to produce from 1–20 village proposals. *PBM* is a competitive process between economic groups formed in the village. This process adopts an 'open menu' approach focusing on areas such as food and nutrition, education, health, community economic development and infrastructure. Other areas like Agriculture are part of the community economic development program. All proposals will be verified by the village meeting together with the village facilitators (two persons, a man and a woman). After the verification stage, *PBM* continues into the drafting and designing phase, including developing the project budget. The village people, together with the village facilitators, conduct all the drafting, designing and budgeting.

The *RESPEK* management also provides a list of items not eligible for funding including no chainsaw purchase, no chemical fertilizer purchase, no payment for government employees, no gun purchase and no church or mosque development financing.

From the social security or food security perspective, *RESPEK* provides valuable support for the farmers and impoverished people to be able to access cash money (Interviews, 2008 and 2009). This is one concrete benefit of a combination of special regional autonomy and international cooperation. Before the special autonomy era, under the centralized government system, access to capital was a big issue for Papuan farmers. That situation indicates a lack of government services to develop village economy. This is the reason the *RESPEK* funding is channeled directly to the village rather going through *kecamatan* level so the villagers will receive the full benefit of the funding.

Knowledge Availability for Capacity Building

As has been discussed in Chap. 2, farmers' capacity is one of the important issues that needs to be addressed in order to improve Indonesian biosecurity capacity. Farmer capacity is closely related to knowledge that he or she has access to and that can be applied in his or her daily activities. In the context of the farmers in Papua, there are three sources of knowledge: Knowledge from their experience and self reflection, knowledge gained from interaction with peer farmers (inside or outside the farmer group) and knowledge from other sources such as agriculture extension officers and the internet or other media. The most effective knowledge transfer is among the farmer's peers. Information from the agriculture extension officers could be considered a secondary source and sometimes unreliable.

For any information to gain its value as 'knowledge', the farmer needs to access it through practical examples. But the form of information is not the only issue. Many times trust also plays an important role. In order to gain trust from the farmers, there is a need for continuing and deep interactions between the information bearer and the information receiver. For example, as happened in Papua, agriculture extension officers will able to undertake their roles effectively only if they live and work with the farmers and assume the role of a farmer themselves, avoiding playing the role of 'teacher' toward farmers. This kind of extension officer is able to combine scientific information and their own field experience, with farmers' experience. Even a good extension officer needs "field examination" (Interviews, 2008 and 2009).

The experience of two farmers in Papua, Setu and Dortheus Paiki's in Manokwari, provides an example. In their rice field areas, the most common pests are leaf roller, stem borer and snail. For the leaf roller, pesticides will work, but for the stem borer it is difficult and for the snail there is no cure. Their experience told them to use 'spontaneous' pesticide based on continuing observation. They also use non-chemical cures such as *gadang* which is a kind of *kemili* (*Stemona tuberosa*) that contains poison and effectively works against the pest.

In another village, the extension officer lives in the city and periodically visits the village. Due to low interaction with local farmers, the officer was not able to handle the issues himself. As a self-defence mechanism, the extension officer composed a new pattern of communication with the farmers as his subordinates. According to one senior farmer and traditional leader, he does not believe that kind of extension officer's credibility is strong enough to handle his village agriculture problems. Because of that the community leader is far from willing to involve the extension officer in solving the community's agriculture problems. In solving their problems, the farmers decided to find information through their own experiences, media news and books. In his words "maybe the extension officer doesn't even understand how many existing varieties of *Sago* there are in this land" (Interview, 2009). *Sago* or sago (*Metroxylon sago rottb*) is the local staple food and the tree serves many needs in the farmers' lives. The farmers are able to identify different kinds of *Sago* varieties based on their interactions with the local ecology.

Another type of agriculture officer in the village is the pest observer officer. The story is similar to the extension officer above. In one village the officer dedicated himself fully to his work, but the problem was that the local agriculture service did not pay serious attention to the report. In another region the officer did not carry out his work properly, being aware that his report is undervalued and in the end this jeopardized the value of the role in the eyes of the community. These examples show that equal and practical communication will be more effective in achieving biosecurity outcomes. Communication that is 'stratified' according to hierarchical roles is shown to not work effectively, and indeed often has negative outcomes.

The findings show there are several issues related to local knowledge and biosecurity that need to be considered. First of all, farmer capacity is closely related to knowledge that is gained and applied in the course of daily activities. There are three sources of knowledge for the farmers: knowledge collected from their experience, trial and error and self reflection, knowledge gained from interaction with peer farmers (inside or outside the farmer group), and knowledge from other sources such as the media and agriculture extension officers. Secondly, the farmer is the producer of knowledge as well as the knowledge user. From their daily experience, their knowledge is friendly to nature due to their interaction with the local ecology. Finally, there are two models of information transfer: The most effective one is from the equal and practical interactions between farmers and extension officers; and the most ineffective is the stratifying interaction between the farmers and the extension officer. The latter type of communication is ineffective.

Conclusion

This chapter has described a number of local and provincial level examples of the issues and challenges associated with 'development' in areas whose population is mixed, but essentially traditional Papuan people. In describing these detailed examples, I am hoping to show some positive ways in which policy and legal frameworks might actively engage with local knowledge for the benefit not only of biosecurity management, but of food security and sustainable economic development. Moreover, these findings shed direct light on the question for this chapter, which is how local level governance capacity can be enhanced in order to mesh effectively with national and international policy frameworks. These partnership-based interactions as set out here will, at the same time, increase the local communities' capacity to participate in Papuan development using local knowledge in sustainable ways.

The need for strengthening traditional or Indigenous communities as the Indigenous or traditional knowledge holders is supported in the data, and by existing research literature. The support comes from several quarters. First, respect for local people is proven to be the most effective way of communicating with them, and of working together to produce desired change. Second, local knowledge can offer different and locally appropriate ways of managing biosecurity that technology and modern science may as yet lack. Working with local people as partners is the most likely means of achieving benefits for all. Third, regional economic development is most likely to occur in sustainable ways if the above partnership approaches are introduced and strengthened, as economic development such as ecotourism and niche local food product markets rely on local knowledge for success.

In order to achieve these goals, Indonesia's central government should provide political support for *MRP* and *Dewan Perwakilan Rakyat Papua* (*DPRP*) to function more effectively and increase the level of trust with Papuans. This is why early bureaucratic reform program is essential.

Although *RESPEK* is a good program, it is insufficient to provide sustainable benefit for native Papuans. There is a need for entrepreneurship development programs for native Papuans through training, local entrepreneur empowerment, provision of capital and affirmative action. Training entrepreneur-farmers is a sustainable way to empower the villages as community units. The farmers' will have a significant impact and bring greater ecological benefit. The research findings elaborated in this chapter show that a sound national policy takes more than the national actors to realize it. The role of local actors and international support is also important to provide capacity support and organization, especially when local government capacity is limited. That limitation creates a demand for public participation, especially by the local institutions to help deliver the services to the communities.

On the issues of food security and effective biosecurity management, meshed as they are with biodiversity policy in Indonesia, the national and local governments in this country need to address several issues. The most important one is to provide economic empowerment for Indigenous Papuan traders through special markets and promotion, training, access to capital and information. Promoting and highlighting local products is part of this strategy, whether local rice or Sago, in order to avoid dependency on food originating from outside Papua. Massive scale and often single crop agricultural development should not set aside the important roles and rights of the communities who should be partners in the development.

References

Boissiere, M., & Purwanto, Y. (2007). The agricultural systems of Papua. In A. J. Marshall & B. M. Beehler (Eds.), *The ecology of Papua* (pp. 1125–1148). Singapore: Periplus.

BPS. (2008). *Papua dalam angka (Papua in figures)*. Jayapyura: Badan perencanaan pembangunan provinsi Papua and Badan pusat statistik provinsi Papua.

Christie, M. (2008). Traditional aboriginal knowledge practices and north Australian biosecurity. *Kritis-Learning Communities*, *Special Co-publication*, 64–74.

Creagh, S. (2010, March 15). Greens fear Indonesia forest loss for food estate. *Reuters*, 25 Mar 2010. Retrieved April 12, 2010, from http://www.reuters.com/article/idUSTRE62O2BU20100325

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2005). *The sage handbook of qualitative research* (3rd ed.). Thousand Oaks: Sage.

Falk, I., et al. (2008). Community management of biosecurity: Overview of some Indonesian studies. *Kritis-Learning Communities*, *Special Co-publication*, 1–40.

Kementerian Pertanian. (2010). *Program kerja 100 hari kementerian pertanian* [Agriculture ministry first 100 days program]. Retrieved April 12, 2010http://perkebunan.litbang.deptan.go.id/?p=berita.5.131

Kompas. (2010, February 17). *Tata ruang "food estate" di Merauke belum jelas* [Merauke food estate land use planning is not clear yet]. Retrieved April 12, 2010, from http://cetak.kompas.com/read/xml/2010/02/17/02584686/tata.ruang.food.estate.di.merauke.belum.jelas.

Muller, K. (2008). *Mengenal Papua* [Understanding Papua]. Jayapura & Jakarta: Papua Province & PT Freeport Indonesia.

Setneg. (2010). *Food estate, harapan ketahanan pangan masa depan* [Food estate, a hope for the food security future]. Retrieved April 12, 2010, from http://www.setneg.go.id/index.php?option=com_content&task=view&id=4314&Itemid=29

Simamora, A. P. (2010). *Minister Hatta backs much-debated food estate*. Retrieved April 12, 2010, from http://www.thejakartapost.com/news/2010/04/03/minister-hatta-backs-muchdebated-food-estate.html

Suharto. (2007, December 11). *Peran karantina dalam rangka perlindungan sumberdaya genetik dan keanekaragaman hayati* [The role of quarantine in the protection of genetic resource and biodiversity]. PowerPoint presentation at Pusat Informasi dan Keamanan Hayati, Agriculture Quarantine Agency of Indonesia, Pontianak.

Sumule, A. (2003). Swimming against the current. *The Journal of Pacific History, 38*(3), 353–369.

Suryadi, S., et al. (2007). Conservation laws, regulations and legislation in Indonesia, with special reference to Papua. In A. J. Marshall & B. M. Beehler (Eds.), *The ecology of Papua* (pp. 1276–1310). Singapore: Periplus.

Syamsudin., et al. (2007). *Sudahkah aspirasi masyarakat terakomodir dalam rencana pembangunan?* [Have the society's expectations accommodated in development plan?]. *Governance Brief*, *34b*.

Tabloid JUBI. (2010, February 12). *Merauke "food estate": Mencari beras di dalam lumbung padi* [Merauke "food estate": Looking for rice in the padi barn]. Retrieved April 12, 2010, from http://tabloidjubi.com/index.php?option=com_content&view=article&id=5390:merauke-food-estate--mencari-beras-di-dalam-lumbung-padi-&catid=88:lembar-olah-raga&Itemid=97

WALHI. (2010, March 3). *Food estate bukan jawaban kerawanan pangan Indonesia* [Food estate is not the answer for Indonesian food crisis]. Retrieved April 12, 2010, from http://www.walhi.or.id/in/kampanye/air-dan-pangan/143-siaran-pers/931-food-estate-bukan-jawaban-kerawanan-pangan-indonesia

Chapter 4
Crossing the Community-Government Border: The Case of Citrus Biosecurity Management in West Timor, Indonesia

I Wayan Mudita

Introduction

In his foreword to the special co-publication of Kritis-Learning Communities journal on community management of biosecurity, Professor John Lovett, the Chairman of Board of the Cooperative Research Centre for National Plant Biosecurity (CRC NPB), Australia, emphasizes the importance of borders in a number of contexts (Lovett 2008). He argues that the shrinking world due to globalization has resulted in more complex border issues. In this shrinking world, distance is no longer an element of defence and, as borders become closer and jurisdictions become more complex, pest and pathogen incursion emerge as a much greater threat than ever before.

Borders are, however, not only physical but also social. Although different in their forms, both share the common meaning of a "zone" where two sets of different entities meet. Physical borders are the zones that separate geographical areas and farmer fields, for example, while social borders are zones that separate understanding, actions, knowledge and cultures. Whilst physical borders may provide an obstacle for pests and pathogens from entering a particular area, social borders may impede participation and cooperation in managing biosecurity breaches across the meeting zone. Both physical borders and social borders need to be negotiated in order for physical borders to work properly. In this era of globalization, cross-border management is indeed in the forefront of biosecurity management. Within this cross-border management framework, negotiating the social borders for better managing pests and diseases is as important, if not more so, as ensuring the physical borders are not being crossed by incurring pests and pathogens.

I W. Mudita (✉)
CRC for National Plant Biosecurity, Canberra, ACT, Australia;
Charles Darwin University, Darwin, NT, Australia

Nusa Cendana University, Kupang, NTT, Indonesia
e-mail: mudita.undana@gmail.com

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_4, © Springer Science+Business Media B.V. 2011

The case of citrus in West Timor provides a good example of community biosecurity management for a number of reasons. In the highlands of West Timor, it is a crop that has long been bound to local traditional agriculture (Crippen International 1980c; Ormeling 1955). Nationally, citrus has been part of an agricultural development program aimed at increasing household income, particularly in the highlands (Research Station for Citrus and Sub-tropical Horticultural Crops 2004). Worldwide, citrus is an important crop throughout the tropics and sub-tropics (Verheij and Stone 1992). No matter where it is cultivated, however, citrus is a crop that is subject to a large number of destructive pests and diseases (Roistacher 1991). There are now various measures available to manage these pests and diseases, but for such control measures to be implemented effectively, government policies need to carefully address social borders that may arise as a result of a lack of common understanding on local biosecurity issues.

This chapter focuses on the need for social border crossing that exists between the community and the government in the management of biosecurity. The research focuses on the project themes of governance, knowledge transfer and policy, and employs mixed methodologies to identify biosecurity issues upon which the influences of various social factors are to be investigated. The results will provide the basis for developing a community biosecurity management model that is not only applicable for the region but can also later be used as the reference model for other regions.

Local Communities and Their Biosecurity Issues

West Timor's Highland Communities

The term 'community' has been used in a range of different contexts, but in its most straight forward definition, refers to a group of people who share a common identity or interest, whether it be a geographic location, cultural background, occupation, sport, language, age, school or sexuality. However, community is much more complex than a simple collective of people. Throughout this chapter, the term is used loosely to identify a unit of analysis on the basis of shared geographic location, interactions and connectedness that occurs between individuals and groups, existing specific sense of belonging, value, identity and acceptance, as well as the ability to meet the needs of its members using the available resources (Hooper 2006; Ife 2002; Kenny 1999). In this sense, community encompasses an administrative boundary, but for the purpose of identifying a unit of analysis, administrative boundary at the smallest local level population group, that is, village, is employed. Reasons to choose village as a unit of analysis are based on the fact that in West Timor, most locally existing community groups operate within village boundaries and close traditional ties among members of local communities exist mainly within a village (McWilliam 1999; Nordholt 1971; Ormeling 1955).

Communities in the highlands of West Timor relate closely to kinship groups of people known as the *Meto* (also referred to as the Atoni, the Dawan, or the Timorese Proper) (Ormeling 1955). In the past, these people built their settlements in narrow fans along the course of rivers or around springs often found on the foot of projecting rocks known in the local language as *fatu*. Settlements were usually separated from each other by a vast area of grasslands and woodlands. These grasslands and woodlands provided people in the settlement not only with access to natural resources, but more importantly also with distance as an element of defence from attacking enemies. Since colonial time and particularly after independence, the local governments have made many efforts through various schemes to move these isolated settlements closer to road networks. Not all of such efforts were successful, but now most villages are accessible by road.

In the past, life in the settlements was linked with traditional concepts in which group effort and mutual helpfulness predominated in accomplishing the heavy work of land clearing, fence erecting, house construction, and path clearing. This resource sharing, Dove (1990) argues, has stabilized the community for centuries against natural disturbances such as famine during the monsoonal drought and social disturbances such as tribal warfare. According to Fox (1977), this concept of sharing has begun to develop into a system based on mutual exchange and reciprocity rather than simply sharing for free. This change in community life has been interlinked with other changes such as inter-breeding with people from other areas, primarily the Rotenese (Rote is a small island close to the West Timor mainland), the Savunese (Savu is a small island some distance from West Timor), the Chinese, and even the Buginese (an ethnic group from the island of Sulawesi), replacement of the traditional with a modern government, and embracement of Christianity from traditional beliefs (Monk et al. 1997). Recently, government programs such as *RASKIN* (Rice for the Poor) and BLT (Direct Cash Compensation for Oil-price Increase) have raised tensions between community members as the programs are not based on the concept of sharing, but individuality.

Formal leadership is now a common feature across this highland region that stretches from the northern part of the Timor Tengah Selatan (TTS) district in the west to the northwestern part of the Timor Tengah Utara (TTU) district in the east (see map in Fig. 4.1). Administratively, each district is divided into sub-districts (*kecamatan*), *kecamatan* into villages (*desa*) and desa into settlements (*dusun*). Each of these administrative divisions is headed by the *Bupati*, *the Camat*, the *Kepala Desa*, and the *Kepala Dusun*, respectively, who are primarily responsible for formal government affairs. For social recognition these formal leaders usually involve themselves in non-formal community affairs, but this involvement is not decisive. The decision regarding informal community affairs is largely made by traditional leaders such as elders of a leading kinship group, religious leaders and teachers.

Involvement in non-formal community affairs provides a focal point for community members to maintain social networks. It also provides a way for formal leaders to gain social recognition and acceptance from among traditional leaders. This type of involvement also facilitates information exchanges, alongside other means such

Fig. 4.1 Administrative division of the highlands of West Timor, Indonesia

as village meetings, traditional weekly market days, bathing times in common village springs, family visits, and recently, mobile phone communications. Information that is exchanged through these communication networks includes various things, ranging from personal matters such as well-being to much wider community interests such as land clearing, planting times, joint works, etc. A mandarin nursery man admits the importance of this type of information exchanges:

> I knew where to go for buying RL [rough lemon for rootstocks] seeds last year from a relative I met in a wedding ceremony. He told me that in his village, RL was grown everywhere and the trees bore fruits abundantly that year. So I went there and bought six kilos of RL seeds. No way could I get this kind of information from government officials (interview transcript, 2009).

Information exchanges taking place during this type of involvement have further reaching social, cultural, political and even financial benefits in comparison to those taking place formally. There are, however, some exceptions to this type of informal information exchange. Some government officials are specifically and purposively contacted by local people because they have developed social networks that extend beyond their professional setting.

The Rise and Decline of Mandarins in the Region

Despite some changes that have taken place in community life, agriculture in these highlands remains basically unchanged (Crippen International 1980c; Messakh et al. 2010). People still engage in slash-and-burn swidden cultivation by the same methods and with the same simple tools for producing annual crops as their staple food. Livestock is now an important source of cash income but, as has been the case for centuries, neither its labour nor manure is utilized. Perennial crops are usually planted around their houses or in group-owned land known as *mamar* located around a spring. The perennial crops consist of those important for their social life such as betel nut (*Areca catechu*) and peper betel (*Piper* sp.) and also some fruit trees. Among these fruit trees, the mandarin (*Citrus reticulata*) was and still is an important element of home-garden crops in this part of West Timor. Highland estate crops such as Arabica coffee (*Coffea arabica*), despite a decade of government efforts to promote its planting, have never been widely grown in the region.

The presence of the mandarins in West Timor has a long history. According to Ormeling (1955), the mandarin was introduced by the Portuguese during their first encounter in Timor in early 16th century. This is very unlikely however, considering the geographical origin of mandarins is China (Ashari 1992) and the Chinese had engaged in trade for sandalwood, beeswax, and dye-wood in Timor since the 15th century. Local people have since called the mandarin 'lemon China', literally means citrus from China, or *leol kase*, meaning the mandarin brought by foreigners. Ormeling (1955) quoted Dampier who in 1699 saw "citrus being grown in the garden of the Dutch port in Kupang", van Hagendorp who reported that "in 1779 oranges thrived luxuriously in the island", and van den Dungen Gronovius who wrote that in 1849 there was a "copious harvest of citrus that, due to little economic importance, the fruits were fed to pigs".

The flourishing of the mandarins and other citrus species in West Timor largely depends on the local climate and soil. Timor is distinct from other islands in Indonesia in various aspects; the most striking difference can be found especially with respect to its climate and soil. Timor is amongst the driest islands in Indonesia, not because of low total rainfall but because of rainfall distribution over time and region (Crippen International 1980a; Monk et al. 1997). Total annual rainfall in the highlands can reach up to 2,500 mm, but most of this rain can occur only within 2–3 weeks in January or February. On the contrary, annual rainfall as low as 100 mm is observed in the northwestern coastal areas, which are within the rain shadow of the Inner Arc islands from the wet west monsoon. Meanwhile, soil in West Timor is largely derived from limestone parent rock. As its development is quite recent, soil in the area is generally low in nutrient content (Crippen International 1980b). In addition, because the topography is predominantly mountainous and the landscape lacks vegetation cover, soil is easily subject to erosion. The traditional slash-and-burn swidden agriculture practised throughout the area has for centuries further exacerbated the situation, causing a large portion of land to be no longer suitable for cultivation (Monk et al. 1997). Surprisingly, it is within these environmental conditions that mandarin has thrived as part of the local subsistence agriculture. According to Ashari (1992), mandarins, particularly the very loose-skinned cultivars, including the cultivar (cv.) Keprok Soe now dominating the region, need a pronounced dry season (more than 3–4 dry months) and a relatively cool climate (highlands between 600 and 1,300 m in the tropics) to grow and bear flowers well. Other citrus species such as pummelo (*C. maxima*), sweet orange (*C. sinensis*) and hybrids of sweet oranges and mandarins are also now cultivated in the region, but the local climate and the promotion by local governments have made the Soe mandarin predominate.

Local government efforts to promote Soe mandarin cultivation started in the 1970s, but intensified cultivation only began later around the 1990s (Pellokila et al. 2004; Suek et al. 1998). Mandarin production reached its peak during the late 1980s until early 1990s (Kompas 2003). Since then however, the production started to decline because of an epidemic that, according to local governments, was of diplodia rot. The intensified cultivation program that took place during the 1990s was launched mainly to revive the declining orchards that were believed by local governments to be caused by the disease and traditional cultivation practices. To revive the declining citrus cultivation, local governments put citrus into one of their priority crops, with funding support from overseas institutions such as the Japanese Office of Economic Co-operation Fund and the American non-governmental organization Winrock International. An ambitious target was set by the Provincial Food Crop Service in 1997 to extend citrus planting area from 2,018 ha into 6,628 ha by 2003 (Wei et al. n.d.). Such an intensified cultivation did succeed in bringing back increased production until suddenly, despite the government program to increase the planting area, it once again started to decline. It was found by Mudita (1998) that the latter decline was caused by phytophthora disease, however the local government denied the finding, accusing the researcher of trying to sabotage the project. This controversy was resolved after a team of researchers from *Balai Pengkajian Teknology Pertanian* (BPTP), a research station under the Ministry of Agriculture, proved that it was the *Phytophthora* incited disease that caused the mass death of mandarin trees (Murdolelono et al. 2004).

All citrus species and hybrids currently in cultivation throughout the tropics and subtropics, including mandarins, are subject to a large number of destructive pests and diseases (Jagadish-Chandra and Singh 1998; Roistacher 1991). The reason diseases have been so threatening to citrus biosecurity is related to a number of interconnected factors. Foremost among these is the fact that to maintain desired quality of a particular cultivar citrus is mainly propagated vegetatively, particularly by grafting. Vegetative propagation creates genetic homogenicity and hence can render citrus susceptible to pathological and entomological pressures (Manner et al. 2006). This limited genetic variation will potentially increase the genetic vulnerability of the crop to devastating pathogens. This situation has been aggravated by the fact that, according to Verheij and Stone (1992), budwood is used indiscriminately for production planting material. Because most destructive diseases of citrus, particularly those caused by virus and bacteria, are graft transmitted, it is easy to understand that such diseases spread easily with seedling distribution. To overcome this problem, most citrus growing countries impose a strict regulation on seedling production and distribution. For example, budwood should be collected only from healthy source trees tested free from pathogens and seedling importation should be under strict quarantine inspection (Williamson and Jackson 1994). However, this regulation is difficult to enforce – especially for citrus greening now known internationally as *huanglongbing* (*HLB*) and in Indonesia as CVPD (Citrus Vein-Phloem Degeneration, the Indonesian name for HLB), because symptoms are not specific and masked by those of nutrient deficiencies (Bove 2006). Citrus nurseries are widespread small-scale business operations and the diseases are vector transmitted. A number of plants serve as alternative hosts, and accurate diagnostic tests are not affordable for small-scale business citrus propagation (Roistacher 1991).

In practice, it is unfortunate that these requirements cannot be adequately met by the local governments. The multiplication blocks that now exist both in TTS and TTU district are too small to provide budwood to all nurseries engaged in seedling production. To cope with the budwood shortage issue, local agricultural services respond by allowing nurseries to use source trees from outside the multiplication blocks provided the trees had been previously inspected and tagged. Such trees would be eligible to be source trees for only a period of one year and if to be used again in the following year, inspection and tagging would again be required. However, because the demand for grafted seedling is so high, many farmers have set up their own nurseries. This is possible because during the course of the government effort to promote mandarin intensification, training has been provided to farmers to produce their own grafted seedlings. Understandably, because farmers who are involved in grafted seedling production are so scattered, strict inspection is no longer possible. In addition, there are also local government officers that take advantage of the situation, engaging themselves in the business for personal financial gain.

The consequences of this practice are multiple. Nowhere in the region can healthy citrus now be uniformly found as was the case in the 1990s. Instead, dying and dead trees (Fig. 4.2a, b) are found everywhere. Some trees look healthy, but close examination will reveal symptoms of various diseases, among which that of HLB is also common (Fig. 4.3a, b). The symptom can even be found on source trees and seedlings (Fig. 4.4a, b). Thus the future of this crop with such a long history and close association with the livelihood of local people has been jeopardised.

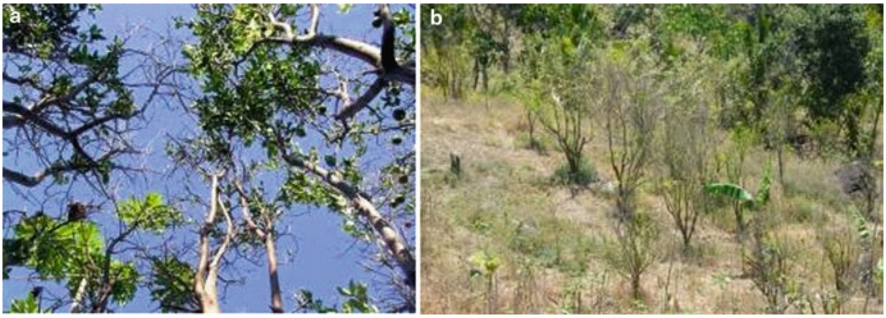

Fig. 4.2 Mandarins found in the highlands of West Timor consist of mostly dying trees such as in a newly developed orchard in Oelekam Village (**a**) and dead trees such as in a previously lush orchard in Ajaobaki Village (**b**)

Fig. 4.3 Symptoms of HLB found in TTS and TTU Districts consist of yellowing of shoot (**a**) and asymmetric yellowing and thickening of leaves (**b**)

Fig. 4.4 Symptoms of HLB found on a source tree (**a**) and on seedlings (**b**)

Unless there is a significant change to the current top-down development mainstream, the future of this crop seems very unpromising.

Community Biosecurity Issues

Citrus growers in the highlands of West Timor are generally aware that the decline of mandarins has been caused by disease. Some mention that the decline is due to diplodia rot, but most do not know the cause. Instead, they speculate about the effect of various factors and not all are necessarily true. For example, a grower mentions that the decline is caused by ants that:

> … come out of the ground, climbing up the trees to lay their eggs on citrus shoots. They are so abundant, sucking sap out of the shoots, causing the trees to die suddenly (interview transcript, 2008). Ants do climb citrus trees, but they do so to feed on aphids, an actual pest to citrus. In another interview, a village leader believes that the decline is caused mainly by an inappropriate land preparation practice recommended by a former head of district coupled with the recently intensifying drought due to global warming:
>
> A former head of this district required people to prepare their lands by digging deep in order to turn the fertile bottom layer of soil up into the surface. This would cut off roots, prevent trees from getting enough moisture from the soil. And now, the pronounced drought caused by the global warming is further intensifying the effect [of lack of moisture] (interview transcript, 2008).

Another grower blames propagation by grafting as causing trees to die early because:

> … the tap root of the seedling has to be cut off or folded. When this seedling is planted, the tree no longer has the root that can penetrate deep enough into the soil to get moisture and nutrients so it will die within less than 10 years. Trees propagated directly from seeds stay productive for more than 25 years (interview transcript, 2009). It is not the fault of growers, however, that they do not know that the mandarin decline has been caused by disease. According to most of them, the local governments have never provided enough information about pests and diseases. The only information they are aware of being provided is that the decline is caused by diplodia rot.

Only rarely did we find that interviewed citrus growers mentioned other pests and diseases. Such people usually held important positions in the villages. For example, a village head in TTU District admits that he knows the names of citrus pests and diseases from attending a Farmer Field School (FFS) of Integrated Pest Management (IPM). Unfortunately, he fails to correctly mention the name of pests and diseases he has learned. This is because, according to him, he was taught mainly in the classroom with only a brief field session. He still keeps his notes, however, and it is clearly written there that CVPD is one of citrus diseases that have been thought to be present (CVPD –Citrus Vein-Phloem Degeneration– is the Indonesian name for HLB). There are mandarin trees with very recognizable symptoms of HLB, but he could not provide any specific answer when asked if a tree was suffering from HLB.

Most growers and nursery men are aware that pests and diseases could spread from neighboring villages and from mandarin trees in their neighborhood to trees in their home gardens. However, they do not know how it is possible and what makes it happen. A nursery man, a retired government official who had been aware of the presence of HLB from brochures he received when he was still an active officer, speculates about the spread of the disease by saying:

> I first saw the symptom of the disease [HLB] in Tobu when I supervised a project there in early 2000s. The village is more than 15 km from here [his nursery location in Soe]. One or two years later, one of my source trees was showing the same symptoms. I suspect the pathogen is blown by wind. I could not say that it was CVPD. What I can tell you now is that the symptom looks like the one I have seen before in the brochure (interview transcript, 2009).

The pathogen is not wind-borne but the vector *Diaphorina citri* is. The vector can be blown by winds to establish an initial population from which it can fly short distances to spread the HLB pathogen to the neighboring trees (Gottwald et al. 2007).

Responses to the government program of extending mandarin planting areas by distributing seedlings to villages are mixed. Some growers are enthusiastic about receiving the seedlings, expecting that they would be able to recover their orchards. Some growers, however, are not so enthusiastic, knowing that the seedlings would die even before they could get the first harvest:

> Some three years ago I got seedlings distributed by the government and planted them close to other healthy trees. I suspect these seedlings have brought disease from somewhere. I cut down all those dying trees but the remaining trees keep dying instead (interview transcript, 2008).

Such a concern is not without reason because government supervision on seedling production is, in fact, not as strict as it is supposed to be. A representative officer of UPT-PSB (*Unit Pelaksana Teknis Pengawasan dan Sertifikasi Benih* or Technical Implementation Unit for Seed Supervision and Certification, an office under the provincial agricultural service) for TTS District maintains that:

> As long as the mandarin here is concerned, it is our responsibility to guarantee that grafted seedlings produced by district government and private nurseries meet the quality standard as required by law, including, of course, plant health requirements (interview transcript, 2009). Interestingly, a senior officer of UPT-PSB however provides different information. According to him, UPT-PSB officers are able only to supervise diseases that produce readily observable symptoms, not for those that have a long latent infection period, during which symptoms are unobservable. He further asserts that the currently existing multiplication blocks can by no means supply all the budwood requirements. To overcome this budwood shortage, the officer further explains, nurseries are allowed to obtain budwood from trees previously inspected and tagged by UPT-PSB officers. Toward this policy, a retired government officer who now sets up a nursery of his own says:
>
> How many trees are already tagged for the source of budwood? I do not believe that those [tagged trees] are sufficient. And more importantly, who knows where every nursery gets their budwood from? For every nursery the only important thing is to produce seedlings … it is the responsibility of the government to guarantee the seedlings are healthy. UPT-PSB [officers] always inspect my seedlings … I also get a letter of approval from the quarantine … before my seedlings are sent outside to many places in Indonesia … including to Timor Leste (interview transcript, 2009).

The senior officer also admitted that such source trees have never been closely inspected for the presence of diseases such as HLB. However, he says that the PCR (*polymerase chain reaction*) test has been carried out once on specimens taken from the foundation block located in Nonbes, a lowland village close to Kupang, and the result was weakly positive. He doesn't consider this result as being too threatening considering that HLB only develops in warm climates, not in the cool climate of the highlands where the mandarin is mostly grown in West Timor. He seems unaware, however, that in TTS District citrus is no longer only planted in the highlands, and that temperature is not influenced only by altitude. Temperature is also influenced by slopes, whether it is facing or leeward against wind directions. Temperature readings in Soe at an altitude of 800 m of the east side of Mount Mutis during the southeast monsoon may reach 30°C (Food and Horticultural Crops Services of TTS District 2008), well within the temperature range for HLB development of 22–32°C (Bove 2006). In South China, 100% of trees are affected by HLB in orchards located at altitudes of 1,090–1,200 m, where *D. citri* is abundant, while between 1,385 and 1,620 m, the percentage goes down to 3% and no psyllid have been found (Zhao 1981).

To cope with disease problems currently devastating the mandarins in the region, the only recommendation provided by local governments is to treat trees with a lime sulphur mixture. This mixture, locally known as California mixture, is prepared by boiling calcium hydroxide and sulphur together with a small amount of surfactant. However, a senior officer who is also a citrus grower refuses to use the mixture arguing that:

> It is not yet proven effective. I very much worry that instead of curing, the mixture may weaken the trees because it contains lime (interview transcript, 2009).

According to Radja (n.d.), this mixture is recommended only for control of citrus fungal pathogens, not for those of bacteria and virus. More specifically, it is an eradicant of over-wintering fungal spores on the surface of citrus trunks. The Research Station for Citrus and Sub-tropical Horticultural Crops (2004) recommends lime sulphur mixture for control of diplodia rot, not for other diseases.

Policy Frameworks Specifically Addressing Government-Community Issues

Laws and Regulations Related to Biosecurity Management

Despite recent developments in biosecurity management in the neighboring countries of Australia and New Zealand, Indonesia has not yet adopted an integrated national biosecurity policy. Biosecurity is currently addressed through a number of acts and government regulations that provide the basis for particular government agencies to take the necessary actions in case of incursion or outbreaks. To Untung (2008), this is understandable considering that biosecurity is a recent development. Using the FAO definition of biosecurity (FAO 2007) as the starting point, he identifies tree policy aspects within which the Indonesian government has addressed biosecurity, namely quarantine, food safety and genetically modified organism products. On the other hand, on discussing the same issue, Semangun (2008) focuses more specifically on crop protection using Act No. 12 (1992) concerning Crop Cultivation Systems and Government Regulation No. 6 (1995) concerning Crop Protection as the basis for his discussion.

With regard to plants, biosecurity is basically the management of risks to food and agriculture (FAO 2007). Understanding this notion, it becomes clear that biosecurity encompasses threats from both alien and existing pest and diseases. In line with this understanding, it is logical to treat Act No. 12 (1992) and Act No. 16 (1992), concerning Animal, Fish, and Plant Quarantine along with its succeeding government regulations, Government Regulation No. 6 (1995) concerning Crop Protection and Government Regulation No. 14 (2002) concerning Plant Quarantine, as the basis for discussing government policy on biosecurity in Indonesia. Act No. 12 (1992) is actually an umbrella law for all aspects of crop cultivation systems because it adopts IPM (Integrated Pest Management) as its framework (Article 20) that consists of three components (Article 21): (a) prevention from the introduction of pests and diseases into, and the distribution of pests and diseases within, Indonesian territory, (b) management of the existing pests and diseases, and (c) eradication of accidentally introduced pests and diseases into, or between, areas within the country. On the other hand, Act No. 16 (1992) specifically addresses quarantine: (a) to prevent the introduction into the country and concomitant exportation, if so required by the country of destination, of quarantine pests and diseases of animals, fish and plants and (b) to prevent the dissemination of quarantine pests and diseases on animals, fish, and plants from one area to another within the country (Chapter 1 Article 3). It is obvious that these two laws are related, as Article 21 of Act No. 12 (1992) dealing with prevention measures becomes the basis for Act No. 16 (1992).

Most sections of these two laws deal with technical aspects of crop protection measures and quarantine procedures and therefore do not warrant further discussion here. Important aspects that are relevant are articles that deal with the role of the government and the society at large. As required by Act No. 12 (1992), the government is responsible for: (a) carrying out crop protection measures hand in hand with the community (Article 24), (b) enforcing eradication or requiring eradication to be carried out with compensation (Articles 26–26), (c) setting up quality standards for registers and supervision, and whenever necessary bans and limits to pesticide importation, distribution, and application (Articles 38–40), (d) developing policy directions regarding regulation, guidance and provision of crop cultivation activities (Article 52), and (e) promoting agricultural extension and providing information and technology necessary for advancing crop cultivation. This law requires participation from the community in terms of: (a) reporting and taking any necessary actions should a particular pest or disease be found in a particular location (Article 24), (b) carrying out crop protection measures according to the standard operating procedures already set up by the government (Articles 28 and 41), and (c) seeking further information and technology for improving production (Article 57). Interestingly, Act No. 16 (1992) deals almost entirely with the roles of government, including generating public awareness (Article 28) and encouraging public participation (Article 29).

The governments, both national and local, set up policy direction in accordance with the above laws and regulations. This is however not an easy task, considering the large number of government bodies dealing with policy making concerning agriculture and forestry, including trade related to agricultural and forestry products. At the national level, this includes the Ministry of Agriculture, Ministry of Forestry, and Ministry of Trade, each of which consists of a number of Directorate Generals responsible for particular aspects of the ministry. Under the current law of regional autonomy (see below), each autonomous provincial and district/city government has its own offices for agriculture, forestry and trade services. An office at the district/city level is no longer subordinate to that at the provincial level, as is an office at provincial in relation to the national level. Coordination will obviously become a real issue here because it involves networking between national and local autonomous government bodies and between concerned sectors within a particular level of the autonomous governments' hierarchy. Time is fast running out for taking the necessary immediate responses to protect such a vast archipelagic country as Indonesia against incursion.

An integrated approach toward biosecurity management is only in its infancy in Indonesia. Traditionally, Indonesian bureaucracy is used to divide roles and functions among government institutions than to coordinate those institutions having similar tasks. In addition, under the current political situation, it is hard for a politician to engage in issues that lack popular support. That biosecurity is important is clear, but without political support necessary for decision making, biosecurity will become simply a big word without a clear meaning and support for actions. It is in this respect that both the politicians and the public at large in Indonesia are divided. Indonesia has been under a military regime for 32 years, where security is easily understood as something repressive. *Ketahanan hayati*, the Indonesia translation for biosecurity coined during the International Summit on Community Management in Denpasar, Bali, 24–25 May 2007, is not yet widely recognized. These are among the challenges to be faced by anyone trying to bring biosecurity into the policy mainstream in Indonesia.

Other Laws and Regulations That Could Impact Biosecurity Management Policies

To better understand how complicated laws and regulations in dealing with pests and diseases under current autonomy have become, it is necessary to take into account Article 58 of Act No. 12 (1992). According to this article, central government is required to delegate part of its roles to local government and assign local government to take actions on behalf of the central government in accordance with laws in effect. Before the enactment of law on regional autonomy or decentralization (first under Act No. 22 (1999), later Act No. 32 (2004), and recently Act No. 8 (2005) concerning Regional Administration), this was quite straightforward because provincial government is subordinate to the central government and district/city government is sub-ordinate to the provincial government. Now that regional autonomy has been affected, these sub-ordinations do not exist anymore and, as such, delegation and assignment to local government are no longer simple.

Under Act No. 32 (2004), regional administration is shared between regional government and regional parliament (Article 3). Between central government and these regional governments, division of administration exists, in which only foreign affairs, defence, national security, justice, monetary and fiscal, and religious affairs are fully under central government jurisdiction (Article 10). Each region is led by a head of region, that is, the governor for the province (*provinsi*), head of district (*bupati*) for district (*kabupaten*), and mayor (*walikota*) for city (*kota*) (Article 24). Being directly the head of part of the country, the governor is required to act also as the representative of the central government in the province (Article 37). *Kecamatan* is part of *kabupaten* or *kota*, but not as an autonomous sub-division (Article 126). *Kecamatan* consists of both autonomous villages (*desa*) and non-autonomous municipalities (*kelurahan*) (Article 100). The autonomous provincial and district/city government is responsible for setting up long, medium, and short-term development plans for its own region (Article 150) and allocating budget for implementing the development plans (Article 155). With all of these complexities in government structures and administration, the issue is no longer simply one of coordination, but of potential conflict of authority, with resultant inconsistencies in the way policy is viewed and implemented.

Taking Farmer Field Schools (FFS) of IPM as an example, none of the interviews with growers and village leaders in TTS mentions having heard of FFS. On the contrary, growers and village leaders in TTU district mention at least having heard about it, and some mention having participated. FFS is a vital component of IPM whereas IPM itself is the system of crop protection in Indonesia as dictated by Article 20 of Act No. 12 (1992). Having attended FFS, it is not surprising that citrus growers and village leaders in TTU District tend to be more knowledgeable and more open in discussing citrus pests and diseases. On the contrary, growers and village leaders in TTS District, tend to be more reluctant when discussing the same matter. It is true that FFS may not guarantee anything about manageability of the existing biosecurity issues, but one thing that is very clear is that FFS provides an opportunity for participatory learning in partnership. As Wallace (2008) put it explicitly, biosecurity challenges keep changing and because of this, people can only deal with them through the process of learning. By the process of learning through FFS, IPM has not only brought gradual changes in farming practices but also, and more importantly, brought back dignity and self-confidence (Winarto 2004). All of these do not seem to support the view of the TTS government that government officers have made every effort possible to prevent destructive pests and diseases being introduced here. Citrus may be dying in both districts now, but there will be greater differences between these two districts in the future than simply that of dead trees.

IPM had been the mainstream of agricultural development before the 1998 Reformation Movement that brought tremendous changes in Indonesian politics; among others was regional decentralization in effect, first under Act No. 22 (1999). The promotion of IPM by the Indonesian government in 1986 was a major departure from the earlier approaches associated with the Green Revolution since the 1960s. This paradigm shift in dealing with pests and diseases had enabled Indonesia to reclaim self-sufficiency in rice after a significant decrease of rice production due to the Brown Plant Hopper (BPH) outbreak starting in late 1984 (Monk et al. 1997). Despite all these successes, however, IPM has been criticized for being most visible only on Java and Bali, the areas of most intensive irrigated rice production in Indonesia (Whiten et al. 1996). It also had focused only on irrigated rice and only later, around 1997, started covering secondary food, horticultural, and estate crops. These areas and crop foci later had tremendous consequences for its further development in other areas of Indonesia. Also, as with any other success associated with the New Order regime, it is easily forgotten after the euphoria of political reform. By law, it is now still the system of crop protection, but in practice everything is up to the policy of the already decentralized regional and local governments for the implementation.

Crossing the Border

The Unseen Border

If members of the community have been aware that diseases are the cause of the decline of the mandarins for so long, why do they remain quiet? If they know that seedlings distributed by the government are already diseased, why do they accept such seedlings and plant them? Is it not the case that under the current political reform people are supposed to be able to express their concerns more openly? A number of related questions could be asked, but are there any answers? The people do speak, they do question the status of the seedlings, they do express their concern, but it seems as if no one listens to them. They want to speak louder, to refuse the seedlings, to talk to the media about such a bad government practice, but is there anyone willing to get their messages up to the policy level?

For citrus growers, the decline of the mandarin has caused them to lose an important source of income. In addition, by planting seedlings distributed by the government, they will waste their time and energy given that most of the trees will die even before setting fruit for the first time. Despite this, they plant the seedlings because, as one grower put it:

> I am only a small farmer, expected to follow government orders. Of course we are free to speak up about our concerns and I do. But if I am too outspoken, what will my neighbors think about me? (interview transcript, 2008).

It is clear that this citrus grower is afraid of social sanction he may experience if he is too outspoken in protesting about government policy. In this particular somewhat isolated community, being too outspoken is against the rules because everyone is expected to follow the common norms as a means of security, in the broadest sense of security. He continues:

> I get help for many things from my neighbors. Besides, we all need help from the government in time of need. If I am too outspoken, they [government officers] will very easily delete my name from the list of BLT [Direct Cash Compensation for Oil-price Increase] receivers (interview transcript, 2008).

Thus silence is not for nothing, but always something unseen. Another grower puts it in a different way:

> I have my close relatives also work for the government. I do not want them to think of me as jeopardizing their careers. Besides, who knows some day my son will also want to join the government, and I will need their [relatives] help anyway. (interview transcript, 2008).

This is a clear case of reciprocity where some benefits are foregone for perceived alternative and perhaps preferable benefits. Most members of the community very much understand this, yet it is something hardly seen by outsiders.

Even for the nursery men the reason is also for something reciprocal, but clearly for a different purpose. In this case, it is a share in seedling business matters. For those officially recognized, the reason is clear that by not being too outspoken they will keep receiving official orders. For those not officially recognized, they produce seedlings for purchase by government officers who set up private seedling businesses. A leader of a group nursery reasons this way:

> I know I am free to speak about this. But what worries me is that my group nursery owes government money that we should pay back by selling the seedlings we produce. What will happen if the government stops taking our seedlings? Here only the government buys seedlings in a large quantity (interview transcript, 2009).

Currently, eight nurseries are officially recognized in the TTS District, one of which is the nursery the man above owns. Of these officially recognized nurseries, five are run by groups and three by individuals. In addition to these officially recognized nurseries, there are hundreds of unofficial ones scattered throughout the region. The government will of course not buy seedlings produced by the latter nurseries, but government officers do for their private businesses. The price is much cheaper at these unofficial nurseries because it does not need to cover the labeling costs. In fact, the pressure of operating against the law forces these nurseries to accept a lower price.

If the community has been so cooperative, what is the purpose of the government claim that citrus in this region is free from such devastating diseases as HLB and tristeza? Are there any other fundamental reasons besides personal business interest? Most importantly, what implications does such a claim have for the future of the citrus industry locally and regionally?

The claim that citrus in this region is free from such destructive diseases as HLB and tristeza does not necessarily mean that such diseases are not there. From the bureaucracy's standpoint, pests and diseases are categorized into official and unofficial, regardless of their being destructive or not. Diplodia rot, which is a relatively mild disease in citrus, is an officially recognized one. Being official, this disease receives treatment in the form of lime sulphur mixture provided free to the growers. For unofficial diseases, let alone control treatment, even information is kept in secrecy. It is like a person without an identification card who is neither eligible for RASKIN nor BLT. As already discussed in the preceding section, both RASKIN and BLT are subsidies provided to the poor that for their eligibility require a valid ID card.

Several factors lie behind this categorization. Officially recognizing that a destructive pest or disease has been accidentally introduced into a particular area requires the local government to carry out eradication of diseased crops or ban transportation of planting material from infected areas (Act No. 12 of the Republic of Indonesia 1992; Government Regulation No. 6 of the Republic of Indonesia 1995). Under the current political system in Indonesia in which Heads of Districts and Governors are elected on the basis of popular votes (Act No. 32 of the Republic of Indonesia 2004), eradication of diseased crops and ban of transportation of infected seedlings will never receive consideration. Instead, programs that are based on free delivery of goods and services are the priority. Distribution of mandarin seedlings to villages under the citrus extension program falls within this political strategy. That such seedlings may transmit pathogens is not the concern. Even if the seedlings do spread a pathogen, as a senior officer at a district Food and Horticultural Crop Services put it, "the disease will take its toll only after we [the current government] have finished our term". Under these circumstances, it is politically more secure to avoid official recognition of these diseases. A senior officer put it very simply:

> We have for years tried to encourage people to grow mandarins. If we have to let them [mandarin growers] know that the mandarins are dying because of these [graft transmissible] diseases, do you think they will still listen to [respect] us? (interview transcript, 2008).

Not recognizing destructive diseases as officially existing in a particular area will certainly provide an opportunity for the area to supply planting material to other areas. Under Act No. 16 (1992) and Government Regulation No. 15 (2002), an area within which a destructive pest or disease exists should be banned from transporting planting material to other areas within which such a destructive pest or disease is not yet found. In the case of mandarins in the highlands of West Timor, seedling production is a big business, much bigger than the fruit marketing business. This business contributes income not only to district government but also, more importantly, to those engaged in the business. Unfortunately, this business opportunity is not for the people, but for some government officers to take the most benefit from it. A retired officer who is now a certified nursery man admits:

> I myself produce up to 600,000 grafted seedlings a year. There are many other nurseries out there … including government officers who also produce seedlings … not officially of course. You know who they are … they come to us to get seedlings at a price of Rp 2,500 or even less and later resell them at the official price of Rp 5,000 (interview transcript, 2009).

Other nursery men provide similar information. That every year the district government designates official nurseries, consisting of either group or individual managed nurseries, to get rolling funds of an amount close to Rp 50 million (approximately US $5,000) from the government. The nurseries are required to return the money from selling their labeled grafted seedlings to contractors winning government bids for the citrus intensification project. However, at the same time some government officers buy seedlings from uncertified nurseries at even lower price and become seedling supplier to the contractor. The officially designated nurseries can do nothing because the government has provided them money.

The seedling business is large scale and lucrative by local standards. According to the nursery man above, those government officers engaging in seedling businesses use their office networks with nurseries to get seedlings at low prices and resell them to companies winning the government bid at the government endorsed price. Such officers usually buy grafted seedlings from certified nurseries at Rp 2,500–3,000 each and even lower from uncertified nurseries. The only thing that the officer needs to do is to keep the seedlings for some time before reselling them at the price of Rp 5,000 each. This practice is of course not official. Officially such officers would be recognized as having devoted their time and energy to advancing the citrus industry in the district. Since the mandarin from this region has been officially recognized by the central government as a distinct cultivar, mandarin cv. Keprok Soe, it has become an icon for agricultural development for the region. For being able to get involved in the mandarin intensification program, such officers would obtain opportunity for career advancement after which they will have more power to further their business at even a larger scale.

What becomes obvious from this discussion is that it is not the support from the community that the government is afraid of losing, but the privilege of being the only mandarin centre of production that is eligible for supplying seedlings to the whole of the country. Being able to be the national supplier for the seedlings means contribution of income to district government. Mandarin cv. Keprok Soe is the one of only a few officially recognized superior cultigens from the province and keeping it from being infected by such diseases is a matter of pride for any government officers. For a head of a government office, all these points mean career advancement while at the same time taking advantage of the emerging business opportunity. Policy, business, and politics each goes hand in hand with citrus, beyond all implications that may arise for citrus biosecurity in this region and, as can be seen above, for the whole country.

Based on all interviews that have been carried out to date, mandarin seedlings from TTS District alone have been distributed not only to other districts in NTT Province but also to other provinces all over Indonesia (map in Fig. 4.5). Before Timor Leste gained its independence, the seedlings had also been distributed to almost all districts there. The distribution started in the early 1990s and continued up to 1996 for Timor Leste and until today for the rest of Indonesia. During a visit to Timor Leste in December 2008 the author found a mandarin tree with HLB symptoms in Tutuala, in the eastern most district, Lautem. According to Roistacher (1991), HLB and tristeza is only two of a long list of graft transmissible diseases in citrus. It is ironic that a government policy, whose purpose is to enhance biosecurity, when accompanied with business interests, can be even more dangerous than the disease itself to the citrus industry nationwide and to other countries.

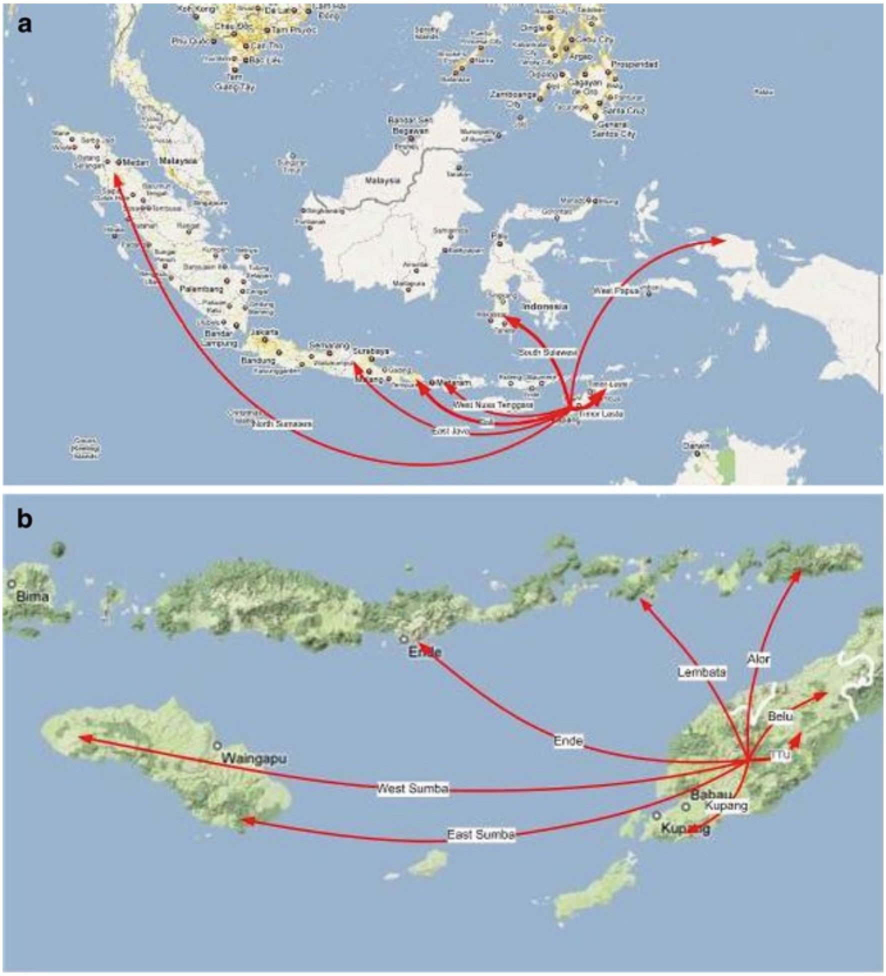

Fig. 4.5 Destinations of mandarin grafted seedling distribution from TTS District to other areas in Indonesia and Timor Leste (**a**) and to other areas in NTT Province (**b**)

Piloting the Route

With all the issues already discussed above, it seems that crossing the community-government border in the management of citrus biosecurity in the highlands of West Timor is not as simple as crossing the border of two neighboring countries. From the community side, members of the community seem to have been losing trust, whereas on the government side officials use secrecy to their own benefit. The impediments are great from both sides but, as with any other obstructions, there are always spaces available for negotiation. The challenge now is how to find the space for the negotiation to take place.

Despite the distrust and secrecy, both sides agree, however, that the mandarin is a shared identity. It is a heritage that has a long history bound to local community existence. It is true that the mandarin has never been as highly praised as maize, but it distinguishes highland from lowland community in West Timor. For the local government, it is an asset that provides both comparative and competitive advantages for the economy of the region. This asset has gained in importance even more since sandalwood, a scented wood of sandal trees *Santalum album*, once the primadona of economy for the region (Ormeling 1955), drained out in the 1980s because of mismanagement (Monk et al. 1997). With cv. Keprok Soe now officially attached to it, the mandarin has been embraced by the local government of TTS District as the icon of their agricultural development even more seriously since Soe is the capital of the district.

Regardless of general distrust in the government, there are community members who expect the government now to focus more attention on coping with the decline of the mandarin instead of wasting money and energy trying to expand its planting areas. A former citrus grower-turned-nursery man after losing almost all their mandarin trees in the 1990s put it as follows:

> It is good for the nursery business that the government keeps trying to expand mandarin planting … but it's more important that they [government officers] are aware of the real problem faced by the growers out there, and help in dealing with the dying trees (interview transcript, 2008).

The government does provide lime sulphur for help in curing the disease that is officially diplodia rot. For the growers, there are reasons to believe, however, that diplodia rot is not the only disease. In their own words, "we applied the mixture but the trees died anyway", "ants are still there after we applied the mixture", "because the tap root of the seedling has been already cut off". Growers know that trees are dying because of different factors and therefore a single cure is not appropriate. They expect that the government should find a specific treatment instead of persisting with the assumed and generalized catch-all solution of lime sulphur.

To be able to provide this specific solution the government needs community participation instead of relying solely on outside experts for recommendations. According to a village leader, a project involving experts from overseas is now underway in his village to find a solution for the problem. An officer from UPT-PSB said that taking specimens from such a vast area was the main difficulty faced in carrying out HLB tests involving experts from outside. It has become clear here that the fact that outside experts can not always be out in the field limits their roles. In addition, outside experts will most likely work on the basis of what Falk et al. (2008) call 'outsider knowledge' that:

> … is not to deny the large amounts of knowledge available through science. The trick … is in finding the best solution to the local pest and disease identification [and management] *for that community* (Falk et al. 2008, italics from the authors)

The solution needs support from local people because, as Christie (2008) already put it clearly, it is only the locals who are capable of piloting a new route. The challenge is now how the government could regain trust from those who are supposed to be the pilots. Handing over control of the ship of citrus planting extension program to the pilot is not the real problem, but passing the ship through local politics and economy does require self-confidence.

While acknowledging that local knowledge is vital, one has to be always aware that biosecurity threats in this shrinking world of globalization will never be local. As already shown in Fig. 4.5, mandarin seedlings from TTS Districts have now reached different parts of Indonesia. With these seedlings as the vehicle, pests and pathogens can reach distant destinations in only a matter of days. Under the circumstances, outside science will always be needed to provide what Christie (2008) calls long distance navigation. It is in this crossing of community-government borders toward better management of citrus biosecurity in this region that the government needs to embrace local knowledge, and local people need to understand how scientific knowledge operates. Biosecurity itself is in fact outsider knowledge: none of the nursery men interviewed understood why seedling transportation has to be taken more seriously than just a matter of formally getting labels from UPT-PSB and clearance from the quarantine.

The Way Ahead

Discussion in this chapter has been based largely on preliminary results of research aimed at understanding the relationship between policy and community engagement in biosecurity management of citrus. As has already become apparent from this discussion, the key issue related to the decline of citrus in the region is of a social nature. It is true that the diseases are destructive, but what makes them even more deadly is the social construct that allows the diseases to develop without control. Local governments that deny the existence of such diseases and provide no information to the community create an environment that supports, just like favorable weather and soil do, the diseases to silently develop and spread. Like favorable weather and soil that need to be modified in order to control disease, this social environment also needs some kind of intervention. Because this social environment involves local governments and communities, any frameworks considered to address the issue should be able to operate within, and across sides.

In a very real sense, the research discussed has acted as the social intervention in its own right, as it has provided an on-going feedback loop for the respondents – farmers, policy personnel and others – for what is really happening to citrus in the region. Scientific tests have been conducted by the research team, and these results have been fed back to, and discussed with, the respondents. Awareness about the reality of HLB and the wider biosecurity context has begun in significant ways, and is expanding as the research itself progresses. This is one of the potential benefits of a participative research design.

To be able to identify the necessary frameworks to address the issue, it has been and remains important to understand relationships between social units, agents, and institutions across different levels within each side and between both sides, and recognize issues of the different values that each level holds. For this purpose, social capital provides the most promising avenue for such a framework. Social capital operates at micro, meso, and macro levels, as groups, trust, networks, and norms that people access for a range of purposes. Social networks are core to social capital, bonding similar people and bridging between diverse people, with norms of reciprocity (Dekker and Uslaner 2001; Uslaner 2001). According to Wallace (2008), networks are informed by social practice, related social constructs and relationships, and hence, do not operate in isolation from other aspects of social capital. Within the context of crossing the social border discussed here, managing citrus biosecurity at either community or government side or both includes strengthening bonding ties which link people of similar level and demographic characteristics, and bridging ties which link people with different geographic characteristics. However, what is even more important with regard to the management of citrus biosecurity in the region is developing linking ties which connect people to those in authority and institutions (government). This is because, as already implied in the preceding discussion, it is the lack of these ties that creates distrust and hence a border that for the majority of community members is difficult to cross.

As demonstrated in the following diagram (Fig. 4.6), the research employs a design that Tashakkorie and Teddlie (2003) call a multistrand mixed method design. This design is characterized by having single or multiple qualitative and quantitative strands, integration of such strands across all stages or within one method only, and the procedure of linking the strands sequentially or concurrently. The qualitative strand will rely much on thematic analysis of transcripts derived from in-depth interviews such as those employed by Royce (2008) in his research on developing a community approach to biosecurity management in remote Australian regions, and also by Wallace (2008) in her work on embedding plant biosecurity in enterprise development through social partnerships in learning. On the other hand, the quantitative strand will employ formal statistical analysis procedures such as those used by Grotaert (1999) in studying the empirics of social capital and economic development in Indonesia and also by Krishna and Uphoff (1999) in their research on collective action for conserving and developing watersheds in India.

A better understanding of social aspects of citrus biosecurity in the region is expected to benefit citrus growers in the region and beyond. As already discussed elsewhere in this chapter, the etiology of the disease has been already resolved. Accurate diagnostic tests have also been available for quick detection and other more affordable tests are now being developed and tested (Bove 2006; Etxeberria et al. 2007). However, as Falk et al. (2008) maintain, for better management of biosecurity, science is important but simply not enough. Nurseries need to be more strictly supervised and citrus growers to be encouraged to eradicate their diseased trees and to replant using disease-free planting material. These all certainly require more than simply science but a better approach in community engagement and policy delivery.

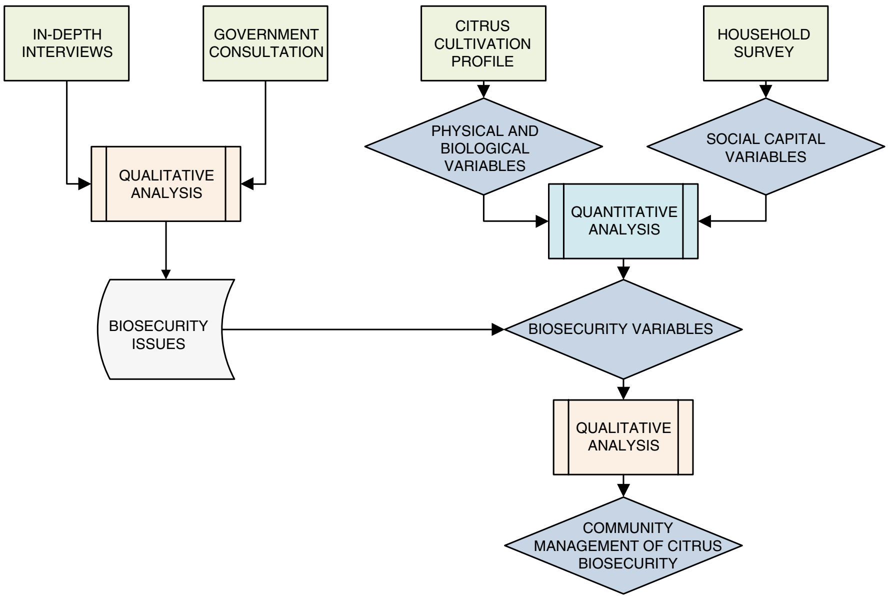

Fig. 4.6 Diagrammatic presentation of the research design to be carried out to obtain better understanding the nature of the community and local government policy in TTS and TTU districts, NTT Province, Indonesia

Concluding Remarks

The future of the citrus industry in the highlands of West Timor is threatened more by inadequate policy and governance than by pests and diseases. The governments of TTS and TTU districts are both now eager to promote the mandarin as an icon for agricultural development in the region. Local climate, topography and soil are in fact largely suitable for the mandarin. Local communities consider citrus, mandarins in particular, as part of their heritage. The market was established in most big cities throughout Indonesia when the fruits were first sent to cities outside Timor through Dili in the 1990s. Apart from these, however, the local government uses secrecy as part of its policy to establish recognition of this mandarin at national level and being so, opportunities arise to supply seedlings to many other mandarin centres of production inside and outside the province. At the same time, along with seedlings distributed across the country, graft transmitted pathogens also spread to other areas.

Despite not yet being integrated, there are laws and government regulations that have long existed as the basis for dealing with plant and disease incursions. These laws and government regulations have also recognized the importance of community participation for early detection in the event that an alien pest or disease is accidentally introduced into a particular area. However, with the current euphoria of democratization and decentralization, it will be hard for any local government to adopt unpopular biosecurity policies such as eradication and banning of seedling distribution. Instead, to gain popular support, local governments encourage growers to set up nurseries to produce a large number of seedlings to be distributed locally and sent outside under the spirit of cooperation between local governments. This effort has provided income for the district government, but unfortunately, competing personal business interests among local government officials means the situation is now out of control, increasing risks of spreading graft transmissible pathogens that will threaten the citrus industry not only locally but also nationally and worldwide.

A great deal more still needs to be learnt, however, about bringing together a shared understanding of citrus biosecurity between local communities and government in the region. This chapter is based on the results of on-going research that still requires additional data to arrive at final results and conclusions. It is apparent that an unseen border exists between local governments and local communities. It is true that at some points both have crossed this border, but each with its own agenda. Unless each side tries to learn something from the other, the citrus industry will be the final victim. Diseases such as HLB and tristeza, not having received the necessary control measures because of their unofficial status, will slowly but surely kill trees and, being graft transmissible, will silently spread crossing every physical border on their way, unless efforts are now initiated to cross the existing social border so that local governments and communities move forward hand in hand towards negotiating the most appropriate solution.

Acknowledgment The author wishes to express his sincere gratitude to Prof. Ian Falk of Charles Darwin University, Darwin, Australia, for his guidance in carrying out this research and writing this chapter. Support for this research is provided by Cooperative Research Centre for National Plant Biosecurity, Canberra, Australia, for which thanks are due to the Board of Management of the centre, particularly to Dr. David Eagling for his continuous encouragement.

References

Act No. 8 of the Republic of Indonesia (2005). Stipulation of Government Regulation No. 3 (2005) concerning Amendment of Act No. 32 (2004) concerning Regional Administration to Become Law. *State Gazette 2005 No.108, Supplemental State Gazette No. 4548*.

Act No. 12 of the Republic of Indonesia. (1992). Crop cultivation system. *State Gazette 1992 No. 46, Supplemental State Gazette No. 3478*.

Act No. 16 of the Republic of Indonesia. (1992). Animal, fish, and plant quarantine. *State Gazette1996 No. 56, Supplemental State Gazette No. 3482*.

Act No. 22 of the Republic of Indonesia. (1999). Regional administration. *State Gazette 1999 No. 60, Supplemental State Gazette No. 3839*.

Act No. 32 of the Republic of Indonesia. (2004). Regional administration. *State Gazette 2004 No. 125, Supplemental State Gazette No. 4437*.

Ashari, S. (1992). Citrus reticulata Blanco. In E. Verheij & R. E. Coronel (Eds.), *Plant resources of Southeast Asia 2: Edible fruits and nuts* (pp. 135–138). Bogor: Prosea Foundation.

Bove, J. (2006). Huanglongbing: A destructive, newly emerging, century-old disease of citrus. *Journal of Plant Pathology, 88*, 7–33.

Christie, M. (2008). Traditional Aboriginal knowledge practices and North Australian biosecurity. *Kritis-Learning Communities, Special Co-publication*, 64–74.

Crippen International. (1980a). *Timor Island water resources development study, Final Report Vol. 4: Climate.* Ottawa and Jakarta: Canadian International Development Agency and Directorate General of Water Resources Development, Ministry of Public Works.

Crippen International. (1980b). *Timor Island water resources development study, Final Report, Vol. 9: Agricultural soils.* Ottawa and Jakarta: Canadian International Development Agency and Directorate General of Water Resources Development, Ministry of Public Works.

Crippen International. (1980c). *Timor Island water resources development study, Final Report Vol. 11: Agronomy* (*Section 11.1.0-11.11.0*). Ottawa and Jakarta: Canadian International Development Agency and Directorate General of Water Resources Development, Ministry of Public Works.

Dekker, P., & Uslaner, E. M. (2001). Introduction. In E. M. Uslaner (Ed.), *Social capital and participation in everyday life* (pp. 1–8). London: Routledge.

Dove, M. (1990). Introduction: Traditional culture and development in contemporary Indonesia. In M. Dove (Ed.), *The real and imagined role of culture in development: Case studies from Indonesia* (pp. 1–37). Honolulu: University of Hawaii.

Etxeberria, E., Gonzalez, P., Dawson, W., & Spann, T. (2007) *An iodine-based starch test to assist in selecting leaves for HLB testing*. Retrieved June 28, 2009, from http://edis.ifas.ufl.edu/

Falk, I., Surata, S. P. K., Mudita, I. W., Martiningsih, E. Ni Gst Ag. Gde., & Myers, B. (2008). Community management of biosecurity: Overview of some Indonesian studies. *Kritis-Learning Communities*, *Special Co-publication*, 1–40.

FAO. (2007). *FAO biosecurity toolkit.* Retrieved June 28, 2009, from www.fao.org/biosecurity/

Food and Horticultural Crops Services of TTS District. (2008). *Data hari hujan dan curah hujan Kabupaten Timor Tengah Selatan* [Rainfalls and rain days data of South Central Timor District]. Soe: Food and Horticultural Crops Services of TTS District.

Fox, J. (1977). *Harvest of the palm: Ecological change in Eastern Indonesia*. Cambridge: Harvard University Press.

Gottwald, T., da Graca, J., & Bassanezi, R. (2007). *Citrus huanglongbing: The pathogen and its impact*. Retrieved August 5, 2009, from http://www.apsnet.org/

Government Regulation No. 6 of the Republic of Indonesia. (1995). Crop protection. *State Gazette 1995 No. 12, Supplemental State Gazette No. 3586*.

Government Regulation No. 14 of the Republic of Indonesia. (2002). Plant quarantine. *State Gazette 2002 No. 35, Supplemental State Gazette No. 4196*.

Grotaert, C. (1999). *Social capital, household welfare, and poverty in Indonesia.* Retrieved August 5, 2009, from http://www.worldbank.org/socialdevelopment/

Hooper, K. (2006). *Defining community.* Retrieved August 5, 2009, from http://www.hooperanalytical.com/blog/definition-of-community

Ife, J. (2002). *Community development: Community-based alternatives in an age of globalization* (2nd ed.). Sydney: Pearson Education Australia.

Jagadish-Chandra, K., & Singh, S. J. (1998). Management of viral and related diseases in tropical fruits. In R. K. Arora & V. Ramanatha-Rao (Eds.), *Tropical fruits in Asia – diversity, maintenance, conservation and use. Proceedings of the IPGRI-ICAR-UTFANET regional training course held at Indian Institute of Horticultural Research* (pp. 18–31), May 1997, Bangalore, India (Online). New Delhi: IPGRI Office for South Asia.

Kenny, S. (1999). *Community development for the future* (2nd ed.). Melbourne: Thomson.

Kompas. (2003, February 7). *Menanti kebangkitan jeruk Keprok Soe* [Waiting for the revival of Soe Mandarin]. *Kompas* (p. 1).

Krishna, A., & Uphoff, N. (1999). *Mapping and measuring social capital: A conceptual and empirical study of collective action for conserving and developing watersheds in Rajasthan, India.* Retrieved August 5, 2009, from http://www.worldbank.org/socialdevelopment/

Lovett, J. (2008). Foreword. *Kritis-Learning Communities*, *Special Co-publication*, iii–x.

Manner, H., Buker, R., Easton Smith, V., & Elevitch, C. (2006). *Citrus (citrus) and Fortunella (kumquat)*, 2.1. C. Elevitch (Ed.) Retrieved November 14, 2008, from www.traditionaltree.org/

McWilliam, A. (1999) From lord of the earth to village head: Adapting to the nation-state in West Timor. *Bijdragen tot de Taal-, Land- en Volkenkunde 155*(1), 121–144. Retrieved May 19, 2010, from http://kitlv.library.uu.nl/index.php/btlv/article/view/3191/3952

Messakh, M., Heo, M, Siahaya, W. A., Liubana, S., Pandak, J., Lado, A., Dauth, B., Praing, D. L., Angelinus, Kase, A., Albertus, M., & Toto, Y. (2010) Komunitas Membaca dan Membaca Komunitas: Studi Partisipatif Sistim Pertanian dan Pemanfaatan Lahan di Mollo, Timor Tengah Selatan [Reading community and community reading: Participatory research on agricultural systems and landuse in Mollo, South Central Timor]. *Online Journal of NTT Studies, 2*(1), 61–101. Retrieved November 10, 2010, from http://ntt-academia.org/nttstudies/mesakhetal2010b

Monk, K. A., de Fretes, Y., & Reksodihardjo-Lilley, G. (1997). *The Ecology of Nusa Tenggara and Maluku* (The Ecology of Indonesia Series). Hong Kong: Periplus.

Mudita, I. W. (1998). *Identification of causes of citrus decline in TTS District.* Kupang: Unpublished report submitted to Winrock International Kupang Project Office.

Murdolelono, B., Yusuf, & Bora, C. (2004). Masalah dan alternatif pengendalian penyakit jeruk keprok soe di Nusa Tenggara Timur [Disease problems of Keprok Soe mandarin in East Nusa Tenggara and alternatives for their control]. *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian, 7*(1), 44–53.

Nordholt, H. G. S. (1971). *The political system of the Atoni of Timor*. The Hague: Martinus Nijhoff.

Ormeling, F. (1955). *The Timor problem: A geographical interpretation of an underdeveloped island*. Djakarta/Groningen: J.B. Wolters.

Pellokila, M. R., Wiendiyati, & Reku Raya, U. (2004). *The impact of technology improvement on the provitability of Soe Keprok citrus farming in Timor Tengah Selatan*. Kupang: Universitas Nusa Cendana.

Radja. (n.d.). *Integrated disease management in citrus.* Retrieved May 20, 2009, from http://www.indg.in/agriculture/crop_production_techniques/technologies-for-north-east-india/disease_management_in_citrus.pdf

Research Station for Citrus and Sub-tropical Horticultural Crops. (2004). *Panduan teknis pengenalan dan pengendalian hama dan penyakit jeruk* [Technical guide for identification and management of pests and diseases of citrus]. Batu: Centre for Horticultural Crops Research and Development, Agency for Agricultural Research and Development.

Roistacher, C. N. (1991). *Graft-transmissible diseases of citrus: Handbook for detection and diagnosis.* Retrieved May 10, 2009, from http://www.fao.org/docrep/t0601e/t0601e00.htm

Royce, P. (2008). A community approach to biosecurity in a remote Australian region. *Kritis-Learning Communities*, *Special Co-publication*, 90–115.

Semangun, H. (2008). Role of community in the control of plant pests and diseases. *Kritis-Learning Communities*, *Special Co-publication*, 55–63.

Suek, J., Naraheda, Z., & Widinugraheni, S. (1998). *Kajian Usahatani Jeruk Keprok di Kabupaten Timor Tengah Selatan dan Timor Tengah Utara Propinsi Nusa Tenggara Timur. Suatu Telaah Potensi, Kendala dan Ekonomi Jeruk (Keprok mandarin farming in South Central Timor and North Central Timor districts, East Nusa Tenggara Province: A study on potential, constraints, and economic opportunities). Report submitted to Winrock International*. Kupang: Centre for Research on Natural Resources and the Environment, Nusa Cendana University.

Tashakkorie, A., & Teddlie, C. (2003). The past and future of mixed methods research: From data triangulation to mixed model designs. In A. Tashakkorie & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 671–702). Thousand Oaks: Sage.

Untung, K. (2008). National policy and biological diversity (biosecurity). *Kritis-Learning Communities*, *Special Co-publication*, 228–238.

Uslaner, E. M. (2001). Volunteering and social capital: How trust and religion shape civic participation in the United States. In E. M. Uslaner (Ed.), *Social capital and participation in everyday life* (pp. 104–117). London: Routledge.

Verheij, E., & Stone, B. C. (1992). *Citrus L.*. In E. Verheij & R. E. Coronel (Eds.), *Plant resources of Southeast Asia 2: Edible fruits and nuts* (pp. 119–126). Bogor: Prosea Foundation.

Wallace, R. (2008). Social partnership in learning: Embedding plant biosecurity in regional communities through enterprise development and learning. *Kritis-Learning Communities*, *Special Co-publication*, 251–267.

Wei, S., Woods, E., Adar, D., Bano, M., Singgih, S., & Serman, N. (n.d.). *Taste panel analysis of mandarin in Indonesia*. Retrieved November 20, 2008, from http://www.ifama.org/2001Conference/Papers/Area%20II

Whiten, A., Soeriatmadja, R., & Afiff, S. (1996). *The ecology of Java and Bali*. Singapore: Periplus.

Williamson, J., & Jackson, L. (1994). *Citrus propagation*. Retrieved November 10, 2008, from www.ultimatecitrus.com

Winarto, Y. (2004). The evolutionary changes in rice-crop farming: Integrated pest management in Indonesia, Cambodia, and Vietnam. *Southeast Asian Studies, 42*, 241–272.

Zhao, X. Y. (1981). Citrus yellow shoot disease (huanglongbing) in China – A review. *Proceeding of the International Society of Citriculture, 1*, 466–469.

Chapter 5
Using a Community Approach to Foster Effective Biosecurity Practices Across Social Borders

Paul Royce

Introduction

While biosecurity is a relatively new term in the Australian context, an Indigenous elder living in this community recognises that traditional land owners have been "caring for country" for thousands of years and long before "whitefella set foot on this place" (personal communication, February 19, 2008). In contemporary times however, the intergenerational sharing of local knowledge, skills, expertise and practices that would otherwise help to identify and address potential threats to food sources and landscapes has been replaced by modern science. Although this has provided considerable benefits to food security, agricultural trade and community sustainability, the effective management of biosecurity has not been addressed by science in the same way. There is a role for social science, as reported here, in examining the social, cultural, political, environmental and economic composition of the community, the positions of power and decision making as well as the social connections between differing community groups (or lack there of). Of particular interest to this research is the exchange of new knowledge through social networks, which it is assumed, will enable biosecurity practices to be effectively implemented across social borders.

This chapter describes the findings of a qualitative research project in an agricultural community in Northern Australia. Although the community is remote in terms of its proximity to the state's capital city, it maintains a population of some 5,600 people,[1] 26% of whom identify as Indigenous Australians. Federal and state government regulatory and agricultural agencies have granted the community 'Area

[1] The population doubles in the dry (April to September) season due to tourism.

P. Royce (✉)
Charles Darwin University, Darwin, Australia

Cooperative Research Centre, Canberra, Australia
e-mail: Paul.Royce@cdu.edu.au

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_5, © Springer Science+Business Media B.V. 2011

Freedom' status because the district is free from the many pests and diseases found in other growing areas of Australia. One of the benefits of Area Freedom certification is that the region's produce can be exported to lucrative state, national and international markets without the application of costly post-harvest treatments and stringent quarantine measures. However, to keep Area Freedom certification in this community (and therefore maintain the commercial viability of the local agricultural sector), growers, industry groups and government agencies must adhere to strict international biosecurity standards and guidelines.

The International Plant Protection Convention (1995, 1999, 2006), a subsidiary of the Food and Agriculture Organisation of the United Nations, provides a set of guidelines, which have been used and adapted by many countries, to safeguard against an incursion of exotic pests and diseases. Here, Area Freedom status is granted if there are demonstrated and documented systems in place to establish and maintain pest free environments, to verify the continued attainment and maintenance of pest free environments as well as the introduction of identification, integrity and security measures for the import and export of food products (IPPC 1999). The biggest threats to this region's Area Freedom status are biological incursions by, for example, Medfly (*Ceratitis capitata* or Mediterranean fruit fly) (AQIS 2010a) and citrus greening (*Huanglongbing* or HLB) (AQIS 2010b), which can be introduced by the human transportation of contaminated fruit, vegetables, honey and other plant materials in to the community. Although the implementation of surveillance, monitoring, suppression, eradication, documentation and public awareness strategies are fundamental to keeping the region free from pests and disease (IPPC 2006), biosecurity initiatives should also be guided by the skills, knowledge and experiences of a broader community membership rather than be solely dependent on government and agricultural systems.

One of the difficulties however, for biosecurity proponents in this community is that agriculture is no longer the sole industry in the region and as such, is viewed more on the periphery of other local activities, both physically and symbolically. With mining, tourism, government agencies, service industries and Indigenous activities now central to the region's economy, local people and the community are no longer dependent on agriculture to maintain their livelihood or lifestyle. The agricultural landscape has also changed over the past few years and is now dominated by a small number of large, nationally owned horticulture and forestry groups whereas until just recently, the same irrigable land mass supported a significant number of small, family owned properties.

While there are several biosecurity measures in place in and around this region to protect the agricultural industry from exotic pests and diseases, biological incursions still occur periodically. The research identifies some of the common assumptions made by biosecurity agencies about communities and why the provision of generic biosecurity information does not necessarily result in an increase in biosecurity knowledge or a change in biosecurity practice and behaviour. The role of community relations and social networks is also discussed with particular attention given to the ways in which local knowledge is exchanged, the factors that motivate local people to participate in biosecurity initiatives, including attachment to place, and the implications such processes have for effective biosecurity management at a community level. Finally, this chapter will offer several examples on how understanding and using existing social networks within the community may assist in the implementation of community-based approaches to biosecurity management.

A Theoretical Platform for the Project

This research introduces a number of key social science themes. Concepts of community and community engagement underpin this project and provide opportunities to better understand the ways in which biosecurity information and new knowledge is transferred between different sectors of the community, which are referred to here as 'social borders' following Mudita's term in Chap. 4. While there is no single accepted definition of 'community', in this study the term is used to refer to groupings of people who share a common location or place, common interest or a common affiliation or identity (Cohen 1985; Willmott 1989). Within the broad grouping of 'community', it is also recognised that interactions and connections occur between people and groups of people, which result from and sustain shared interests, experiences and relations while fostering a sense of belonging, value and acceptance (Howarth 2001; Ife 2002; Kenny 1999; Muirhead 2002; Wills 2001). For Cho (2004) and Wilkinson (1991), communities emerge wherever the human processes of social interaction occur and the shared needs of its members are being met.

While the type, strength and quality of social interactions are key characteristics of communities, such relations exist on three different dimensions, or as bonding, bridging and linking social ties (Granovetter 1973, 1983; Narayan 1999; Putnam 2000; Woolcock 2001). Bonding ties are considered to be close, closed and densely knit interactions that develop within homogenous groups that share and maintain common interests, values or situations (Falk and Surata 2007). Loyalty is a strong characteristic of these networks with attention primarily given to satisfying the needs and interests of its members, which result in the formation of relationships based on trust and reciprocity (Foster et al. 2003). The second type of interaction, bridging ties, is typified by weaker, perhaps less frequent, relations amongst a broad, heterogeneous group from varied social networks. The diversity of these relations cuts across age, cultural background, occupation or socio-economic position, which enables an overlapping of group membership and access to a wide range of resources and information inside and outside the community (Stone and Hughes 2002). The third dimension of interactions as described by Woolcock and Narayan (2000) is linking social ties, which refers to relations developed with people or organisations in positions of power or influence to leverage resources, information and ideas from beyond the community (Stone and Hughes 2002).

Although the concept of community used here refers to groupings of similarly located people with a shared purpose and identity, Cohen (1985) rightly points out that a single 'community' contains different groups within itself. Such groups may have a socio-economic, ethnic, gender or a common interest basis. The implication of these subdivisions is that the process of how communities engage with new knowledge is likely to be more intricate than a single approach, such as brochures. A more complex method would therefore need to account for a broad range of interactions that are inclusive of people from the different social groupings indicated above (DSE 2005).

Community engagement, as defined by the Centre for Disease Control and Prevention (1997, p. 3), can be described as "the process of working collaboratively with groups of people affiliated by geographic proximity, special interests or similar situations with respect to issues affecting their well-being". The research reported here builds on the idea of 'working collaboratively' as engaging different social networks. Some research identifies the aim of such engagement practices as being to provide individuals and groups with the opportunity to develop, enhance and maintain mutually beneficial relationships, which in turn is assumed to enable greater participation in decision making at a local level. Such a process may promote grass-roots ideas to 'bubble up' to address the issues that impact most on the lives of local people (Muirhead 2002), which brings about opportunities to introduce meaningful and authentic social change and transformation (Bryson and Mowbray 2005; Hashagen 2002; Onyx 2001).

In describing his view of engagement, Hashagen (2002) acknowledges the presence of two systems in society; a governance system and a community system. Hashagen (2002) recognises that if complex activities, such as the community management of biosecurity, are to cross social borders and meet the needs of all community members, relationships have to be formed whereby governance systems fully understand the dynamics of the community they intend to work in. Governance systems must therefore adapt and develop structures and processes that make governance agencies more accessible and relevant to individuals and groups in the community. In this way, engagement not only warns against making assumptions about communities, but also asks for a dialogue with communities. According to Blake et al. (2008) and Hashagen (2002), any engagement process must therefore focus its attention on the development of relations between governance and community systems and acknowledge that centralised systems need to engage with communities and ask that communities engage with them.

The Implementation of the Project

The research described here required the long term investigation of biosecurity and social issues, events and relationships within a remote, Northern Australian agricultural community. Qualitative research methodologies were used to collect and analyse data, which provided an opportunity to introduce a rich, in-depth and naturalistic approach to understanding the concept of biosecurity within a context-specific setting. An initial period of familiarisation provided opportunities to gain an insight into local customs, attitudes, behaviours and lifestyles as well as existing social, political, economic and cultural structures. This period formed the basis of a community scoping study, which identified six community sectors as having a role to play in biosecurity, each with their distinct characteristics and locations. These six sectors were representative of the breadth and depth of the community's population and included young people, Indigenous groups, primary industry, tourism, organisations and government agencies as well as local residents. This period of familiarisation also guided the drafting of interview questions, the selection of potential interview participants and compilation of interview schedules.

Using a participative approach, data was collected from each community sector using the ethnographic techniques of participant observations,[2] semi-structured interviews and a review of documents and artefacts. A total of 47 interviews were held with 78 people from all community sectors, ensuring an even distribution of gender, age, education, occupation and tenancy in the community. Using nVivo software, a thematic analysis of interview transcripts and field notes was undertaken, which resulted in the identification of nine main data categories. A further review of the data collapsed these categories into four key themes, which included place, groups, information and people. Diagrams were created using Mindmanager software to refine the analysis further and provide a visual representation of each theme. Once all analysis was complete, six follow-up interviews were conducted for cross-referencing purposes to independently verify the analyses. Following a synthesis of all data analyses, key findings were finally crystallised.

The Reality of Providing Biosecurity Information to Local Communities

The concept of a whole of a community approach to the management of biosecurity is a commendable one. However, key players in the biosecurity game cannot announce that 'the community' will play a significant role in reducing the risks of biological incursions by simply providing information, and without first understanding the contextual landscape in which the community exists. This includes a comprehensive interpretation of the social, cultural, political, economic and environmental characteristics of the community as well as the patterns and relationships that influence decision making and the distribution of power. One of the primary aims of a community approach to biosecurity is to foster a change in biosecurity attitudes, actions and behaviour from within by raising awareness and participation in biosecurity activity at an individual, communal, organisational and institutional level. However, at present there is an assumption amongst biosecurity agencies that the provision of generic information through the use of brochures, websites and road signs will be taken up as new knowledge by the general public and translated into a change in biosecurity practice.

[2]Participant observations included observations, conversations and participation.

While brochures, websites and road signage have their uses in biosecurity practice, this research found that people gather information relevant to their local community through a number of informal mediums including word of mouth, community newspapers, local radio and community notice boards while also accessing broader levels of information from national and state media outlets, the internet, industry reports, bulletins and newsletters. However, by far the most effective method to exchange local information is through the close, bonded social networks that exist amongst the community's members. For example, evidence from this community suggests that information is most readily transferred by word of mouth from young person to young person, tourist to tourist, grower to grower or work colleague to work colleague. This study also found that the strength of relations within social networks not only determines access and volume of information shared but whether information is accepted as credible or accurate and taken up as new knowledge. As such, two notable characteristics make social networks an effective mechanism to exchange biosecurity information across social borders; the personal, reciprocal interactions that occur between local people and the formation of mutually trusting, respectful and honest relations. While these characteristics are central in the exchange of information from one person to another, the same relations do not exist between local people and those agencies providing information on biosecurity.

People in this community recognise that if information is to be taken up as new knowledge and influence a change in behaviour, it has to be available from a trusted or respected source and in a format that allows for the reciprocal exchange of local ideas and expertise. At present, biosecurity information is informed by quantitative, scientific experimentation and provided to communities by centralised agencies in formal, one way and partisan mediums with very little scope to consider local input. While the availability and provision of factual, accurate and current material is important, such a process does not allow for a two-way dialogue in which local people have the opportunity to ask questions, put forward their own opinions, challenge other viewpoints, share their experiences and learn from the experiences of others. As a result, opportunities to build an understanding of biosecurity are limited to the written material provided by external agencies, which offers local people a very narrow field in which to determine whether biosecurity information is correct, relevant and meaningful to the individual and to the community in which they live. Similarly, such a process does not allow for the development of mutual relations of trust and respect because the only interface between local people and biosecurity agencies is the brochures, websites or road signs they provide. As one local community resident remarked, "you can't have a conversation with a brochure" (personal communication, December 18, 2007).

More successful in raising biosecurity awareness in this community however, is the use of preventative, sometimes involuntary, measures that restrict the movement of fruit, vegetables, honey and other plant products in to the region. For example, biosecurity agencies have in place a quarantine checkpoint at the nearby state border, random inspections of airport luggage, fruit flies traps at some 230 sites across the region as well as disposal bins for fruit and vegetables at caravan parks, backpacker hostels and other public venues. The most successful of these measures are the quarantine inspections on the state's border, which not only reduce the movement of plant products into the region, but also raise awareness of biosecurity issues with local, interstate and international travellers. Although this research identified that only those involved in the agricultural industry know of the term 'biosecurity', all sectors of the community are aware of having their vehicle or personal items inspected upon entering the state. The practical nature of such procedures not only allows individuals to participate in biosecurity activities and interact, discuss and ask questions of those working within biosecurity agencies, it also encourages people to make decisions about their own biosecurity practices and consider the consequences that such decisions may bring. Evidence here suggests that the take up of new biosecurity knowledge is effective when it is experiential and participatory.

Translating Biosecurity Information into Social Change

While information exchanged through trusted and respected relations is beneficial to those on the inside of close, bonded social networks, it is to the exclusion of others on the outside. As such, information relevant to one sector of the community has a tendency to circulate within that social setting with limited opportunities to cross social borders into other sectors. Although loose, bridging relations may have the capacity to transfer information from one social network to another, in the instance of biosecurity management, this is not the case. There are a number of reasons why this occurs, most of which revolve around the notion that local people have a limited relationship with the agricultural industry and biosecurity agencies, and therefore have little motivation to understand and adopt the biosecurity practices that are integral to maintaining Area Freedom status in the community.

Unfortunately, biosecurity agencies still maintain the assumption that information provision equals social change; the greater the volume of information, the greater the probability that people will adopt biosecurity knowledge, which will in turn bring about a change in biosecurity attitudes, practice and behaviour. When a change in biosecurity outcome is not forthcoming, there is a tendency by biosecurity agencies to view this as a failure on the part of the community and its members. Evidence collected during this study however, suggests that continued biological incursions in the region are more likely to occur because of a failure of systems to exchange information that is relevant and meaningful to its members. For example, while there are complaints from within the agricultural industry that intrastate travellers continue to bring fruit and vegetables in to the region,[3] the only measures to safeguard against such activities are road signs, purposely located disposal bins and a limited distribution of brochures. A more effective approach may instead include the use of social networks amongst travellers to share information about food items that can be

[3]The quarantine checkpoint only inspects vehicles crossing the border from the neighbouring territory and not those travelling to the community from within the state.

brought into the community and those that cannot. As a result, the only sector that is aware of the term biosecurity, and voluntarily puts in place varying levels of biosecurity practice to safeguard the agricultural industry from biological pests and diseases, is the agricultural industry itself.

One of the most significant findings to emerge from this study is that, regardless of how many biosecurity brochures, websites, road signs or disposal bins are located in and around the community, local people will not take up biosecurity information and translate it into new knowledge and social change unless the perceived net result of such information is likely to impact on them personally or more specifically, the lifestyle and livelihood they currently, or will potentially lead. This research therefore indicates that social change is not an assumed or immediate response to information provision, but rather a stepped process that involves information access, assessment, verification, reflection, motivation, action and evaluation. In the first instance, information has to be available in a medium that is accessible to people from all sectors of the community.[4] If this occurs, local people will individually assess whether the information provided is of interest to them or more particularly, if the net result of the information is likely to impact on their family, their property, their social networks, their work place (or capacity to generate income) and/or their recreation and leisure pursuits. If the impact is assumed to be negligible or non-existent, local people will take very little interest in the information provided. However, if there is a perceived risk to an individual's social, emotional or financial wellbeing, further information is sought and exchanged with a trusted, secondary source for clarification and verification. In some circumstances, the trusted source is one's self, whereby individuals develop new knowledge through repeating and refining personal practice, knowledge or experiences. If the original information is confirmed by a trusted source, it is accepted as being accurate and becomes new knowledge. If information is challenged or unsubstantiated by a secondary source, further research is undertaken or the information is disregarded because the viewpoints of those within bonded social networks are more valued, trusted and respected than those where no relationship exists.

Once new knowledge is adopted, a period of reflection or further research determines what impact this new knowledge is likely to have on an individual's lifestyle and/or livelihood, which in turn motivates a corresponding degree of action; an expected high social impact correlates with a high level of action while a low social impact results in minimal or no action at all. An evaluation at the end of this process enables an individual to determine whether the action taken addresses or reduces the likely impact on lifestyle or livelihood, which in itself is a form of gathering new knowledge. Social change therefore comes from understanding the impact new knowledge brings to the key aspects of an individual's world. In terms of applying the same process to biosecurity management, local people first have to believe that exotic pests and/or diseases will impact on their lifestyles and livelihoods before

[4] Young people, Indigenous groups, the agricultural industry, tourism, organisations and government agencies as well as local residents.

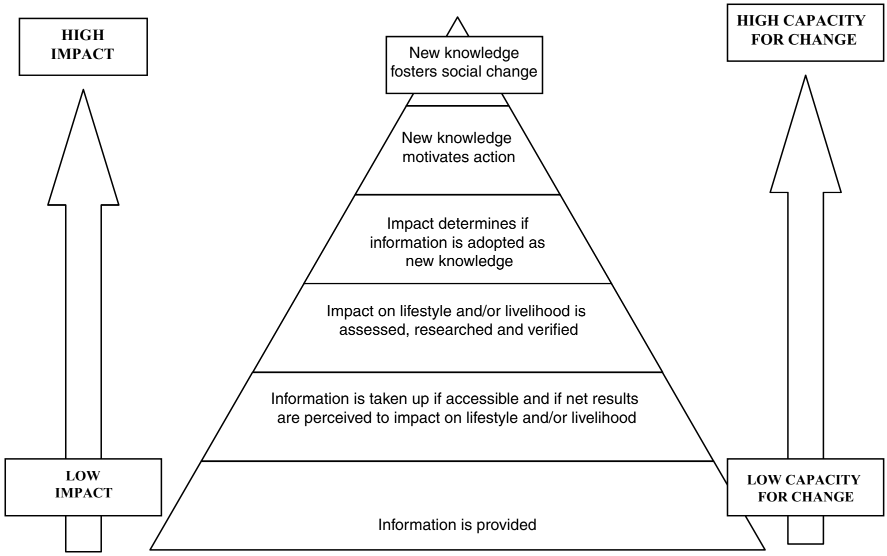

Fig. 5.1 The social impact of information on livelihood and lifestyle determines social change

information is taken up and adopted as new knowledge and biosecurity attitudes, practices and behaviours change (Fig. 5.1).

Attachment to Place and Its Impact on Social Change

The stepped process of social change is particularly evident when viewing local people's attachment to the landscapes, water systems, rocky outcrops and alluvial flood plans that exist throughout the region. This research found that there are different characteristics that draw people to the community and encourage them to stay, which in turn impacts on their attachment to place and their motivation to take up new knowledge and introduce social change. While the vast majority of non-Indigenous people come to the region for income generation and/or to gain experiences in an isolated though resource rich part of the country, Indigenous people choose to live in the community because of a cultural, historical and spiritual attachment to the land. According to one local Indigenous elder, "This is my country, I belong here" (personal communication, February 20, 2008), which reinforces the concept that 'who we are' is determined by 'where we are' (Dixon and Durrheim 2000; Proshansky et al. 1983). As such, the community becomes either a place that serves a specific purpose or a salient aspect of an individual's identity. The distinction between these two viewpoints highlights the difference between a functional attachment to place (what I can take from the community) and an emotional attachment to place (what I can give back to community) (Twigger-Ross and Uzzell 1996).

This study found that most non-Indigenous people intentionally come to the community to take up employment opportunities and/or to participate in tourist activities. In other words, the community forms a functional role in that it provides a range of physical resources that meet the needs of local people. For example, farmers use the land to grow produce and generate an income, teachers, police officers and other government workers undertake a 2 year placement in a remote area for further promotion, tourists come to experience a warm climate and diversity of natural environments while backpackers pick fruit for 3 months to extend their working visas. As such, this research found that local people depend on the community and its surrounds to meet their immediate and future needs, and remain in the region as long as their needs are being met. However, one of the key characteristics that encourage people to stay in the community for longer than expected periods of time is the livelihood that is generated and the lifestyle they can lead.

Data collected during this research indicates that access to employment opportunities in the community enables people to maintain a livelihood that would not be available in other locations. As such, people have access to a lifestyle that is unique to the region, which includes participating in a wide range of outdoor leisure pursuits such as fishing, hunting, boating, camping, hiking and swimming in local water systems and surrounding landscapes. While the community serves a functional role in satisfying financial and lifestyle needs, local people also develop an emotional attachment to place because the environment forms such a central role in local human activity. As such, if lifestyles and/or livelihoods are threatened by external forces, local people are more likely to be motivated to take up new knowledge to reduce or limit the impact these forces may have on the most important parts of their world. This is particularly evident in the agricultural industry where a high level of biosecurity knowledge and practice is displayed by local growers to safeguard their crops from pests and disease. While continued biological incursions within the agricultural industry will result in the loss of Area Freedom status and impose significant economic, social, cultural, environmental and physical implications for local growers, others in the community perceive the effects to be minimal on their daily lives. Alternatively, an environmental phenomenon such as an encroaching front of cane toads (*Bufo marinus*) (Australian Museum 2010; Kimberley Toadbusters 2004), has caused considerable community-wide activity because local people assume that the pending incursion will have a substantial impact on places, such waterways and landscapes, that are a valued part of their lifestyle and considered integral to their social and emotional wellbeing.

Strategies for Engagement and Meaningful Social Change

The most effective way to exchange local knowledge is through the social networks that exist within local communities. While such a concept may challenge current thinking on the provision of biosecurity information, this research suggests the use of 'community' as an alternative and effective mechanism to increase new knowledge and bring about a change in biosecurity practice. Recognising that local people are likely to be motivated to take up new knowledge and enact social change because of a perceived risk to places of personal value or importance, biosecurity agencies and the agricultural industry may consider providing local people with the resources to be active biosecurity practitioners ‘on their own turf’. As such, local people would not only take responsibility for reducing the risks of, for example, Medfly by appropriately disposing of unused fruit from domestic mango or grapefruit tress, but also take note of any changes in plant or animal form at a favourite waterhole, fishing spot, camp site or other outdoor places that contribute to their emotional wellbeing. Such an approach to biosecurity would also encourage local people to share information and advocate participative practices with others in their social networks who may value the same or similar places in the community.

The key objective for biosecurity agencies is to develop appropriate, two-way interactive mechanisms to exchange biosecurity information with local people so that if an anomaly is detected at any particular site, local people know what to do, who to contact and where to find out more about the identification of likely pests and diseases. While the use of brochures and websites can be a useful, supplementary tool in this instance, the most effective mechanism here is the development of personal and interactive relations between biosecurity agencies and members of the local community. One option worth considering in this community is the use of public displays of living specimens of invasive weeds and insects at the local Saturday morning markets. Such an approach is not only participatory and experiential for local people but it also provides a suitable arena for individuals on the inside of biosecurity agencies to establish a dialogue with those on the outside, which presents greater opportunities to form reciprocal and trusting relationships.

The establishment of different relationships between biosecurity agencies, the agricultural industry and the broader local community is important in changing the existing net result of biosecurity practice. However, rather than attempt to establish new relationships of trust and respect in areas that don’t already exist (and are not likely to exist), biosecurity agencies may benefit by linking with a cross section of people who have established social networks in the community. Here, individuals within certain social settings may be effective in sharing biosecurity information by using a common, contextual language with those who maintain similar interests, attitudes, experiences, backgrounds or occupations. Such a process bypasses the social, cultural or physical barriers that may exist across communities and allow for example, young people, Indigenous elders or tourists to share their knowledge of biosecurity experiences and practice with people who trust and respect their position or point of view. Similarly, biosecurity agencies may also choose to link with trusted and respected organisations to share information across a broad population base. For example, an exchange of resources, skills and ideas with community-based groups, such as those addressing an incursion of cane toads, could provide reciprocal avenues of support and advocacy, which would enable biosecurity information to be dispersed across all sectors of the community.

While one of the great expectations of biosecurity agencies is that local people will take up new knowledge and enact social change on their own accord, this study found that significant attention and behaviour modification was recorded by local people exposed to involuntarily biosecurity initiatives such as compulsory vehicle inspections at the border checkpoint and random luggage searches at the local airport. As such, the further use of involuntary biosecurity practices should also be considered as a positive activity to compliment other community-based initiatives throughout the region. For example, at present there are two roads entering the community, one from the east for interstate travel and one from the west for intra-state travel. While there already exists a quarantine checkpoint on the border with the neighbouring territory, there are no established mechanisms, other than road signs, disposal bins and brochures, to encourage people to relinquish their fruit, vegetables, honey or other plant products when travelling to the community from within the state. In other words, biosecurity agencies are relying on people to elevate the biosecurity of the community over and above the food items they have in their possession. While there is no way to determine whether this occurs, there is every likelihood that incursions will continue in the region if there is no real incentive for people to modify their behaviour. The use of mobile quarantine check-points for intrastate travellers however, can be an effective method to reduce the risk of biological incursions, not only by confiscating plant products and establishing opportunities for personal interaction with biosecurity agencies but also to encourage the exchange of information amongst the social networks of intrastate travellers. The expectation being that the involuntary biosecurity activities experienced by one traveller will be shared with other travellers en route to the community, which will in turn influence the decisions they make about the food items they bring into the region.

Although there is a range of physical and relational measures that can increase biosecurity knowledge and social change at a local level, a community approach to biosecurity should also expect a change in biosecurity thinking at an institutional level. For this to take place, some form of biosecurity de-centralisation has to occur to give local communities greater autonomy to make decisions about the biosecurity issues that impact most on their lives. While biosecurity agencies still maintain significant power and responsibility in the management of biosecurity, and there is no expectation that this will be renounced, it is hoped that instead of operating as a singular, centralised, external entity, agencies can also work inside and beside local communities to address biosecurity issues. The hope here is that such agencies will act as a stakeholder amongst many to jointly develop policies that reflect the issues identified by local people and assist in the implementation of practices that are relevant and meaningful to the communities they are attached to. The important consideration here is that policy development and decision making are informed by local knowledge and expertise, which extends beyond centralised policy makers and biosecurity agencies and includes input from the local agricultural industry as well as Indigenous groups, young people, organisations and community groups, the tourism sector and other local residents. If not, the process of biosecurity management becomes meaningless and disempowering and has the potential to further isolate local communities, including the agricultural industry, from local biosecurity issues and practices.

Conclusion

This study found that the generic and centralised approach to biosecurity management is not an effective strategy in increasing biosecurity knowledge and social change in local communities. While the vast majority of local information is exchanged through social networks, local people will not take up new knowledge or change biosecurity practice, regardless of how many brochures, websites or road signs appear in the community. People will be motivated to implement change however, if there is a perceived risk to their livelihood and/or lifestyle from outside forces. As such, individuals introduce a stepped process to determine the impact such forces will have on their personal circumstances, which in turn influences whether new knowledge is adopted and social change practices enacted. One of the key motivating features of such actions is an attachment to place. While most non-Indigenous people maintain a functional attachment to place by utilising local resources to meet their personal needs, access to an active outdoors lifestyle is an important aspect of an individual's social well-being, which results in an emotional attachment to the local environment. Unfortunately, biological incursions within the agricultural industry are perceived to have a minimal impact on the lifestyles and livelihoods of the broader community, particularly as there is a growing dependency on other industries for financial viability.

The challenge for biosecurity agencies and the agricultural industry in this region is to develop and adopt a community approach to biosecurity management whereby local people are self motivated to take up biosecurity knowledge and enact social change because they choose to. While involuntary biosecurity initiatives, such as random mobile biosecurity checks may still be a consideration in some localities, local people are more likely to be motivated to broaden their personal biosecurity knowledge and find greater meaning in biosecurity practice, if such measures are specifically designed to safeguard the places that are special, valued or important to them. While this may require the use of supplementary tools such as brochures and websites, a key to the successful implementation of participatory and experiential biosecurity approaches is the opportunity for local people to interact with those who work on the inside of biosecurity agencies; to ask questions about the pests and diseases relevant and of interest to them, to seek clarification on biosecurity issues, to share their own knowledge and begin to develop interactive, reciprocal, trusting and respectful relations. Only then will local people better understand biosecurity as a concept and as a practice, and only then will biosecurity agencies better understand the communities in which they are working. Similarly, biosecurity agencies may also utilise the social networks that exist in local communities by developing closer, reciprocal relations with trusted and respected individuals and/or organisations that already share information across a broader population group. The greatest challenge here however, is to allow local communities to play an active and immediate role in raising issues, developing solutions, making decisions and drafting policies to address the biosecurity concerns that impact most on their lives. Biosecurity agencies therefore must work along-side local communities so that when ideas bubble up from within, they are there to hear them.

References

AQIS. (2010a). *Exotic fruit flies*. Commonwealth of Australia. Retrieved April 24, 2010, from http://www.daff.gov.au/aqis/quarantine/pests-diseases/plants-products/exotic_fruit_flies

AQIS. (2010b). *Diseases of plants: Citrus greening disease.* Commonwealth of Australia. Retrieved April 24, 2010, from http://www.daff.gov.au/aqis/quarantine/naqs/naqs-fact-sheets/citrus-greening

Australian Museum. (2010). *Animal species: Cane toads*. Retrieved March 15, 2010, from http://australianmuseum.net.au/Cane-Toad

Blake, G., Diamond, J., Foot, J., Gidley, B., Mayo, M., Shukra, K., & Yarnit, M. (2008). *Community engagement and community cohesion*. York: Joseph Roundtree Foundation.

Bryson, L., & Mowbray, M. (2005). More spray on solutions: Community, social capital and evidence based policy. *Australian Journal of Social Issues, 40*, 91–107.

Centres for Disease Control and Prevention. (1997). *Principals of community engagement*. Atlanta: Public Health Practice Programme Office.

Cho, S. (2004). *Community goal dynamics: A case study*. St. Louis: Washington University.

Cohen, A. (1985). *The symbolic construction of community*. London: Routledge.

Dixon, J., & Durrheim, K. (2000). Displacing place-identity: A discursive approach to locating self and other. *The British Journal of Social Psychology, 39*, 27–44.

DSE. (2005). *What is community engagement?* The State of Victoria. Retrieved December 3, 2009, from http://www.dse.vic.gov.au/DSE

Falk, I., & Surata, S. P. K. (2007). Real social capital in Bali: Is it different from the literature? *Rural Society, 17*(3), 308–328.

Foster, M., Meinhard, A., & Berger, I. (2003). *The role of social capital: Bridging, bonding or both?* Ontario: Centre for Voluntary Sector Studies, Ryerson University.

Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology, 78*(6), 1360–1380.

Granovetter, M. (1983). The strength of weak ties: A network theory revisited. *Sociological Theory, 1*, 201–233.

Hashagen, S. (2002). *Models of community engagement*. Glasgow: Scottish Community Development Centre.

Howarth, C. (2001). Towards a social psychology of community: A social representations perspective. *Journal for the Theory of Social Behaviour, 31*(2), 223–238.

Ife, J. (2002). *Community development: Community based alternatives in an age of globalization* (2nd ed.). Australia: Sydney Pearson Education.

International Plant Protection Convention (IPPC). (1995). *Requirements for the establishment of pest free areas* (IPSM no. 4). Geneva: Food and Agriculture Organisation of the United Nations.

International Plant Protection Convention (IPPC). (1999). *Requirements for the establishment of pest free places of production and pest free production sites* (IPSM no. 10). Geneva: Food and Agriculture Organisation of the United Nations.

International Plant Protection Convention (IPPC). (2006). *Establishing pest free areas for fruit flies* (*Tephritidae*) (IPSM no. 26). Geneva: Food and Agriculture Organisation of the United Nations.

Kenny, S. (1999). *Community development for the future* (2nd ed.). Melbourne: Thomson.

Kimberley Toadbusters. (2004). *Cane toad fact sheet*. Retrieved October 23, 2009, from http://www.canetoads.com.au/canetfact.htm

Muirhead, T. (2002). *Weaving tapestries: A handbook for building communities*. Perth: Local Government Community Services Association (WA).

Narayan, D. (1999). *Bonds and bridges: Social capital and poverty*. Washington, DC: The World Ban.

Onyx, J. (2001). Third sector as voice: The importance of social capital. *Third Sector Review, 7*(2), 73–88.

Proshansky, H., Fabian, A., & Kaminoff, R. (1983). Place-identity: Physical world socialisation of the self. *Journal of Environmental Psychology, 3*, 57–83.

Putnam, R. (2000). *Bowling alone: Civic disengagement in America*. New York: Simon & Schuster.

Stone, W., & Hughes, J. (2002). *Social capital: Empirical meaning and measurement validity*. Melbourne: Australian Institute of Family Studies.

Twigger-Ross, C., & Uzzell, K. (1996). Place and identity processes. *Journal of Environmental Psychology, 16*, 205–220.

Wilkinson, K. (1991). *The community in rural America*. New York: Greenwood Press.

Willmott, P. (1989). *Community initiatives: Patterns and prospects*. London: Policy Studies Institute.

Wills, J. (2001). *Just, vibrant and sustainable communities*. Townsville: Local Government Community Services Association of Australia.

Woolcock, M. (2001). *Using social capital: Getting the social relations right in the theory and practice of economic development*. Princeton: Princeton University Press.

Woolcock, M., & Narayan, D. (2000). Social capital: Implications for development theory, research, and policy. *The World Bank Research Observer, 15*(2), 225–250.

Chapter 6
Social Partnerships in Learning: Engaging Local, Regional and National Partners in Plant Biosecurity Management

Ruth Wallace

Role of Small Enterprise Development

Culturally based, small enterprise development has proved to be a sound basis to undertake biosecurity management while also providing a basis for economic development and stability in remote regions (Wallace et al. 2009). Partnerships in biosecurity management that utilize enterprise models can build sustainability through enhanced shared ownership of local initiatives and coordinate decision making across and between communities and stakeholders. Social partnerships in learning models are designed to ensure that community management of biosecurity is integrated into existing institutions and relationships. These partnerships are flexible, place based, context driven and use approaches that support the development of social capital in local and national relationships. Relationships work across individuals and the organizations or groups they represent. The relationships are not necessarily benign, equal or mutually supportive. Consequently partners need to have a clear picture of the processes, skills and knowledge required to work across different priorities, unequal power relationships or value systems.

The partnerships discussed here focus on developing the learning systems and workforces related to biosecurity management in remote Aboriginal communities. In particular, the potential role of enterprise training and development in embedding plant biosecurity management at a local level to achieve environmental, economic, cultural and social sustainability is discussed. The Australian Cooperative Research Centre for National Plant Biosecurity's pilot study in Northern Australia and Eastern Indonesia identified three key features of partnerships that support the community based management of plant biosecurity (Wallace 2008, pp. 251–268). There is a need to understand firstly, the ways local communities interact with policy and

R. Wallace (✉)
Charles Darwin University, Darwin Northern Territory, Australia 0909, Australia
e-mail: Ruth.Wallace@cdu.edu.au

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_6,

industry; secondly, the potential of enterprise development in the engaging local communities in the long term; and finally, the need for a training framework to endorse local knowledge for the community management of biosecurity in both countries is a significant issue to be addressed.

Through their analysis of the key elements of integrated rural development in East Nusa Tenggara, Indonesia, Blyth et al. (2007) outlined the range of opportunities for integrated rural development through enterprise development at a local level. A key element of natural cultural resource management is the management of plant biosecurity through local and national partnerships between community members, land managers, regional bodies, government and researchers. The management of plant biosecurity at the community level has the potential to be embedded into enterprise models that draw on local knowledge, build local capacity and build connections with national policy approaches.

This chapter outlines some of the issues related to engaging individuals and their institutions in the community management of biosecurity in regional and remote sites in Northern Australia. The process of engaging communities is underpinned by understanding the ways institutions and communities transfer knowledge about biosecurity management and implement community management processes that govern the knowledge transfer. The training framework described here, has been developed to support the engagement of Indigenous people in leading community management of biosecurity for cultural, social, economic and environmental benefit. Registered training organizations, employment agencies, national and State or Territory agencies can all be partners in economically and socially sustainable enterprise partnerships. In particular, this chapter discusses not only the issues around managing knowledge in cross-cultural and remote areas but how to enact that knowledge in order to have impact on the practices that operate across social, cultural and regional borders. The findings inform the development of the model and the resources of Indigenous community-based management of plant biosecurity.

Plant Biosecurity Community Management

The successful identification, management and eradication of plant biosecurity incursions across the extensive and sparsely populated Northern Australian coastline is a significant challenge. Plant incursions include weeds such *Mimosa* (*mimosa pigra*) and *Parkinsonia* (*markinsonia aculeate*) that threaten large areas of Southern Arnhem land. These incursions impact on Aboriginal people's lives as they can compete with, and displace, wetlands' fauna and flora. The flora and fauna are important food sources and without access to these sources people consume poorer quality commercial food products, which impacts community members' health outcomes. In addition, weed eradication work undertaken by Aboriginal people has implications for the Australian agricultural industry that would otherwise need to expend considerably more than the current $4 billion per year to address production losses and manage costs (Altman et al. 2008).

Effective partnerships between Indigenous land managers and relevant government agencies have developed to undertake biosecurity management in these remote regions. Biosecurity surveillance, reporting and management work therefore has the potential to be developed to support economic, cultural and social sustainability in remote Indigenous communities. Indeed, the Commonwealth government recognizes its importance through natural resource management initiatives such as the Caring the Country program. This program integrates delivery of the Australian government's previous natural resource management programs, including the Natural Heritage Trust, the National Landcare Program, the Environmental Stewardship Program and the Working on Country Indigenous land and sea ranger program. The potential for stabilizing and extending these programs and securing the environmental, agricultural industries' and Indigenous people's futures is being realized through connection to emerging enterprises and existing areas of expertise.

Biosecurity management is influenced by the policy and government structures locally, regionally, nationally and internationally. The key processes that manage biosecurity control in Australia work at a range of different levels. The Australian Biosecurity System for Primary Production and the Environment (AusBIOSEC) coordinates biosecurity activities between a range of stakeholders including the Australian government, State and Territory government agencies, landholders, industry agencies, and other key stakeholders in the environment and primary production areas (Australian Government Department of Agriculture, Fisheries and Forestry 2009). The National Biosecurity Policy is noted through the National Biosecurity Committee (NBC) which provides:

> … strategic leadership in managing national approaches to emerging and ongoing biosecurity policy issues across jurisdictions and sectors. NBC will take an overarching, cross-sectoral approach to national biosecurity policy, and will work collaboratively to achieve national policy objectives for biosecurity in Australia. (Australian Government Department of Agriculture, Fisheries and Forestry 2009)

Through their analysis, Blyth et al. (2007) noted that a sustainable livelihood approach requires the integration of physical, economic, political and socio-cultural environments. Across the Northern Australian coastline and neighboring countries, biosecurity engagement is managed through the Northern Australian Quarantine Strategy (NAQS) which conducted surveys and worked closely with local communities. NAQS is under the auspices of the Australian Quarantine Inspection Service (AQIS). The strategy worked across State and Territory borders and with a range of Indigenous and non-Indigenous people, communities and institutions. Developing partnerships that are supported by security and sustainable livelihoods in regional and remote communities have at their core sound processes and structures to create, share in and recognize emerging and local knowledge, practices and standards.

The complexity of the relationships that work across Western and Indigenous scientific and cultural knowledge, as well as across regional and institutional borders cannot be underestimated. This is a key issue for partnerships such as the Biosecurity Engagement Practitioners Network which is initially considering biosecurity issues in horticultural regions. Examples of other enterprises are Indigenous Rangers taking on contracts to undertake land management and specimen collection as well as establish cultural tourism businesses. Community-based enterprises tender for work through a range of agencies and develop socially based enterprises in communities. What is needed is a sound model for capacity building to undertake this work, manage the relationships, and achieve all of the stakeholders' goals. These enterprises also require adequate resources to support their activities.

Indigenous Economic, Cultural, Social and Environmental Sustainability

The *Northern Territory Indigenous Economic Development Strategy* (Northern Territory Government 2005) recognizes the strength, resilience, diversity and cultural integrity of Indigenous people, and the high levels of disadvantage which impact on the capacity of people, families and communities to engage in economic and social development activities. Indigenous enterprise training and development has operated in many cases to meet the aims of Indigenous people and communities. Altman (2001) in a study of sustainable development options on Aboriginal land, suggested that hybrid approaches that include scientific, biological, social, commercial viability and "Indigenous expert assessment of cultural practice" (Altman 2001, p. 8) are needed. Mature hybrid enterprise development models recognize the need to build capacity to grow business develop complementary businesses support business processes develop corporate governance expertise undertake succession planning and integrate with effective lifelong learning and training delivery.

Enterprise and contract based work has developed with Northern Territory Indigenous communities through the Caring the Country projects. An example of these enterprise based partnerships is the contracts facilitated by the Yugul Mangi Land and Sea Management Corporation. The Corporation worked closely with AQIS to support Indigenous Rangers to undertake land management activities. These enterprise based contracts negotiated with Rangers[1] relate to the monitoring of biodiversity and primary agricultural industry threats. This work recognizes and values Aboriginal peoples' geographic and ecological knowledge while supporting the development of related knowledge, for example sample collection. The roles rangers undertake included monitoring illegal foreign fishing vessels debris, ants, mosquitoes, weeds and collecting feral animal blood samples to monitor diseases. Rangers develop records using Global Positioning Systems (GPS) to collect samples which are assessed by AQIS scientists. The funds are earned and used to develop the land and sea management program (CAEPR 2008a).

As Indigenous enterprises are operated by the community, rather than individuals, owner-operated enterprises emphasize usefulness and employment for community members rather than profit. Indigenous community enterprise members, while having a marketable product, have far less capacity to access the capital to develop their

[1]Rangers indicates Australian Indigenous Rangers throughout the rest of this paper.

business than non-Indigenous business owners (Flamsteed and Golding 2005). This includes access to business services, commercial labor markets, business models and sites and learning through involvement in other Indigenous businesses. For enterprise development and training, this means developing a new way to understand and incorporate all of the social, human and physical capital in any community or in systems as a whole. Examples already exist such as the arrangements that have been negotiated between the Yugul Mangi Land and Sea Management Corporation and Aboriginal land and sea management groups to increase their funding base and employment opportunities. Aborigianl ranger groups are managing contracts and enterprises on their own country that care for country and provide economic security. Enterprise planning and trials have been undertaken in relation to carbon abatement, harvest of longneck turtles, crocodile egg collection, waterlilies, sugar bag and pet meat (CAEPR 2008b).

Workforce, economic and community development and training programs conducted with remote Indigenous communities need to relate to a new paradigm, one that has an economic development dimension and targets "previously unrecognized productive activity spin-off benefits to industries and regions beyond the Indigenous estate" (Altman 2001, p. 8). The negotiation and management of these programs involves a range of stakeholders who can work in partnership in the long-term, through their constant change and complexities.

An enterprise training and development approach recognizes the role of Indigenous people and the different ways of enacting knowledge in managing by security work and sites on Aboriginal land. Christie described Indigenous knowledge traditions from a trandisciplinary research perspective, focusing on collaboration through partnership across different knowledge systems. He stated that "Indigenous knowledge traditions resist definition from a Western academic perspective" (Christie 2006, p. 86) and as locally contextualized, responsive, active, undertaking constant renewal processes, "eco-logical" and "more as something that you do than as something you have, knowing how rather then knowing what" (Christie 2006, p. 79).

Much accepted Western knowledge is codified through long accepted processes such as qualifications awarded by educational institutions, and formal training system. The development of a training framework recognizes the range of knowledge and skills that is involved in undertaking by security management through enterprises and the range of stakeholders involved. It is a framework for negotiating the best approaches to training and qualifications. A training framework examines not only the qualifications framework but the ways the framework engages people across diverse knowledge systems. That is, it outlines the key elements of a framework that recognize the governance structures underpinning knowledge utilization and management in diverse knowledge systems, the impact on representations of knowledge, ways to negotiate and transfer knowledge as well as the social contract between stakeholders in biosecurity management. These diverse knowledge systems operate in bureaucratic, policy, cultural, Western and Indigenous scientific, business, academic and industry based processes, just to name a few. They have different governing structures, expressions and interpretations of actions.

The processes and governance structure can be explicitly or implicitly undertaken, insular or facilitate working in partnership with others, focused on a long or short term view. They are dynamic and can have agreement or conflict within and across the knowledge systems depending on the activity, as well as the institutional or individual participants. The complexity of working within and across the knowledge systems cannot be underestimated, as anyone knows who works in this way. Engagement means learning about how things work while also finding out how much more is not understood.

Social Partnerships in Learning: Partnerships in Knowledge Management and Utilization

Embedding plant biosecurity at a local and national level draws together the principles of community management of plant biosecurity in relation to leadership, governance and change. This proactive approach to managing plant pests utilises social partnerships in learning to help people collaborate across community, policy, regional and national boundaries. These partnerships connect biosecurity management and implementation with existing economic, cultural and social structures and so increase chances of sustainability. In Australia, this strategy has been developed to respond to the changing nature of work and economic viability of Indigenous people in remote and regional communities. The strategy is responsive to recent national policy changes in relation to Indigenous community and workforce development and Indigenous people's desire for economic independence. These partnerships move beyond pre-and post-border approaches to biosecurity and recognize the need to invest in management of biosecurity and the engagement of local communities, industry and governments in those processes. That is, the social partnerships in learning approach works *across* borders between these entities to ensure a smooth process of knowledge exchange. The approaches that are needed focus on the interactions between stakeholders and the work they do to understand how responses to incursion can be optimized. These partnership based approaches see the whole system as well as the interplay of the individual components to improve proactive and targeted responses to bioincursions.

Innovative and successful approaches to learning partnerships and regional development in remote and regional contexts with Indigenous people necessitates effective partnerships and the recognition of diverse knowledge systems as they relate to the worlds of work, community engagement and learning. Social partnerships catalyze and enable change in human or social policy (European and Sustainable Design International 2005). Social partnerships *in learning*, then, are the interagency and interdisciplinary relationships that enable effective learning in different disciplines, workplaces and training sites. Social partnerships in learning frameworks are used to: examine diverse knowledge systems, develop capacity building processes and understand the underlying relationships that facilitate connections, engagement and decision making between government, non-government, enterprise, community, stakeholders and individuals (Wallace 2008, p. 7). These frameworks operate at and across all level, involving individuals, organizations and learning systems.

Unewisse and Grisogono (2007, p. 4) examined the issues related to complex environments as they are:

> … dynamic, unpredictable and constantly changing nature, including changes brought about by other actors in the environment. Therefore the ability to adapt appropriately is absolutely fundamental to success in coping with those changes.

They outline the need to utilize adaptive processes that do not rely on predetermined strategies, are able to learn from successful strategies resulting in new capabilities, strategies and behaviors that reinforce success. Adaptive systems rely on a sound understanding adaptation, how it works or fails, and being able to harness adaption. Unewisse and Grisogono (2007) propose a framework for adaptability that includes five nested adaptivity levels: action-in-the-world, learning-to-learn, improve learning how to learn, aligning internalized success with authentic success and finally co-adaption using with interwoven and parallel threads. Adaptive systems are characterized by being agile, flexible and resilient. These systems are able to recognize different contexts and changes that require the most appropriate strategy to be implemented in that situation, recognize and manage challenges effectively to do different things in different ways (Unewisse and Grisogono 2007, p. 5). What does this mean when considering biosecurity management in Indigenous contexts? In biosecurity these adaptive systems might be evident in ways of working, deciding who can do what and ways of classifying country, knowledge, ways of working and how to progress effective management.

These partnerships operate in complex and conflicting institutional relationships. Ellis (2005) discussed the barriers faced by government, industry, other agencies and aboriginal people in trying to promote sustainable partnerships that promote strategies that support agencies to 'hear' traditional knowledge and "fostering the capacity of aboriginal people to bring traditional knowledge to bear in environmental decision making" (Ellis 2005, p. 1). The barriers to communication across culture, language and the underpinning knowledge systems are not always clearly understood by stake holders. People have different ways of re-expressing ideas and concepts. The lack of understanding of various concepts is based on a lack of understanding others' values, contexts and practices. These values, contexts and practices underpin traditional knowledge and need to be recognized in the research process (Ellis 2005, pp. 66–77).

An example of the complexity in maintaining partnerships in biosecurity management is the Yugul Mangi Community Council, an organization that works to ensure Aboriginal customary law is core in land and sea management across clan estates. They have supported a range of groups to undertake land management activities and manage finances. Over time the success of the venture meant the capacity of the partners to meet the rapidly expanding profile of short-term grants and work program outgrew this initially successful support arrangement. Stress on the capacity was exacerbated by high turnover in the community council management and the subsequent loss of understanding of customary Aboriginal governance underpinned by the land and sea management program. In turn, the loss of understanding had a significant impact on relationships between Rangers the community management and traditional owners. It also impacted on their capacity to make informed decisions together and undertake government contracts relate this land and sea management. A result of these changes, it is evident that people and groups in partnerships need to be skilled at managing the impacts of these constant changes.

Social partnerships in learning are the relationships that attempt to work across diverse knowledge systems and governance structures. The different knowledge systems, groups or institutions that attempt to work together can often be characterized as a 'system of systems' as described by Norman and Kuras (as cited in OECD 2009). They note systems of systems are not designed rather they are opportunistic interactions amongst existing or previously planned systems. Norman and Kuras (as cited in OECD 2009) found that the issues may include:

1. There is not a shared conceptual basis for engagement
2. The systems are designed for different purposes and may not be designed to operate with other systems
3. May have an acquisition culture which encourages them to be stand alone
4. A lack of effective common management or control
5. Do not have a common funding basis which can be accessed to address integration issues
6. The system of systems may have internal and external customers
7. Individual systems, and systems of systems, develop at different speeds, rapidly, subject to diverse pressures and requirements. This is particularly true in the case of information communication technologies systems.

Working in partnership across knowledge systems involves recognizing that the work is complex and, at times, uncomfortable. The biggest challenge is to understand the unsettled and discomforting states of partnership and that this is an important part of developing a shared basis for working in sharing knowledge. In many ways this is not new but having a framework to operationalise it is new. Relationships of trust over time are fruitful in achieving positive outcomes for all stakeholders. It is important to invest time and resources to develop the trust and retain flexibility within the team to seek new opportunities.

An Enterprise Training and Development Framework

Aboriginal ranger groups in remote communities are examples of small enterprises that provide employment and sustainable futures that meet the social, cultural, economic and environmental aspirations of Indigenous people and to a large extent the broader Australian government agenda. Rangers undertake paid work on their own country, making most of their competitive advantage. Their competitive advantage is, of course, their extensive knowledge of that land, its management and the cultural knowledge supporting its management. These enterprises undertake valuable bio-management work across vast areas and have the potential to encourage new enterprises to develop providing a broader base to the local economy and increasing the available workforce. An example of Aboriginal ranger based enterprises is the Dhimurru Rangers in Manindgrida NT, who are involved in sustainable commercial use of wildlife. This includes collecting and incubating crocodile eggs, participating in tourism, patrolling East Arnhem Land beaches to identifying marine turtle nesting areas. These programs undertaken by aboriginal ranger groups in Arnhem Land have contributed to facilitating traditional knowledge transfer through the involvement of traditional owners and rangers with different levels of expertise (CAEPR 2009).

Indigenous ranger enterprise development can support the resilience of Indigenous communities to develop enterprise and biosecurity management models in partnership: to make mistakes, deal with complexity, confront problems and recover from them. The community leaders and mentors that develop through the enterprise provide models for working in ways that incorporate Indigenous and Western scientific and management knowledge, recognize different expertise and how to negotiate across these ways of working and knowing. The knowledge Indigenous people have about their country was learned with senior relatives in place-specific ways. They learned by going to places and seeing how plants and land management practices worked in that place and the ways that knowledge connected to a broader set of principles and practices (Altman et al. 2008).

Fundamental to a successful training framework is engagement in learning. This is achieved by working with people's cultural and social experiences, relationships and identities. Developing successful approaches to training in remote and regional contexts with culturally and socially diverse people is dependent on effective partnerships and the recognition of diverse knowledge systems as they relate to the worlds of work, community engagement and learning. These processes may be innovative in that they are adaptive and not prescriptive. They are likely to be sustainable if they are embedded in local community management structures and create links with other stakeholders beyond the local level. As one of the research participants observed:

> Often the jobs or occupations that are identified for training in Aboriginal communities are those that do not incorporate or relate to traditional knowledge, languages or skills. They target the weaker skill levels of participants rather than capitalizing and building on their strongest skills such as performance, cultural work and Indigenous traditional and contemporary knowledge.

The training framework, as described in the next section of this chapter, started by recognizing the learners' existing knowledge and skills, then describing an accurate map of the knowledge they needed to develop their land management skills, both in the short and long term. Educational systems that engage with regional communities, industry and government stakeholders may work across knowledge systems in their relevant contexts. Innovative approaches to education are based on relationships through locally based action for shared benefit. While this has been the goal for educational institutions and policy for a long time the missing element has been an understanding of the multidisciplinary and multiscalar relationships that underpin information exchange and shared engagement in the university's process and outcomes. These are described as *social partnerships in learning*. These social partnerships in learning are the connecting tissue between learning systems and agents.

Development of the training framework has demonstrated an example of social partnerships in learning that acts to negotiate across industry government and training institutions. It interprets ways of working that work, that prioritizes and accepted ways of working. Enterprise development and training is defined in this context as training that supports enterprise development and draws on local Indigenous knowledge and is connected to local Indigenous government structures. Customized training is tailored to the enterprise owners' development and maps to nationally accredited training. In Australian Indigenous contexts, customized training is sensitive to local situations and explicitly makes links to the relevant national agendas. The training framework developed, therefore provides a model recognizing knowledge, codify what is needed and known in the workplace for negotiating the difference. The training framework outlines not only the relevant conservation and land management qualifications undertaken by Aboriginal rangers and also identifies the additional skill sets required by Aboriginal rangers to utilize computer based learning, manage an enterprise, and on-the-job skills recognition processes. The training framework outlines how to connect to registered training organization and employment support structures work.

Flamsteed and Golding (2005) emphasized the importance of learning through business and incorporating learning opportunities that are linked to earning, context specific, developed in parallel to actual work and applied through practice in commercial business activities. They also noted the importance of incorporating resources that developed in terms of Indigenous entrepreneurs and enterprises and potential students and communities needs. Developing professional learning partnerships that engage practitioners in transformative learning incorporates the active management of knowledge. Knowledge management (Wenger 1994) is more than communication flows, interpersonal connections, document repositories and institutional and cultural norms about the value of knowledge. It is crucially important to have the active involvement of practitioners in the process, because they own the knowledge and understand its implementation, what should be recorded formally, and which forms of recording are appropriate.

Ranger groups meet regularly to share knowledge about better ways of working, sharing knowledge and adoption of their approaches into mainstream land management practices. This work has been recognized as valued and enjoyed by families as they can continues the cultural and environmental management of their clans' country with long term positive impacts for future generations (CAEPR 2008a).

The efficacy of practices to ensure plant biosecurity, namely, the identification and management of incursions of pests and diseases in regional and remote communities, is connected to the responsiveness and support of the relevant knowledge management partnerships. Blyth et al. (2007, p. 11) have identified essential components for integrated rural development and its implementation. They include learning about better approaches from past failures, developing flexible approaches that focus on capacity building at a local level, and involve shared ownership of learning models that are 'people-centred and people-driven'. They note that learning models need to recognize and build on existing local knowledge about opportunities, limitations, and shared understandings of issues at the micro and macro levels. Approaches to enterprise development and training that build from local knowledge and strengths have the potential to engage local and broader knowledge in learning partnerships that embed plant biosecurity practices and management systems within regional communities.

Implicit is the development of powerful connections that are based on joint need in shared capacity. By explicitly understanding how to work across systems, stakeholders are better able to negotiate and rationalize their learning experience. Educator's support the connections by accessing approaches to learning such as problem based learning that link to local enterprise issues. That is, they customize learning to the individual investment in building good networks around knowledge and capacity. This move is the focus of educators' professional development in pedagogical approaches that capitalize on individuals and their strengths rather than focusing on normalizing systems. The use of ICT supports multimedia and multi-literate approaches to knowledge sharing and assessment that values diverse knowledge systems.

The development of an effective approach to training and regional economic development must include strong partnerships that create individual and community confidence, sustainable career pathways and effective regional strategic development (Allison et al. 2006). Blyth et al. (2007) have outlined the strategies needed to improve the design and implementation of integrated rural development projects. These include an institutional environment that builds shared ownership of local initiatives and coordinates decision making across and between communities and stakeholders approaches to projects that are flexible, source local knowledge and informed by location-tailored research analysis. In addition they should support the development of social capital through building relationships and management, while consolidating sustainability through community participation. At every stage, there needs to be training of local staff to continue projects and to ensure projects are integrated into existing institutions.

Young et al. (2007, p. 7) have found that there is a:

> … significant misalignment between the content and delivery modes of VET[2] and the prior skills, educational demands and aspirations of desert Indigenous people. VET programs struggle to adapt to and address the types of learning needs that arise as a result of language and cultural differences and the different ways work is constructed.

The development of a training framework that effectively engages local and broader knowledge in learning partnerships has the potential to support embedding plant biosecurity management in regional communities. This training framework focuses on partnerships and relationships, rather than systems. These partnerships are central in negotiating and enacting training and workforce development approaches that build cultural, economic and socially sustainable livelihoods.

[2] Vocational Education and Training.

The key elements of a successful training framework that align with the goals of regional Indigenous communities workforce develop are examined below. The framework outlines appropriate approaches for training in plant biosecurity through enterprise development in these communities. The framework focuses on approaches that embed plant biosecurity management in a sustainable way, endorse local expertise and create links across policy structures.

Training can be negotiated within a framework that incorporates employment outcomes, teaching, assessment and learning strategies, units and resources. The framework can include a number of approaches that can build better approaches to training with Indigenous people and enterprises. Skills sets may be a better starting point for designing training plans and qualifications that fit Indigenous enterprise owners' priorities. By analyzing the work in context and as it develops over time, skills sets can be established that are then matched to competencies. Digital resources offer the opportunity for people to demonstrate their knowledge of and competence in many areas including biosecurity management through audio, visual and written forms, that can be flexible, mapped by Indigenous people to their knowledge systems and expectations and to more accurately represent Indigenous people's knowledge. As effective resources are developed and used by businesses they will form the examples for future training and development, and their developers becomes the future trainers. What is important then is ensuring people involved in training have digital literacies and the confidence to work across a range of emerging technologies.

Key Elements of the Training Framework

Workbased learning: Workplace based learning and assessment is a key component of VET delivery where work, learning and assessment were well integrated. In the enterprise development workplaces, learning was based on the requirements of working in the Indigenous community context and cultural domains. Training was implemented according to students' individual needs and their involvement in work and cultural responsibilities and obligations. Through workbased learning, assessment was conducted by assessors strongly connected to the relevant enterprise's work context. In this way, training was customized to reflect the needs of the Indigenous client group. Trainers, trainees and employers negotiated the learning projects to match appropriate workplace activities. Training activities and resources were developed over time and became part of the learning culture and resources in the community. In this environment, student support was characterized by initially integrating the principles described by Arnott et al. (1988), not an additional activity.

Learning partnerships: Community ownership of learning partnerships that manage the process and its integration into the commitments of a community is vital. Shared ownership challenged training providers and other stakeholders to take a holistic approach to engagement in the partnership and continually ensured enterprise owners maintained responsibility for the learning contract. It is not the role of training providers to generate the enterprise ideas, rather they played an important role in sharing what is possible and how the VET system can help. Seeing what other people did was a great way to stimulate the imagination, as projects develop through sharing.

Some of the learning is undertaken with other Indigenous enterprise peers through a community of practice. This reduced the emphasis on the trainer as the only expert. In successful partnerships, facilitators, mentors and partners worked together with Indigenous enterprises and was achieved in a number of ways. Trainers developed training experiences and materials in response to the area of need or interest identified with the enterprise and student. Training providers have a role to make people aware of a range of options but the vision had to come from the community. This changed the way a training team in a learning partnership was constructed, including trainers, community leaders, Aboriginal rangers, government and industry partners. Partners varied between the enterprises, however the members of each enterprise viewed them as being essential to their enterprises success. Industry support and business partners, where possible, were essential to enterprise development and sustainability. There are many ways this can happen, but all emphasized the importance of the Indigenous family, clan or tribal group leading the direction and processes of the enterprise and training.

Recognition of Prior Learning (RPL) is the crucial first step of any training. The RPL process recognizes and records the knowledge and skills individuals have as it relates to their contexts and experience. One of the challenges in Aboriginal contexts is the recognition of community competence, that a group of rangers can undertake work as a team, each knowing parts of the process and know who and how to access the knowledge they need. Training plans can then be targeted to individual's actual needs and can then focus training time on their actual priority areas. The training framework includes mapping workbased tasks to training modules and the types of evidence that is collected on the job. This process recognizes the valuable informal training that occurs when teams work together over time and develop confidence in their work focused competence. Digital technologies provide a range of tools to collect evidence using written, visual and audio means. These technologies mean people can demonstrate their skills in their own context, language and time.

Trainers and others experts are an essential part of the training relationship. They provide expertise in identification, monitoring and management of biosecurity incursions, technical skills, utilizing policy frameworks, communication strategies, regional landscapes and histories, scientific specialty and working within indigenous contexts and government structures. Gaining access to and building expertise is part of any community management strategy. A combination of attention to relationships that develop a shared understanding and respect is essential in any training program. Expert roles may include people able to exploit a specific idea but not at maintaining sustainable trading relationships.

Experts, then, include people who are within and outside the community. Together they provide a network of expertise on which learners can draw and share knowledge. The facilitation of this process provides an opportunity to ensure the relationships encourage critical analysis of different ways of understanding community management of plant biosecurity and its implementation. Experts include Aboriginal community members, whose expertise needs to be recognized and valued as much as that of external partners. Working with local experts and people in related workplaces helps the identification of opportunities to link to and support local activities, resources and priorities. This assists in building local capacity and avoids replication and waste of resources.

Professional practice and delivery: A responsive training program facilitated by expert trainers/learning facilitators over a long term partnership made a significant difference to enterprise success. Effective training programs developed through shared knowledge and trust, assumed Indigenous people had considerable knowledge and competence to bring to the training relationship. They focused on positive elements and outcomes. Trainers with high skill levels in relevant areas and appropriate cross-cultural knowledge were identified and supported to develop sound learning relationships. It proved important to link delivery of training (and assessment) to actual industry practice, relating both directly to work on the ground.

Working with Indigenous enterprises is based on long term interactions built on trust and commitment. Partnerships with Elders and local experts were significant in recognizing students' knowledge, competence in a range of contexts and supporting the integration of learning into the everyday work environment. It is only after having a clear idea about participants' aims for their enterprise that the trainer could negotiate the training plan, even when the trainer disagrees with that assessment. The most successful enterprise training programs started with what the individuals wanted to achieve and then worked back to the training system, deciding which units would be appropriate, which should be delivered together, when, who else might need to get involved and how it could lead to a full qualification. This tailor-made approach to developing a training plan took considerably longer than the development of a standard qualification's training plan, is was negotiated over the life of the partnership and achieved better outcomes for all stakeholders. This was evident in workforce outcomes, completed studies, continued studies and extension of the program to other enterprise partners.

Training frameworks: Qualifications were not the final aim of training; employment and personal outcomes needed to focus of any training framework. Training outcomes and assessment were more relevant and successful where delivered on the job, particularly in remote areas, where industry 'context' is very different from anywhere else. There was a need for training providers to be creative in exploring a range of training packages[3] and units from different industries that are customized to clients' needs. That is, programs that consider clients' long term needs first, and secondly the other issues such as who will fund it, what will be delivered, who will deliver it. Training frameworks developed understood the flexibility of National Training System and ways to adapt the relevant training package to meet enterprises' requirements. The framework reflected the enterprise's goals rather than a single qualification or unit of competence.

[3] A training package is a set of Australian nationally approved standards and qualifications for recognizing and assessing people's skills in a specific industry, industry sector or enterprise.

Diverse knowledge systems: Management of any biosecurity issue or concept is dependent on the successful engagement of knowledge systems that are diverse, have contradictory bases for their knowledge and competing goals. The stakeholders may have little, superficial or inaccurate knowledge of each other's lives goals, resources, governance, or knowledge sets. There are frequently power differentials which are likely to be protected by the stakeholders at the expense of the shared goal or outcomes. The dominant system in any given situation would tend to advantage one of the existing knowledge systems. People will respond based on the historical, social and cultural factors which may not be clear to other stakeholders. Engaging biosecurity knowledge in training and workforce development is underpinned by a preparedness to accept that people think and relate to biosecurity issues differently. The training program facilitates being able to do more than translate concepts but also to understand how that knowledge is used in different contexts and the value of seeing an issue from a number of perspectives.

Digital technologies: Enterprise training recognizes the importance of working with local community knowledge about governance, cultural knowledge, land ownership, and enterprise owners' priorities for the business and their lives. Digital knowledge systems and resources offered considerable opportunities to work in new ways. Technology has become increasingly intuitive and accessible in remote areas, making the use of ICT more viable. A range of digital technologies were effective (see also Chap. 11) in supporting people to work in different ways and demonstrate the knowledge as it related to their contexts. The key to this approach is the role of Indigenous people in the development of the resources, using software and hardware resources within the enterprise and collecting evidence through an e-portfolio.

Learning using ICT is enhanced by working in partnership with Indigenous people, including elders and community members. These partnerships developed opportunities to use ICT to learn and share knowledge in appropriate visual, audio and multimedia forms. Indigenous learners and people are a key part of any exploration of technology and they lead the best ways to share cultural, environmental, social and enterprise knowledge. Transgenerational learning that included a range of people was important to sharing and negotiating rules about how cultural and other knowledge or images are shared and represented. Educational systems need to recognize and integrate the plurality of the society in which it operates.

Policy: The training framework presumes the recognition of the local context, the priorities of the people in that place and the worksite. Funding models work with the development of the Aboriginal rangers and assist Registered Training Organizations[4] to work with the ranger group, rather than being constrained by annual training targets. By moving from a focus on qualifications to skills sets and the associated unit, teams recognize the realities of working in complex workplaces. The work includes working across knowledge systems, including science, technical, enterprise systems, literacies; written and spoken English, numeracy, digital, workplace,

[4] An organization that is accredited to deliver nationally approved training in Australia.

employability skills and cultural competences. The framework outlines the ways policies can support ranger groups to negotiate the training they want and need, rather than accepting the proscribed course from a training provider. The assessment models for any funding focuses on the outcomes for the rangers, their employment and sustainability rather than the completion of qualifications.

In Conclusion

Analysis of regional learners' experiences of learning engagement challenges formal educational institutions to consider the appropriateness of current approaches to supporting students' learning. Using learning partnerships as a basis for negotiating training means understanding the processes involved in educational practice and policy that have shaped the current system. The continued input and ownership of stakeholders is essential in this process, in combination with the ability to analyze, articulate and operationalise partnerships that improve engagement of learners, educators, community government and industry stakeholders. These partnerships can contribute to and benefit from the development of more appropriate processes. It can also provide the basis for modeling that focuses on improving outcomes for individuals and communities and for improving educational and workforce outcomes in regional areas.

Developing an approach to community management of plant biosecurity that recognizes the expertise and commitment people have to biosecurity can be supported by collaboratively developing a training and skills recognition framework. The framework can explicitly endorse community knowledge and skills sets that focus on identification, intervention, management and eradication of plant pests. The content would be developed through a sustainable 'patchwork of enterprise' approach to regional and training development in regional and difficult contexts that can be integrated into existing and developing structures. By explicitly recognizing and endorsing local knowledge and skills, connections to policy level descriptions and support can be developed that ultimately improve outcomes for communities' economic, cultural, social and economic futures.

References

Allison, J., Gorringe, S., & Lacey, J. (2006). *Building learning partnerships: Partnerships, social capital and VET performance*. Adelaide: NCVER.

Altman, J. (2001). *Sustainable development options on Aboriginal land: The hybrid economy in the twenty-first century*. Canberra: ANU, Centre for Aboriginal Economic Policy Research.

Altman, J., Kerins, S., Fogarty, B., & Webb, K. (2008). *Why the Northern Territory Government needs to support outstations/homelands in the Aboriginal, Northern Territory and National interest*. Canberra: ANU, Centre for Aboriginal Economic Development.

Arnott, A., Clark, T., Clarke, L., Henry, J., Langton, M., & Wells, J. (1988). *Djama and Vet: Exploring partnerships and practices in delivery of vocational education and training in rural and remote Aboriginal communities (Vols. I and II)*. Darwin: Northern Territory University Press.

Australian government, Department of Agriculture Fisheries and Forestry (AusBIOSEC). (2009). Retrieved November 7, 2009, from http://www.daff.gov.au/animal-plant-health/pests-diseases-weeds/biosecurity/ausbiosec

Australian Government, Department of Agriculture, Fisheries and Forestry. (2009). *National biosecurity committee.* Retrieved November 7, 2009, from http://www.daff.gov.au/animal-plant-health/pihc

Blyth, M., Djoeroemana, S., Russell-Sith, J., & Myers, B. (2007). Integrated rural development in East Nusa Tenggara, Indonesia: Overview of opportunities, contracts and options for improving livelihoods. In S. Djoeroemana, B. Myers, J. Russell-Smith, M. Blyth, & E. I. T. Salaen (Eds.), *Integrated rural development in East Nusa Tenggara, Indonesia, ACIAR Proceedings* (Vol. 126). Canberra: ACIAR.

Centre for Aboriginal Economic Policy Research (CAEPR). (2008a). *People on country*. Canberra: ANU, Centre for Aboriginal Economic Policy Research. Retrieved July Retrieved July 01, 2009, from http://www.anu.edu.au/caepr-old/country/doc/YugulMangi.pdf

Centre for Aboriginal Economic Policy Research (CAEPR). (2008b). *Yugul Mangi land and sea management corporation*. Canberra: ANU, Centre for Aboriginal Economic Policy Research. Retrieved July 01, 2009, from http://www.anu.edu.au/caepr-old/country/doc/YugulMangi.pdf

Centre for Aboriginal Economic Policy Research (CAEPR). (2009). *Dhimurru Aboriginal Corporation*. Canberra: ANU, Centre for Aboriginal Economic Policy Research. Retrieved July 01, 2009, from http://www.anu.edu.au/caepr-old/country/doc/YugulMangi.pdf

Christie, M. (2006). Traditional research and aboriginal knowledge. *Australian Journal of Indigenous Education, 35*, 78–89.

Ellis, S. (2005). Meaningful consideration? A review of traditional knowledge in environmental decision making. *Arctic, 58*(1), 66–77.

European Union, Sustainable Design International. (2005). *Social partnerships guideline principles on their establishment and operation within the European Union*. Retrieved July 6, 2007, from http://www.sustainable-design.ie/sustain/socialpartnership.htm

Flamsteed, K., & Golding, B. (2005). *Learning through Indigenous business: The role of vocational education and training in Indigenous enterprise and community development*. Adelaide: NCVER.

Northern Territory Government. (2005). *Northern Territory Indigenous economic development strategy*. Darwin: Northern Territory Government.

OECD. (2009). *Education today: The OECD perspective*. Paris: OECD.

Unewisse, M., & Grisogono, A. (2007). *Adaptivity led networked force capability*. Presented at the 12th ICCRTS Conference Adapting C2 to the 21st Century, Cambridge.

Wallace, R. (2008). *Identities of reluctant students: Constructions of learners' identity against educational institutions' best intentions*. Adelaide: NCVER.

Wallace, R., Manado, M., Agar, R., & Curry, C. (2009). Working from our strengths: Indigenous community engagement through enterprise development and training. *Learning Communities: International Journal of Learning in Social Contexts, Dec 2009*, 104–122.

Wenger, E. (1994). Knowledge management is a donut. *Ivey Business Journal*, January–February Issue.

Young, M., Guenther, J., & Boyle, A. (2007). *Growing the desert: Educational pathways promote indigenous people*. Adelaide: NCVER.

Part III
Specific Enablers

Chapter 7
Bridging Cross-Cultural Knowledge Through a Bilingual Biosecurity Glossary*

Sang Putu Kaler Surata

Introduction

Biosecurity is fast gaining wide interest among policy makers, politicians and researchers. There is a strong push to use the analytical framework of biosecurity as a way to describe the management of anthropogenic environmental impacts (Galbraith and Clendon 2007).

Biosecurity management provides a basis on which to engage the general community and social scientists in developing a shared understanding of a social and scientific process. The management of environmental risks can have significant social and economic impacts, evidenced by several recent biosecurity outbreaks such as bird and swine flu. Underlying the concern to engage the wider population in managing biosecurity is the observation that although biosecurity risks are based on biological *impacts*, biosecurity *management* is truly interdisciplinary: the definition and interpretation of risk and adverse effects are socially constructed and contextually dependent (Galbraith and Clendon 2007). As Flora (2008, p. 50) notes, the increasing vulnerability of local landscapes to invasive species requires ongoing mobilization of all community resources, which she refers to as *community capital*, including sufficient agility for prompt and effective responses. Therefore, community participation is a key ingredient in the management of biosecurity, particularly as awareness and early reporting are important strategies in reducing the time taken to identify an incursion and minimize its impacts (AusIndoBIOCOM 2009).

---

* The English version of the Glossary with the Indonesian language equivalent terms is reproduced as Appendix A to this book. There is in addition, an Indonesian Glossary. The Glossary is published in full on the AusIndoBIOCOM website www.ausindobiocom.net with a link on the home page.

S.P.K. Surata (✉)
Department of Biology Education, Universitas Mahasaraswati, Denpasar, Indonesia

Environmental Management and Regional Planning, Cooperative Research Centre for National Plant Biosecurity, Denpasar, Indonesia
e-mail: kalersurata@gmail.com

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_7, © Springer Science+Business Media B.V. 2011

Based on results from previous research, we have found that knowledge and awareness of biosecurity among communities in both countries is limited. However, effective management of biosecurity is not about science and technology alone, but also the social applications of that knowledge. This chapter describes the development of the *Glossary of Biosecurity Management* used to define key terms used to describe in research conducted in Australia and Indonesia. The Australian–Indonesian Biosecurity Community (AusIndoBIOCOM), an Indonesian and Australian partnership of agencies, that generated the glossary, is a research partnership between Australia and Indonesia examining the ways of managing plant pests and diseases at a regional and community level and, as a result, alleviate poverty through greater food security (Falk et al. 2009). It was initiated by the Australian Cooperative Research Centre for National Plant Biosecurity (CRC NPB), Charles Darwin University (CDU) Australia, *Universitas Mahasaraswati* (UNMAS) Denpasar-Indonesia, *Universitas Nusa Cendana* (UNDANA) Kupang-Indonesia, and *Universitas Kristen Satya Wacana* (UKSW) Salatiga-Indonesia. This project commenced in 2007 and is ongoing.

Global Biosecurity: Emerging Issues

Biosecurity is emerging as one of the most pressing issues facing developed, developing and transition countries. The Food Agriculture Organization (2007, p. 11) points out that:

> Globalization, the increased movement of people, agricultural and food products across borders, greater attention to biodiversity and the environment, the emergence and spread of transboundary diseases, changes in the way food, plants and animals are produced, processed and distributed, uncertainties surrounding new technologies, as well as international legal obligations are some of the trends driving this growing interest, and highlighting the importance of adequate biosecurity capacity.

The rapid movement of people by air from continent to continent, movement of cargo by roll-on, roll-off containers, and expulsion of ballast by ships, are some of the ways by which biological organisms move from country to country. While many of the organisms fail to survive in the places they land, a significant number manage to survive and adapt to their new environment (Jay et al. 2003). Swine influenza illustrates the speed biological organisms can be spread internationally by human-to-human contact, like other influenzas. The new strain of influenza A/H1N1 was identified in Mexico in Mid March 2009. Within a few days it was detected in various countries including North America, South America, Asia, the Middle East and Australia (WHO 2009). Today, human populations internationally are threatened by an influenza pandemic because the strain is novel and is transmitted from human-to-human against a background of limited immunity (Sabbour 2009). Another disease that is causing significant economic loss in nearly 30 countries is citrus greening, caused by the bacteria *Liberibacter asiaticus.* The disease was originally reported in

China over 20 years ago, and has been spreading to citrus in regions in different continents. Only in Australia and the Mediterranean Basin has citrus greening not been reported (Chung and Brlansky 2006, pp. 1). Thus, biosecurity is now an issue of broad international concern, because it has major economic and social implications for the environment and biodiversity, agriculture, forestry, fisheries, tourism, water supplies, amenity and water recreation (Australian Academy of Technological Sciences and Engineering 2009).

It can be concluded that there is some urgency for biosecurity to be managed effectively sooner rather than later in order to reduce human, plant, animal and environmental health problems. Given that farmers and other community members live and work in the places where plant pests and diseases incursions can first be detected, and communities themselves are only one segment of the network of those concerned with the problem, there is clearly a need for a broadly-based regional, country and inter-country strategy for biosecurity. Such a strategy should be developed with the primary goal of reducing of the severity and likelihood of biological catastrophes through anticipation, prevention, preparedness, intervention and recovery from incursion, whether the events are of intentional, accidental or natural origin (Murch et al. 2005).

Enhancing Global Biosecurity Capacity Through Community Engagement

Globalization has enhanced the public's appreciation of the need for improved biosecurity as a strategic and integrated approach to analyzing and managing relevant risks to human, animal and plant life and health, and associated risks to the environment (FAO 2007). It is based on recognition of the critical linkages between sectors. Therefore, biosecurity management involves science and technology as well as social science research questions, to consider how to engage communities and regions to increase their awareness of biosecurity issues, and how can communities develop sustainable strategies for addressing these issues?

To examine the social issues related to biosecurity, the CRC NPB engaged in a research project in 2007 to examine the roles Indonesian and Australian communities might play in identifying and managing pests and diseases of plants. Partnership, collaboration, and cooperation by experts in both countries have already made a positive contribution to the management of pest organisms (Lovett 2008). One of the findings in the community management of biosecurity research was the need to include two dimensions of communities in engaging and facilitating communities in biosecurity. These two dimensions are the community's *structure* (the types and formation of community groups, organizations and governance bodies) and the community *processes* (the ways in which the individuals, groups, organizations and governance bodies relate to each other) in facilitating community action (Surata 2008). These are explored more fully in the other chapters of this book and indicated that;

1. a new model of effective management of biosecurity occurs through auditing community capacity in terms of its structure and process, building capacity to identify gaps in line with the identified common purpose of the specific change process, working with a balance between structure and process for that particular purpose in engaging with communities from grassroots to policy;
2. there is an urgent need for a new model of leadership, local knowledge and governance to achieve effective policy outcomes;
3. effective outcomes for biosecurity will rely on how leadership allows new knowledge to be received, understood and acted upon through knowledge transfer (Falk et al. 2008). All these findings provided a source for terms to be included in the glossary.

Glossary and Cross-Cultural Knowledge

An issue identified early in the CRC NPB research the need to implement proactive management of plant pests and diseases through the development of a system across the two countries that linked governance structures from grassroots to senior policy levels, with particular relationships or processes specified between these groups. The management system would develop models of leadership training for those involved at central, regional and community levels to make the new decentralization policy work for those people best placed to identify, and sustainably manage, biosecurity. Often, in Eastern Indonesia and Northern Australia, these are people below the norm in terms of income and available resources. At the core of any successful management strategy lies effective communication. Early on it became apparent that even the term biosecurity had different (or no) meaning across the two countries or with those who were expected to recognize plant threats. It is in the context of effective intra- and intercultural communication that the need for a glossary was identified, and terms to be included in it accumulated.

The Glossary of Biosecurity Management (GBM) is a bilingual glossary in which a list of terms in one language are glossed by synonyms and defined in another language. It allows translation to and from both languages (English and *Bahasa Indonesia*), and consists of two sections, each listing words and phrases of one language alphabetically along with their translation. For the reader's convenience, the English version of the Glossary is published as Appendix A of this book. The full version of the Glossary is linked on the http://ausindobiocom.net/ausindobiocom archives/publications/book-collections/2010/11/new-release-bilinggual-glossary-of-biosecurity-management/.

Because the GBM encompasses a wide range of biosecurity issues based on cross-border community management, the glossary will help to bridge ethnoscience and modern science (Western science), global issues and local practices, and other cross-cultural knowledge. The glossary will assist in implementing a model of proactive management through empowering, sharing and knowledge exchange about global biosecurity, across English and Indonesian speaking people and systems. The GBM will be developed to involve more countries as well as stakeholders. It will also facilitate the development of global biosecurity policy gradually evolves from a narrow focus on agricultural pests to a broader awareness of the multiple economic, social and ecological aspects of biosecurity.

Methodology for Constructing Glossary

As previously noted, the *Glossary of Biosecurity Management (GBM)* was conceived as a tool for promoting mutual understanding of multi-disciplinary and cross sectoral terms used, or likely to be used, in the effective management of biosecurity. It reflects the need for clarity in communication about biosecurity management. Clarity is required not only in scientific terms – the term biosecurity being the first and best example of this need – but also in terms of effective identification and management of solutions. For example, it was known that 'strong governance structures' are an important (indeed essential) ingredient for effective biosecurity management, but what kind of structures are these? How are these defined and operate in each context and country? How are the relevant structures and processes described in each context? As the preliminary research found the governance structures were indeed important, but that the *processes* they engaged in or in fact didn't engage in (Surata 2008) were equally important. These concepts need to be adequately described and understood across language and power systems.

According to Velardi et al. (2009, pp. 1–2), a general method for constructing a glossary is to collect a vocabulary, collect definitions, establish format rules, establish rules for writing definitions, examine definitions for multiple meanings, write basic definitions, review and compare for consistency of meaning, classify, select preferred words, group words, review and finalize the glossary. Also Bodine (2009) describes several other stages for making a glossary, such as writing each term on a separate sheet of paper and alphabetizing the list of terms.

Since there are no standard rules for developing a glossary, especially a bilingual one, here we describe our procedure:

- Defining the purpose of this glossary: to exchange and increase understanding of terms and definitions which are used for the management of biosecurity issues across physical, social and knowledge borders;
- Constructing a diagram for scoping and mapping biosecurity terms (Fig. 7.1). Each main scope of terminology is comprised of several sub-scopes. The definition of biosecurity includes animal and human biosecurity, plant biosecurity, international standards for biosecurity, natural and manmade ecosystems, biology and ecology. Social science consists of social-ecology, research methodology, social network, and organizations, as well as community management including community capital, management and leadership;
- Building an initial list of terms and definitions using a semiautomatic glossary acquisition. It has been developed using information from many field studies, as well as both formal and informal literature mainly sourced from the internet, using various key search terms both in English (for example, biosecurity, community, management and traditional knowledge) and *Bahasa Indonesia* (for example, *ketahanan hayati*, *kearifan tradisional*, and *pengendalian hama dan penyakit*). Other terms

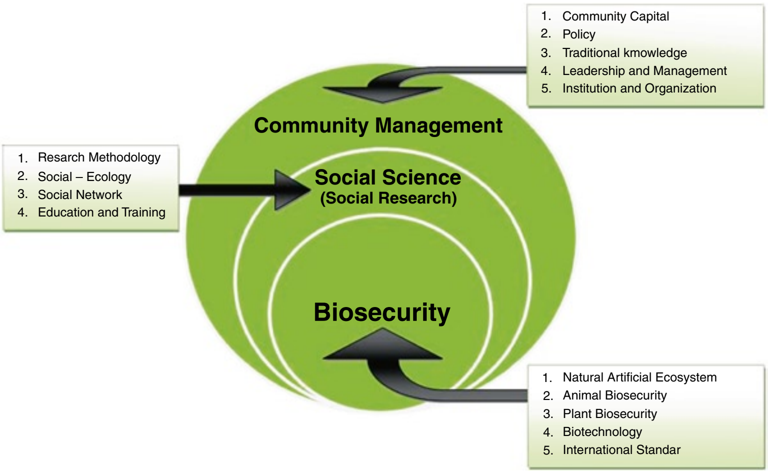

Fig. 7.1 Scope of the Bilingual Glossary of Biosecurity Management

come from previous projects, a Kuala Lumpur International Biosecurity Master Class meeting, various AusIndoBIOCOM workshops, a university's online library and other sources;

- Translating terms and definitions from English to Indonesian, and vice versa, using several computer programs for translating and describing terms. Originally we used Glossarium 2006 (Pusat Bahasa Departemen Pendidikan Nasional 2006). It consists of 182,415 words from Brunei Darussalam, Indonesia, and Malaysia in the form of *Majelis Bahasa Brunei Darussalam–Indonesia–Malaysia* (Mabbim). Then we compared terms from *Kamus* 2.03 a small, simple, easy and fast dictionary, with 41,894 words English–Indonesian and 35,524 words Indonesian–English (http://ebsoft.web.id). If we still had questions about a concept, we used Paradox 9.0 (Corel Cooperation and Corel Cooperation Limited 1999), and also Worldweb 5.52 (Lewis 2008). A similar approach was undertaken by the team in translating terms from *Bahasa Indonesia* to English, but without using the Worldweb 5.52.
- Evaluation of the Glossary by a team consisting of 11 core team members and their immediate colleagues. This process involved continual discussion and sharing through a participatory approach that will be described below;
- Publication of the first edition of the GBM via the Glossary link at www.ausindobiocom.net. The English section is included in this book as Appendix A for the reader's reference.

The current phase of the participatory research is occurring across two areas, Northern Australia and Eastern Indonesia. There are five major sites in Northern Australia while in Eastern Indonesia, the areas most directly concerned in this study are the provinces of Greater Papua, Gorontalo, Southeast of Sulawesi and East Nusa Tenggara (especially West Timor and Rote). The methodology (outlined in Fig. 7.1) used in glossary's development is to audit all aspects of the on-going participatory research to garner terms and activities requiring clarification and documentation. The team meets as listed below where there is an opportunity to discuss the glossary, and gather information from team members about the accuracy of terms and those needing documentation. Meanings and definitions are also discussed and recorded. In other words, the glossary development is progressing through a form of participatory action research, which in turn will lead to leadership capacity building and implementation of innovative breakthrough activities.

Social-Ecological Approach to Biosecurity

The focus of this work is social-ecological systems related to biosecurity, that is, an ecological system intricately linked with, and affected by, one or more social systems (Anderies et al. 2004). It can be represented by the different attributes needed to draw a structural map, for example, information, power, movement of pests and diseases and plant distribution (Janssen et al. 2006). In the case of plant pests and diseases, minimally the network consists of ecological nodes, social nodes and ecological-social nodes plus connections among them through material and information flows (Fig. 7.2). While biological invasion is an ecological problem,

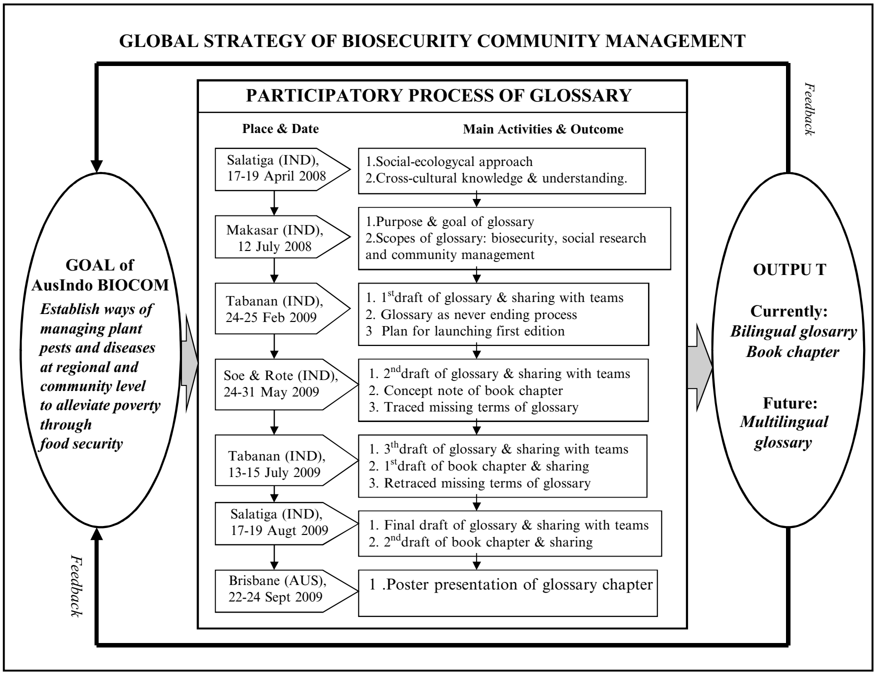

Fig. 7.2 The glossary is ongoing process, and its future role in the global strategy of biosecurity management

it cannot be understood or solved without dealing with problems within society. Biological invasions, as well as other biosecurity problems, are generally anthropogenic, so a social-ecological approach in addressing issues of biosecurity can be applied. Social-ecology is a way of integrating the practice of science, the use of technology, and the expression of human values. This offers an opportunity for the issues to be explored through a cross border, geography, management, social science, sociology and economic perspective as well as biology (Galbraith and Clendon 2007). As Murch et al. (2005, p. 3) mentioned:

> The GBM utilises a strategic framework to define complementary and overlapping dimensions of biosecurity management categories.

Defining Community Management of Biosecurity Terms

While the research is about community management, it is also about management of a specific area of plant biosecurity. In the early stages of the research, the Westerners in the team found a major surprise: there was no equivalent term in *Bahasa Indonesia* for biosecurity. A web search in early 2006 found there were some uses in relation to Western projects on bird flu (three mentions) but that was all – no term in Indonesian. Investigations revealed that there were no such one-for-one translations of the term. This is not to say the *concept* was foreign, just the terms. However, in the regions and communities, plant pests and diseases only had meaning in relation to a more plentiful and sustainable food and income stream. That is, in one of the world's poorest regions of Eastern Indonesia, it translated as a poverty issue. The World Bank, government and NGO bodies call the management of a food supply *food security*.

However, there were others. In Indonesia, the policy on biodiversity was the nearest policy area to biosecurity. The Director General for Higher Education in Indonesia gave a keynote speech at a project International Summit, which became a foreword to a bilingual journal on the subject (Falk et al. 2008), and in these he aligned biosecurity with a combination of food security, biodiversity and Indigenous knowledge (Brojonegoro 2008, pp. i–iv). A search for Indonesian terms for biosecurity was conducted, and so far only one paper was found, that of Untung (2007, p. 2), in which he translates biosecurity to *ketahanan hayati* or, literally translated in English, 'biological resilience'. The team uses two alternative terms in translating biosecurity to Indonesian: *ketahanan hayati* or *biosekuriti*. Hence the term 'biosecurity' is introduced into Indonesian as *ketahanan hayati*, the same as some other terms such as *biodiversity* (*bio = hayati; diversity = keragaman*) into *keragaman hayati*, biopesticide (*bio = hayati*; *pesticide = pestisida*) into pestisida hayati and *biosavety* (*bio = hayati*; *savety = keamanan*) into *keamanan hayati*. On other hand, teams also considering converting *biosecurity* into *biosekuriti*, because several English words are translated to *Bahasa Indonesia*, in the same way. For example *biotechnology* into *bioteknologi*, *biodegradation* into *biodegradasi* and *bioaccumulation* into *bioakumulasi*. In the following chapter, Jayantini discusses, the reasons *ketahanan hayati* was chosen as the equivalent to *biosecurity* and not *biosekuriti* in more detail.

So at a national level, there were divergent and overlapping meanings, a situation echoed internationally, and officially, where we found approximately ten definitions of biosecurity with various meanings (Table 7.1). The Food and Agriculture Organization (FAO) has three terms for biosecurity, from a narrow perspective in which biosecurity is protection from spread of disease agents (FAO 2003), to very a wide view, namely protecting plants, animals, humans and the environment (FAO 2003; 2007). The majority of sources describe biosecurity as being about the effort of protection from biological invasions, for example harmful organisms (BSD Team 2001a, b, 2002, cited in Hall 2004), exotic pests and diseases (Deverson and Kennedy 2004), a malicious use of pathogens (Science Magazine 2004), and infectious diseases (USDA 2008). Another source was focused on different areas, for example, misuse of life sciences and technology (Murch 2005). New Zealand, as a country that has undertaken advanced work in biosecurity management defines biosecurity, for the context of their country (Biosecurity Council 2000). Based on all these considerations, the team decided to define biosecurity as an integrated approach to managing risk for plant, animal and human health and associated environments (FAO 2007). Some definitions of biosecurity are listed in Table 7.1.

Table 7.1 Definitions of biosecurity

No.	Definition	Sources
1	The protection of a country, region, location or firm from economic, environmental and/or human health damage as a result of harmful organisms	BSD Team 2001a, b, 2002 cited in Hall (2004)
2	Strategic and integrated approach that encompasses the policy and regulatory frameworks (including instruments and activities) that analyse and manage risks in the sectors of food safety, animal life and health, and plant life and health, including associated environmental risk	FAO (2003)
3	Procedures followed or measures taken to safeguard the flora and fauna of a country against exotic pests and diseases	Deverson and Kennedy (2004)
4	Efforts to prevent, reduce or eliminate the threats, applications and effects of intentional and unintentional misuse of life sciences and technology, while promoting and pursuing beneficial pursuits and uses	Murch (2005)
5	A strategic and integrated approach to analysing and managing relevant risks to human, animal and plant life and health and associated risks to the environment	FAO 2007
6	The implementation of measures that reduce the risk of the introduction and spread of disease agents	FAO Animal Production and Health (2008)
7	Measures to protect against the malicious use of pathogens, parts of them, or their toxins in direct or indirect acts against humans, livestock or crops	Science Magazine (2004)
8	Precautions taken to minimize the risk of introducing an infectious disease into an animal population	USDA (2008)

(continued)

Table 7.1 (continued)

No.	Definition	Sources
9	New Zealand context: protection from the risks posed by organisms to the economy, environment and people's health through exclusion, eradication and control	Biosecurity Council (2000)
10	The principles, technologies and practices that are implemented to secure pathogens, toxins and sensitive technologies from unauthorized access, loss, theft, misuse, diversion or intentional release	Clevestig 2009
11	The measures of protection, control and accountability as applied to biological weapons-related dual-use materials within facilities or during transport, which are implemented to prevent their unauthorized access, loss, theft, misuse, diversion or intentional release	Trapp (2008)

The reason community management was chosen as one major area for the glossary was awareness and early reporting from the community are important strategies in managing biosecurity. The degree of community engagement in biosecurity management has been shown to reduce the time taken to identify an incursion and minimize impacts of biosecurity. However, the opportunity to engage cross border communities in neighboring countries to manage both the source and pathway for biosecurity threats is planned, but has not been developed further. In this context, the glossary attempts to bridge the cross-cultural knowledge and understanding between Australian and Indonesian communities. Community management consists of two terms, namely community and management. Community is a group of people often of different economic classes, clans or family groups, ethnic groups, gender groups, and other interest groups whether they are living in the same place or having a particular characteristic in common (Cowie 1990; Royce 2008). For example, a neighborhood, village, or municipal, rural region or other interested groups, with sharing and unifying common identity and interests such as customs, manners, traditions, sports, schools, sexuality, language and cultural background. Further, management is the act, art or manner of managing, or handling, controlling and directing. Terms relating to this concept are listed in Table 7.2.

Based on these terms, the team decided to define management for biosecurity context, as the engagement of multiple and cross-sectoral stakeholders in government, organisations and communities. The reason is that community management is not only management based on community. It was found that all stakeholders both inside and outside of a community must be involved and engaged in addressing biosecurity issues.

Table 7.2 Several terms related in meaning to community management

No	Definition
1	**Community action**: a community practice approach characterized by the use of power, influence, and negotiations to achieve change (Schoech 2008)
2	**Community based**: works and projects in which community plays an integral role in the collaborative process and creation of work (Carruthers 2006)
3	**Community development**: a community practice approach to building community by enabling, teaching, and motivating people and local organizations for self-help (Schoech 2008)
4	**Community engagement**: a structured dialogue, joint problem-solving, and collaborative action among formal authorities, citizens at-large, and local opinion leaders around a pressing public matter (Schoch-Spana et al. 2007)
5	**Community participation**: a process of active involvement of local individuals and groups in assessment of needs, planning solutions, creating structures for and implementing solutions and assessing outcomes (Zakus and Lysack 1998 cited in Myers 2008)
6	**Community planning**: a planning approach to community development involving a rational structured process that includes the setting of goals, objectives, and priorities (Schoech 2008)

The Challenge and Future Opportunities

Development of the GBM will be an ongoing process, not only because of missing terms but also because biosecurity incorporates new issues and is developing quickly. Consequently new terms will appear, and the glossary must be updated regularly to maintain its relevance both in content and context. The team has decided to form a cross disciplinary editorial panel to provide advice on structure and content in the next stages of its development. One participant mentioned a need to balance the number of terms from three major areas, as described below:

> … to balance all scopes of GBM, it is necessary to add many terms related to policy, for example decision making, policy framework, new development paradigm and public policy. (T. Litaay, 2009, personal communication, email, June 5)

Other participants suggested the need to promote awareness and engagement of biosecurity management for young generations and the public who need terms that are understood easily. Another interesting idea came from another team member, Sri Jayantini, who analyzed Indonesian terms from the angle of an academic translator. She proposed that, in translating technical terms from English into Indonesian, there are two interesting 'trends' that can be observed, namely domestication and foreignization (S. Jayantini, 2009, personal communication). This are discussed in detail in Chap. 6.

Biosecurity is an emerging issue, but its concepts have not received much attention from social scientists until recent years, despite the fact that the overwhelming majority of invasive species introductions have been human-caused. There does not appear to be much analysis of the social and political elements of species spread and species invasions, although there is substantial literature on the distribution and ecological impacts of species invasions (Jay et al. 2003). This is because of political priorities, institutional divisions, the allocation of funds and functions between different agencies of government, and a scientific knowledge base that provides a relatively comprehensive understanding of science and technology. They tend to neglect community management, as social science.

Previous results found that cross border community understanding and awareness of biosecurity threats are still limited. The engagement of the community is an essential role for addressing biological invasion as well as other biosecurity problems, because if the community has an effective system for controlling pests and diseases, they will have the ability to take action as early as possible, so that biosecurity threats can be prevented, eradicated or reduced at local level. Biosecurity risk analysis is a multidisciplinary issue that attempts to predict the impacts of exotic species in the environment, production systems, and society as a whole. According to Murch et al. (2005), all sectors must work together to foster a culture of advocacy, research, education and policy formulation to reduce threats and increase opportunities that come from new life science knowledge and technology outcomes. Furthermore, they stressed academia has important contributions to make and an obligation to contribute to the advancement of biosecurity and the public good through many areas of scholarship, research, learning and outreach (Murch et al. 2005). In the context of community management, academia can foster consciousness raising, teaching and training especially for young people, strengthening local organizations and the sense of community, promoting programs and generating group energy, democratic discussion and social mediation.

The biosecurity glossary is a small step in addressing biosecurity threats, among international, regional, national and local levels as well as government, industry and private sectors and communities. If we are able to continue our participatory approach we will strengthen our partnership, cooperation and collaboration. Cross-cultural knowledge exchange will support the AusIndoBIOCOM partnership and contribute to an enhanced global strategy for biosecurity (Fig. 7.3). The participatory process in arranging the glossary is in fact a model of partnerships in social learning, in which transfer of knowledge and science exchange occurred through all participants from different fields, working jointly, using a shared conceptual framework in the collecting, sharing and interpreting of key terms. It's a type of interactive learning that places each participant in an equal position. They can teach and learn with each other. Thus, developing the GBM as a multilingual glossary through cross-cultural participatory processes will be widening our network in social learning. This is a major contribution to the management of global biosecurity.

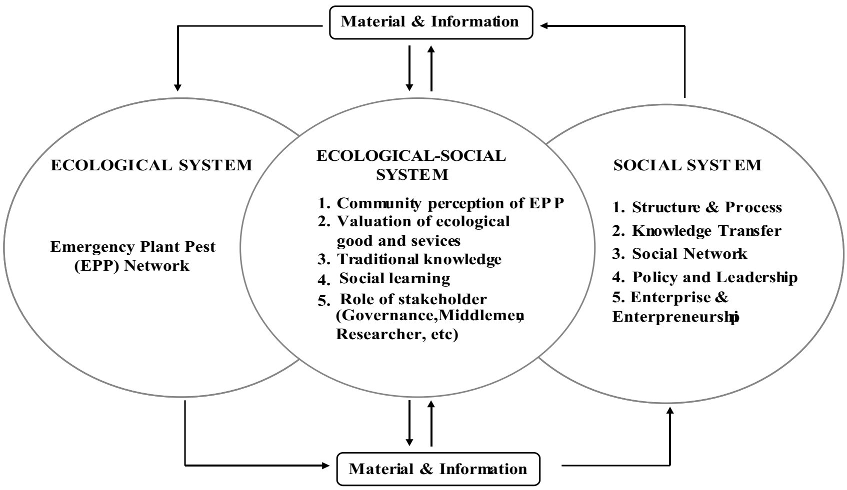

Fig. 7.3 The social–ecological approach to plant pest and diseases

References

Anderies, J. M., Janssen, M. A., & Ostrom, E. (2004). A Framework to analyze the robustness of social-ecological system and institutional perspective [Insight]. *Ecology and Society, 9*(1), 18. Retrieved June 14, 2007, from http://www.ecologyandsociety.org/vol9/iss1/art18

Australian Academy of Technological Sciences and Engineering (ATSE). (2009). *Biosecurity – a future imperative towards effective science, statute and community based strategies*. Retrieved November 4, 2009, from http://www.atse.org.au/index.php?sectionid=9

Australian Indonesian Biosecurity Community Management Project (AusIndoBIOCOM). (2009). Retrieved June 24, 2009, from *AusIndoBIOCOM brochure*. http://www.ausindobiocom.net

Biosecurity Council. (2000). *Towards a biosecurity strategy for New Zealand*. Wellington: Biosecurity Council.

Bodine, A. (2009). How to make a glossary [eHow]. *How to do just about everything*. Retrieved May 14, 2009, from http://www.ehow.com/how-to.html

Brodjonegoro, S. S. (2008). Foreword. *Kritis-Learning Communities*, *Special Co-publication*, i–ii.

Carruthers, B. (2006). *Mapping the terrain of contemporary ecoart practice and collaboration art in ecology: A think tank on arts and sustainability*. Vancouver: UNESCO.

Chung, K-R., & Brlansky, R.H. (2006). *Citrus Diseases Exotic to Florida: Huanglongbing (Citrus Greening)*. Retrieved October 14, 2006, from http://polkhort.ifas.ufl.edu/documents/publications/Citrus%20Greening.pdf

Clevestig, P. (2009). *Handbook of applied biosecurity for life science laboratories*. Retrieved August 6, 2009, http://books.sipri.org/files/misc/SIPRI09HAB.pdf

Corel Cooperation and Corel Cooperation Limited. (1999). *Paradox Version 9.0 Runtime*.

Cowie, A. P. (1990). *Oxford advanced learner's dictionary of current english*. Oxford: Oxford University Press.

Deverson, T., & Kennedy, G. (Eds.). (2004). *The New Zealand Oxford Dictionary* (2008). Retrieved September 1, 2008, 2008http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t186.e5443

Falk, I., Surata, S. P. K., Mudita, W., Martiningsih, E. Ni Gst Ag. Gde., & Myers, B. (2008). Community management of biosecurity: Overview of some Indonesian studies. *Kritis-Learning Communities*, *Special Co-publication*, 1–40.

Falk, I., Ndoen, M. L., & Wallace, R. (2009). Progress of the CRC Food and Biosecurity Research Project. *Suara FORUM KTI*, February 2009.

FAO. (2003). *Biosecurity for highly pathogenic avian influenza (Issues & options)*. Retrieved November 3, 2008, from http://www.fao.org/biosecurity

FAO. (2007). *FAO biosecurity toolkit*. Retrieved June 20, 2009, from http://km.fao.org/biosecwiki/images/2/20/Overarching_Biosecurity_Draft_170107_CLEAN.doc

FAO Animal Production and Health. (2008). *Biosecurity for highly pathogenic avian influenza, issues and option*. Rome: FAO.

Flora, C. B. (2008). Social capital and community problem solving combining local and scientific knowledge to fight invasive species. *Kritis-Learning Communities*, *Special Co-publication*, 41–63.

Galbraith, M., & Clendon, D. (2007). *Biology is not alone: The interdisciplinary nature of biosecurity*. Paper presented at the Soccon 2007 Conference 'People and Perspectives', 24–26 September, Auckland. Retrieved May 21, 2009, from http://www.soccon.org.nz/abstracts/soccon_abstracts/biosecurity.doc.

Hall, C. M. (2004). *Biosecurity: A significance issue for wine tourism*. Retrieved September 28, 2008, from, http://eprints.otago.ac.nz/155/1/Hall%20CAUTHE%20full.pdf

Janssen, M. A., Bodin, O., Anderies, J. M., Elmqvist, T., Ernstson H., McAllister R .R. J., et al. (2006). A network perspective on the resilience of social-ecological systems. *Ecology and Society*, *11*(1), 15. Retrieved February 7, 2007, from http://www.ecologyandsociety.org/vol11/iss1/art15/

Jay, M., Morad, M., & Bell, A. (2003). Biosecurity, a policy dilemma for New Zealand. Published in *Land Use Policy*, *20*, 121–129, 2003. Retrieved June 10, 2009, from http://waikato.researchgateway.ac.nz/bitstream/10289/1308/1/02-biosec'ty-Land%20use%20policy.pdf

Lewis, A. (2008). WorlWeb 5.52. Licencing, Princeton University. Retrieved July 7, 2008, from http://worldweb.info.contact.html

Lovett, J. (2008). Plant biosecurity in a shrinking words [Foreword]. *Kritis-Learning Communities*, *Special Co-publication*, iii–x.

Murch, R. (2005, May 9–10). *Seeking to prepare the next generation*. Presentation slides, presented in Virginia Tech's University Biosecurity Summit, Alexandria, Virginia, 9–10 May 2005.

Murch, R. S., Franz, D. R., & Singer, P. A. (2005). *Global biodiversity: The vital role of academic leadership*. Retrieved November 26, 2007, from http://www.biosecuritycodes.org/docs/VTBioSecurity.pdf

Myers, B. (2008). *Community processes in development and implementation of practices for the management of plant pests and diseases*. Discussion paper.

Pusat Bahasa Departemen Pendidikan Nasional Republik Indonesia. (2006). *Glosarium Istilah Asing-Indonesia*, Retrieved June 11, 2009, from http://www.research.ui.ac.id/v1/index.php?

Royce, P. (2008). A community approach to biosecurity in a remote Australian region. *Kritis-Learning Communities, Special Co-publication*, 90–115.

Sabbour. (2009). *Swine (pig) influenza pandemic concerns and what to do to reduce the risks of getting infected*. Retrieved June 22, 2009, from http://sabbour.wordpress.com/

Schoch-Spana, M., Franco, C., Nuzzo, J. B., & Usenza, C. (2007). Community engagement: Leadership biosecurity and bioterrorism. *Biodefense Strategy, Practice, and Science*, *5*(1). Retrieved September 26, 2008 http://www.upmc-biosecurity.org/website/focus/community_engage/2007_working_group/full_report.html

Schoech, D. 2008. *Glossary of community and administrative practice terms.* Retrieved May 20, 2009, from, http://www2.uta.edu/cussn/courses/3306/coursepack/Glossary.pdf

Science Magazine. (2004). *A guide to online biotech and medical dictionaries and glossaries here (focusing on genetics and genomics)*. Retrieved May 20, 2009, from http://www.sciencemag.org/feature/plus/sfg/education/glossaries.shtml

Surata, S. P. K. (2008). Structure and process in facilitating community action in Bali. *Kritis-Learning Communities, Special Co-publication*, 75–89.

The World Health Organization (WHO). (2009). *Influenza A (H1N1)*. Retrieved June 5, 2009, from http://www.who.int/csr/don/2009_05_06/en/index.html

Trapp, R. (2008). *Implementing biosavety and biosecurity, who, what, why and how*. Retrieved October 14, 2008, from http://www.bwpp.org/MX2008Training/documents/TrappMX2008Implementingbiosafetyandbiosecurity.pdf.

United States Department of Agriculture (USDA). (2008). *Avian influenza glossary terms*. Retrieved November 30, 2008, from http://avg.urlseek.vmn.net/search.php?lg=en&mkt=en&type=dns&tb=ie&tbn=avg&q=www%2Eusda%2Egov

Untung, K. (2007, July 6). *Kebijakan nasional ketahanan hayati* [National policy on biosecurity]. Paper presented in Biosecurity Workshop by Center of Eastern-Indonesian Study, Salatiga (Indonesian version).

Velardi, P., Poler, R., & Tomas, J. V. (2009). *Methodology for the definition of a glossary in a collaborative research project and its application to a European Network of Excellence*. Retrieved March 1, 2009 http://interop-esa05.unige.ch/INTEROP/Proceedings/Interop-ESAScientific/PerPaper/I10-1%20492.pdf

Chapter 8
Knowledge Transfer Through Bilingual Publications on Food Security and Biosecurity

I. Gusti Agung Sri Rwa Jayantini

Introduction

This chapter discusses the contribution of translation, particularly scientific translation, to the enrichment of both source and target languages, as well as the transfer of knowledge due to the language borders among people within a country or in different countries with their various cultures. There is clear evidence that any language can be developed through a translation activity since the form and the meanings as well as the linguistic features are transferred in the process of translation. The forms that contain meaning involve all linguistic elements ranging from phonology to discourse as the largest unit. However, beyond the transfer of meaning that is strongly believed to be the core of any translation activity, there occurs a greater impact on broadening one's knowledge through the transfer of knowledge. Actually it happens at the same time that the meaning is transferred from source language (SL) to target language (TL) since the meaning can also be seen as a concept which contains information. The information is, in fact, the knowledge to be shared world wide.

How can knowledge exist across borders? Or, as asked by Montgomery (2000), how is knowledge rendered mobile? What makes it able to cross boundaries of time, place and language? The answer would appear simple, in that it usually occurs through translation. Although it is generally defined as a matter of rendering the words of one language into those of another, in a broader sense, translation is the helping hand in making the knowledge mobile. The dissemination of knowledge will be successfully conducted when people are engaged in circumstances that allow them to understand each other. In this volume, the concern is with biosecurity management, and this chapter looks at some of the underlying translation issues

I.G.A.S.R. Jayantini (✉)
Foreign Language College Saraswati
Denpasar, Bali, Indonesia
e-mail: srijay04@yahoo.com

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_8, © Springer Science+Business Media B.V. 2011

as people cope with the language borders, people mediate meaning through translation of publications on biosecurity In this way, information is transferred across language borders. Thus, translation is a key issue in cross-border communication, and it takes formal and informal guises (Chap. 1).

To support the discussion about the role of translation and the transfer of knowledge across borders, this chapter will cover three significant points. First, language borders and how the knowledge is possibly transferred in a translation activity. Here I am concerned with the interrelation between meaning, concept and knowledge as something valuable to be transferred in different languages. Second, the existence of bilingual publications is 'the bridge' connecting people across language and cultural borders. Of course, ideas and research findings are shared with wider target audience through bilingual publications. Third, the issue of national, regional and local implications of translation is also discussed to show that translation contributes to all levels of society.

In linguistic sense, it is interesting to see that a large number of phenomena occur in translation. One phenomenon that stands out from the linguistic perspective is when translation is of use for the enrichment of both the source and target languages. It occurs, for example, when the translator has to translate some new terms in one language which have no exact equivalent in another language. The phenomena of *borrowing*, *adapting* then *adopting* are frequently unavoidable. The translator borrows the source language (SL) terms and adapts them into the target language (TL). Then, the adoption occurs once the SL terms are integrated into the TL. In the case of English-Indonesian translation, many terms are translated in a simple way by adapting them phonologically and orthographically such as

Biotechnology (English) → bioteknologi (Indonesian), management (English) → manajemen (Indonesian), and community (English) → komunitas (Indonesian) (Chap. 7).

The process mentioned above shows that the meaning or even the concept behind the SL terms is directly transferred through so-called literal translation. Bell (1991) and Vinay and Dalbernet in Venuti (2000) agreed that the direct transfer of SL features to TL features is labeled literal translation. Three categories of literal translation are called the 'procedures of translation': *borrowing, calque* and *literal translation* that enable the translator to adopt the flavor of SL culture into translation; in translating a term from the SL into the TL, certain foreign terms may be used. It normally happens without changing both the form and meaning. Principally, *borrowing* and *calque* are similar in that through these two procedures, terms are translated literally. *Borrowing* is adopted as the simplest translation method in which the translator gives the flavour of the source language (SL) culture in a translation. For example, *ecosystem* in English becomes *ekosistem* in Indonesian. *Calque* is defined as a special kind of borrowing. It occurs when one language borrows an expression from another and then translates it literally in terms of each of its elements. The translation of *biotic stress* into *cekaman hayati* is an example of calque. However, in terms of lexical choice, this procedure can be categorized as a way of finding the natural equivalent in the target language (Indonesian). Instead of translating it into *stres biotik*, the translator tries to make the term *biotic stress* sound more naturally Indonesian as *cekaman hayati*.

Vinay and Dalbernet in Venuti (2000) emphasize that among the seven procedures they propose, it is possible to utilize more than one procedure in translating a phrase or a clause. The translation of *biotic stress* above is an example of the combination of *calque* and *adaptation*. In addition to three types of literal translation, there are four procedures of non-literal translation that seek the TL equivalent of the given SL terms or some other SL expression. These four procedures are *transposition, modulation, equivalence* and *adaptation*. The non literal translation approaches seem to highlight the procedures of *domesticating* the SL terms so that the creation of new TL terms is possible. For example, the term *biosecurity* is introduced as *ketahanan hayati* for the Indonesian audience. This term is not directly translated into *biosekuriti* which may still leave a question as to what the term really means. Then the term *ketahanan hayati* emerges as a result of *adaptation*. This procedure contributes to the introduction of a new Indonesian scientific term by transferring the English values in *biosecurity* and making the term more readable for the Indonesian audience. Such a process is considered to be the implementation of *domestication*, not *foreignization*. In line with the way translation contributes to the enrichment of the target language, these two ideologies of translation will be specifically discussed in the next section of this chapter.

Apart from the linguistic phenomenon, translation is also the act of transferring the cultural values of the source language, because language is a part of culture. Language is a means of communicating people's ideas, concepts and knowledge. The associated concepts and knowledge vary among people since they have their own cultural backgrounds. Many cultural terms are represented by linguistic features, or linguistically formed but the concept of the terms is culturally specific. In line with this, a translator often faces many obstacles in transferring certain cultural terms because they are not only a combination of linguistic units, but also of cultural values that often cannot be directly transferred to the target language. A cultural term must be translated carefully as it deals with very specific and contextualized concept of something believed, valued, inherited and often intended to be preserved. Catford (1965) notes that cultural untranslatability is due to the absence in the target language culture of a relevant situational feature for the source text:

> What appears to be a quite different problem arises, however when a situational feature, functionally relevant for the SL text, is completely absent from the culture of which the TL is a part. This may lead to what it is called cultural untranslatability. (Catford 1965, p. 99)

To sum up, translation should not only be seen as an activity of converting meaning in the form of product or process or even as linguistically and culturally problematic, but also as an action of transferring knowledge. Specifically, the transfer of knowledge is more feasible in the case of scientific translation as it is a means of technology acquisition, introduction, installation and operation (Al-Hassnawi 2003). Thus the more accurate meaning of translation is one that includes how knowledge is transferred, not just as a matter of translating words from the SL to the TL. By focusing on linguistic and cultural values, translation enables knowledge transfer across language and cultural borders.

Language Borders

The discussion of 'language borders' in this chapter focuses on cross border communication. In this case, the implicit meaning of 'border' is viewed not in terms of a line separating two languages. For example, many researchers may face cross border communication in undertaking their research in a foreign place where the language is unknown to them. Conducting biosecurity research in Eastern Indonesia, Martiningsih (Chap. 9) has faced cross border communication issues, that is, the need to grasp the meanings represented by different languages. To share these ideas with a wider audience, her interviews in Sulawesi had to be translated from Indonesian into English. Good translation can only be carried out by understanding the informants' interviews and information. Here, the inability to speak the language where the research is undertaken as well as to transfer ideas in one language to another language is certainly a 'border' in the sense of linguistic barriers. The other border is to understand the messages conveyed by the informants in the whole context, and in the context from which the informant is speaking. These are the cultural borders.

Take for example, the following interview transcript which is presented in bilingual version and clearly demonstrates that the language border is a major problem in dealing with the transmission of ideas through language as well as across different cultures. It also shows that it is possible to understand others' views and intentions through language. Of course, it includes not only transferring the messages of one language into those of another, but also a full understanding of the culture and society behind the message.

> (Indonesian): Program sudah terpadu sesuai dengan RPJM dan RPJP. Tidak *membedakan peran laki dan perempuan*. Perempuan masak kemudian ikut lagi kerja di sawah. Di kantor ini banyak perempuan daripada laki. Karena di Menado lebih banyak perempuan yang kerja daripada laki. Perempuan lebih senang kerja yang tertata sehingga masih dapat mengurus keluarga. (Martiningsih's interview in North Sulawesi, 2008)

> (English): The program has already been integrated and is in accordance with RPJM and RPJP without discriminating between women and men's role. The women cook and then work again in the rice fields. There are more women than men in this office, because in Manado there are more women who work than men. The women like to have a well-managed job so that they are still able to take care of their family. (Martiningsih's interview in North Sulawesi, 2008)

Here, Martiningsih needs to be able to do more than translate the words literally. Despite her understanding of the words of the informant, she also needs to explore and so understand the situation in the place where the interview is undertaken. At least, she has to have some references about the role of women and men in North Sulawesi. The first interpretation that may be given to the informant's words is that women play an important role in family life. In the next step, such an interpretation must be supported by seeing the facts as well as knowing the real situation. What are the actual tasks that have been done by women in North Sulawesi?

Further investigation is needed to find out what is actually meant by "the women cook and then work again in the rice fields" or "because in Manado, there are more women who work than men". What is the 'work' that is being referred to? Work in the rice fields, or outside jobs, for example? In this case, Martiningsih cannot generalize the values of women's role as being the same as that of women in Bali since she herself is a Balinese. This is the border in which the intention conveyed through language must be contextually interpreted so that Martiningsih can obtain a full understanding of the ideas delivered by the informant. That is, the cultural viewpoint of Martiningsih is potentially as important for accurate translation of text as the cultural context of the person being interviewed. This phenomenon demonstrates how language as well as the cultural values which frequently emerge in (and always imbued in the words of) people's discourse are the borders that challenge communication, even if it is conducted in the same language.

In analyzing the Indonesian discourse, the background information regarding the location, people's habits and world view must be known by the researcher. Thus, the above discourse can be best interpreted based on its context. Since language is part of culture, the cross border communication cannot be smoothly conducted without some references concerning people's way of life and their worldview construction. Bourdieu's concepts of *habitus*, field or location and the worldview are aspects in the analysis of the dynamics of power relations in social life. All of the aspects will be reflected in the informant's discourse; the message they share through the interview. In order not to misinterpret the informants' meanings, the one who conducts the research has to comprehend the *habitus*, the social life of where the informant lives, as well as how they consider something. In conclusion, the border of cross culture communication that is possibly mediated through translation is not only related to linguistic values but also cultural values.

Knowledge Transfer and Translation

Simply put, translation can be considered as a contact between one language and another which primarily focuses on the transfer of meaning. As seen in the last section, it is not the meaning alone that is transferred but rather the whole context of the meaning expressed in the smallest to the largest unit of linguistic components. The whole context means the meaning is hidden in each linguistic form. The concept is the information implicit in language that allows people to grasp the bundle of meaning represented by the grammatical linguistic unit.

With regard to the relationship between science and translation, Montgomery (2000, p. 2) states that knowledge has always been a mobile form of culture, whatever its contents. This is a representative summary of various definitions about knowledge such as a body of fact and hypothesis, the product of a scientific labour, or an instrument of domination. It is also a human understanding, literary or scientific, that has undergone enormous travel between people and places over the span of history. Montgomery highlights that the movement of knowledge has come on the heels of war and conquest, commerce and trade, religious conversion, immigration and discovery. The mobilization of knowledge has happened, more quietly and perhaps more profoundly, across the creep of millennia, as an elemental feature of daily life along national and linguistic borders, both within and between cultures.

Language is included as one of the factors that challenge knowledge transfer. Language plays a very significant role in the process of communication. To communicate with each other either in written or spoken form, people utilize language in representing their mental understanding. More importantly, language is a bridge to connect different beliefs, assumptions, cultural norms and experiences. These factors are frequently considered as the cause of failure in knowledge transfer. The inability to understand others' languages will postpone the process or even worse, the transfer may not be able to be made. This is an example of an intra-lingual problem, when people fail to communicate their ideas because of others' different beliefs. However, the inter-lingual problem can be solved when people think of transferring ideas and sharing information through a translation activity. In this case, the activity of translating from one to another language, if it incorporates accurate 'translation' of the underlying cultural innuendos, can be seen as the major facilitator of knowledge transfer.

In the field of management, the topic of knowledge transfer emerges whenever we discuss organizations. From a managerial perspective, knowledge transfer is seen as a process (not a one-time act) which needs to be implemented gradually. On the one hand the process of knowledge transfer within an organization is believed to be a difficult and time-consuming process, whereas on the other hand some people expect it to be an instantaneous process. Szulanski (1999) proposes a diachronic analysis of 'stickiness' in the process of knowledge transfer. Stickiness refers to the difficulty in transferring the knowledge. A diachronic analysis is borrowed from linguistics to suggest contrasts between earlier and later moments of communicative activity. The analysis is based on a model of transfer process, or organizational knowledge. Through such a model, different stages of the transfer and possible predicators of difficulty for each stage are identified.

In line with linguistics, translation is not just a product, it is also a process. This is the very nature of translation as proposed by Larson (1998). Translation is basically a change of form. The form of language refers to actual words, phrases, clauses, sentences and paragraphs which are spoken or written. In translation, the form of the source language is replaced by the form of the receptor (target) language. The form from which the translation is made will be called the source language and the form into which it is to be changed will be called the receptor language:

> Translation consists of studying the lexicon, grammatical structure, communication situation and cultural context of the source language text, analyzing it in order to determine its meaning and then reconstructing this same meaning using the lexicon and grammatical structures which are appropriate in the receptor language and its cultural context. (Larson 1998, p. 3)

Catford (1965) in *A Linguistic Theory of Translation* explains the importance of language elements, for example classification of language levels, language rules and language phonology. Translation must be done totally. In other words, it is a holistic process. The aim in a total translation must therefore be to select a target language register equivalent not with the same meaning as the source language items, but with the greatest possible overlap of situational range. Meanwhile, Bell (1991, p. 5) states that translation is the expression in another language (or target language) of what has been expressed in another, source language, preserving semantic and stylistic equivalences. In relation to the nature of equivalence, Bell defines translation as follows:

> Translation is the replacement of a representation of a text in one language by a representation of an equivalent text in a second language. It is apparent, and has been for a very long time indeed, that the ideal of the total equivalence is a chimera. Languages are different from each other: they are different in form having distinct codes and rules regulating the construction of grammatical stretches of language and these forms have different meaning. (Bell 1991, p. 6)

There are three principles of translation proposed by Nida (1975, p. 27). Those principles mean that no translation in a receptor language can be the exact equivalent of the model in the source language. All types of translation involve the following conditions: (1) loss of information means that the translation of items in the SL does not explain the whole information in the TL or is not transferred into the TL; (2) addition of information is the translation of items in the source language into the target language with the addition of extra information; (3) skewing of information indicates the translation of items from the source language is not the exact equivalence in the target language.

In a detailed description about the process of translation, Schubert (2009) states that the process of translation is twofold: there is an internal and external process. It is seen from the procedural perspective that has, for a relatively long time, been a basic feature of the approaches taken by many scholars in translation studies:

> The internal translation process is the mental activity involved in carrying out the translation work with all its steps and decisions. The external process is everything in the translation process which can be observed by another person. In other words, the external process is the translation workflow. The translator's mental activity is not open to direct observation. (Schubert 2009, p. 19)

In a specific discussion about the external process, Schubert mentions that the external process of translation involves three simplifications. Firstly, it is necessary to separate the translation work from the general business process and to disregard the latter. This means that the focus of the observation is not on how the translator and the customer agree to make the contractual arrangement. Such a factor must be disregarded. Secondly, he chooses to introduce a producer-orientation. The activities and influences from a single agent's vantage point should be viewed and taken into account as they are experienced or carried out by the person who conducts the translation. The translators themselves are the producers of the texts. Finally, the third simplification is the distinction between primary and secondary activities and processes. The primary process happens when the target text is created and edited. Meanwhile, activities in which other workpieces are made or changed are labeled the secondary process. These two processes are primarily differentiated by their workpiece.

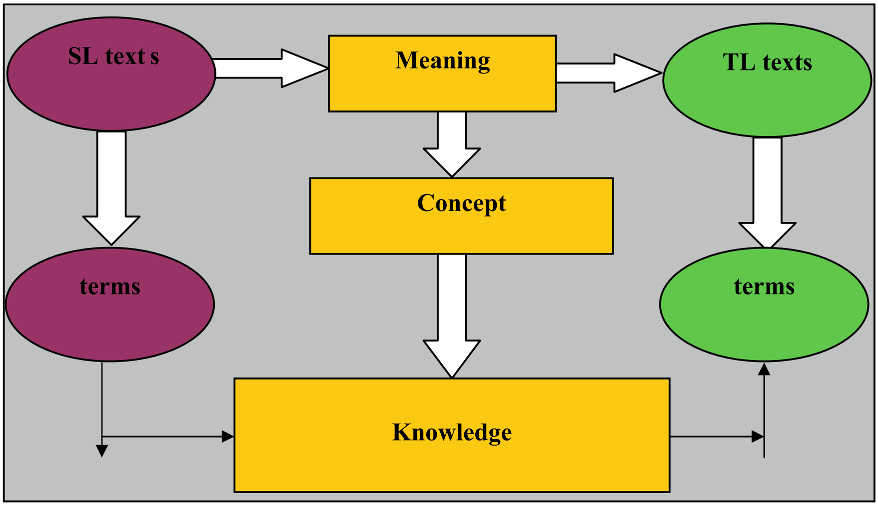

Fig. 8.1 The interrelation between meaning, concept, and knowledge in translation

> If the primary process is translating, then for example the creation and maintenance of a terminology database is a secondary process (workpiece: termbase), as is the extraction of translatable source text from untranslatable data in which it is embedded as in software localization (workpiece: text files or table or database plus codes for the reintegration of the target text components in the embedding data). (Schubert 2009)

In translation, the type of knowledge that is expected to be transferred is the encultured knowledge which is actually the process of achieving shared understandings through socialization and acculturation. Language and negotiation become the discourse of this type of knowledge in an enterprise. Socialization and acculturation is, for sure, the implicit message of any translation activity. From its surface aspect, translation is widely understood as socialization of meaning because it is converted from one language to another. However, when we deeply understand the process of transferring meaning itself as it has an implication of delivering one set of cultural values to another, acculturation actually happens. It is not merely linguistic phenomenon, in which one form of SL is replaced by one form of TL. Yet it is more about socialization of knowledge and concept through the process of analyzing, reconstructing and conveying meaning as it is defined by many linguists in translation studies.

Figure 8.1 outlines how knowledge transfer is realized in translation. In short, translation is widely understood as the transfer of meaning. If the meaning is the core of any linguistic form which has a bigger concept, then the concept itself is actually the knowledge to be shared. Three elements are transferred whenever a certain source language text is translated into target language text. Meaning, concept and knowledge come together as a package. Scientific texts in particular consist of technical terms that share ideas of researchers and scholars. Terms are translated through a cognitive process experienced by the translator. Translating the source language technical terms, especially when the terms are fully adapted by introducing new terms in the target language is much more challenging. The translator has to understand the concept behind the linguistic form as well as having excellent knowledge about the subject translated. Thus, once the meaning is converted, knowledge conveyed through linguistic units is also transferred.

Scientific and Technical Translation

Scientific and technical translations are often assumed to be the same activity. In promoting translation services, some organizations label them as the same activity, thus they offer one name, 'scientific and technical translation,' which is intended to be the translation of any scientific paper with their technical terms. Some others just mention 'scientific translation' or 'technical translation' alone to refer to the same activity, which is the translation of any scientific paper. According to Byrne (2006), despite the obvious connection between the two in the sense that they are information based (to varying degrees) and the work of experts, scientific translation is quite distinct from technical translation.

It is evident that either scientific or technical translation contains specialized terminology and deals with complicated scientific subject matter to an extent. However, looking at the words themselves, namely scientific and technical, they can be easily differentiated. On one hand scientific translation relates to science which is defined by the Chambers Dictionary as "knowledge ascertained by observation and experiment, critically tested, systematized and brought under general principles" (as cited in Byrne 2006, p. 8). On the other hand, technical translation relates to technology which is defined by the Concise Oxford English Dictionary as the application of scientific knowledge for practical purposes. Therefore, scientific translation relates to pure science "…in all of its theoretical, esoteric and cerebral glory while technical translation relates to how scientific knowledge is actually put to practical use, dirty fingernails and all" (Byrne 2006, p. 8).

Byrne (2006, pp. 7–11) claims that technical translation is undoubtedly more restricted in range than aesthetic translation. To be successful in delivering the communication aspect of the text, a technical translator has to find novel and linguistic solutions. That this task is often challenged by a restricted vocabulary and stylistic constraints merely makes the achievement all the more difficult. The primary concern for technical translators is to make sure that information is conveyed accurately. In addition, they are also responsible for ensuring that the information is presented in the correct form, and that it is complete so that the information can be used correctly and effectively.

Byrne (2006) mentions some factors that need to be considered in doing a technical translation. Such an activity aims at presenting new technical information to a new audience, not reproducing the source text *per se* or reflecting its style or language. It involves several aspects such as detailed knowledge of the source and target cultures, target language conventions, text type and genre conventions, register, style, detailed understanding of the audiences: whether the translator realizes it or not, an understanding of how people learn and use information is also required. More importantly, as the main concept of every translation, presenting information is not enough. It is expected that the readers are able to utilize the information shared through the work of translation easily. This means that technical translation is not merely transmitting information, but rather presenting it using technical language which is less regulated, less literary, and even colloquial on occasion, but always strictly functional (Pinchuck in Byrne 2006).

Newmark (1998, p. 151) also prefers to name the translation of scientific papers which mostly deal with technical terms as technical translation. He considers technical translation as one part of specialized translation; institutional translation, the area of politics, commerce, finance and government. He takes technical translation as potentially non-cultural, therefore, 'universal'. It is mainly distinguished from other forms of translation by terminology, although terminology usually makes up about 5–10% of a text. Both its characteristics and grammatical features merge with other varieties of language. Its characteristic format is the technical report, but it also includes instructions, manuals, notices and publicity, which put more emphasis on forms of address and use of the second person.

Al-Hassnawi (2003), an Arabic translator, prefers to describe any scientific paper's translation as scientific translation. Aimed at highlighting the problems that are likely to be encountered in scientific translation, Al-Hassnawi (2003), in his work *Aspects of Scientific Translation*, utilizes English-Arabic translation as a case study. Specifically he analyzes aspects of scientific translation ranging from the requirements of a scientific translator to a suggested model for scientific translation. In relation to the qualities of scientific translation, there are some requirements that must be fulfilled by a scientific translator, such as broad knowledge, a well-developed imagination, intelligence, a sense of discrimination, the ability to use one's owns language with clarity, conciseness, precision and practical experience in translating from related fields. On the other side, there are some ways of establishing the model for scientific translation such as analyzing the code of scientific text, handling of the linguistic elements of both SL and TL including grammar, lexicon and field-related registers. Translating competence, which includes structurization and contextualization, mastery over programs of expression in both SL and TL, and knowledge of the alternative standards of equivalence are also included as factors of a suggested model for scientific translation.

Bilingual Publications

To cope with the problems due to language borders, translational activities have been used to convert either written or spoken source language texts to equivalent written or spoken target language texts. A translator is required to be capable of translating various kinds of texts including religious, literary, philosophical, law, scientific texts, and so forth. In order to do their job effectively, it is suggested that the translators must not only master both SL and TL perfectly, but also be familiar with the subject matter. Dealing with different types of texts, the translator has to apply proper procedures to make the translation readable to the TL audience.

In fact, carrying out translation services becomes a prospective career since communication across countries must be actively conducted for the sake of global trading, international affairs, political affairs, economic system and science exchange. In the field of science and technology, the exchange of new information and the latest inventions are much needed by scientists in different countries. Scientists have to disseminate information about updated inventions and in return, to receive new incoming information as well. It benefits people all over the world to utilize the technology and the research conducted by scholars. Accordingly, today new research findings for example, must be translated into one language or even multi languages. That is one of the ways knowledge is shared world wide. More translators are required to translate scientific texts in any specific field ranging from exact natural sciences to social sciences, or even interdisciplinary studies.

In the field of technical translation from the English language, it is inevitable that new English terms are used to express new concepts, techniques, procedures and inventions which must be accurately translated. Many English terms have developed more rapidly during the last couple of years as science and technology grow rapidly. Since the terms are representative of very specific concepts, the translators may face some difficulties in transferring the message precisely. Sometimes the translators are not convinced in translating the English terms using the closet equivalent of the TL language because the readers seem to be more familiar with the English terms which are adapted as new terms through the process of changing the spelling and pronunciation. Consequently, most translators 'borrow', 'adapt' and finally 'adopt' the terms to enrich the vocabulary of the language into which the English terms are translated.

Similarly, this problem is also faced by the translator in translating the technical terminology from English into Indonesian. Sometimes, the use of English terms or the foreign terms which have been integrated into Indonesian terms are preferable because people are more familiar with them. The translators may not even try to propose new 'original' Indonesian terms to replace 'the foreign-adopted' terms. In other words, borrowing seems to be the predominant strategy in translating English-Indonesian scientific terms. However, it needs further investigation as to whether this assumption is true or not. It must also include the analysis of the translator's ideology and strategy in translating scientific terms from English into Indonesian.

Facing the information presented above, I will now discuss the advantages gained in English-Indonesian technical translation. The *Glossary of Biosecurity Management (GBM)* is considered representative as the data source in my investigation of technical translation and the ideology behind it. The term biosecurity is defined from many perspectives by some scholars because it is closely related to either exact and natural science or social science. It involves agriculture, ecology, biology, economy, community management, environmental management and social learning. The term is defined in a number of the chapters here, especially Chap. 1. However, for the reader's convenience, FAO (2003) defines biosecurity as a strategic and integrated approach that encompasses the policy and regulatory frameworks (including instruments and activities) that analyze and manage risks in the sectors of food safety, animal life and health, and plant life and health, including associated environmental risk.

The *Glossary of Biosecurity Management (GBM)* (refer to Chap. 7 for a full description of the GBM, and to Appendix A where the English version is included in full) consists of many technical terms ranging from A to Z which, in general, represent three specific fields of study, namely biosecurity, community management and social learning. In this publication, more than 400 technical and scientific terms are listed which were translated utilizing different procedures of translation. The procedures applied can be contrasted if we look at the implementation of literal and non-literal translation.

It is interesting to note the phenomenon of technical term translation, particularly when it relates to the ideology of translation and whether the translator tries to apply the ideology of domestication or foreignization. Domestication and foreignization shows that translation does not only involve giving the equivalent meaning in TL but also involves considering the values of the TL and SL whether they are linguistic values or cultural ones. Domestication is the ideology of some translators that prefer changing the SL values and making them readable for the TL audience. On the other hand, others prefer keeping the values of the SL and exposing the audience to them. The translators do not ignore all the cultural differences in translation. This is termed foreignization (Al-Dammad, 2008).

Domestication and foreignization are two terms utilized by Venuti (1995, p. 20) as two translation strategies which have the opposite characteristics to each other. Domestication is "an ethnocentric reduction of the foreign text to target-language culture values, bringing the author back home." A domesticating translation is target language-oriented translation whose typical characteristics are fluency, naturalness, transparency, and readability. On the contrary, foreignization is "an ethnodeviant pressure on those values to register the linguistic and cultural difference of the foreign text, sending the reader abroad." A foreignizing translation is source language-oriented and makes purely formal replacement of one word or phrase in the SL by another in the TL dominant.

The discussion of this section focuses on the translation of technical terminology from English into Indonesian in terms of ideology, procedures and equivalence to show how the creation of new Indonesian technical translation happens. These three aspects are interrelated because the investigation of translation ideology cannot be separated from the procedures applied by the translator and the equivalence of meaning from SL to TL. The ideology of translation, either domestication or foreignization is reflected in the procedures applied by the translator. Theoretically, literal translation is considered as the reflection of foreignization whereas non literal or free translation which enables the TL values included in the translation is the translator's way of domesticating the SL term. Therefore, a new TL term is created which eliminates cultural borders.

Technical translation takes a great deal of effort because the translators are often confronted with the problems of making the translation accurate and avoiding confusion on the part of the reader. In addition, as noted earlier, technical terms represent specific concepts that must be precisely translated. Practically, the information in this chapter could serve as a reference for translators in overcoming the problems faced during the process of translation, particularly those who are interested in technical or scientific translation in which a vast inventory of technical and scientific terms are to be found. There are many new English terms that must be 'creatively' translated by the translator in order to deliver the exact concept implied. It means that the field of creating new Indonesian terms is wide open for the translator, whether to phonologically or orthographically adopt the terms, or to find out how the terms should be accurately translated based on the list of standard vocabulary for foreign translated lexical items suggested by *Pusat Bahasa Indonesia* (Centre of the Indonesian Language Development).

The following are some examples of how some English terms are translated into Indonesian found in the GBM (Table 8.1).

Looking at some translated terms above, it seems that the translator tries to 'domesticate' the English terms into Indonesian. For example, *Biosecurity* is translated into *Ketahanan Hayati*, not literally adopted into *biosekuriti*. In translating this term, the knowledge of the translator about what biosecurity really means is inevitably transferred. *Ketahanan Hayati* is chosen and then introduced to the target language audience. Before the decision is made, consideration must be given to how the term should be perfectly translated. Understanding the concept of biosecurity assists the translator in choosing the linguistic unit (words or phrases) to represent the concept. Indeed the chosen linguistic units imply the knowledge to be shared. Hence the target language audience can enrich not only their vocabulary of technical terms but also, on a wider scope, the knowledge in their mind.

This process incorporated elements of componential analysis into the linguistic analysis process described in this chapter. Componential analysis is primarily concerned with understanding each part or semantic features of the word. Bell (1991, p. 88) states that the essential assumption of componential analysis is that the meaning of a word is the sum of a number of elements of meaning which it possesses – semantic distinctive features – and that these elements are binary, namely marked as present

Table 8.1 Examples of English technical terms that are domestically translated into Indonesian

SL (English)	TL (Indonesian)
Abiotic Stress	*Cekaman Abiotik*
Action Research	*Penelitian Tindakan*
Adaptive Capacity	*Plastisitas*
Artificial Insemination	*Inseminasi Buatan*
Research Centre	*Pusat Kajian*
Bioassay	*Uji Hayati*
Biodiversity	*Keragaman Hayati*
Biosafety	*Keamanan Hayati*
Biosecurity	*Ketahanan Hayati*
Biotic Stress	*Cekaman Hayati*
Bridging Social Capital	*Modal Sosial Bridging*
Bonding Social Capital	*Modal Sosial Bonding*
Food security	*Ketahanan Pangan*
Bio	*Hayati*

or absent (+ and −). For instance, a set of English words such as man, woman, boy and girl show how a componential analysis can be used to specify the lexical entry for each, limited (for the time being) to semantic features which create dictionary like listings. Those four words are actually four concepts which form a set of items. They share the characteristic or feature ‘human’. Man and woman share the feature ‘adult’ and man shares with boy the feature ‘male’. For this set, these three features are sufficient to create definitions for each which distinguish them ambiguously: man = ‘human, adult, male’.

In this chapter, I chose the parameters based on the definitions commonly used in a specific field of study to check whether the transfer of concept is appropriately done through translation. Each parameter was identified with a plus and minus whether the target language term contains all information provided in the source language term. The term biosecurity which is translated as *ketahanan hayati* is a good example of how the understanding of the concepts behind the term is vital. The term has a specific concept that undoubtedly must be precisely yet communicatively translated by the translator. Then, *biosecurity* is domestically converted using the adaptation procedure since the TL term has its own features that have to be reflected in the TL term. Thus, the data analysis process will be as follows:

Parameters	Biosecurity	Ketahanan Hayati
Managing risks in the sector of food safety, animal life and health, plant life and health	+	+
The spread of pest and diseases, harmful organism, threats	+	+
Safeguard the flora and fauna of a country	+	+/−
The malicious use of pathogens, parts of them, or their toxins in direct or indirect acts against humans, livestock or crops	+	+
A set of preventive measures designed to reduce the risk of intentional removal (theft) of a valuable biological material	+	+/−

As it is named, the term biosecurity may be directly interpreted as only to guard the flora and fauna from the other harmful organisms, pests and diseases. In fact, it means more than just ‘safeguarding’ but still can be differently interpreted by people at their first reading of the term *ketahanan hayati*. Similarly to the concept of prevention, people may not interpret the term as an act of preventing unless they are previously familiar with the field.

National, Regional and Local Implications

In relation to humanity in general, translation is even believed to contribute to civilization. Of course, it is more than just a matter of knowledge transfer. This indicates that the implications for translation are on a wider scale, namely international, national, regional and local levels. Translation is an international issue since a translation involves converting messages from one language to another language.

In the case of the GBM, it is directly related to Indonesian/Australian cultures and languages:

> … the history of translation helps those who are interested in translation, literature, and cultural studies to better understand the contribution of translation to civilization and to the development of cultural and intellectual life. All the awakening periods in the history of nations start with translations. In other words, translation is the power behind the awakening periods of nations. (Aksoy 2001, The study of the history of translation, para. 1)

Translation which we now recognize as the meeting of different cultures and civilizations, leads countries and nations to a wide range of perspectives on their paths to modernization as well as intellectual advancement. Furthermore, Aksoy states that translation from its intellectual aspect is a means of cultural enrichment. To rewrite the original text of SL text into a new and naturally readable text in the TL is the task of the translator. Hence the chance to share the information in a certain language is open for the translator. In this way, the translator does not only play a significant role in sharing the information in SL text, but also an actor who transfers the concept, information and, more importantly, the knowledge hidden in SL text.

In summary, the implications of scientific translation range from the linguistic enrichment of both SL and TL to the transfer of knowledge. The process of knowledge transfer has relevance at international, national, regional and local levels. For example, in Indonesia alone, nearly 500 different languages are still used. Facing such richness in language, translation is an important option to assist people gain knowledge and understanding. Nationally, the enrichment of the national language, *Bahasa Indonesia,* which is a means of communication among people from different regions in Indonesia, can be realized through translation. From the perspective of regional and local interest, a translation activity also plays an important role in enriching regional language and local knowledge as well. It is realized through the approach implemented by the translators when they translate the source language text. Translation does not only involve the languages of two countries but also languages within the same regions which represent a 'border'. When translators are involved in translating texts from local languages, they must be aware of local knowledge and knowledge systems. In this way, a translation product can bring new knowledge which can then be merged with existing knowledge.

Conclusions

In this chapter I have discussed the issues related to knowledge transfer through bilingual publications on food security and biosecurity. *Ketahanan hayati* (biosecurity), *ketahanan pangan* (food security) are examples of new Indonesian technical terms which are introduced through the translation of some English publications on food security and biosecurity. In translation, the transference of meaning is simultaneously done with the transference of information from one language into another language. The information shared is actually the knowledge contained in the source language text. In deciding how certain technical terms should be most appropriately translated, the translator should be able to transfer the concept brought by the term. Concepts and information allow people to know something with a considerable degree of confidence. There must be a transfer of something beneficial once translation is done. To sum up, three elements are actually transferred whenever a certain source language text is translated into target language text. Meaning, concept and knowledge come together as a package. Scientific texts in particular consist of technical terms that share the ideas of researchers and scholars. On a small scale, terms are translated through a cognitive process undergone by the translator. However, in the wider perspective, the impact of a translation is to enable knowledge transfer across language and cultural borders.

In addition, there are implications of this work on knowledge transfer via translation for national, regional and local domains. Translation involves two connections: the connection of two texts in different languages and the connection between the translator who transfers the idea of the source language's writer and the target language reader. To sum up, the implication of translation covers national, regional and local interest that not only transfers the linguistic features found in the source language but also enables the transfer of 'knowledge' in broader socio-cultural sense. The role of the translator is to adopt an approach and enact the transfer. From the perspective of national interest, the knowledge is developed and more accessible because the translated text utilized national language. Similarly, knowledge transfer through translation also occurs between different local languages and cultures. Through translation, people can learn and exchange new concepts introduced through the impacts of contact between different languages.

References

Aksoy, B. (2001). *Translation as rewriting: The concept and its implications on the emergence of a national literature*. Retrieved June 1 , 2009, from http://accurapid.com/journal/17turkey.htm

Al-Dammad, A. (2008). *Domestication and foreignization in English-Arabic translation*. Retrieved June 1, 2009, from http://www.proz.com/doc/1643

Al-Hassnawi, R. A. (2003). *The aspects of scientific translation*. Retrieved June 1, 2009, from http://www.translationdirectory.com

Bell, R. T. (1991). *Translation and translating: Theory and practice*. New York: Longman.

Byrne, J. (2006). *Technical translation: Usability strategies for translating technical [Documentation]*. the Netherlands: Springer.

Catford, J. C. (1965). *A linguistic theory of translation*. London: Oxford University Press.

FAO. (2003). *Biosecurity for highly pathogenic avian influenza* [Issues & options]. Retrieved November 3, 2008, from http://www.fao.org/biosecurity

Larson, M. L. (1998). *Meaning-Based Translation: A guide to cross-language equivalence* (2nd ed.). New York: University Press of America.

Montgomery, S. (2000). *Science in translation: Movements of knowledge through cultures and time*. Chicago/London: University of Chicago Press.

Newmark, P. (1988). *A text book of translation*. London: Prentice Hall.

Nida, E. A. (1975). *Language, structure, and translation: Essays by Nida*. Stanford: Stanford University Press.

Schubert, K. (2009). Positioning translation in technical communication studies. *Journal of Specialised Translation, 11*, 17–30.

Szulanski, G. (1999, June 14). *The process of knowledge transfer: A diachronic analysis of stickiness*. Prepared for OBHDP, special issue on Knowledge Transfer. Retrieved June 1, 2009, from http://knowledge.emory.edu/papers/914.pdf

Venuti, L. (1995). *The translator's invisibility: A history of translation*. London: Routledge.

Venuti, L. (2000). *The translation studies reader*. London: Routledge.

Chapter 9
Gender Issues in the Community Management of Biosecurity in Eastern Indonesia

Ni Gusti Agung Gede Eka Martiningsih

Introduction

A common religious perception of a woman in many of the regions studied in this work is that she is a creation of God with a womb and the natural functions of menstruation, pregnancy, giving birth and breastfeeding, with a socially responsible role in caring for and nurturing babies. Traditionally, a woman's role is related to undertaking reproductive work, related to work at home, while men are associated with productive work outside the home (Mien 2007). At the same time, women in rural areas of Asia play an important role in productive economic activities related to plant biosecurity especially in areas such as agriculture and food security (Rola and Rubzen 2007, p. 122–131). This phenomenon is the case in developing countries such as Indonesia where most women are associated with agricultural work. Their roles are very important because agricultural work is related to sustainable food and/or income supply in their daily lives. All activities such as taking water from the well, getting firewood for cooking, preparing food for their family and other basic needs are carried out by women. In rural communities, women have the central role of managing their environment and sometimes playing the roles of being consumers, campaigners, educators and communicators (Rodda 1993). Untung (2007) pinpoints the fact that biosecurity awareness increases when the community is fully involved. However, in Indonesia, at least until quite recent times, poor communities in geographically remote areas have been neglected by both local and national authorities, and by aid agencies. Hence, they developed specific self reliance strategies although their local resources are limited and intervention by outsiders has become crucial to development (Ria 2002). In previous research conduct by Rodda (1993), Papuan women in Teluk Bintuni managed their mangrove forest as a strategy to support themselves.

N.G.A.G.E. Martiningsih (✉)
Women Study Centre, Universitas Mahasaraswati, Denpasar, Bali, Indonesia
e-mail: ekamtbn@yahoo.co.id

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_9, © Springer Science+Business Media B.V. 2011

Given women's pivotal role in agriculture and food security, it is nevertheless the case that there is little research concerning what the role of women is in managing biosecurity, and none found on how this can be maximised. For example, in societies such as Indonesia where women have traditionally taken agricultural roles such as planting rice seedlings and harvesting the rice, it is easy to see how they might be better placed to be on the 'front line' of identifying anything unusual in the way of plant pests and diseases. It seems a simple leap to then say how this information can be used towards better managing biosecurity. However, the 'simple' labour of planting or harvesting rice is embedded in highly complex, rigidly prescribed and difficult to change social and cultural practices. Attempts to change these complex relationships during the 'green revolution' of the 1970s which imposed new technological guidelines on farmers resulted in some environmental and biosecurity catastrophes for the very reasons pointed out here, that what seems simple on the surface is underpinned by complex cultural practices entrenched in the society for millennia.

It is this gap between the 'obvious' and the underpinning cultural complexities, that this chapter begins to address. In order to address the gap, the research has had to take a step back and examine the highly intricate and interrelated ways in which culture and gender intermesh with biosecurity practices. It uses a blend of Western and Asian literature about gender and social networking concepts to do so, and only claims to make a small start at the task. Only by understanding these interrelationships will it be possible, as it is at the end of the chapter, to make some predictions about how women's roles may be used to better manage biosecurity. In so doing, the research has adopted a qualitative approach (Creswell, 1998) and taking a very broad view of, in this case, Indonesian cultural practices as they relate to gender, then to make assumptions about possible future roles in managing biosecurity.

This chapter therefore discusses women's roles in agricultural, social, economic and cultural activities and asks whether women participate in their communities amongst different regions, cultural and gender issues? In addition, it describes experiences of women who have received good government training on pest and disease management and are transformational in leading others, for example the successful IPM (Integrated Pest Management) training to farmers through Farmer Field Schools (SLPHT, *Sekolah Pengendalian Hama Terpadu*). At the end of this chapter, I will outline the strategies to be utilized that can build women's capacity in transferring knowledge processes and encouraging women to be aware of pest and disease issues associated with biosecurity management in their plantations.

The Role of Women

Women's roles in agricultural and social activities, especially in rural communities, are important facts that drive government policy focused on gender inequity issues. Evidence shows that women are direct agents of social change and family unity within a community. Indonesian women are actively involved in social, cultural, spiritual, agricultural, and tourism activities and there are many documented cases in

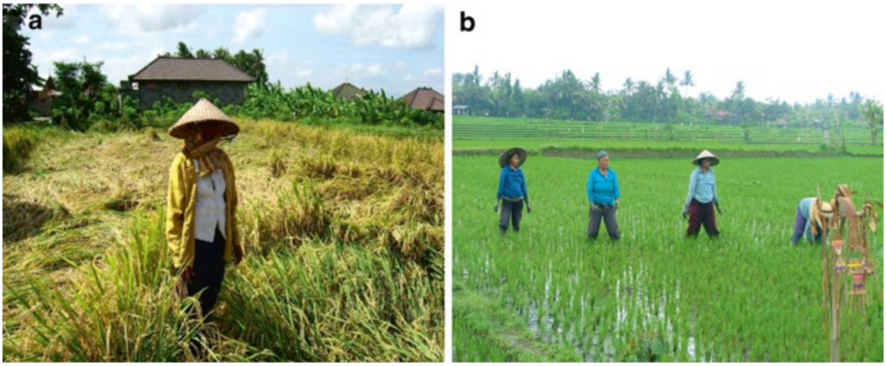

Fig. 9.1 Women in harvest activity figure (**a**) and women in sowing activity (**b**)

which women have been successful natural resource managers (Nakatani 1997; WALHI 2007). In Bali and other regions of Indonesia which have strong rules and religions such as Eastern Indonesia, are cases of the important role of women in almost all aspects of life. According to Suryani (2006), it is essential that women realize that they are the ones responsible for fulfilling the obligations. Meinzen-Dick and Zwarteveen (2003) indicate that women tend to have enough additional time to be able to participate in social activities, develop networks, and use their time for the purpose of transferring knowledge and information. Women always have time to get together and keep their relationship with their community (Maluccio et al. 2003). However, there has been little research to determine how women use this positive social capital to empower themselves through understanding and solving problems. There has also been little analysis of the position of women in organizational structures and decision making at the village or sub-village levels (Fig. 9.1).

According to Pietra (2006), social capital is a resource that can be used to encourage a community to understand and contribute to overcoming community problems together, to address community interests and increase community awareness. Social capital held by women can be investigated and built on to empower women and their communities. According to Flora (2007), empowering the community to overcome their problems should have an on-going effort. This is particularly important in an era of globalization which has brought on rapid developments in the movement and exchange of goods, services, money and communities. Globalization has resulted in increased movement of pests and diseases of plants, animals and humans. If this issue is not taken seriously, food security and environmental balance could be threatened over the longer term. The empowerment of communities to address community problems requires making use of the existing social capital resources that have been developed among individuals or groups who have mutually beneficial relationships. In Eastern Indonesia, principles of cooperation already exist within communities. It is called *Mapalus* in areas such as North Sulawesi and Papua, and it is demonstrated by communities helping other communities when they build houses, repair the irrigation systems, plant, manage and harvest plants. This demonstrates integrated systems of community cooperation (Pietra 2006). Furthermore the intensity of the relationships between communities tends to produce useful communication among different groups of people including women in each activity, which give them the useful knowledge transfer between each other. This phenomenon emerged in the transmigration areas in Central Sulawesi, where the process of knowledge transfer occurred between the local people and the outsiders.

At the government level there is a women's organization called Women, Welfare and Empowerment or *Program Kesejahteraan Keluarga (PKK)* which acts as a coordinating body for all women's activities in villages, districts, regencies and at provincial levels. The *PKK* was for many years considered as having an important role for the implementation of government development programs, especially in rural areas. In recent years, the role of this organization has been changed so that only elite women are able to join this organization's program, and the program sometimes only contributes to a small sub-group of members of the organization. Therefore women still need sustainable programs to encourage membership of *PKK* especially in rural areas (village and district levels).

Gender Issues

The challenge of discrimination against women began about 30 years ago, and forced the CEDAW (Convention on the Elimination of all Forms of Discrimination against Women) declaration by the United Nations in 1998. In Indonesia the term that emerged relating to the concept was 'gender', however until now this term is still debated among Indonesian communities. In the 1970s, at the birth of 'gender', the concern was to theorize a social identity not given by 'sex', free from biological determinism and the arbitrary naturalization of the gender order (Pearson and Cecile 2000). Feminists needed to deny that biology was destiny and anthropologists provided the necessary scholarship on the enormous range of different gender identities which formed around biological females and males in other cultures. In the twenty-first century when the term 'feminism' emerged, there was much debate about the concept of this terminology. In Indonesia, many women wanted to articulate and discuss the concept of feminism and women's rights. International communities remained focused on Western feminism views which contained an 'anti-men' focus, namely, women's perception about men who argue for a continuation of the inequitable status between women and men in communities (Saparinah 2002). This is despite the fact that the principle of gender equality is enshrined in Article 27 of 1945 Constitution in Indonesia.

However, feminism or gender equality in Indonesia recognizes women's different personal experiences, which cannot be separated from their cultural background. One example is Raden Ajeng Kartini, who was one of Indonesia's most prominent emancipation leaders. She lived more than a century ago. In her case, communities see Kartini and almost all Indonesian women at that time as facing structural barriers (Saparinah 2002).

Saulnier (2000) identifies five branches of feminist theory: (1) liberal feminism, (2) cultural feminism, (3) post modern feminism, (4) womanist and (5) radical feminism. According to Saulnier (2000) liberal feminism focuses on equal rights, access to service and control over privacy. Cultural feminism focuses on developing women's culture, women's spirituality, peace and ecology, restructuring of society and increased valuing of women. Post modern feminism articulates a feminist viewpoint, analyzing how women are affected by the social world, examines power and knowledge, and imagines society's transformation. Womanist feminism focuses on social action and social change, articulation of social consciousness, self healing and resistance systems of oppression. The last branch, radical feminism, draws on connections between personal and political, eliminates male privilege in public and privates spheres, heals internalized sexism, protects women from male violence and restructures society. Furthermore, Saulnier (2000) states that feminist theories articulate the structure and dynamics of women's experiences based on socio-political and interpersonal sexual hierarchies. She also argues that the division of feminist theory into several branches is a useful way to select the strategies for solving women's problems in different situations, different times and different backgrounds.

According to World Bank (UN 2005) figures, the number of women globally is slightly higher than the number of men. For example in Cambodia 52% of people of productive age are women, in Thailand 51% of the population are females, and in Indonesia, the female population is still higher than the male. It is not surprising that more women live in poverty and it is also the case that more women are concentrated in rural areas. In rural areas, the roles of men and women are important as food producers, to gain money from formal employment, and to manage their agricultural and natural resources. The roles of women in particular already carry out specific activities in the domestic household, a role in family lives, in spiritual, religious life and social life (Pendit 2002). Suryani (2006) asserts that in these roles women feel that they have rights and have fulfilled their obligations according to the community's norms and regulations.

Within the household women are responsible for looking after the family (husband, children and in-laws) and all aspects of family welfare. In addition to fulfilling their domestic role, some women also have duties within the public arena such as careers and social networks (Indrayoga 2006). Rola and Rubzen (2007) emphasize that women have domestic and public roles within communities. Domestic roles are implemented through reproductive roles and social roles. These roles are commonly unpaid but women take the responsibility because they assume that the roles are women's rights and obligations. On the other hand public roles relate to economically productive activities. Moser (1993) contends that these roles are directly related to producing money or goods, and women may work as employees, sellers, traders, formal workers or farmers. Rola and Rubzen (1997) found that the contribution of women's roles in agricultural activities are manifested in all sectors starting with seedling activity, sowing, weeding, fertilizing and pesticide application, harvesting and finally threshing – all except land preparation. The tightening of the global economy has the effect of increasing the number of male farmers going outside their agricultural pursuits to gain different jobs to increase their household income.

The National Community Empowerment Program (*Program Nasional Perberdayaan Masyarakat* – PNPM)[1] in Indonesia has reported some useful results to guide the rules for women's engagement and also encourage and reward innovation. The PNPM reports that gender roles are ascribed by norms and influenced by various factors such as tradition, religion and state ideology. Further they argue that women would not be confident when they argued with the men in general, but they would feel comfortable when they discussed the issues among fellow females. These findings can be utilized to improve women's communication to produce an enhanced impact through the peer groups, which is also useful for the knowledge transfer process between communities. Overall, an increase in awareness of problems amongst women's communities is likely to broaden their horizons and improve the capacity of women, protecting cultural identity and empowering the community (Suryani 2006).

According to Indrayoga (2006), the most crucial women's issue is to improve the position of women in society. Within the workplace (especially in Indonesia), most women only hold middle to low positions and very few ever make their way to executive positions where they have decision making powers. Indrayoga goes on to say that inequality between men and women is only due to a way of thinking, particularly men's attitudes which consider women as having a lower status. This attitude has persisted so long that even women have come to see themselves as second class within the society. One of the questions for this research is how this attitude can be changed so that women can be considered equal to men? Furthermore, discourse around the issue of gender equality is becoming stronger throughout the world. The demand for equality is ambitious and humanistic, because through this demand, women have been given more confidence to speak out and to realize their rights and responsibilities. The demand for gender equality is considered a critique of men and acts as a brake to stop men treating women as they please. Arguments from the Western perspective of 'equality' are important, but must be worked through in non-Western contexts such as in Indonesia, in ways that are respectful of Indigenous and local culture and knowledge, and do not set women up in opposition to their cultural beliefs and values. That is, the goal would be negotiating new and culturally grounded meanings of 'equality' that are acceptable according to the principle of equality to the Indonesian women and according to many cultures in Indonesian contexts.

In regards to Bali, Ardhana (1994, p. 6) argues that there are two major problems that currently grip this Province: problems associated with human capital and natural capital. According to Pietra (2006), these are the two pillars of social capital which guarantee development and community empowerment for sustainable livelihoods. A feeling of cultural ownership which supports community empowerment will fade (Pietra 2006). This notion is supported by Suryani (2006), who asserts that harmony in life should be nurtured so that life is not only for working but also for

[1] 'National Community Empowerment Program', or PNPM for short. This is a national program part funded by the World Bank, aimed at community-based education regarding raising the level of awareness concerning all aspects related to poverty alleviation and employment creation.

creating good relationships with others. Furthermore the role of women in the Provinces of Sulawesi and Papua is significantly different from Bali, due to the differences in culture, religion and natural capital.

Pietra (2006) discusses several phenomena that occur within the village that hinder the community's unique ability for self development, contribution to nation-building and development of the local culture of the village. However these resources within the local community will play a role in confronting globalization and economic liberalization. Villages possess strong social capital in the area of community development, which can drive improvements in rural communities. A lack of understanding of social capital, work networks and local leadership may lead to negative effects on the relationship between communities and their environment. Without social capital, community cohesion is reduced so that communities may not be able to organize themselves to create sustainable livelihoods (Beeton 2006). This is also evident in the increased level of crime and other social issues in the community, particularly issues around traditional practices in Bali and a reduction in family cohesion and community participation (Grootaert 1998).

Cases of violence (both physical and verbal) towards women are increasing and indicate that the values of equality and friendship are being destroyed. Narayan (2000), Dasgupta and Serageldin (2000), and Flora (2007) explain that bonding social capital relates to the cohesive ties within social groups that are relatively homogenous (such as in a family or ethnic group) and bridging social capital refers to social groups that are only loosely associated and can form a bridge between organizations and communities, between friends, associations or colleagues (for instance, human rights movement, seminars or professional networks). Putnam (2000) and Hanson et al. (2006) add linking social capital, which is a vertical relationship in the form of bridging between groups with different social status, wellbeing and strengths. An ideal community will be achieved if all three forms of social capital are present in equivalent amounts (ABS 2002).

Hery's (2007) research on how to utilize the Integrated Pest Control School for empowering women farmers finds that if the training for women was conducted regularly and involved women farmers actively in the field during the training, female farmers improve their knowledge and abilities faster than male farmers. Further results indicate that after four to five planting seasons, farmers are already expert enough to share their knowledge with others. They are also confident enough to do plant a variety of crops on their own land without guidance from agricultural extension officers. Farmers also usually share their new knowledge and innovations with other farmers. Currently, women farmer groups are gradually starting to develop all of the technical knowledge and skills related to integrated pest and disease control.

This model shows the elements of a strategy to empower farmers which can contribute to sustainable and secure livelihoods. Roshetko et al. (2007) find the farmer extension approach an important way to empower motivated farmers to enhance the productivity and profitability of their agroforestry systems to gain market opportunities. The approach incorporates NGO's (see Fig. 9.2). Moreover, it shows that it is important to include all these elements, where the role of women is valued and incorporated.

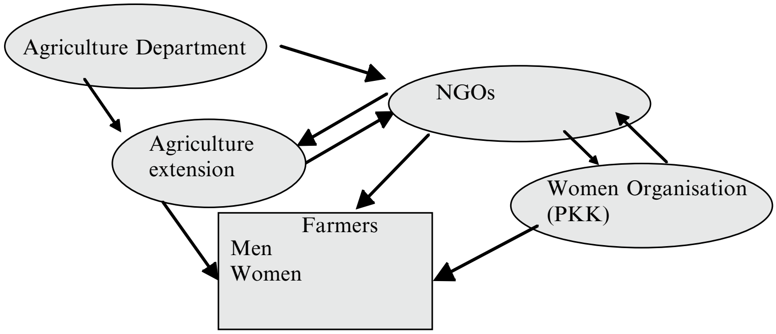

Fig. 9.2 Agriculture programs implementation (Roshetko et al. 2007)

Success Stories

In this section, there are three different groups of stories from different sites with different focuses. The first is on training and education, the second on women's leadership and the impact of decision making impact and the last is on women's participation and utilization of knowledge transfer.

Training and Education

Discussions about women's need for training and education emerged across all sites in Sulawesi, Papua and Bali. What follows is an example of a successful community empowerment and knowledge transfer process through women's involvement in integrated pest management. The information is drawn from the original research conducted by the author reported in Martiningsih (2008). I will call the woman Bunga. Bunga is an active member of the Integrated Pest Control Field School (Sekolah Lapang Pengendalian Hama Terpadu, SLPHT). She is 45 years old, has four children and relies on rice farming to make a living. Her husband is a *becak* (three-wheeled bicycle form of transport pedaled manually) driver who works outside the house almost every day, leaving her to do almost all of the work in the rice fields. Rice planting is not difficult for her as she has been involved in farming since she was a child. The income from her husband's *becak* driving is insufficient to support the family. The family has only 750 m^2 of flooded rice fields so Bunga needed to find a way to improve productivity.

After joining the Integrated Pest Control Field School from 1995 to 1996, Bunga was better able to prepare the soil in an environmentally friendly way and produce good harvest. By reducing the use of non-organic fertilizers and chemical pesticides and replacing these with organic fertilizer and biological control of pests, she has been able to increase productivity of her rice field by almost 100%, reducing her pest control costs by 50%. Since this success, Bunga frequently sets out to meet with women in her community and has started to share the principles of integrated pest control. She encourages others not to use pesticides because, besides increasing production costs, pesticides may threaten ecological balance and have negative effects on human health. Pesticides and non-organic fertilizers are no longer used by farmers in her area. As Bunga herself put it:

> Even though I only had a primary school education, once I had training from one project I felt like I had a university degree! It was more useful than money (interviewed by Martiningsih 2008)

SLPHT served as an example of an activity which can improve the capacity and skills of women in the community. It is hoped that the Integrated Pest Control Field School can also contribute to the development of sustainable lifestyles which includes empowerment of farmers, biodiversity conservation, food security, community learning and public health.

Women's Leadership: Decision Making and Problem Solving

In terms of leadership within the government at village administration level in the Sulawesi and Papua sites, women already have an organization, the *PKK*. In both sites *PKK* has offices at the Provincial, Regency, District, and Village level.

In general, the wife of the top government leaders (for example, Governor of a province) automatically becomes the head of the *PKK* at the Province level and likewise for the wife of the District head. In each research site, the organisation of *PKK* consists of the head, the secretary, the treasurer and several sections which usually represent different areas of program activities. *PKK* programs are known as *Dasa Wisma* which consist of: (1) *pancasila* (the five basic principles of the Republic of Indonesia) teaching and implementation; (2) collective community work; (3) food; (4) clothing; (5) home management; (6) skills training; (7) health; (8) developing a cooperative livelihood; (9) environmental conservation; and (10) health planning (Fig. 9.3).

As an organization, *PKK* designs its own agenda but often conducts activities in cooperation with the village head. The *PKK* has routine activities such as monthly meetings, health clinics and *arisan* (where members contribute a small amount of money and take turns in winning the total amount each month). However, for the activities that involve local government or traditional leadership, the *PKK* must consult with the male leaders in the community.

Problem of Poverty in *PKK* Program

Leadership training for *PKK* members was offered in several provinces in Sulawesi and aimed at promoting women's confidence in decision making at the village level. The program was organized by the *PKK* at the District (*Kecamatan*) level.

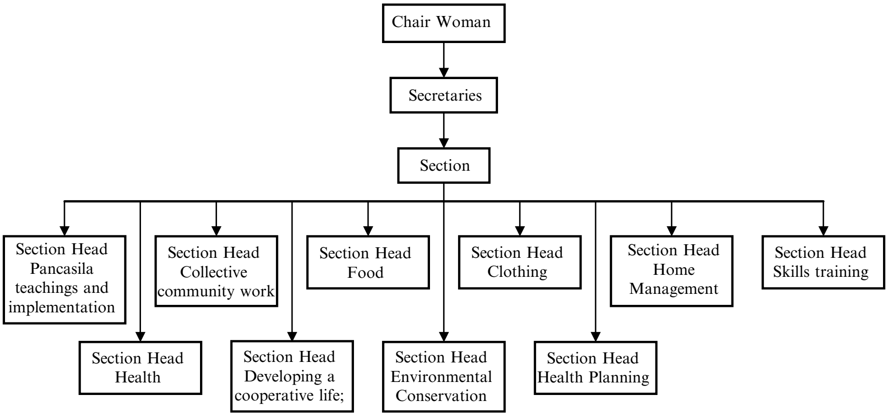

Fig. 9.3 Organizational structure of the *PKK* (Adapted by Saparinah (2002))

Another special program organized by religious organizations and offered on a regular basis focussed on the development of confidence in public speaking for women. At the meeting, women often discussed important issues related to their group and their family, including agricultural problems. In Papua, the *PKK* launched a similar program but due to the lack of qualities and abilities of *PKK* members, the implementation of the program has been more difficult.

One important issue that needs to be discussed is that poor women had more trouble engaging in *PKK* programs because their priorities needed to be generating an income. It is more difficult to empower poor women than rich women through designed programs. This suggests that it is important for such programs to target poor women, and in such ways that the education and training suits their needs and lifestyle.

Problem of Two-Way Communication

In general, there is a community structure, in Indonesia, known as *Badan Musyawarah* (BAMUS – Community Discussion Body), which acts as a bridge between the village's government and traditional structures (Surata 2008). Women are not represented within the leadership structure of BAMUS. This was revealed during in-depth interviews in Bali, where one member of the *PKK* said:

> Actually women need to be included in all leadership structures, including BAMUS, because in reality women are going to be involved in all activities and often in very important positions. Because of the lack of representation of women in BAMUS, which coordinates all government and traditional activities, there is often miscommunication and women are forced to forego their own interests (interviewed by Martiningsih 2008)

This statement raises concerns that women's interests will not be accommodated. women's groups are expected to relate to men's groups but the reverse is not true.

However, in North Sulawesi the position of women is already similar to that of men in community activities, problem solving, decision making processes and in opportunities to control the family's economic situation. This situation also emerged in Southern and Central Sulawesi. This is demonstrated by the success of the *PKK* over there, where the women maintain their independence to implement collective programs in managing the plantations, and then encourage the group to be more cautious about the problems and find the solutions without government support. It is crucial to forge the communication between decision-makers at district level with communities, in which the decision makers are expected to be more attentive of the needs and aspirations of poor women, and enhance the understanding of community's rights and obligations. Definitely, women are excellent agents for disseminating information on issues related to health, education and agricultural technologies, all of which are in turn related to food security issues.

Women's Participation and Utilization of Knowledge Transfer

One of the Bali sites is a village in the middle of the main tourist area. The community is heterogonous with almost half of its inhabitants coming originally from an area outside the village (Martiningsih 2008). The majority of people have livelihoods associated with tourism and therefore the community is highly mobile in response to the opportunities in the tourism industry and demands for community obligations. In this village, some economically productive groups are formed but unfortunately they are poorly organized. The formation of groups is based on their common interests and a common location. The groups include the local traders, massages on the beach and handicraft seller. According to one informant, the reason for group formation was to enhance women's opportunities to earn credit from the bank.

Besides the economically productive groups, other groups were formed on the basis of common hobbies such as sport or art. Interestingly, as Martiningsih (2008) explains, all the Balianese women are aware of and concerned about environmental sanitation, particularly in the laneways. This awareness arose from previous experience with the outbreak of dengue fever in the area. Based on that experience the members of the *PKK* in all the *banjar*[2] designed a competition for cleanliness which is judged weekly. Locations are evaluated by members of the *PKK* who have been recognised for their efforts to eradicate dengue fever. Each *banjar* has five groups who undertake a weekly inspection for mosquito larvae in all laneways. Laneway cleaning activities are undertaken independently by the *PKK* under the guidance of the local health clinics. This shows that women already possess the skills to independently manage their local environment and to maintain common facilities. The PNPM program in

[2] Traditional sub-village level organization and the community buildings housing it.

Sulawesi shows also that groups of this kind and *PKK* members can serve as role-models, enhancing women's confidence to follow in their footsteps and take on challenging positions (PNPM 2008).

In another Bali site, a remote rural village, the majority of the community members are farmers. Women are involved in all farming activities, which include seed sprouting, planting, crop maintenance and harvesting through to post harvest. However, women do not participate in training activities provided by the Horticulture Agency covering topics such as pest and plant disease control as they are not included in the formal consultation by the community's agent when visiting the community. It is important for women to understand pest control as they are involved so extensively in farming activities. There is a clear case for the inclusion of women in these training activities based on their significant role in all agricultural activities. However, poverty remains an issue for participation in education and training activities, as women feel constrained to put their time into those activities most likely to produce food or money for the family.

In general, communication between women is frequent, and in-depth interview results showed that women within the villages are very close. This is evidenced by the close relationships between female relatives, friends and others in the community. Their relationships are based on frequent visits to each other's homes, telephone conversations and through postal mail. The importance of the participation of women was also raised in areas where conflict is common, for example in Poso in Central Sulawesi. There, women more often tend to carry out activities related to economic activities and are more likely to 'keep things going' behind the scenes of the public conflict.

Furthermore in transmigration areas,[3] women facilitate useful knowledge transfer between local communities and outsiders' communities in daily activities such as family caretaking and in the technology of agriculture, especially in plantation managing and to solve pests and diseases incursion. However, there were several constraints on women's participation caused by different norms, customs, cultures and perceptions of communities on women's positions in their workplace that could be addressed through more pro-active action from government and NGOs concerned with gender inequity. An example of this approach by The National Community Empowerment Program (PNPM) was to solve this phenomenon first, in an attempt to change the attitudes of male leaders in the villages that limit women's involvement and keep them in their traditional roles. Secondly, this approach attempted to organise the recruitment process and employment procedures to increase the possibility of women being employed. Finally this approach aimed to manage the traditional role of women in community management which encourages women to work in volunteer positions and gives them the opportunities to earn money.

[3] *Transmigrasi* is a government program whose primary aim is to target poor people from high population areas and re-locate them to areas of lower population densities, usually in other Provinces and islands.

Women Empowerment

Capacity Issues

There are some differences in the ways that the communities across the research sites profile their capacity to achieve collective goals. One example of this difference is the success of the women in motivating members of their group to undertake sustainable collective activities such as the successful dengue fever eradication program discussed above. Women in several sites on the other hand, had a higher tendency to undertake individual activities as indicated by the failure of several groups to develop. As one element of social capital, human resources are also very low. The majority of respondents in remote villages only completed high school and most work as farmers. According to Awan (2005), in most cases the income of farmers is insufficient to meet the families' basic needs and the community is then classified as having a poor quality of life. This low level of welfare means that women are fully occupied trying to meet their family's basic needs, leaving them almost no time for group activities. This is in accordance with Collier (1998) who says that social capital emphasizes the close relationship between social capital and human capital. Social capital can overcome opportunistic issues, thereby facilitating collective actions. Women in all sites prefer to implement activities in accordance with the policies of government and village leaders. As a result, women can be said to be passive. This was demonstrated by the failure of women to guide their own collective activities. The ability of individuals to understand their common interests and goals is still very low as noted by Adler and Woo Kwon (1999) who stated that social capital is a public good that encourages individuals to neglect their obligations in maintaining a group, expecting other group members to ensure its continuation.

As a result, women are greatly in need of support to assist them to understand that group processes that work towards common interests, common problems and increase their awareness of the environment are important. Awareness concerning their rights to improve their collective well-being is also important. Suryani (2006) states that there needs to be increased awareness among the women to increase capacity overall. This is important for maintaining cultural identity and harmony, and to improve the lives of the family and the broader community.

The female community members who are better off socio-economically appear more articulate and more capable of independently managing their collective activities. This is demonstrated by the success of the local *PKK* in eradicating mosquito larvae through routine cleaning of local laneways. This has become the basis for improving community capacity including in the area of biodiversity conservation. In addition, work networks in the community have become closer, even though many of the residents originate from outside of the village (BPS 2006). This may be a result of the leadership structure, for example in the Bali site, where they have the slogan *[Name of village] United* which has been a trigger for that village to work and have collective activities to achieve common goals. In another site such as in Gorontalo province, the *Hari Krida Pertanian* program has been implemented, which involved a weekly training and encouragement program to improve pest and diseases management and to achieve their goals *Lumbumg Pangan* (Food Producer Center).

Decision Making

The disparity in the decision making powers between men and women indicates a need for strengthening of women's groups. The formation of strong integrated women's groups will allow increased efforts to improve women's rights for collective development and increased capacity in areas such as agriculture and biodiversity conservation. Flora (2007) describes social capital as the relationship between people and organizations where there is mutual trust and collective action for a shared future, and cooperation for common goals. If this does not occur, it will not be possible to create and maintain healthy ecosystems or a strong economy. Without social capital, cohesion in a community will decrease until the community is not able to organize itself to maintain a reasonable quality of life or sustainable livelihoods (Beeton 2006). According to the World Bank (1998) this is also true of social capital from an institutional perspective as community networks are a product of the political, legal and organizational situation of a community.

Knowledge Transfer

Available data indicates that women in both Bali and Eastern Indonesia (Sulawesi and Papua) have frequent communication between families, between friends and with business colleagues. This regular contact represents an opportunity for women to exchange information. This information sharing is an asset that allows the formation of networks, which in the future may strengthen the ties between members of the community to improve their ability to recognize, understand and overcome problems together. However, so far there is very little discussion about the basic needs for driving collective activities for a common goal. Communication amongst women is still generally limited to discussions about family, tradition and spiritual issues. This social capital should be further strengthened so that this communication can be directed toward addressing community issues and finding solutions together.

Research conducted by Rodda (1993) found that women in the Papuan mangrove forests are able to have a positive impact on the environment in their role as consumers (using the environment for daily needs), educators (able to transfer knowledge) and as communicators (able to pass on and disseminate information to benefit others). From this success, women in Papua have been able to improve the quality of life of their families and disseminate their knowledge regarding the use of forest products to their children and their neighbors. Other significant evidence shows that women in transmigration areas in Sulawesi facilitate a useful transfer of knowledge between local communities and outsiders in many aspects of life such as daily life, caretaking families and also agricultural technology. The members of the provincial branch of the Indonesian Department Agricultural Department agree that this knowledge transfer in transmigration areas, especially in Centre Sulawesi and Keerom Regency in Papua, was important to encourage the awareness of local people about their nature and help them to manage it for improving their livelihoods.

Implications

In order to strengthen the often inherent capacity of women to contribute more to positive biosecurity management, some changes are suggested for government, for the education sector (shown as ‘Academics’ on Fig. 9.4) and for communities, including NGOs.

The government should take real action which accommodates people’s needs, particularly women that can participate in either the domestic or other productive domain. In the domestic domain, women are housewives and contribute to the economy in that way. However, they can also work as civil servants, in the private sector and as farmers. Government could develop an employment strategy to encourage women to enter the productive domain, especially at the regional government level. Broadening the employment base would lead to a more flexible and productive workforce. Women should be included in the policy development group at the regional level. It is widely known that most women in the villages work in the agricultural sector so a responsive government policy concerning women’s need is certainly required. From an interview with the Head of the Agricultural Agency in Timor Tengah Selatan (TTS), the area around Kupang, the capital city of West Timor, it was revealed that:

> Women are more thoughtful and can really help to move things forward. There is a lack of knowledge in regional government on gender equity issues as well as why and how to address them. There are still not enough policies to support gender mainstreaming in implementation (interviewed by Martiningsih 2009)

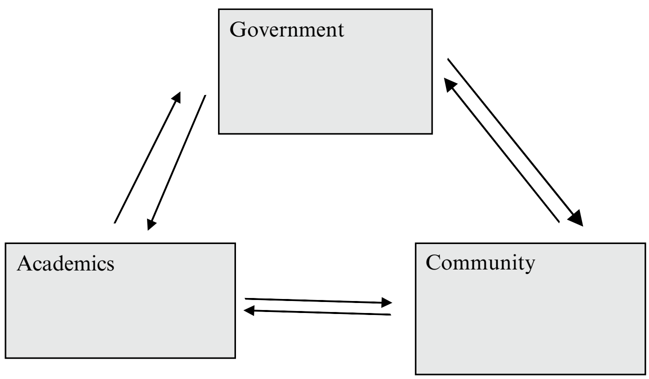

Fig. 9.4 Triangle for community management (Munir 2007)

However, poverty adds another dimension to the difficulties involved in affirmative action programs by government (or NGOs, for that matter). Affirmative action on the part of government is necessary to make systematic progress towards achieving gender equity, so specific initiatives must be included to assist the overcoming of the poverty trap, such as paying for time to attend awareness sessions and training courses. It is clear from Fig. 9.4 that there must be simultaneous cooperation among the three elements, namely government, academics, community such as private sectors and NGOs.

Sustainable socialization from the academic sector concerning gender equity and community empowerment, particularly for people living in the villages that still survive under the poverty line, is also needed. From some interviews undertaken in the research sites, it was found that mentoring and training which had been programmed by the government was often unsustainable. In some cases, there was no follow-up action after the completion of mentoring and training. To avoid such a situation, sustainable mentoring is required so that the community is equipped with the knowledge to overcome their problems. Scheduling, reporting and accountability mechanisms for gender equity implementation strategies are also needed.

Most of this research was carried out in sites where the people have strong cultures and customs. The customary law in most of the research sites treats women differently from men, not having the same rights and opportunities. Women are treated as second class in community membership underneath the shadow of men. To begin addressing this problem, it is necessary to garner strong commitment concerning women's position in the community. The commitment here is to transform cultural norms that have a negative impact on gender relationships, which is sensitive to the impact of religious and cultural values of women's conditions, and pluralism and openness to differences. The ever-present issue to be managed is that exposure to a range of ideas challenges the status quo. These ideas have been derived from women's perspectives (drawn from Western ideas, and also from Indonesian forerunners such as Kartini) and have helped women to see and analyze many of the problems experienced by other Indonesian women (Saparinah 2002). However, as noted earlier in this chapter, moves towards gender equality in Indonesia must recognize women's different personal experiences, which cannot be separated from their cultural background. For gender equity in Indonesia, this must mean negotiating new and culturally grounded meanings of 'equality' that are acceptable according to the principle of equality, to Indonesian women and many cultures in Indonesian contexts.

Increasing access to resources for women is also considered necessary for achieving gender equity, for example a group of women given access to bank credit to develop a new enterprise. Women should be given access to mentoring related to managing agricultural land also. This strategy needs government backing in order to provide greater opportunities for women to participate more actively in the government programs aiming at enhancing women's skills. Women must be given more opportunity to join either formal or informal meetings to share their ideas confidently.

Women should be provided with opportunities to develop greater explicit understanding of their ability and potential in skills acquisition, as well as to empower them in conducting their activities. This will also have the benefit of showing the wider community that they can contribute to the productivity of the community. As a result, they understand that they are able to do things that were previously considered taboo. By taking these steps, confidence and self-image will develop, along with the ability and willingness to build a mutual continuous network with other women's groups.

Conclusions

Women play a large role in collective activities but continue to be in the shadow of men. Through participation in group organisations, women have the ability to improving wellbeing, but this impact is not being maximized and is still undeveloped. The ability and desire for effective communication among women's groups is present and should be used to assist women to have an impact on their local environment to undertake collective activities for achieving common goals in biosecurity management and other areas. Women have the power to improve the strength of their social capital using the seven aspects of social capital as outlined by Flora (2007), increasing participation and action at the community level by identifying and overcoming social, cultural, spiritual and agricultural problems in the community.

According to Suryani (2006), women should not continue to see themselves as victims of inequality. They need to demonstrate to the community that they have abilities equal to those possessed by men. By demonstrating their success in getting an education, running a household and participating in community activities, community members, particularly men, will automatically begin to not only see someone as a 'woman' but as a capable person who can contribute to positive economic and community outcomes.

The structure for women's leadership, the *PKK,* is a means for beginning to empower women at the village levels, to increase understanding of their rights and obligations, to recognize issues, make decisions and overcome community problems together. Efforts should be made to improve and facilitate the existing social capital amongst women, such as the ability to independently undertake collective activities, communication activities and success in forming groups to address common interests, so that these things can develop and become social capital for biosecurity.

It must be recognized that women's roles in collective village activities within traditional and formal leadership have a major influence on the success or failure of these activities. Women have a special role that is not able to be filled by men. Cooperation between women's and men's groups needs to be strengthened to undertake collective activities for the common good. Inequality within the community culture occurs because of the social structure that has developed over many centuries and become unwritten law, which is held and defended as a 'cultural inheritance'. If this culturally ingrained inequality can be redirected in a positive direction such as by strengthening the social capital already possessed by women, it may be used to empower the community's women to better address local issues and overcome problems together, including issues of biosecurity.

References

Adler, P. S., & Woo Kwon, S. (1999). *Social capital: The good, the bad and ugly* [Expanded Paper]. Los Angeles: Marshall School of Business (Academy of management Meeting in Chicago), University of Southern California.

Ardhana, K. (1994). Bali dalam kilasan sejarah dalam dinamika masyarakat dan kebudayaan Bali [Glimpses of Bali in the history of the dynamics of society and culture of Bali]. *Bali Post.* p. 6.

Australian Bureau of Statistics (ABS). (2002). *Social capital and social wellbeing discussion paper*. Retrieved Maret 5, 2007, from http://www.oecd.org/dataoecd/2/30/2360806.pdf.,doakses

Awan, M. A. (2005). *Perbedaan gender di bidang pertanian* [Gender differences in agriculture]. Retrieved Maret 5, 2007, from www.pikiran-rakyat.com/2005

Badan Pusat Statistik (BPS). (2006). *Kabupaten Badung: Kecamatan Kuta dalam angka* [Badung regency: Kuta in numbers].

Beeton, R. S. J. (2006). *Society's forms of capital: Framework for renewing our thinking.* Paper prepared for the 2006 Australian State of the Environment Community, Department of the Environment and Heritage. Retrieved Mei 24, 2007, from http://www.deh.gov.au/soe/2006/emerging/capital/index.html

Collier, P. (1998, November). Social capital and poverty. *World Bank SCI Working Paper*, 4. Retrieved Mei 24, 2007, from www.iris.umd.edu/adass/proj/soccap.asp

Creswell, J. W. (1998). *Qualitative inquiry and research design choosing among five traditions*. Thousand Oaks: Sage.

Dasgupta, P., & Serageldin, I. (2000). *Social capital: A multi faceted perspective*. Washington, DC: World Bank.

Flora, C. (2007). *Community capitals framework*. Presented in the International Summit Community Based of Biosecurity, Sanur, Bali.

Grootaert, C. (1998). *Social capital: The missing link*. Retrieved Mei 24, 2007 from http://www.worldbank.org

Hanson, D., Muller, R., & Durrheim, D. (2006). *Documenting the development of social capital in a community safety promotion coalition using social network analysis*. Retrieved Maret 3, 2007, from http://www.engagingcommunities2005.org/abstracts/hanson-Dale-final.pdf

Hery, C. (2007). Integrated pest control for empowering women farmers. *Leisa Magazine, 23*(4), p. 2–3

Indrayoga, O. K. (2006). *Apa peranan perempuan bali?* [What is the role of Balinese women]. Presented at Lokakarya Nasional Upaya Peningkatan Peranan Perempuan dalam Pengembangan Wirausaha. Retrieved April 15, 2007, from http://www.kompas.com/kompas-cetak/0304/27/utama/28042.htm

Maluccio, A. J., Haddad, L., & May, J. (2003). Social capital and gender in South Africa, 1993–98. In A. Quisumbing (Ed.), *Household decisions, gender and development: A synthesis of recent research*. Washington, DC: International Food Policy Research Institute.

Martiningsih, E. Ni Gst Ag. Gde. (2008). The role of women in community management of biosecurity. *Kritis-Learning Communities, Special Co-publication*, 116–134.

Meinzen-Dick, R., & Zwarteveen, M. (2003). Gender participation in water management: Issues from water users associations in South Asia. In A. Quisumbing (Ed.), *Household decisions, gender and development: A synthesis of recent research*. Washington, DC: International Food Policy Research Institute.

Mien, R. Oe. (2007). The role of women in rural communities in East Nusa Tenggara. In *ACIAR proceeding* (Vol. 106, pp. 116–121). Canberra: Australian Centre for International Agricultural Research.

Moser, C. O. N. (1993). *Gender planning and development theory, practice and training*. London: Routledge.

Munir, M. (2007). Peran *Perguruan Tinggi dalam Pengentasan Kemiskinan: Revitalisasi KKN sebagai Program Pembelajaran Pemberdayaan Masyarakat* [The Role of Higher Education in Poverty Alleviation: Revitalization of CCN as a Learning Programme for Community Empowerment]. Presented at Asian Student Forum Salatiga, 16–17 Agustus 2007.

Nakatani, A. (1997). Private of public: Defining female roles in the Balinese ritual domain. *Southeast Asian Studies, 34*(4), pp. 722–741.
Narayan, D. (2000). Social capital: Implications for development theory, research, and policy. *The World Bank Research Observer, 15*(2), 225–249.
Pearson, R., & Cecile, J. (2000). *Feminist visions of development*: gender, analysis and policy (pp. 1–18). London and New York: Routledge.
Pendit, N. S. (2002). *Bhagavadgita*. Jakarta: Gramedia Pustaka Utama.
Pietra, W. (2006). *Masyarakat kita punya apa?* [What our society has?]. Presented at Modal Sosial, Jakarta.
PNPM (2008). *Gender in community driven development project: Implication for PNPM strategy*. Working paper on the findings of joint donor and government mission.
Putnam, R. D. (2000). *Bowling alone-the collapse and revival of American community*. New York: Simon & Scuster.
Ria, G. (2002). Men, women and community development in East Nusa Tenggara. *Women in Indonesia. Institute of Southeast Asian Studies, Singapore.*
Rodda, A. (1993). *Women and the environment*. London: Zed Books.
Rola-Rubzen, M. F. (1997). *Intrahousehold impacts of government policies in the Philippines*. Armidale: University of New England.
Rola-Rubzen, M. F. (2007). Role of women in rural areas in Asia. In *ACIAR proceeding* (Vol. 126, pp. 122–131). Canberra: Australian Centre for International Agricultural Research.
Roshetko, J. M., Nugraha, E., Tukon, J. C. M., Manurung, G., Fay C., van Noordwijk, M., et al. (2007). Wanatani sebagai matapencaharian tambahan dan pengembangan usaha [Agroforestry as an additional livelihood and enterprise development]. In *ACIAR proceeding* (Vol. 126, pp. 138–148). Canberra: Australian Centre for International Agricultural Research.
Saparinah, S. (2002). Feminism in Indonesia in an International Context. In K. Robinson & S. Bessell (Eds.), *Women in Indonesia; gender, equity and development* (Indonesia Assessment Series). Singapore: Institute of Southeast Asian Studies. p. 80.
Saulnier, C. F. (2000). *Incorporating feminist theory into social work practice: Group work examples*. Boston: Boston University, School of Social Work.
Surata, S. P. K., (2008). Structure and process in facilitating community action in Bali. *Kritis-Learning Communities, Special Co-publication*, 75–89.
Suryani, L. K. (2006). *Apa peranan perempuan Bali?* [What is the role of Balinese women?] Presented at Lokakarya Nasional Upaya Peningkatan Peranan Perempuan dalam Pengembangan Wirausaha. Retrieved April 15, 2007, from http://www.kompas.com/kompas-cetak/0304/27/utama/28042.htm
UN. (2005). *Statistics and indicators on women and men*. New York: United Nations. Retrieved February 8, 2006, from, www.un.org
Untung, K. (2007). *Kebijakan nasional ketahanan hayati* [National policy of biosecurity]. Presented at Workshop Interdisipliner Ketahanan Hayati dan Pengetahuan Asli (Biosecurity and Indigenous Knowledge). Pusat Studi Kawasan Timur Indonesia UKSW, 6 Juli 2007.
WALHI (2007). *Penuhi hak asasi perempuan di dalam pengelolaan sumber daya alam dan pengelolaan lingkungan* [Meet the rights of women in natural resource management and environmental management]. Retrieved Maret 16, 2007, from http://www.walhi.or.id/kampanye/psda
World Bank. (1998). *The initiative on defining, monitoring and measuring social capital* (Overview and Program Description). Washington, DC: Social Development Family, Environmentally and Socially Sustainable Development Network.

Chapter 10
Accessing Local Knowledge to Achieve Economic and Social Sustainability

Marthen L. Ndoen, Ruth Wallace, and Helti Lygia Mampouw

Introduction

Understanding the systems that underlie effective biosecurity surveillance or management in a remote area in Eastern Indonesia supports the design and implementation of a community based biosecurity strategy. The systems that operate are not only the biophysical systems but also the social systems that govern knowledge management and influence behaviour and decision making. On a remote island, the importance of maintaining efficient food production has a direct impact on food availability, particularly when weather patterns make it difficult to import additional food. This chapter reports on a case study that examined the relationship between local knowledge, food production and biosecurity in Rote Island, off West Timor, Indonesia. It finds that food and plant biosecurity are influenced by:

(a) National policy priorities and investment
(b) Shared local knowledge of plant management
(c) Knowledge transfer processes that are managed and reinforced in line with the communities' social, cultural and historical governance structures.

M.L. Ndoen (✉)
Satya Wacana Christian University, Economic Department and Post Graduate Development Studies, Jl. Diponegoro 52–60, Salatiga 50711, Indonesia
e-mail: mndoen@yahoo.com

R. Wallace
Social Partnerships in Learning Research Consortium (SPIL), Charles Darwin University, Darwin, Australia
e-mail: Ruth.Wallace@cdu.edu.au

H.L. Mampouw
Department of Mathematics Education, Satya Wacana Christian University (SWCU), Salatiga, Indonesia
e-mail: h.mampouw@gmail.com

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_10, © Springer Science+Business Media B.V. 2011

(d) The community's shared investment in food and biosecurity
(e) The integrity, knowledge and use of integrated food and biosecurity management practices.

This study identified a number of changes in individual lifestyle and workforce priorities that impact on the transfer and maintenance of the skills and knowledge to engage in food production activities. Local knowledge is not merely restricted to food production and includes the knowledge of local plant diseases and pests. Changes in people's livelihoods have impacted on their food use and production. The viability local plants that have long provided people with their staple food is challenged as the reduction of demand impacts on the readiness of farmers to grow such plants and maintain the species. Changes in remote and regional people's livelihoods have potential impacts on the maintenance of biosecurity management knowledge and practices within regional communities. These biosecurity concerns need to be addressed when ensuring the food security of each community. This chapter examines the knowledge transfer processes related to biosecurity and food security that operate in and across a community undertaking considerable economic and social change. It identifies and discusses the impacts of local knowledge transfer on food security, biosecurity and the engagement of local knowledge in making decisions locally, now and for the future.

From International Policy to the Island of Rote

In Indonesia today, local knowledge is a term that is readily found in a range of journals or newspaper articles, but during Soeharto's New Order rule (1965–1998) was rarely mentioned. During the New Order, the government pursued economic progress to establish Indonesia as part of a modern world, therefore local knowledge was considered unimportant by the regime because it was seen as traditional and anti-modernist. The Indonesian government attempted to locate Indonesia among modern states by pushing economic growth on average by 6–8%, which was applauded by international communities. The World Bank (WB) and International Monetary Fund (IMF) considered Indonesia as a good example for other developing countries in implementing policies designed by these international agencies (Yustika 2005; Tambunan 2006). These international agencies believed that other developing countries would reach similar economic performance if they learned from Indonesia's example of the implementation of economic policies. International communities were impressed by Indonesian economic performance and predicted it would be part of The New Industrialized Countries (NICs) or The Asian Tigers (McVey 1992). The Asian Tigers consisted of a number of countries in East Asia (South Korea, Taiwan, Hong Kong, and Singapore), that in the 1990s showed an impressive economic performance. These goals were not realized as the economic crises of 1998 flattened the Indonesian economy and Indonesia had to consider a new direction (Hill 1999). The impacts of these policies on food and agricultural management have had significant impact on people's livelihoods and food security.

Every policy has its advantages and disadvantages; as central government officers in Jakarta celebrated the success of high economic growth, in the eastern part of the Indonesian archipelago, local people did not benefit from that economic growth to the same degree. Government's economic policies aggravated regional economic differences between Java and several regions in Eastern Indonesia (Hill 1996). Several regions in Java rely on the industrial sector as their main sources of incomes while regions in the eastern part of the archipelago continue to rely on primary sectors as the major sources of income. More and more people in industrialized regions were absorbed into the industrial and manufacturing sectors, while the majority of people in Eastern Indonesia continued to subsist on agriculture as their main source of income.

Following President Soeharto's era, policies were implemented that sought to encourage Indonesia to become self-reliant in food production by growing and consuming rice. Even though these policies were internationally well-recognized, Soeharto used them to boost his power and legitimacy in order to stay in office. The production of rice increased in the 1980s, reducing the price of rice for most people. Rice was available and widely consumed by a majority of the Indonesian people. People changed their diets from local food such as varieties of taro and sago to rice. As a consequence, rice has become the major staple for most urban people, and also in some remote regions. Increased consumption exacerbated the risk that a shortage of rice could lead to regional political instability. For this reason, the national government focused on efforts to provide enough rice for the population. The government also controlled the price of rice to ensure that its cheap labor force, who received minimal remuneration, was able to buy the rice, helping keep a possible food rebellion at bay.

To increase rice production, the government imposed a compulsory rice cultivation policy across the nation. The policy encountered few problems in Java and other western parts of Indonesia, since these regions have plenty of water. There were, however, major problems for several regions in the eastern part of the archipelago as a lack of rainfall made some of these regions unsuitable for rice cultivation. In regions that experienced sufficient rainfall, such as Maluku or Papua for example, the policy faced the additional problem of local people lacking in the knowledge of rice cultivation. The people in these regions collected their food from the sago tree or alternatively, planted corn in dry lands, such as in Timor Island. Knowledge of wetland rice planting is rare among local people in Eastern Indonesia and this lack of knowledge was substituted by transporting Javanese migrants to islands such as Maluku and Papua under the program of transmigration. These migrants then transformed the bare land into wetland rice fields. Biosecurity management was a key issue as local people had an extensive knowledge of pest and disease management for traditional local crops but not for the introduced species of rice. This had significant implications for ensuring optimum levels of food production across different regions.

Local knowledge has been promoted by various non-governmental organizations (NGO's) to encourage the local community to engage in development activities (Yustika 2005). The focus on the role of local knowledge in Indonesia increased after the collapse of the New Order in 1998. Soeharto's government's major focus was on boosting economic growth through a centralistic policy rather than adopting local knowledge as a development strategy. The government implemented identical policies across Indonesia. The government failed to recognize the role of local knowledge in maintaining the livelihood of the local people. In such situations, the local people were mostly passive in response to the government's development program.

The Rote Context

The impact of the development policies of central government, to a certain extent, was felt in Rote Island. Rote is a small island next to Timor, which lies at the most southern part of Indonesia and is considered a remote island in the archipelago. In the past, this island has been neglected by the authorities because it was economically unattractive. The central government paid attention to Rote just recently after they lost the island of Ligitan to Malaysia. The government began protecting border islands like Rote as they were concerned about losing more islands to neighboring countries. Anticipating a foreign claim of Rote, the Indonesian government installed a brigade of marines on the island to guard the border.

Rote was established as its own regency in 2004, whereas before it was part of the regency of Kupang. The population of Rote in 2007 was 109,610 people, who live in eight districts. The total area of Rote Island is about 1,278 km^2 with a population density on the island of 87 people per km^2 (BPS 2008). The capital of Rote is Baa, a small town with a few small shops mostly owned by migrants from South Sulawesi and those of Chinese descent. There are also some Javanese migrants who run food stalls. In general, the modern sector is controlled by migrants, whereas the traditional sector is mainly controlled by local people.

Some areas in Eastern Rote are suitable for wetland rice production, while areas in Western Rote rely on dry land farming. As part of national policy to boost rice production, the Green Revolution was introduced in Rote, in which the national government encouraged the use of chemical fertilizers to increase rice production. Due to its remoteness, the cost of chemical fertilizers is consistently higher in Rote than other regions, which had made the farmers vulnerable to the volatility of the market. The prices were higher than neighboring places like Kupang due to poor transportation facilities, especially during the several months of the west wind season. Previously, local people used organic fertilizers, but they abandoned this practice when chemical fertilizer was introduced. The decision to change fertilizers had mixed results.

On the one hand, it was a sagacious decision to shift from organic fertilizer to chemical fertilizer as instead of producing manure compost that took some time to create, the farmers had readymade chemical fertilizers despite having to spend money on them. These fertilizers were easily obtained and showed an immediate result in enhancing rice production when applied to rice fields. However, on the other hand, the use of chemical fertilizer had an adverse effect on soil quality.

The soil was left barren and in need of additional chemical fertilizers to be productive. Therefore, in order to sustain the production, the farmers increased their use and dependency on chemical fertilizers. This situation is regarded as a *green revolution trap*, in which the farmers consistently increased their use of chemical fertilizers and seeds from external sources as they participated in the government's agricultural green revolution program. As in other parts of Indonesia, the constant use of chemical fertilizer had reshaped the environmental conditions of the region (Fanslow 2007).

In Rote, the majority of indigenous people engage in the agricultural sector as dry land farmers, few engage as small traders and as fishermen, while some were also involved in cultivating seaweed. Seaweed cultivation can be found along most of the shore line of Rote and its cultivation is a common agricultural activity across many islands of Indonesia, conducted by people from another island. There are also some individuals who prefer to work outside their home island as life on this island is very harsh. Some young people, mostly young women, have left the island and migrated as workers to Malaysia, Singapore and Hong Kong, where they earn money to support their families in Rote. This has a significant impact on the maintenance and transference of local knowledge about plant pest and disease management.

There are several plants that are depended on for food security that need protection to maintain sustainable livelihoods for the people of Rote. One plant that plays a major part in the diet of the people from Delha and other parts of Rote is the *lontar* tree (borassus sundaicus) from which a staple of the community is obtained; palm sugar. A *lontar* tree can be harvested for the first time 15 years after planting and can continue to be harvested for around 40 years. Even though the *lontar* tree can be planted elsewhere, most local people in Rote believe that this tree will grow naturally by itself. That is why they only rely on nature for new trees. Since local people do not plant them, the number of trees continues to decline. The old trees are dying out but not being replaced by the new ones. Some informants in Delha expressed concern that one day they might have to import palm sugar if the current situation does not change. *Lontar* trees are not only an income source; they also shape the material cultural of the Rotenese.

Local people collect the sap from the *lontar* tree and convert it into different kinds of products. The juice is boiled to make liquid and solid palm sugar. The liquid palm sugar is widely consumed by the Rotenese as a staple food as well. Liquid palm sugar is still considered by most Rotenese as a major staple in the household. All informants we interviewed revealed that they only felt secure if they had sufficient reserves of liquid palm sugar in storage. Several informants who solely rely on seaweed or fishing as their main sources of income purchase palm juice after they sell their products. In the past, people from Delha brought liquid palm juice to be bartered with rice in the eastern part of Rote. In all, palm sugar has played a major role in Rotenese dietary culture. Even though palm sugar no longer plays a major role in some Rotenese's diet, in the past, the Rotenese considered this product as the main staple. There is a saying that the people of Rote do not eat their meal but drink their meal (Fox 1977). Palm sugar can be referred to as *hunger rescue* in times of food difficulties due to ecological hurdles.

In other parts of Rote, wetland rice is cultivated by local people as these regions have an abundant water supply. This is not the case in Delha. A lack of water means local people in Delha do not plant wetland rice in the region. In the past, people from Delha went elsewhere in Rote to work on rice fields and after harvesting they brought rice home which was considered a luxury item, now almost everyone eats rice. During the 1970s, people in Delha did not have enough money to buy rice as it was an imported item and used to show social status. When local people had some rice they occasionally served it for honored guests or served it at breakfast time as porridge for children. They believed rice was better for improving children's nutritional status. The daily menu for adults consisted of a daily meal based on local ingredients whilst also drinking juice from the *lontar* tree throughout the day.

It is very common for one household on the island to own more than one plot of land and indeed, the average ownership is two to four pieces of land per household. These plots are spread out in different places, with the distances between one plot and another sometimes being as long as 5 km. Local people set up different plots in different places in order to spread the risk of crop failure. The duration of the rainfall season is very short, only about 2–3 months. After that the warm weather lasts the rest of the year. Farmers plant their crops at the same time; otherwise the crops will not be able to maximize water access and do not produce a high enough yield. By planting immediately and simultaneously the farmer can minimize the risk of pest invasion. The pests, such as, birds and monkeys, will eat the crops as they ripen. This approach spreads the risk of crop losses due to pest invasions. This can be referred to as *shared pest burden.* When the invasion takes place, the pest will attack any plant that is unattended. The farmers work together to watch over their crops to guard against pest invasions, sometimes by bringing their dogs to scare the monkeys or the birds away.

Blurred Lines of Labor Division

Gender roles in Eastern Indonesia have an impact on participation in decision making and roles undertaken in biosecurity management, food production, household management and child rearing. The relevant information was managed and shred along gender lines. As Martiningsih (Chap. 9) notes, while men and women both work in agriculture, women tend to work longer hours and are involved in aspects of farming that do not bring in direct cash income; rather their work supports others to generate income. Gondowarsito (2002) in her work has observed a similar situation whereby women engage in tasks that are financially unrecognized.

In general, after the planting season, the women in Rote were in charge of caring for plants, such as weeding the grass or removing any insects that might eat the plants. Such division of labor allowed the women to detect early signs of pests and diseases that attacked the plants. The women attempted to eradicate the pests and diseases employing traditional methods. For example, when encountered with withered plants, they only remove the plants without any further investigation. The problem is that local government ignored local knowledge of plant diseases among women farmers. This was a missed opportunity for the local government as these women could have provided surveillance information for the authorities about the presence of new pests and diseases. Martiningsih (Chap. 9) notes the importance of recognizing women's roles within the traditional and formal leadership structures that have a major influence on the success or failure of these agricultural activities, and that cooperation between women and men's groups needs to be strengthened to undertake collective activities for the common good. By recognizing and working with the strong collectives in a community, there are opportunities to address issues of local impact and overcome biosecurity problems.

In the past on Rote, the division of labor between men and women in the household and on the farm was very clearly defined. There were and continue to be several activities that are considered suitable for men but unsuitable for women. For example, men were supposed to engage in more dangerous activities relating to food production and the women were not allowed to undertake these activities that were considered unsafe for them. For example, activities like tapping the *lontar* tree were done only by men and were unsuitable for women as they might have fallen to the ground when climbing due to the restrictions of the traditional costume that women wear. In the past, the women usually wore a *sarong* (a piece of cloth wound around a woman's waist) for everyday activities, with the *sarong* wrapped tightly around to their waist and legs making it difficult for women to climb a tree. As such, the women's role was to boil palm juice collected from the trees, reducing the liquid to palm sugar.

One of the responsibilities of women is to process the raw ingredients in preparation for cooking. This job is very tiring because some ingredients need a lot of hard work to process. For example, to peel the shell of the sorghum and foxtail millet, the women have to pound the grain causing calluses to form on their hands. The shell of foxtail millet is very hard and each part of the process of pounding the wheat takes about 3 hours. Women are also involved in harvesting, which can take a whole day. Since there are no transport facilities to the field, local people have to carry the yield home, with women usually assigned this task and sometimes carrying produce over considerable distances between the field and house.

The people in Delha preserve palm sugar for future consumption. From each tree a farmer can collect 3 litres of juice per day, so if a man can climb 20 trees twice a day then he can collect 60 litres. The amount of juice in the morning is greater than in the afternoon. In the morning they produce around 2 litres per tree and in the afternoon 1 litre per tree. The juice is then converted into liquid palm sugar, solid palm sugar, *laru* (fermented palm beer), and vinegar. To produce 1 litre of liquid palm sugar they need to boil 5 litres of palm juice. They store some of the product for family consumption, while the rest will be sold in the market.

Boiling palm sugar is mostly done by women at home or in the field. They usually set up a traditional stove with four to five jars made out of clay. The number of jars depends on the *lontar* trees they have. The more trees they have, the more jars that have to be on the furnace. In the morning, the women start boiling palm juice from around 4 o'clock to 7 o'clock. In the afternoon, the women start working from 4 o'clock to 7 o'clock in the evening. But when they have more trees, the women have to work longer hours. The palm juice very easily becomes sour; therefore it has to be boiled under the right conditions in order to generate better quality palm sugar.

Methodology

The Rote case study was conducted in a rural area called Delha that has a strong connection to the utilisation of local knowledge and facilitates the transfer of knowledge of local food across generation and gender. This community is also experiencing rapid change in food production development and food security due to the impact of national policies. The data collection was undertaken using ethnographic techniques of interview and observation with members of the local community. The qualitative analysis of the data was devised to define the relationship between local knowledge and transfer of knowledge that supports the sustainability of the living standards of the locals.

One of the arguments for the utilisation of qualitative research methods is to acquire better quality information or data. One of the main concerns is building rapport with the informants, since a good initial rapport determines the quality of information from an interview (Glesne 1998). During the process of developing rapport the researchers had the opportunity to become familiar with the field and the informants. As one of the researchers comes from Delha and can speak the local dialect, the process of rapport building was undertaken over a short time. The small size of the area also made it easier to built rapport with potential informants. The participants were chosen using snowballing methods to approach the potential informants. Each participant was identified by interviewing one informant and then approaching the next one on the recommendation of the preceding informants. The project commenced with 5 informants and finally concluded by interviewing 30 informants who were engaged in both dry land farming and seaweed farming, or they were engaging in dry land farming in the past and currently engaged only in seaweed. The older and more experienced farmers were able to comment on the process of knowledge change in the community, while the younger generations described their awareness of local knowledge. The sample comprised of an almost equal number of male and female participants.

Interviews were conducted using semi-structured interview techniques and focused on developing a strong rapport with participants and recognising socially and culturally appropriate ways to listen to and record information. Namely the approach valued recognising the importance of adapting interview sessions to people's working lives and preferred ways of communicating. Generally interviews were conducted in the evening after the farmers returned from work, over 1–2 hours, and several visits to the same informants had to be made when more information needed to be gathered. The research team visited the informants' worksites, their farmland or seaweed farm. From these site visits, the process of working was observed, as was the acreage of land under cultivation, the height of the *lontar* trees or the process of planting and weeding the seaweed. All the interviews were transcribed and the results of the analysis were translated.

The following sections outline the findings of the research as they relate to the literature and considerations for future practice in biosecurity and food security management in Rote.

Local Knowledge

In Chap. 4, it was established that 'biosecurity management is the biggest challenge' for governments. To support citrus agricultural development in NTT, the area of crucial concern is to understand ways to bring together shared knowledge of biosecurity in local communities and government agencies in ways that promote partnership for sustainable crop production. Knowledge of local food is still maintained among the adults in Delha. An adult woman was able to explain in detail, food procurement, food preparation and knowledge processes relating to pests and diseases attacking local plants. The same with most adult men we met, who were well informed about local food and could explain about food procurement and knowledge of pests attacking their cultivated plants. For example, the recent outbreaks of the *ais-ais*, a fungus that attacks seaweed crops and poses a severe biosecurity and livelihood threat, was well understood by informants. There are several plants considered by local people as main staples: maize, sorghum, foxtail millet (*feta*) and different kinds of beans. People in Rote prepare these ingredients for different types of cooking. Food is produced locally and provides a subsistence living for the community. These products are produced from the farmland in the region. Almost every household relies on their farmland as a source of food. Those who do not own the land are migrants, but they usually gain permission to work on the local landowner's farm. The farmers have established the use of local knowledge as a survival strategy in harsh natural conditions. They understand the course of the climate, the nature of rainfall and the nature of the soils. The accumulation of local knowledge on these issues shapes their holistic comprehension of the region. This can be referred to as knowledge stock that can be circulated among local people. Based on this knowledge stock the farmers can build strategies to cope with the environment.

It was common to hear a similar narrative of local food from different people all over the island. The narratives of local food were repeated and duplicated across geographical boundaries. Besides Rote, knowledge of local food was also introduced to the Rotenese migrant communities who live outside the island on other islands such as Timor and Flores. People who live on islands such as Sumba and Flores are familiar with the names of Rotenese dishes. Marriage across ethnic line is one explanation to account for the spread of Rotenese dishes. A number of women from Rote are married to the men of different regions. The women introduce Rotenese gastronomy when they move to their husband's homeland. The second reason might be those people who stay for a while in Rote and bring back the knowledge of local dishes to their place of origin. Therefore, the knowledge of local food and the management of biosecurity threats cannot be contained within geographical borders but spreads across ethnic borders in different regions.

Dependency on introduced food has its own problems, specifically the ability of local people to adapt to the price fluctuations of the non-local food or preparing for shortages or absences of the non-local food supply. This study highlights the relationship between local knowledge, transfer of knowledge, and food security in a remote rural area. Food security has become an issue in this part of Indonesia because the transformation of local diet that has taken place might diminish knowledge of local food. This research has identified the value of a small community's knowledge of food security to achieve economic sustainability and enhance local biosecurity. Moreover, the existence of the local plants and efforts to encourage a local plants-based economy is an example of the utilization of seaweed to generate income. The issue for local communities is the impact of change on these communities. Communities face changes in their borders due to tourism, mobile workforces, sources of income generation, changing lifestyles and the roles of different generations of community members. These changes in lifestyle, livelihoods and economic production have impacts on the local communities' capacity to manage biosecurity issues. These include the impact of new biosecurity threats with new industries and the maintenance of knowledge about biosecurity management related to existing industry.

Litaay (Chap. 3) describes local biosecurity knowledge as the collective experiences and practices that guide decisions at local and practical levels about courses of action in managing biosecurity issues and recognizing the role of local knowledge in making decisions related to biosecurity management at all levels. Van der Riet and Boettiger (2009, p. 3), in a study of participatory research, note that acknowledging local knowledge of the research participants is designed to bring about social change that is based on what people know. This approach potentially has a higher success rate because it is designed to enable participants to be less dependent on outside resources and knowledge, thus ensuring greater sustainability. Recognizing participants' knowledge that is brought to any situation, changes the power dynamics within the implementation of biosecurity management approaches. This study focused on understanding local knowledge about food production and its relationship to a range of knowledge processes.

Intergenerational Knowledge Transmission

Knowledge about local food, so far, has been transferred from one generation to the next generation without any problem. The new generations 'learn by doing' from older generations and other community members about seed preservation, planting processes, and food preparation. When the children grow up, they usually help their parents in the field and learn about the plants. Some children are still in school, so they can go to the fields after school. The children will be involved in weeding, planting and harvesting. The children are only allowed to be involved in minor jobs such as weeding the wild grass and keeping away the birds. Although they are involved in minor activities, the children gain knowledge from an early age about the behavior of the plants and how to keep pests away from plants.

When the children grow up, they will have more responsibilities in the fields. The children usually still live with their parents until they marry, but move out of the house as soon as they enter a marriage contract, except for the older son, who can stay with the parents after his marriage. The women usually join their husband's family after they marry. The grown up children will do much of the work in the field. Even when the parents are present, they will serve as supervisors of their children in the field or if they do work, they only do some minor work. Adult's tasks are to clear the bush or to plough the soil. Older people usually are involved in planting seeds and harvesting. By organizing the work this way, the older generations can deliver local and indigenous knowledge to the younger generations.

Oral descriptions are used by local people to transmit local knowledge. Written records of local knowledge are hardly found since most people in this region do not have a written tradition. In a society where writing is not common, people rely more on oral description to deliver their knowledge. Young farmers very often share information with older adults about the problems they encounter in farming activities in order to find solutions. Consequently, the knowledge they have gained from particular sources is shared with other people who might face similar problems. This is the way local people pass on local knowledge across the island.

To preserve local and indigenous knowledge, transfer of knowledge to the next generation is essential for the future of the community. As has been mentioned earlier, knowledge preservation is aimed at maintaining the sustainability of the household economy. The new generation gains skills to maintain their own household needs when they set up their own family. Moreover, the transfer of knowledge to the next generation is intended to maintain the sustainability of the community. The knowledge shared by community members is both explicit and tacit, managed and transferred through strong social capital processes. Tacit knowledge is that which is personal and held in people's heads, while explicit knowledge can be explained and articulated (Sanchez 2004). The role of local community members as knowledge workers is crucial in negotiating the local community structures and priorities.

Knowledge transfer is not merely limited to the planting process, but includes the knowledge about plant pests and diseases. Older generations who have accumulated the local knowledge on these plant pests and diseases will pass it on the future generations. Local people even developed tacit knowledge on local ingredients to get rid of the pests and diseases. The transfer of local and indigenous knowledge might be a problem in the future. The challenge comes from those students who attend the school. The majority of those interviewed did not value local knowledge. Parents have trouble teaching their children because some children are reluctant to learn the knowledge that they consider as traditional or old fashioned. They are not interested in working as farmers but prefer to apply for a job as a civil servant, which they consider essential in ensuring their future. Therefore, education has an impact on the sources of knowledge transfer to students and the value placed on local knowledge. Education has therefore tended to disconnect young children from valuing local farming practices.

Food preparation is mostly undertaken by women. The women in Delha have expertise in different types of cooking with local ingredients. The younger generations gain their knowledge of cooking from older generations through on-site training. The young women see their mothers as role models, especially regarding knowledge of food preparation. Young women help their mothers in the kitchen and learn each type of cooking very early on. Sometimes the young women learn from other women in the community, for example, they exchange recipes through which tacit knowledge that can be passed around from one woman to another.

Tourism's Impact on Biosecurity

For the last 10 years, Delha has been transformed from an ordinary village into a tourist resort. Two famous places that attract tourists are Nemberala and Boa. These two villages have beautiful beaches and waves which are well-known to surfers. Every year a growing number of tourists arrive, most of who stay in Nemberala. Nemberala is favorable because the accommodation is located there. There are two expensive hotels run by foreigners and three cheaper hotels and home stays run by local residents. Local people also rent out some rooms at their house for the tourists. The arrival of tourists has opened an opportunity for local people to set up businesses.

The type of tourism developed in Delha is *residential tourism*. Instead of staying in a hotel, a number of the tourists lease or buy a piece of land from local people to build their own resort. The tourists, so far, live among local people, a sign that social trust has been forged between the tourists and local people. The tourists feel safe to live among local people, the local people are undisturbed by the presence of the tourists. The increasing numbers of residential tourists have grown from the experience of one Australian. As a result, local people have slowly learnt about non-Rotenese habits and become familiar with them. At the same time the tourists have attempted to understand and become familiar with local customs and habits. This cross-cultural learning leads to cultural understanding between two neighboring countries.

The new foreign residents bring new plants from their home country and introduce them to the local people. Local people responded positively to those plants and were not aware of the consequences that these plants might harm local species of the same kind. For example, people in Delha are planting a new kind of chilli brought over by tourists from Australia. Some of the tourists also brought flowering plants over to the region to plant in their new houses. The effect of the new plants cannot be seen in the short time, but has the potential to affect local species of plants. The reverse effect might take place as the tourists bring over local species from Rote to their home countries, in which they might introduce pests and disease to home grown plants. Tourists might bring seeds that remain undetected by the authorities in their home countries, but the possibilities are very small since they will face strict regulations entering their own country. As such, Delha is more prone to foreign pests and diseases incursions than the other way round.

Implications

One of the main findings is that the pressure for household cash and fluctuating income from traditional farming has prompted increasing numbers of farmers to move away from traditional farming to newer income sources such as residential tourism and seaweed farming. This is a rational decision as the farmers cannot rely solely on agricultural products to meet their household's mounting needs. Since the price of farm products are subject to fluctuation, farmers are subjected to irregular earnings and therefore must look for alternative sources of income. Tourism activities and harvesting seaweed promise a better and more stable income as they provide a regular income. Consequently, some of the farmers abandon their farmland and move to activities that grant them with immediate cash.

The change of activities from dry land farming to other income sources such as tourism impacts on the dilution of local food. As people move away from their farmland, the production of local food declines. People still depend on imported food as long as money is available, but when they do not have any cash to buy food household food shortages ensue. When this situation occurs, the future of the food security of this region is at risk and can lead to food insecurity. Food insecurity is characterized as a state in which a community encounters limited or uncertain availability of nutritionally adequate and safe food (Dollahite et al. 2003). Early signs of food insecurity can be recognized when malnutrition is identified among the children in a community.

Food insecurity can also be brought about through insufficient rainfall. Given the hostile climate in this region, local people have few options for growing local plants without adequate precipitation. They have to rely on fast yielding plants such as maize, sorghum, foxtail millet, and different kind of beans, but these crops are only short term solutions with brief plantation periods. As the population in the region increases, it will put additional pressure on already limited resources. Some of the household members will be forced to search for jobs in non-farm sectors. This also contributes to a decreased engagement in the agricultural sector that may lead to food insecurity.

The present study also suggests that there is a shift of diet from the local food to rice in Delha. Instead of consuming local food products like maize, sorghum, foxtail millet, and different kinds of beans, an increasing number of people in this region have moved to rice as a staple. People in this region consider this change as normal, marking a shift in social mobility from traditional to modern society. Since rice is consumed mostly by the higher classes in society, people identify rice with societal status. Given the position of rice as being representative of social status, it serves as social reference for many people in this region.

As mentioned earlier, the consumption of local food in Delha is seasonal and irregular in nature. To cope with food security problems, people still rely on palm sugar as a regular part of their diet. In times of food scarcity people will eat less of the local grain and rely more on palm sugar. The consumption of palm sugar has significantly increased over time even though the region experiences more frequent crop failure. Most people in Rote consider palm sugar as a product that grants their food security. Palm sugar is also part of the cultural discourse: indeed, people from Delha believe that babies begin their existence by drinking palm sugar immediately after their birth.

Overall, people in Delha are vulnerable to food insecurity. Vulnerability is attributed both to a growing dependency on rice that is not produced locally and to diminishing local food. The challenge now is to encourage local people to produce local food. Local food makes important contributions to the local area by improving human nutrition. Staple foods like maize, sorghum and foxtail millet, offer calories but are not rich in protein. Protein comes from beans, meat and fish which can be easily found in Rote. Those products play an important role in ensuring nutritional security of the community.

Another challenge is for the local people to maintain their farming practices and not to lose local and traditional knowledge regarding original plants and their uses, through the use and consumption of local plants harvested by the locals themselves. If farming and the traditional knowledge about it is deliberately fostered and maintained by the locals, then people will have a food security 'stand-by' or back-up in times of shortages. Thus, not only will the return increase the potential for family income by selling excess stock of local foods, but also it is going to help the sustainability of local foods themselves.

One of the reasons local people have shifted to rice is to avoid the difficult work when preparing local food. Technological intervention might be a solution to the negative aspects of local food production. The introduction of a granulator, for example, helps assures continuity of food provision. In addition, normally, harvests are stored in a small room inside the house. If a larger silo was to be built they would have more room to store more of the local harvest, providing greater food security in the future. The next issue is the introduction of new technology to alleviate women from the demanding work of food preparation. Grinding mills are needed to process sorghum and foxtail millet takes a great deal of women's time in food preparation. By introducing such a technology women can save some of their time for other jobs.

Conclusion

The impact of changing lifestyles, food and income production have had impacts on food and biosecurity issues and their management by local communities. The role of social capital was significant in dispersing knowledge of local food among the local people. Local knowledge is needed to grant the sustainability of household economy. Social networks are maintained by the community and assist community members to gain explicit and implicit knowledge of food procurement and food production. Important for managing food security and biosecurity knowledge are the tight social networks within the community that enables its members to maintain and gain new knowledge of pests and diseases that might threaten local plantations.

As trading among regions increases, it also increases the risk of biosecurity threats. Local people are often unaware of biosecurity threats and the impacts on the economic future of the whole community when engaging in the trade of plant products with external regions. Intergenerational knowledge transmission related to responses to those threats provides a basis for long term food security in communities such as those discussed here.

In Delha, the staple food has shifted from local to introduced food. The local communities' staple is primarily made up of beans and corn, whereas the introduced food is rice. The shifting of food consumption itself is triggered by the improved income locals have earned from non-farm sources such as residential tourism and seaweed farming that requires less labor yet produces greater income. The advantages of seaweed in comparison to field plants, among others, are shorter life period and easy-selling process; it renders seaweed then the preferred source of income for the locals. Through seaweed farming locals earn more money which enables a preference for buying rice over local foods. This has a direct impact on future agricultural production and the entrenchment of the *ais-ais* biosecurity threat. The integration of related knowledge about the impacts of changing food production approaches and biosecurity threats needs to be integrated into existing knowledge transfer processes.

The shift in locals' food production to tourism and seaweed cultivation is associated with a new problem: the sustainability of local knowledge. The transfer of local knowledge is hampered by the lessening number of local people engaged in traditional agricultural practices. The fewer number of people working the land means a decreasing number of local plants grown by the locals.

References

BPS Kabupaten Rote Ndao. (2008). *Rote Ndao dalam angka* [Rote Ndao in figures]. Retrieved April 19, 2010, from http://www.ntt-academia.org/files/DDArote2008.pdf

Dollahite, J., Olson, C., & Scott-Pierce, M. (2003). The impact of nutrition education on food insecurity among low-income participants in EFNEP. *Family and Consumer Sciences Research Journal, 32*(2), 127–139.

Fanslow, G. (2007). *Prosperity, pollution, and green revolution*. Retrieved April 4, 2010, from http://beta.irri.org/news/images/stories/ricetoday/6-1/RAE_prosperity%20pollution.pdf

Fox, J. J. (1977). *Harvest of the palm, ecological change in eastern Indonesia*. Cambridge/London: Harvard University Press.

Glesne, C. (1998). *Becoming qualitative researchers, an introduction*. New York: Longman.

Gondowarsito, R. (2002). Men, women, and community development in East Nusa Tenggara. In K. Robinson & S. Besel-Robinson (Eds.), *Women in Indonesia: gender equity and development*. Singapore: ISEAS Press.

Hill, H. (1996). *The Indonesian economy since 1966*. Hongkong: Cambridge University Press.

Hill, H. (1999). *The Indonesian economy in crisis, cause, consequences and lessons*. Singapore: Institute of Southeast Asian Studies.

McVey, R. (Ed.). (1992). *Southeast Asian capitalist*. Ithaca: Cornell University, Southeast Asian Program Publications.

Sanchez, R. (2004). *"Tacit knowledge" versus "explicit knowledge" approaches to knowledge management practice*. Retrieved July 15, 2009, from http://www.synaxx.com/Referenced%20Material/Sanchez%20Tacit%20vs%20Explicit%20Knowledge%202005.pdf

Tambunan, T. (2006). *Perekonomian Indonesia sejak orde lama hingga pasca krisis* [The Indonesian economy from the old order to post-crisis]. Jakarta: Pustaka Quantum.

van der Riet, M., & Boettiger, M. (2009). Shifting research dynamics: Addressing power and maximizing participation through participatory research techniques in participatory research South Africa. *Journal of Psychology, 39*(1), 1–18.

Yustika, A. E. (Ed.). (2005). *Perekonomian Indonesia, deskripsi, preskripsi & kebijakan* [The Indonesian economy, description, prescription & policy]. Malang: Bayumedia Publishing.

Chapter 11
Engaging Biosecurity Workforces Through Mobile Learning and Technologies in Community Management of Biosecurity Research

Ruth Wallace, I Wayan Mudita, and Remi L. Natonis

Introduction

An effective model of community-based management of biosecurity, specifically the management of Emergency Plant Pests (EPP), is underpinned by sound knowledge management processes. As noted by Falk et al. (Chap. 1), the processes include the identification of community structures and resources, developing approaches to work with the community to establish awareness and common problems, negotiating common purposes and the development of practical solutions that weigh and address local, national and global expectations. Local community based knowledge plays a key role in developing effective processes, namely processes that are adopted and that address local issues of national and global significance. The negotiation, collation and representation of knowledge is supported by the identification of appropriate resources to record and represent knowledge as it operates in the range of stakeholders' knowledge systems. The potential of digital technologies to support the representation and transfer of knowledge in a range of ways: audio, visual, written and multimedia, is now well recognized.

R. Wallace (✉)
Social Partnerships in Learning Research Consortium (SPIL),
Charles Darwin University, Darwin, Australia
e-mail: Ruth.Wallace@cdu.edu.au

I W. Mudita
Department of Crop Protection, Universitas Nusa Cendana,
Kupang, East Nusa Tenggara, Indonesia
e-mail: mudita.undana@gmail.com

R.L. Natonis
Department of Agriculture, East Nusa Tenggara, Indonesia
e-mail: remi.natonis@gmail.com

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_11,

Mobile technologies and their associated m-learning processes utilize emerging technologies that have been adopted widely by communities that have previously had limited access to formal knowledge processes. Mobile technologies also provide a medium through which community members can represent their own tacit and explicit knowledge in ways that they find meaningful for their own internal communication and interaction with broader and formal systems. This chapter examines two uses of mobile technologies and learning to recognize and share local knowledge in an Indonesian small farming community in West Timor and with Indigenous people in Northern Australia. The case studies provide a basis to consider the potential of mobile technologies to provide a tool for engaging policy makers, scientists and local people in discussions about knowledge, issues and solutions from many perspectives. The implications for incorporating mobile technologies in community based processes are discussed, with particular reference to the community management of plant biosecurity in remote areas.

Biosecurity and Knowledge Exchange

As noted in Chap. 1, successful eradication of an EPP in large measure depends on the length of time between the initial incursion and its subsequent detection and identification. In this region, regional and remote communities are key drivers in early detection and reduction and management of incursions. In Australia, this means the involvement of Australian Indigenous rangers and other enterprise owners whose cultural, social and economic livelihoods are connected to biosecurity and environmental outcomes, while in Indonesia, this involves local government officers and local communities. The development and verification of a community-based model for the management of EPP incursions and the learning from the research partnership has involved a range of stakeholders. The outcomes of that research are reported in the final chapter of this book. Basically, it has been found that both the associated processes and structures need to be considered in biosecurity management at a community level. The structures include governance structures, organizations, community groups and associations, which need to be mediated by well negotiated and understood processes. An effective model of community management of biosecurity involves identifying the community structures and resources, identifying and working with the community to establish awareness and common problems, identifying a common purpose and developing practical solutions.

Mudita has noted in Chap. 4 that biosecurity management is dependent on involving local communities in the management of the diseases and facilitating governments to provide the necessary information to enable the community to better use their local knowledge for the management of biosecurity. He has found that the decline of citrus in the highlands of West Timor is more a result of inappropriate local government policy than being solely caused by pests and diseases. Local governments continue distributing seedlings for extending citrus planting areas, arguing that every attempt has been made to keep citrus in the region free of pest and disease incursion. Royce (Chap. 5) has found that while the rhetoric around biosecurity management requires a ‘whole of community’ approach, there is very little evidence to suggest that community members or organizations have the capacity to undertake this work. He notes the need to challenge the assumption that any group has equal access to biosecurity related information as distribution methods may not recognize the diverse ways that groups access knowledge based on cultural, linguistic, social, economic and physical attributes. Royce asserts it cannot be presumed that biosecurity information is equally adopted as new knowledge by community members that they are motivated to translate new knowledge into action or that community members have equal access to participate in local decision making processes.

Representations of Knowledge Across Knowledge Systems

Sound knowledge exchange and communication processes provide opportunities for all stakeholders to contribute to and benefit from the knowledge base and its governance. The associated communication strategies need to consider methods that engage local people’s ways of representing and sharing information that provide a basis for two way communication and knowledge building. Community based biosecurity management models include ways to help people communicate effectively to make change happen; this is not about changing people and their culture but the ways people communicate across any points of difference. That is, knowledge management incorporates both explicit and tacit knowledge. Explicit knowledge, (information that can be articulated, recorded in formal documentation that can be shared through formal processes, with the implication that “new knowledge can be created through a structured, managed, scientific learning process” (Sanchez 2005, p. 6). Sanchez (2005) describes tacit knowledge as that which is personal and remains in people’s heads; it recognizes individuals as ‘carriers of knowledge’. An approach to knowledge management recognizes the role of tacit knowledge and seeks to transfer that knowledge to make it explicit when working in partnership. When working across knowledge systems, knowledge workers need a range of processes to share knowledge within its context, in ways that are linked to people’s lives and that support people to be able to implement that knowledge in local decision making processes.

Litaay (Chap. 2) has noted, in his analysis of the policy environment that surrounds biosecurity management, the importance of being able to recognize and incorporate traditional or local knowledge into biosecurity frameworks. The recognition of knowledge across diverse cultural, linguistic, social and physical systems is connected to understanding the underpinning systems that inform and control its use, and production. For example, diverse knowledge systems may have different ways to represent key concepts for that time and place and those representations are negotiated in accordance with the governance structure of that knowledge. This could include visual, audio, written, oral and connected ways of demonstrating a range of knowledge. In Australia:

> (Aboriginal) People use the digital resources in a social context as props or artifacts, in the same way that they would use non-digital resources like paintings, photos, diagrams, ceremonial objects, and of course the land itself and natural phenomena in talking about and representing themselves and their histories, and making agreements … the use of Aboriginal digital resources is serious business, making claims about ownership, about rights and responsibilities, and appropriate behavior. In these cases the ways that the resources are identified and validated, the way they are accessed and displayed and the ways assemblages are put together and used in context, is a crucial part of the knowledge production process, and negotiations over resources. (Christie 2007, pp. 2–3)

Further Christie (2006, p. 83) discussed the influence of "Aboriginal knowledge and theories and practices" the use of digital technologies is not predefined but develops in relation to the context and use: "they are reinvented and configured in response to agenda arising from the context" and are only useful when "revived in new contexts of knowledge production in active, creative, situated negotiated encounters".

Falk and Golding (1999) note the impact of relationships and learning support networks for learners in regional communities and the importance of social activity through interpersonal relationships, group learning, trust and credibility in facilitating communication flow to achieve outcomes at the local level. Kahn and Kellner (2006) comment on the need to use ICT (information and communication technologies) referring to the competing interests and lack of consensus about knowledge systems and practices involved in ICT literacies and the institutional forms in which it is represented or represents knowledge. If used with an awareness of the critiques, the many and connected forms of ICTs provide opportunities to accurately represent, share, work across and with diverse knowledge systems.

Gee (2004) asserts that people learn better through embodied processes, where content is related to activities, discussion and sharing ideas. Embodied knowledge is embedded in educational systems' elements and interactions (Sharples et al. 2007). Through these interactions and experiences related to specific contexts, people learn and become partners in creating ways of understanding those elements in that context. The interactions related to learning create connections that are mediated through communities of common interest, that may be connected through m-learning processes across regional, social and workplace boundaries, just to name a few. Gee (2003) describes the communities of learners as affinity groups that form around a common endeavor first and secondarily. Concerning socio-cultural connections, their knowledge is holistic rather than separated into specific, narrow disciplines and incorporates intensive, deep knowledge about matters of importance to the community. Community engagement processes, including those in community development and agricultural extension programs benefit from approaches to knowledge transfer that promote active participation and negotiation by all stakeholders. Those processes are supported by finding ways to recognize and examine old and new ways of understanding common issues and approaches.

Mobile Learning and Technologies

The integration of mobile technologies, for example mobile phones and MP3 players, into a broad range of communities has been rapid and extensive. Historically, many of these communities have had limited access to digital technologies for work or learning purposes:

> Digital technologies create new possibilities for how people relate to each other, how knowledge is defined in negotiation between actors and changes our conception of learning environments in which actors make meaning. (Erstad 2008, p. 181)

Portable, accessible mobile learning devices and software provide the powerful tools for people to share and interpret their knowledge in ways that are meaningful to them rather than only in relation to curriculum based contexts. They incorporate ways of presenting ideas in visual, audio and written forms, and for people at basic entry level of skill and technology to remix those forms as they understand it.

The uses of technology have developed with the technological advances and, as Kress and Pachler (2007) note, the incorporation of a range of devices into many peoples' social and cultural practices has followed. Consider the impact of changes in battery size, voice recognition, touch screens, digital photographs and being able to beam files on your use of use of mobile technologies. The use of mobile technologies for knowledge management like education, has been described in terms of the mobile devices and software used in learning, tools that are available for immediate interaction in educational settings without physical restrictions; tools that are personal and pervasive (Kukulska-Hulme 2005). Physical restraints continue to impact on their use, such as the impact of battery life or being out of range of telecommunication services.

As mobile technology is increasingly integrated into daily life, people's expectations of their capacity to be available, and fully functioning increases (or tolerance of being non-functional deceases). Mobile technologies' use is being integrated into social and cultural practices of a range of societies. Mobile technologies include digital media in common use such as digital cameras, audio recorders, mobile telephones, personal media devices (such as iPods), laptop computers, smart phones, personal digital assistants (PDAs), SMS (Short Message Service) text messaging (Kukulska-Hulme 2005) wireless modems, and through sharing audio, visual and text files. M-learning utilizes these devices to support learning experiences. These core platforms are often enhanced by location-sensing functionality such as the Global Positioning System (GPS), video, audio and image capture and playback functionality. M-learning also includes digital cameras and using devices (such as PDA's) to improve data entry functionality. The core platforms extends beyond a techno centric view of mobile learning connected to a specific technology and considers the ways mobile technologies impact on learning experiences (Kukulska-Hulme and Traxler 2007, p. 181).

Haythornthwaite (2007) notes that the digital divide (related to the access to and competence in use of a range of technologies like computers and high speed internet) impacts on communities' access and therefore their engagement in e-learning (including m-learning). The digital divide can be described in terms of income, education, school connections, occupation, ethnicity, region and life stage. Mobile technologies and their use may provide a tool to address the boundaries that are educational and social results of the digital divide. The use of mobile technologies has extended rapidly across a wide range of communities around the globe; including communities that have limited access to computer technologies.

People can access, capture, interpret, remix and present information about their own and other's worlds in multimedia formats. They can use their own devices to participate in the production and sharing of resources about their own lives without being restricted by extensive and expensive infrastructure. The opportunities for engagement of a range of people whose distance from major centres, economic realities or language background differ from the mainstream and have limited opportunities should not be underestimated. M-learning (learning that utilizes mobile technologies) tools extend the ways information can be collected, formatted, mixed and shared, particularly as learners can use readily available technologies in socially approved and recognized ways. For example, young people taking photographs with mobile phones, creating digital stories about their lives or recording elders' oral histories:

> Digital tools create new possibilities for getting access to information, for producing sharing and reusing… The main point is more and more people in our culture can take part in these remixing activities; not only elite or specific groups. Everyone engages in remix in this general sense of the idea…what is needed is, of course, the impact of digital technologies. The possibilities of remixing all kinds of textual expressions and artifacts have thereby changed. (Erstad 2008, pp. 185)

Beetham (2007) notes that technologies should not be included in learning situations without understanding participants' competence and confidence in using technologies and ideally extend that competence to build bridges to learning new skills and knowledge. The ways people learn is based on reflecting on their own cultural models of the world that do not denigrate their identities, social connections and strengths, and then to contrast them to new models (Gee 2003):

> Contrary to trends in the developed world, where the PC and Internet-connectivity is almost ubiquitous, mobile phones are currently the most important networked knowledge exchange technology used in the developing world. From a developing country perspective, features such as limited or no dependence on permanent electricity supply, easy maintenance, easy to use audio and text interfaces and the affordability of these devices are critical for mobile technology in education. (van den Berg et al. 2008, pp. 290–231)

Africa is a case in point, where mobile technologies have been adopted in areas where the general lack of infrastructure, regular electricity supply, access to networks and technical support has previously restricted access to many communication technologies whereas the affordability and easy to use interface of mobile technologies, particularly mobile phones has provided opportunities for access (Traxler and Leach 2006; Botha and Ford 2008). This rapid adoption would seem to indicate that people in infrastructure-poor and disenfranchised communities have found mobile technologies to be valuable in their lives.

Mobile technologies are frequently connected to people's lives, are used for people's own purposes for recording and communicating information. These uses of mobile technologies focus on making meaning and connection beyond the educational to the social. Mobile devices are characterized by potential for making connections through spontaneous collaboration and communication, location focused information, being readily available, beaming information between devices and providing portable means of collecting and sharing audio and visual information (Kukulska-Hulme and Traxler 2005). Mobile devices provide opportunities for a wider group of people to create and share new forms of information using multimedia forms for their own purposes. Some examples are collecting videos on a mobile phone, creating a digital story, responding to an automated bill by text message or a wedding invitation by MMS (Multimedia Messaging Service).

The use of mobile technologies in learning environments has been integrated into formal educational contexts to enhance the communication of knowledge and development of ideas between learners, experts and their peers:

> The mobile learning community has demonstrated that it can (t)ake learning to individuals, communities and countries that were previously too remote, socially or geographically, for other educational initiatives. (Traxler 2008, p. 9)

Access to mobile technologies and m-learning pedagogies can provide learners (including teachers) with meaningful, context driven ways to introduce and share their knowledge and worlds. Mobile technologies are being used to improve plant biosecurity management by Indigenous rangers in remote communities. The itracker and Cybertracker system being deployed by the North Australian Indigenous Land and Sea Management Alliance are a robust PDA and software that supports rangers to collect accurate data using a sequence of customised questions that are recorded in a spreadsheet and displayed by map. These are supported by images to confirm identification of plant incursions. Indigenous rangers involved in the CRCNPB project are using digital cameras, laptops and headsets to record their knowledge and skills related to surveillance and management of plant biosecurity incursions. These are being used to develop training materials that use local language, contexts and people to demonstrate the skills and demonstrate the competence of rangers involved in learning activities. The videos developed by rangers while working in the field are being shared across communities to increase awareness of new biosecurity threats and management strategies as DVDs, videos on mobile devices and advertisements on the local broadcasting network.

As mobile technologies and their uses are products of and a part of social and cultural practices, the issues related to social purpose are worth considering in developing their use for educational purposes such as m-learning. Field (2005, pp. 115–116) discusses the impact of emerging technologies on social capital, the trust and reciprocal relationships between people in society and the development of communities and places in cyberspace, "… where people actively construct their identities as parts of wider sets of shared relationships". The use of m-learning approaches presents opportunities to engage with a range of knowledge sets, constructs and contexts beyond those found in many formal or desk based educational settings.

This might include representations of knowledge as constructed by different social and cultural constructs such as multimedia based representations of diverse home life and belief systems. Through educational experiences, learners can use m-learning to make connections between learners' worlds, make unfamiliar contexts more accessible and create ways of interpreting knowledge that reflect different ways of knowing.

The focus on developing m-learning to meet disenfranchised learners' needs is based on more than the provision of technology. In a study of issues around the digital divide in a remote desert Australian Indigenous community, Sawyer (2004) found that, although technology and infrastructure issues were addressed, key issues of pedagogy, teacher skills and institutional barriers remained (Boyle and Wallace 2008). The related pedagogical issues of m-learning are keys in optimizing the use of mobile technologies in learning. M-learning tools and material have been used in conjunction with a range of software and content management systems. These include system wide mandated systems such as Blackboard, or with freely available software and open source programs that provide access to instant messaging, emails, SMS text messages, Web 2.0, digital stories, voicethreads, scrapbooking, social networking, audio recording and m-portfolios. The challenge, then, is utilizing mobile phones (and other technologies) pragmatically rather than trying to replicate desktop computer functionalities (Botha et al. 2008, pp. 44).

Mobile Technologies in Action

These vignettes provide contexts in which to examine the use of mobile technologies in research, education and information exchange in remote communities in Northern Australia and Eastern Indonesia. They are not meant to be representative, rather they provide examples so that the potential of emerging technologies can be illustrated and examined.

Vignette 1. West Timor Farmers' Identification of Citrus Plant Pests and Diseases

A research project currently being undertaken in West Timor, Indonesia, is using mobile technologies to obtain information from rural community members about pests and diseases that could threaten citrus production and income for small farmers. The research partners identified that people possessed considerable knowledge about plant pests and diseases but there was no means of collecting the data – no individual or organization to report to or access to collated information that farmers could access on a broader scale, such as market price information that could guide their own decisions regarding selling times and prices. Government officials, on the other hand, don't have the networks or resources, such as computers or sufficient numbers of government officials in the field, to collect and manage the relevant information.

The need to share information and make informed decisions was not being met. In Chap. 4, Mudita outlines the context for citrus farmers in West Timor and the need for developing strategies to communicate effectively across borders: the physical and the social. The physical borders in this situation include distance, communication infrastructure and regular access to uninterrupted electricity. The social borders relate to the interactions between local farmers (private and government), the various levels of agriculture, government and non-government agencies and researchers that focus on identification and management of pest disease. This work identified the need to cross manage these borders through mobile technologies, in conjunction with an approach to partnerships based on strong relationships and communication. The use of mobile technologies for the purpose of providing local communities access for their knowledge to be recognized and effectively used for pest and diseases scouting is now being prepared by a team led by Natonis (2009).

Mobile phones are being used to report the incidences of citrus pests and diseases and the sites to the research team who enter the information into a GIS system. The data is then used to analyze the patterns of incidence of the range of pests and diseases that are both officially recognized and not officially recognized. The mapping can be used for decision making by researchers and farmers about which are the most prevalent or important diseases in that region and their locations. Mobile technologies have provided a better way to collect information than relying on government officials to regularly visit each farm across remote areas and collect accurate data by field observations. This approach is reliant on establishing an agreement about who owns or has access to a mobile phone and is able to send an SMS notification, and the research team is still developing that system. The results of the analysis of the GIS data will be reported to farmers, community organizations, government representatives, ministries and researchers to assist in developing more accurate information sets and responses to the incidence of a particular disease or population density of a particular pest. Incidence reporting by people who are daily in the field assists in identifying the importance of a particular outbreak and related conditions of the citrus crops.

The people involved in farming communities have a low level of access to, and experience of technology. The technology that is ubiquitous is the mobile telephone as it requires a relatively low level of infrastructure commitment, in comparison to other mobile technologies. Every district in Indonesia now has access to the TELKOMSEL network which is provided by a series of towers to make good connectivity possible. The majority of people either own or have access to a mobile telephone. In the participating communities, the village head and people working in administrative roles have mobile telephones. The majority of people would access these phones generally for staying in touch rather than for activities related to improving productivity. The researchers are developing expertise in using GIS systems to analyze and report the outcomes. In this partnership, it is not expected that local farmers will be using the GIS system. This project used this existing competence and confidence to build a bridge to new knowledge, using the mobile telephone communication network to improve productivity for small crop farmers.

Vignette 2. Working from Our Strengths – Recognizing and Building Literacy Through the Training and Assessment Competencies

This vignette reports an aspect of a project built on the work of Indigenous enterprise operators across Northern Australia to develop effective strategies to ensure relevant, quality training and qualifications are implemented that support economic independence and knowledge management at a local and national level. Funded by the Australian Government Department of Education, Science and Training, the project used e-learning tools and technologies to support Indigenous enterprise operators who needed to map the development of a training plan with their current and potential staff. The processes recognized the knowledge that is developed and owned by that enterprise and establishes opportunities for leading e-learning training for Indigenous people involved in enterprise training. Established Indigenous tourism enterprise operators and staff from a range of Indigenous businesses participated. Participants undertook recognition of prior learning (RPL) and current competence (RCC) processes that reflect the work undertaken in locally based enterprises and Aboriginal businesses using digital photographs, videos and stories, m-portfolios and web-based conferencing. The final product outlined the process for developing a training plan with an Indigenous enterprise team, ways to use m-tools to collect evidence and examples of successful e-applications for RPL and training plans.

While the project started by considering a range of e-learning approaches, m-learning strategies and resources were found to be most useful. The projects were based in remote Indigenous communities and were best managed by collecting and organizing information with people, while they were involved in relevant work-based and learning activities. In low ICT infrastructure and support environments, it was beneficial not to rely on complicated technology and use approaches that can work anywhere, anytime. M-learning approaches, such as using laptops and cameras were less intrusive and already integrated into people's daily lives, even if they were not used regularly by participants. M-learning based evidence collection strategies ranged from making digital stories and audio files to collating images and texts from various sources. Once these were accepted by students as viable, people identified a broad range of ways to collect evidence. Of particular benefit were peer teams who collected evidence for each other in their own workplace contexts and then reflected on the images and recordings before remixing the information to be presented to the assessor.

The learning and evidence collection strategies were a part of people's lives and accepted, and simply created different ways to think about what is involved in learning and what counts for assessment. This encouraged people to focus on what they can do and how to document and communicate it so others could recognize those skills and competences. Learners also noted the empowerment they experienced by being involved in a learning process that included their worlds, working from their own strengths in managing information and including more than text based ways of making connections. Assessors found alternative ways of recognizing students' knowledge, strengths and potential points for connection to feed into the assessment process.

Key Themes and Implications

Mobile technologies that utilize existing infrastructure reduce the reliance on expensive and site specific connection technologies that are also high maintenance, such as satellites, wireless connections or laptop networks. Accessing SMS and digital cameras embedded in mobile telephones which are cheap and readily accessible, supports individuals' engagement in communication networks. That the technology is in people's pockets while they are engaged in daily work and learning activities increases the connectivity between that knowledge and people's own worlds. SMS and user familiar technologies are simple and cheap. They utilize language that is familiar and draws on simple language in people's own dialects. The images are of people's own worlds, representing people's experience accurately, providing a window to often unrecognized competence and realities. The information is shared in two ways that reciprocate the accountability to local communities and broader systems. One challenge is to ensure the ways information is shared back to community members retains its authenticity, accuracy and simple language or images.

The effective integration of mobile technologies including Geographic Information Systems (GIS) into community management processes is a tool in itself for improving biosecurity management such as for citrus farming as reported here, particularly for detection and decision-making. Members of local communities who have mobile phones and are willing to voluntarily participate have the opportunity to participate in knowledge transfer processes across geographic, language and knowledge borders. In this way, the coverage of detection will be much improved since mobile communication will solve problems associated with difficult access and lack of staff. Decisions about pest and disease detection and management are becoming easier to make with the advent of computerization, and it is therefore easier to present a range of concepts to ordinary people, through the use of visual representations by means of maps and graphs.

Mobile technologies provide access for the communities to information about citrus pests and diseases from a greater diversity of information sources, not only from one source, such as local governments or systems. The greater diversity of information sources facilitate a better learning process for community members to understand not only the pests and diseases they deal with but more importantly the consequences of pest and disease outbreaks to the economy of their households and local communities. It also has potential to open up networks of information on markets and prices, allowing a degree of empowerment for farmer autonomy.

Mobile technologies' integration into work lives provides a means to convince local governments to value the importance of community participation and to start working in a participatory way with members of local communities. Despite laws and regulations that require the importance of participatory work in dealing with biosecurity management [e.g. Act No. 12 (1992) concerning Crop Cultivation System and Government Regulation No. 6 (1995) concerning Crop Protection], local governments do not yet have a framework for how to make it work in a real field situation. Thus integrated mobile communication and GIS mapping provide a way to achieve the biosecurity knowledge framework.

The social contracts that manage the associated knowledge processes need to be negotiated in ways that recognize community based governance structures and the expectations of those who are collecting, assessing, analyzing and reporting relevant information. This social contract might include differentiated roles for all participants. If so, the important issue is how the partnerships involved in using mobile technologies and managing knowledge are negotiated, understood and adhered to.

Mobile technologies have provided a tool for people to represent and explore knowledge in people's own languages, with the images of community contexts: workplaces, farms and natural heritage areas. The images and information provide manageable files to share with peers and experts to identify pests and diseases, approaches to their management, and reporting of the incidence. Rather than being the last person at the end of a communication chain, community people can use mobile technologies to engage in knowledge management with diverse people and systems. The knowledge and its representations is then, in part, owned by and connected to the producer, rather than being imposed externally. This has the potential to increase its effectiveness in introducing plant biosecurity measures and knowledge.

The development of processes, through mobile technologies, to capture, share and remix images, sounds and videos in informative and engaging ways offers a forum for gaining an appreciation of diverse forms of knowledge about plant biosecurity and its management. For policy makers, there is an opportunity to negotiate with local workforces about their communities' futures. Local community members have a powerful avenue for being proactive and inserting themselves into the discussions about biosecurity management. Information is shared through handheld devices by SMS, MMS and Bluetooth at the instigation of the stakeholders, rather than by being directed through external means. This changes the basis for relationships around knowledge and emphasizes the value of recording information in a shared and protected system.

Conclusion

The use of mobile technologies in work and learning contexts has demonstrated the potential that exists in incorporating new technologies to support community activities. The use of mobile technologies is of particular interest as they are already embedded in people's daily lives and practices. People who have been traditionally excluded from established institutional knowledge management systems may be distrustful of using institutional resources. The challenge is to identify approaches that are engaging and encourage people to participate in knowledge exchange for common purposes – purposes that are locally prioritized and valued.

By utilizing existing and embedded mobile technologies, the m-learning process does not impose a technology, rather it utilizes accepted technologies to build bridges to a wider range of knowledge systems and ensure local people are an essential and sustainable part of knowledge transfer processes. An investment in this brokerage role is a crucial part of using mobile technology and m-learning. Effective processes, then, value and build on individuals' strengths and knowledge. Using mobile telephones, people are already expert in the use of the technologies and are extending their use to a new purpose, reducing anxiety about using new technologies. Learning is then scaffolded from existing purposes to new purposes. The use of advances in technologies in knowledge management, recognition and learning are bringing new trends in learning and knowledge transfer in a range of often unrecognized workplaces. Our concern is the need to improve formal recognition processes to support the acceptance of digital information and sound processes to incorporate a range of information into formal systems.

References

Beetham, H. (2007). An approach to learning activity design. In H. Beetham & R. R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: Designing and delivering e-learning*. Oxon: Routledge.

Botha, A., & Ford, M. (2008). *"Digital life skills" for the young and mobile "digital citizens"*. In Proceedings of the mLearn 2008 conference: The bridge from text to context, Wolverhampton.

Botha, A., Traxler, J., & Ford, M. (2008). *MobilED: A tool by any other name*. In Proceedings of the mLearn 2008 conference: The bridge from text to context, Ironbridge.

Boyle, A., & Wallace, R. (2008). *The role of e-learning in 'holistic' approaches to VET in remote Australian Indigenous contexts*. In Proceedings of the 2008 AVETRA conference, Adelaide.

Christie, M. (2006). Traditional research and aboriginal knowledge. *Australian Journal of Indigenous Education, 35*, 78–98.

Christie, M. (2007). Fracturing the skeleton of principle: Australian law, aboriginal law, and digital technology. In *Learning communities: International journal of learning in social contexts*. Darwin: Charles Darwin University.

Erstad, O. (2008). Trajectories of remixing: Digital literacies, media production, and schooling. In C. Lankshear & M. Knobel (Eds.), *Digital literacies* (pp. 177–202). New York: Peter Lang Publishing.

Falk, I., & Golding, B. (1999). A view from the centre: Equity and VET in regional Australia. *Training Agenda: A Journal of Vocational Education and Training*. Burwood: NSW Department of Education and Training.

Field, J. (2005). *Social capital and lifelong learning*. Bristol: The Policy Press.

Gee, J. P. (2003). What video games have to teach us about learning and literacy. New York: Palgrave, Macmillan.

Gee, J. P. (2004). Situated language and learning: A critique of traditional schooling. New York: Routledge.

Haythornthwaite, C. (2007). Digital divide and e-learning. In R. Andrews & C. Haythornthwaite (Eds.), *The sage handbook of e-learning research* (pp. 97–118). London: Sage.

Kahn, R., & Kellner, D. (2006). A multiple literacies approach. In J. Dakers (Ed.), *Defining technological literacy: Towards and epistemological framework.* Palgrave

Kress, G., & Pachler, N. (2007). Thinking about the ‘m’ in m-learning. In N. Pachler (Ed.), *Mobile learning: Towards a research agenda*. London: WLE Centre, IoE.

Kukulska-Hulme, A. (2005). Introduction. In A. Kukulska-Hulme & J. Traxler (Eds.), *Mobile learning: A handbook for educators and trainers* (pp. 1–6). Oxon: Routledge.

Kukulska-Hulme, A., & Traxler, J. (2005). Mobile teaching and learning. In A. Kukulska-Hulme & J. Traxler (Eds.), *Mobile learning: A handbook for educators and trainers* (pp. 25–44). Oxon: Routledge.

Kukulska-Hulme, A., & Traxler, J. (2007). Designing for mobile and wireless learning. In H. Beetham & R. R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: Designing and delivering e-learning*. Oxon: Routledge.

Natonis, R. (2009). *Pengembangan model deteksi dan peringatan dini dalam pengelolaan ketahanan hayati jeruk secara participatory melalui pemanfaatan teknologi komunikasi seluler dan sistem informasi geografis* [Model development in the early detection and warning for biosecurity management through utilization of citrus in participatory cellular communication technology and geographic informatioanal system]. Unpublished Sarjana thesis, Nusa Cendana University, Kupang

Sanchez, R. (2005). “Tacit knowledge” versus “explicit knowledge”: Approaches to knowledge management practice. In *Handbook on the knowledge economy* (pp. 191–203). Cheltenham/Northampton: Elgar.

Sawyer, G. (2004). Closing the digital divide: Increasing education and training opportunities for indigenous students in remote areas. In *New practices in flexible learning. Australian flexible learning framework*. Brisbane: ANTA.

Sharples, M., Taylor, J., & Vavoula, G. (2007). A theory of learning for the mobile age. In R. Andrews & C. Haythornthwaite (Eds.), *The Sage handbook of E-learning research* (pp. 221–247). London: Sage.

Traxler, J. (2008). *From text to context*. In *Proceedings of the mLearn 2008 conference: The bridge from text to context*, Wolverhampton.

Traxler, J., & Leach, J. (2006). *Innovative and sustainable mobile learning in Africa.* Paper presented at the Fourth IEEE International Workshop on Wireless, Mobile and Ubiquitous Technology in Education (ICHIT’06), Athens.

van den Berg, M., Botha, A., Chris Krause, C., Tolmay, C. J. P., & van Zyl, P. (2008). *MobilED: A step backwards to look ahead*. In Proceedings of the mLearn 2008 conference: The bridge from text to context, Wolverhampton.

Part IV
Conclusion

Chapter 12
A Strategy for Managing Biosecurity Across Borders

Ian Falk, Ruth Wallace, Marthen L. Ndoen, Sang Putu Kaler Surata, Paul Royce, I Wayan Mudita, Ni Gusti Agung Gede Eka Martiningsih, Theofransus Litaay, Helti Lygia Mampouw, I. Gusti Agung Sri Rwa Jayantini, and Remi L. Natonis

Borders

In a region of the world as diverse as that encompassed here, it is not surprising that we find examples of all kinds of borders with all kinds of issues about their management. Identified in the various chapters, first by Mudita (Chap. 4), are physical as well as social borders. The management of biosecurity operates on the assumption that

I. Falk (✉)
School of Education, Faculty of Law Education Business and Arts, Charles Darwin University, Darwin, Australia

Cooperative Research Centre for National Plant Biosecurity, Canberra, Australia
e-mail: Ian.Falk@cdu.edu.au

R. Wallace
Social Partnerships in Learning Research Consortium (SPIL), Charles Darwin University, Darwin, Australia
e-mail: Ruth.Wallace@cdu.edu.au

M.L. Ndoen
Satya Wacana Christian University, Economic and Development Post-Graduate Development Studies, Jl. Diponegoro 52–60, Salatiga 50711, Indonesia
e-mail: mndoen@yahoo.com

S.P.K. Surata
Department of Biology Education, University of Mahasaraswati, Denpasar, Bali, Indonesia

Environmental Management and Regional Planning, Universitas Mahasaraswati, Denpasar, Indonesia
e-mail: suratak@yahoo.com

P. Royce
Cooperative Research Centre, Canberra, Australia

Charles Darwin University, Darwin, Australia
e-mail: Paul.Royce@cdu.edu.au

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0_12,

people's behavior can and should be changed. There are therefore two dimensions to the scholarly work underlying change processes across borders that need to be addressed as this research progresses. If it is assumed people *can* change their behavior, there is a clear strategic dimension of the research, whereby aspects of change at individual, community and policy levels are desired by someone or some group for some purpose. If, on the other hand it is assumed people *should* change, this implicates an ethical and methodological dimension, since the justification for assuming the right to intervene (Fox et al. 2009) in people's lives involves both an ethical question, situated in time and culture (Simons and Usher 2000), as well as a methodological one (for example Christie 2006), in that 'intervention' involves a process of engagement with participants.

In the science of ecology, an 'ecotone' (for example Terrell-Nield 1986) is a boundary; it is a boundary forming a transition area between two adjacent but different natural ecosystems, such as forest and grassland, land and sea. An ecotone is a boundary zone that provides for and fosters an increased supply of energy in the form of sunshine, nutrients, water and so on that supports diverse plants and animals. An ecotone supports a greater than usual diversity of species. That is, in bringing together two ecological zones, plant and animal activity is produced in excess of the sum of the two parts. This is called the 'edge effect'. In the social science projects forming the body of the work in this book, the concept of ecotone has been explored through the equivalent concept of 'border' in the sense of a border as not only physical borders separating geographical areas, but also as social

I W. Mudita
University of Nusa Cendana, Kupang, East Nusa Tenggara, Indonesia
e-mail: mudita.undana@gmail.com

N.G.A.G.E. Martiningsih
Women Study Centre, University of Mahasaraswati, Denpasar, Bali, Indonesia
e-mail: ekamtbn@yahoo.co.id

T. Litaay
Faculty of Law, Satya Wacana Christian University (SWCU), Salatiga, Central Java, Indonesia
e-mail: theolitaay@gmail.com

H.L. Mampouw
Department of Mathematics Education, Satya Wacana Christian University (SWCU), Salatiga, Indonesia
e-mail: h.mampouw@gmail.com

I.G.A.S.R. Jayantini
Foreign Language College Saraswati, University of Mahasaraswati, Denpasar, Bali, Indonesia
e-mail: srijay04@yahoo.com

R.L. Natonis
Government of East Nusa Tenggara, Indonesia, Agriculture Department,
Nusa Tenggara Timur, Kupang, Indonesia
e-mail: remi.natonis@gmail.com

borders separating understanding and actions (Mudita 2010). After all, the physical border between two countries is simply a line on a map or across the ground. Biosecurity issues relate to what people and their objects do in relation to those borders. In researching 'borders', the previous research found that it was the engagement or interaction between social actors and their artifacts (such as computers or plants) that produces (or not) outcomes of various kinds.

People, however, are complex. They do not live their lives 'doing science', 'doing food security', 'doing health' or 'doing community management'. Their lives are lived in an integrated way: activities range across all these areas in a single set of thoughts or a single conversation. Interactions between people and groups involve cultural, knowledge and power differentials that must be reconciled through interactive processes if cooperative action is to result. These interactions bring two sets of resources (Falk and Kilpatrick 2000) into consideration:

(a) Knowledge and skills already available to the social actors, including knowledge and skills concerning institutional resources such as the rights of local people to use local knowledge for the future of the community; and
(b) Identity resources that each individual and group possesses – the 'who we are', including importantly 'where we live' which are the built-in roles that people have learned through their lives.

Identity resources prove more potent in successful change processes than knowledge and skills – the most common reason for not adopting change is *not* related to insufficient knowledge or skills, but to people's perception of who they are now, and additionally, compared with who they might become through changing. This explains the fear of change that many people possess. Interactive outcomes can therefore be of two kinds: (a) confirmation of existing patterns of behavior, or (b) changed patterns of behavior.

In human activity, patterns of behavior occur and are analyzed in terms of individuals or groups. Groups include communities and their sub-groups, formal (such as organizations, political parties) and informal (such as social or sporting networks). The groups in society called 'government' have patterns of behavior at various tiers in society: international, national, regional and local tiers. 'Policy' is a means of formalizing several of society's strategies for managing change. That is, policies are developed and enacted in the hope of achieving some desired change, and the dynamics of these processes are explored by Chaps. 2 and 3. Community groups, NGOs, industry bodies, trade unions and other interest groups form additional layers of interaction, each seeking to co-opt human interest to particular ends. The resulting dynamic social field provides seemingly endless opportunities for enhanced ecotonal activity. Royce in Chap. 5 of this volume shows how these forces need to be accounted for in planning a community strategy for biosecurity. Often seen under the guise of democratic processes at work, the interactions within society are those which produce outcomes for one section of the society or another. Our interest is in the production of positive, ethical and beneficial outcomes for enhanced biosecurity measures in communities and societies and indeed between international borders.

Importantly, the past 5 years of research into managing biosecurity found that the meanings of the term 'biosecurity' alone carried significantly different connotations in different regions of study. In Eastern Indonesia, for example, the most important role for biosecurity is to enhance food security for poor people in that region's rural and remote areas close to Australia's borders. However, as we move into the next phase of the research, the intention is not only to build on existing findings and networks, but to utilize these to create new knowledge and networks related to managing biosecurity throughout Asia and the Pacific. As earlier noted, and as was the case with the pilot phases of the research, a participative and collaborative methodology is employed.

A Word on Methods, Methodology and Ethics

Participative methodology is inherently collaborative. In addition, the research, as explained in each of the chapters, has been both multidisciplinary and transdisciplinary in approach. The significant challenge of the research in the past and into the future is to promote the singularities of disciplinary emphases and contributing to those disciplines, while at the same time ensuring it occurs in a collaborative and cross-disciplinary fashion. In examples so far, one team member utilizes a mix of quantitative and some qualitative methods for wide-scale research into the social influences on successful management of biosecurity. The researcher has simultaneously been working closely with government, other universities and their laboratory test facilities, as well as farmer groups to manage new knowledge about a citrus disease of particular threat to Australia. These associated collaborative processes have resulted in change of attitude and policy while at the same time 'proving' scientific facts about the citrus disease. In this sense, the research contributes to the overall multi- and interdisciplinarity of the whole project. However, the researcher has worked closely with farmers, drawing out their local knowledge, and has used this to inform his research. In the latter case, the approach is transdisciplinary.

Dimensions of Managing Biosecurity: Elements of a Strategy

Our task in this chapter is to bring together the results of the analyses performed on the data from all researchers. This is usually called a macro-analysis. However, in order for this to make better sense to the reader, two sets of research are now outlined as emerging from the above discussion. One set is related to interventions, as we have found change processes to be inherently and irrevocably interventions into people's lives often by outsiders such as researchers. The other set is to bring into our discussion the community development model from early-stage research (Falk et al. 2008). The aim in raising these matters at this stage is to bring those two aspects into the present chapter's proposal of a possible strategy for managing

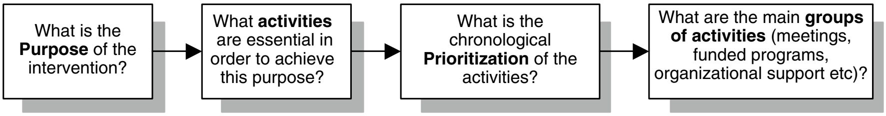

Fig. 12.1 Purpose defines activities that comprise an intervention

biosecurity. After these descriptions the chapters will be individually reviewed, key points brought out, and the results of this process will then be used to forward the ways strategies for managing biosecurity across borders could be approached.

Interventions

Any new policy or strategy is an intervention into the lives of other people. It is important to remember that often people accept change willingly, but equally as often they reject change, especially where (a) they cannot afford it, (b) they do not have the time, (c) they do not see the need or relevance for the change, (d) they can see how the change might be of benefit to some, but not sufficient for them to change their ways. In order to minimise the negative consequences of change through interventions, a participatory and inclusive planning process is used. If the plan is a national one, then the various levels of governance and regional and community stakeholders need to be involved either in existing forums or new ones. Once these tiers of responsibility for planning and activity development are identified, localised action plans can be developed and implemented. It is sound participatory practice to have the implementation occurring on an on-going basis. That is, to have planning activities, feedback loops to the tiers above them, and to implement the strategy at the same time. This ensures all involved can see the planning has practical effects which they can all see. The cycle of involvement and awareness is therefore increased.

The tiers of planning for a holistic strategy as well as the individual activities involved would all follow a similar pattern as shown in Fig. 12.1.

For each component, there needs to be a timeline, and associated activities. Each of the activities will follow the above pattern as well, and each might need more specific objectives or goals under its overarching purpose, depending on the intervention's scope and sequence.

Structure and Process

In Chap. 1 we reported on the findings from the earlier stage of the research, those findings were directed towards identifying a model for the community management of biosecurity. The main components found to contribute to an effective model were *social structures* and *social processes*. In essence, it was found that these two components were each essential, and each variable depended on the community and the purpose. Yes, it was found that the existence of various types of community organizations was indeed important, but it was also found that the *processes* and the nature of those processes that occurred in and around the structures was equally important. In the case of two communities which seem identical in terms of the governance structures and other bodies and organizations they contain, the two communities do not necessarily achieve the same biosecurity outcomes at all. The outcomes are achieved through the social processes that occur in and around the groups, organizations and structures in the communities. In summary, this is how the model was formulated in the earlier research (Falk et al. 2008, p. 35):

A model of community management of biosecurity occurs through:

(a) Assessing community capacity in terms of its structure & process;
(b) Building capacity in identified gaps;
(c) Identifying common purpose of change process;
(d) Working with a balance between *structures* and *processes* in engaging with communities from grassroots to policy.

When the findings reported in the chapters in this book are set against the main finding from the early stage of the research into interventions and the development model for biosecurity (structure and process) the result is synthesized through the use of an intersecting set of dimensions of biosecurity management as described in the following section.

What We Have Learned from Each Chapter

In this section we summarize the contributions each chapter has made towards the research informing a biosecurity strategy. As noted in Chap. 1 and in each of the chapters, certain areas of the research matrix for the whole project (see Chap. 1, p. 15 this volume) were the focus of the various chapters. The following are the findings from each chapter.

Chapter 2

Litaay used biosecurity management in two provinces of greater Papua as case studies and focused on the elements of policy and legal frameworks under which biosecurity currently rest, and there the findings are that current Indonesian biosecurity approaches are reminiscent of the fragmented approach identified by FAO (2008, p. 8).[1] In order to tackle the problems, there is a need for a shift in policy

[1] FAO (March 2008). FAO biosecurity toolkit. STDF Workshop on SPS Capacity Evaluation Tools, Geneva.

approaches toward an integrated one. In order to contribute to policymaking in line with the above characteristics of the integrated approach, the emerging research results indicate that the following issues will need to be brought together to establish a new development paradigm for Indonesia:

- Utilize international instruments on biosecurity for the benefit of Indonesian agriculture development
- Improve the level of Indonesian compliance to international standard by developing sound policies in biosecurity
- Protect and develop indigenous norms, knowledge and institutions to fill gaps in national biosecurity policies
- Develop indigenous knowledge-based biosecurity in local communities through policymaking and legislation processes in the framework of regional autonomy status
- Enforce the related policies, laws, and regulations on biosecurity for the benefit of people in local communities.

When there are connections between people and organizations to make things happen, it is a sign that social capital is present. Social capital can be of three kinds: bonding, bridging or linking. An integrated and new paradigm in biosecurity development policy for Indonesia would need to put into practice a strategy that drew on all three forms of social capital in a cross-cutting structural and procedural approach. Policy is a multi-tiered series of structures and relationships, and only by making two-way connections upwards, downwards and sideways can such a multi-tiered strategy prove effective and efficient.

Chapter 3

Litaay focused on the elements of international, national, and local policy frameworks that engage with local knowledge in order to create a new development paradigm on biosecurity, and there the findings include a call for empowering and strengthening the role in biosecurity processes of local, traditional or indigenous knowledge. The main principle of bureaucracy reform indicated in the data is 'less structure, more function or process'. Not only that, local initiatives from the local leader need international and national support, for example, budget reform and procurement reform. Furthermore, there are some views prevalent about local farmers that are counterproductive to reform. On the issue of food security, the most important issue is to provide the conditions whereby indigenous Papuans can achieve greater knowledge and control over their lives.

On the issue of local knowledge, there are several items that need to be highlighted. First of all, farmer capacity closely related to knowledge that he/she gained and applied in his and her daily activities. Second, the farmer is the producer of knowledge besides playing the role of knowledge user. From their daily experience, their knowledge is friendly to nature based on their interaction with the ecology.

Chapter 4

Mudita focused on the elements of social borders that exist between the community and the government in the management of biosecurity. His discussion is largely based on research findings on community biosecurity management of citrus in the highlands of West Timor, Indonesia and there the findings are that despite not yet being integrated, there are laws and government regulations that have long existed as the basis for dealing with plant and disease incursions. These laws and government regulations have also recognized the importance of community participation for early detection in the event that an alien pest or disease is accidentally introduced into a particular area. A great deal more still needs to be learnt, however, about bringing together shared understanding of citrus biosecurity between local communities and government in the region. This chapter is based on the results of on-going research that still needs more data to arrive at final results and conclusions. What is apparent up to this point is that an unseen border exists between local governments and local communities. It is true that at some points both have crossed this border, but each with its own agenda. Unless each side tries to learn something from the other, it is citrus industry that is the final victim. Diseases such as *huanglongbing* (HLB) and *tristeza*, not having received the necessary control measures because of their unofficial status, will slowly but surely kill trees and, being graft transmissible, will silently spread crossing every physical border in their way, unless efforts are now initiated to cross the existing social borders so that local governments and communities move forward be hand in hand towards negotiating the most appropriate solutions.

Chapter 5

Royce focused on the elements of the principles of community engagement to biosecurity management as an effective way to raise biosecurity awareness across social borders, and there the findings are that the process of engaging with community requires a broad range of interactions that is inclusive of people from all walks of life. Unfortunately, much of the contemporary literature on engagement refers to it as a tool of large organizations. Such an approach to engagement has been criticized for being self-serving and centrally driven as the motivation, resources and action associated with ‘engagement’ primarily focuses on supporting the perspective of large, complex systems rather than the community in which specific issues or activities occur. Engagement therefore can become a meaningless and disempowering process of gathering feedback about predetermined and centralized policy decisions that do not take up or address the needs and aspirations of the community. While honest, trusting and respectful relationships form through a similarity of interests, values, morals or views, individuals in this community also show respect for people who have perceived levels of knowledge and/or experience in a particular field contribute back to the community. One of the key issues about biosecurity in this community, is that local people other than those associated with the agricultural industry, do not have a relationship with biosecurity.

Chapter 6

Wallace focused on the elements of partnerships that bridge diverse knowledge systems and their underlying perspectives as they relate to the community management of plant biosecurity conducted with remote Indigenous people living and working in Northern Australia, and there the findings are that developing an approach to community management of plant biosecurity that recognizes the expertise and commitment people have to biosecurity can be supported by collaboratively developing a training and skills recognition framework. The framework can explicitly endorse community knowledge and skills sets that focus on identification, intervention, management and eradication of plant biosecurity. The content would be developed through a sustainable 'patchwork of enterprise' approach to regional and training development in regional and difficult contexts that can be integrated into existing and developing structures. By explicitly recognizing and endorsing local knowledge and skills, connections to policy level descriptions and support can be developed that ultimately improve outcomes for communities' economic, cultural, social and economic futures.

Chapter 7

Surata focused on the elements of bilingual, bicultural communication and the growth of research capacity in the field of biosecurity and there the findings are that participatory process in developing and arranging the Glossary of Biosecurity Management (GBM). The GBM is in fact a model of partnerships in social learning, in which transfer of knowledge and science exchange occurred through all participants from different fields, working jointly, using a shared conceptual framework in the collecting, sharing and interpreting of key terms. It is a type of interactive learning that places each participant in an equal position. They can teach and learn with each other. Thus, developing the GBM into a multilingual glossary through cross-cultural participatory processes will be widening the social learning network concerning managing biosecurity. This is a major contribution to the management of global biosecurity.

Chapter 8

Jayantini focused on the elements that contribute to a translational activity and the enrichment of scientific terms in the Indonesian language, and there the findings are that in translation, the transference of meaning is simultaneously done with the transference of information from one language into another language. Three elements are actually transferred whenever a certain source language text is translated into target language text. Meaning, concept and knowledge come together as a package of broadening one's mind. From a narrow perspective, terms are translated through a cognitive process experienced by the translator. However, from a wider perspective, the impact of a translation is to enable the knowledge transfer across language and cultural borders. The implication of translation covers national, regional and local interest that not only transfers the linguistic features found in source language but also enables the transfer of knowledge. From the perspective of national interest, the knowledge is developed and more accessible because the translated text utilized national language. Through translation, people can learn more new concepts introduced as the impacts of language contact.

Chapter 9

Martiningsih focused on the elements of women's participation in collective community management of biosecurity activities in Indonesia, and there the findings are that women play a large role in collective activities but continue to be in the shadow of men. Women have experience in group organizations for improving wellbeing, but this is not being maximized and is still unprofessional. The ability and desire for effective communication among women's groups is high and should be used to assist women to impact on their local environment and undertake collective activities for achieving common goals in biosecurity management and other areas. Women need to demonstrate to the community that women have abilities equal to those of men, as a capable person who can contribute to positive economic and community outcomes. Gender inequality within the community usually occurs because of 'cultural inheritance'. However, if this culturally ingrained inequality can be redirected in a positive direction such as strengthening the social capital already possessed by women, it may be used to empower the community's women to better address local issues and overcome problems together, including issues of biosecurity.

Chapter 10

Ndoen et al. focused on the elements of the use of local knowledge to achieve economic sustainability as well as to improve local food sustainability and sovereignty in order to enhance local biosecurity, and there the findings are that the impact of changing lifestyles, food and income production have had impacts on food and biosecurity issues and their management by local communities. The role of social capital was significant in dispersing knowledge of local food among the local people. Local knowledge is needed to grant the sustainability of household economy. Social networks can be maintained by the community that assist community members to gain explicit and implicit knowledge of food procurement and food production. Moreover, tight social networks within the community enable its members to maintain and gain new knowledge of pests and diseases that might threaten local plantations. Consequently, local people are becoming more aware of biosecurity threats and the impacts on the economic future of the whole community. As a result, an intergenerational knowledge transmission process related to responses to those threats could be developed. This provides a basis for long term food security.

Chapter 11

Wallace et al. focused on the elements of the use of mobile technologies and m-learning (mobile-learning) in an Indonesian small farming community in East Timor and with Indigenous people in Northern Australia, and there the findings are that by utilizing existing and embedded mobile technologies, the m-learning process does not impose a technology, rather it utilizes accepted technologies to build bridges to a wider range of knowledge systems and ensure local people are an essential and sustainable part of knowledge transfer processes. By using mobile telephones, people are already expert in the use of the technologies and are extending their use to a new purpose, reducing anxiety about using new technologies. Learning is then scaffolded from existing purposes to new purposes. The use of advances in technologies in knowledge management, recognition and learning are bringing new trends in learning and knowledge transfer in a range of often unrecognized workplaces. The concern now is the need to improve formal recognition processes to support the acceptance of digital information and sound processes to incorporate a range of information into formal systems. An investment in this brokerage role is also a crucial part in using mobile technology and m-learning. The basis of effective processes, then, is to value and build on individuals' strengths and knowledge.

Linking the Chapter Findings to the Strategy

If biosecurity is a multi-tiered series of structures and relationships, then based on all of the findings in this book, effective management of biosecurity occurs when sound science interacts with sound local knowledge and structures. The chapters identify that the missing element in effective management is the effective utilization of local knowledge, structures and processes. It is suggested that there is a need for a new and integrated paradigm in biosecurity development and management. The sound science exists, so the issue for local knowledge is to protect indigenous norms, knowledge and institutions as well as maintain the development of indigenous effective knowledge-based biosecurity practices in local communities. Therefore, this section will try to bring together a series of findings out of a cross-cutting process based on all previous chapters. The section following is grouped into seven main themes.

Governance

In the case of both Indonesia and Northern Australia, the existing policies, laws, and regulations that apply to biosecurity are adequate in number but not yet properly integrated or implemented. Such an integrated biosecurity development paradigm would bring together issues of biosecurity with biodiversity, food security, food safety and the various food and border protection issues. At present there is low participation of local stakeholders in biosecurity-related strategies and concerns. Consequently, local government development programs cannot function well because local knowledge and a participatory policymaking environment are not accessible. Other findings show that, under regional autonomy, local communities have more opportunity to raise concerns to those directly elected to govern, but that directly elected governments may not address electorally unpopular biosecurity issues. Therefore based on the findings, it is suggested that formal policy that integrates science with local knowledge in addressing biosecurity issues is very important in maintaining government development programs locally and nationally. In addition, to achieve a more integrated approach, all sectors in a community should work together to foster a culture of advocacy, research, education, strategy and policy formulation to reduce threats and increase opportunities for effective biosecurity management. Therefore, fostering honest, trusting and respectful relationships through a similarity of interests, values, morals or views between all of those sectors is essential.

Leadership

Local leadership structures and processes lack sustainable support and empowerment from the national level. Local *adat* (customary) leaders who have been appointed and elected to specific roles in the community are often not offered a high level of respect and authenticity by the local government. The case can be exacerbated, as is the case in some Indonesian contexts, when local, state and national government only support community leadership in agriculture if it does not challenge or contradict the centralized policies, positions and activities on biosecurity. This creates a difficult situation for biosecurity management and one which clearly can work against the best interests of sustainable development. Local leaders have the most power to mobilize local community members for taking the first necessary actions against existing biosecurity threats. This is why sustainable support and empowerment from the local and national government for them are vital.

Enterprise and Entrepreneurship

Enlisting industry support and business partners, where possible, is also essential in the development and sustainability of biosecurity related matters, especially when there is investment in the brokerage role in the use of technology. Often one enterprise does not understand how its products and manufacturing processes may risk biosecurity matters in other sectors and even in the economy in general. For example, over use of pesticides and fertilizers may well increase crop output in some locations, but pose a risk to the tourist industry if the natural environment is altered, as was the case with the Green Revolution in Bali where coral was destroyed by excess chemical run-off. There are many ways enterprise can become involved in an approach that works across sectors. One way supported by the findings from the book is to support a greater involvement of local enterprise owners and operators in interacting with community, policy and strategy to plan directions and processes. This is essential in the light of outside influences to change economic activities and futures. Whatever the output is, it should support not threaten the enhancement of the local economies.

Knowledge Transfer

The book found that transfer of knowledge forges community identities. Put more simply, when people engage in active processes involved in learning to manage biosecurity, they form new and consolidate old links and ties, with the net effect that the identity of their community/ies incorporates biosecurity. This results in sustainable approaches to biosecurity with more likelihood of cross-sectoral and whole-of-community involvement. Knowledge transfer across generations maintains the sustainability of local knowledge in the community with an assumption that science and knowledge come together as a package. Here translation plays a central role in the dissemination of knowledge across language and cultural borders. Translation enhances bonding and the production of social capital through knowledge transfer among local people. The use of technology such as mobile phones in these processes is also becoming more important. Technology supports knowledge transfer by helping people to learn and demonstrate competence across language and knowledge systems. Mobile telephone communication and GIS data collection, for instance, enhance the existing competence and confidence in building a bridge to new knowledge networks. The use of technology and its impacts has been described in this book in the case of small crop farmers who were able to improve their productivity. Technology helps knowledge transfer to become more effective by making an equal and deep interaction between the farmers and extension officers in managing biosecurity issues.

Local Knowledge

Local communities tend to identify themselves with their local and indigenous norms and institutions. Knowledge is usually accessed by local people from those they trust, who have local experience and with whom they have personal or professional relationships. In the case of Indonesia, local knowledge has potential to fill gaps in national biosecurity policies and strategies, especially in special autonomy regions such as Papua. Interaction between nature, environment and science paves the way for effective local knowledge. However, the research found that effective local knowledge is not thoroughly evaluated for effectiveness and local applicability nor accessed by the local, state and national organizations involved in agriculture. The research across Eastern Indonesia found that there are many reported highly effective local solutions to biosecurity problems which remain unresearched, unrecognized and therefore largely ignored by officials. One recurrent finding was the importance and, in recent times, under use of the foods that were commonly used before rice became mandated as a staple food three decades ago. There is still knowledge of how to grow and prepare these foods and the management of their pests and diseases. However, changes in people's diets over the last several decades, as well as the formal modern education system have impacted on local knowledge to the extent that it tends to be fading away.

Organizations

In Indonesia for example, there is no single biosecurity authority at the national level and the existing authorities are lacking capacity. Moreover, the local and national government organizations involved in agriculture, such as *Badan Urusan Logistik* (BULOG), maintain all the power, resources and the capacity to make decisions on those biosecurity issues that impact communities at local level. There are also some findings that the local and national actors involved in agriculture do not enter into regular and reciprocal relations with different community sub-sectors to ascertain and understand the impact of biosecurity. These situations create a demand for public participation. Hence, the roles of local and international Non-Governmental Organizations (NGOs) are very important in providing capacity support, especially when local government capacity is limited, by helping them deliver services in partnership with communities. In the context of community management, academia through NGOs can foster consciousness raising, teaching and training especially for young people, strengthening local community, promoting programs and generating group energy, democratic discussion and social mediation. They also help in promoting effective local knowledge to encourage local communities in engaging development activities related to biosecurity.

Ecological

Not all local knowledge provides effective biosecurity management. Neither is all traditional science relevant for all local contexts. Integrating the two together in the context of a local biosecurity issue brings together local knowledge, scientific knowledge and the people who will manage the biosecurity process. It has been found that a social ecological approach provides the theoretical scope to bring these social, scientific and traditional knowledge systems together. The umbrella of social ecology provides the elements of localized strategies for addressing ecological problems. Local solutions to local problems are important strategically because local resources, including people and materials, are more likely to be available and accepted in taking the necessary actions against biosecurity threats.

From Analysis to Model/s

Through participatory processes and based on the previous information, a series of cross-cutting analytic steps followed. This resulted in a preliminary categorization of key findings from each of the research reports on which the chapters are based using the existing matrix. The quantities and nature of each data response were then reviewed, coded according to origins and researcher, and re-categorized into possible new schemas to see which had the best 'fit' for the data and the consensus of the research team.

Structure and *process* were found to be the two categories of elements in a society that needed accounting for in a sound strategy for managing biosecurity. The five structures that arise as being most vital are:

1. Government agencies/policy;
2. Ecological considerations and scientific knowledge;
3. Networks, especially reciprocal relations within network interactions;
4. Institutional knowledge especially the role of enterprise and markets;
5. Local and indigenous knowledge.

There are four sets of processes found to be vital:

1. Leadership and social processes, including culture, language and gender;
2. Engagement (change) processes that produce knowledge and outcomes;
3. Knowledge recognition;
4. Knowledge transfer;

These can be portrayed in a matrix as follows (Fig. 12.2):

		STRUCTURES				
		Local Knowledge	Ecological Knowledge	Enterprise/ Institutional Knowledge	Government Agencies (policty)	Networks/ Reciprocal Relations
PROCESSES	Knowledge Recognition					
	Knowledge Transfer					
	Engagement					
	Leadership & Social Processes (Gender, Language, Culture)					

Fig. 12.2 Matrix showing model components using a structure/process split

Of vital importance is the process element that relates to the engagement processes, since without these no effective and sustainable strategy is possible. Engagement processes have also been shown to be required within all levels of society, grassroots to national government so that knowledge and strategies are shared and become part of the way that group does business. However, this is insufficient as well, as we have learned that these interactions between people and knowledge at one level or another must be two way engagements, and paralleled by interactions linking the various levels of the hierarchy. In summary, all research points to an *integrated* strategy supported by policy as the way forward with planned engagements (formal and informal) at these levels (following Woolcock 2001):

1. **Bond**: Plan activities and interactions *within* sectors/groups/organizations/ communities, towns and so on
2. **Bridge**: Plan *across* sectors at same level
3. **Link**: Plan *up and down* sectors in the hierarchy

In other words, 'top down' must meet 'bottom up' and 'sideways' in structured, trusting and non-threatening forums such as a re-invigorated Musrenbang may provide. As a side issue, any such process benefits from a continuous evaluation program that parallels the strategic planning processes. Figure 12.3 illustrates the various components of this complex integrated strategic planning process:

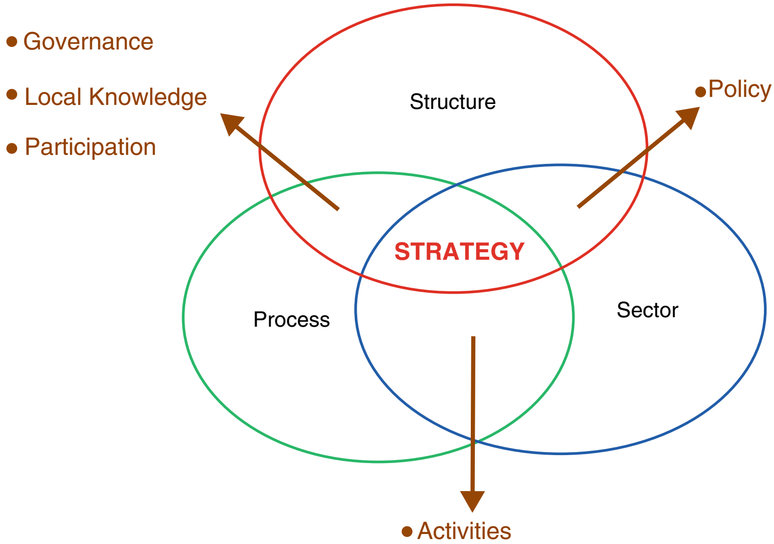

Fig. 12.3 Main components of an integrated strategy

From Model to Planning a Strategy

A strategy is made up of a number of activities. To plan a strategy using this model, the first step is to plan what activities should make up the whole strategy. That is, for the whole strategy and for each activity:

1. Identify common purpose;
2. Consider each dimension of structure & process;
3. Develop action plans aimed at common purpose for each cell where structure & process intersect;
4. Incorporation of collective thinking about intersection of cells ensures participatory, inclusive and ethical activities that form a whole strategy.

Next of importance is to recognise and plan for the different kinds of engagement that are crucial for success in building a strategy that is integrated, comprehensive and sustainable, using the bonding, bridging and linking categories.

Bonding: Local Knowledge Integrates with Scientific Knowledge in a Social Ecological Approach

Bonding interactions are those between people in the same close or homogenous groups, such as family and close friendship groups. In the example below, we see a group of women engaged in informal discussions which revolve around the quality and quantity of the food supplies which they deal with on a daily basis. Women provide the most common connection of food product from field to market yet, as a source of local knowledge about biosecurity matters, their knowledge is not commonly shared so that biosecurity management can be improved. The axes of the matrix into which the photograph is pasted bring together the structural components (columns) with the process components (rows) and provides an integrated framework for considering planning options at various levels as well as cross-checking and evaluating that all major inputs into a rigorous planning process are accounted for. Hence, questions based on the matrix that can be raised with groups such as these, in an informal way, could involve ‘local knowledge’, ‘enterprise’ (Market activities), leadership processes, and perhaps ways in which their ‘knowledge’ could be ‘transferred’ so as to improve biosecurity management (Fig. 12.4).

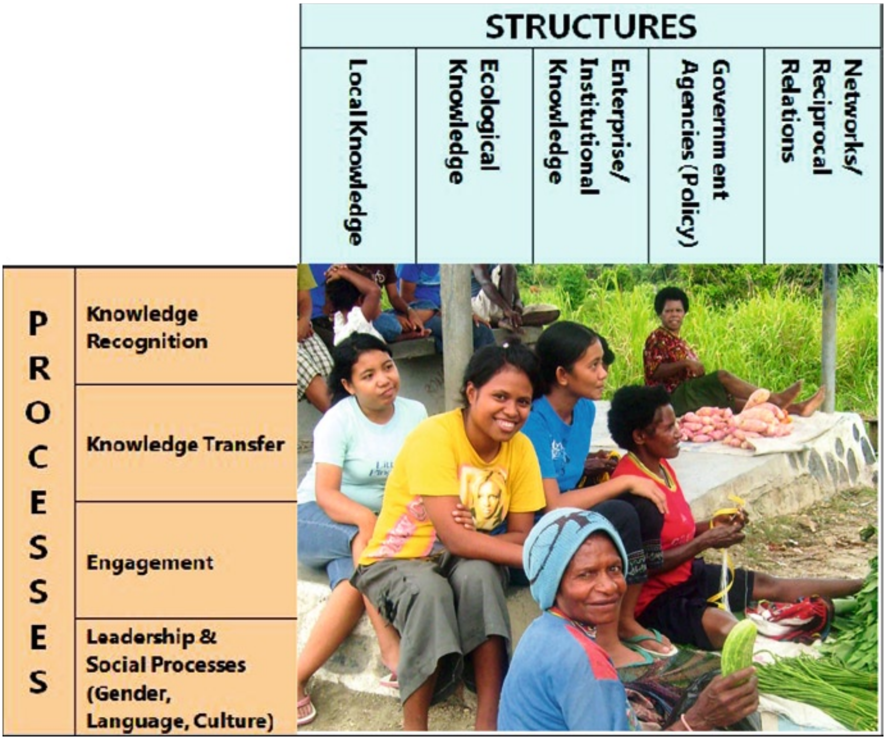

Fig. 12.4 Bonding interactions between women in an extended family concerning food quality

Questions such as knowledge transfer can provide the clues as to how the best benefit could be gained from bridging interactions, such as the example that follows, and representatives of the group pictured could be invited to attend or observe bridging or linking activities such as those below.

Bridging: Sharing Local and Regional Knowledge in Cross-Sectoral Planning Forums for Common Purposes

Bridging interactions are those that connect people in heterogeneous social networks at similar 'levels' in their respective communities and often between different communities. In the example of a planning activity below, we see a photograph of a group of Balinese farmers gathered from around the region, learning about the technologies for the eradication of mice in rice paddies. Again, for this example, the axes of the matrix into which the photograph is pasted bring together the structural components (columns) with the process components (rows) and provides an integrated framework for considering planning options at various levels as well as cross-checking that all major inputs into a rigorous planning process are accounted for. Hence, questions can be framed to inform planning interactions (conversations, meetings, forums and so on) around the components. For example, in a scenario such as the one shown, one could ask if the relevant local and scientific knowledge about rodent management has been discussed in groups such as this, and suitable participative processes taken place so that both sides see the relevance of the other's views. Has the local traditional leadership, as well as bureaucratic leadership, been engaged in discussions? Similarly, for follow-up work, organisers would ask how and who should be involved in the additional bridging and linking interactions that may flow from the planned activities? Planning these kinds of issues and following through will result in an interlocked set of knowledge. Structures and processes related tor biosecurity management in that region (Fig. 12.5).

It should be noted that local modifications to scientific practices are applied depending on the local circumstances. In this region, for example, a quite common 'strategy' is *not* to use these technologies since, based on knowledge passed down from generation to generation, the farmers believe the solution to the mouse problem will be more sustainable if 'nature plays its course'. The decision 'not to act' can be a valid local response and should be respected in the ultimate strategy.

Linking: Connecting All Levels of Information Through Engaging Partners

Linking interactions are those that connect people in social networks between different 'levels' in their society. Linking ties are sometimes referred to as networks of power, as they can be characterised as access to people who have resources or some

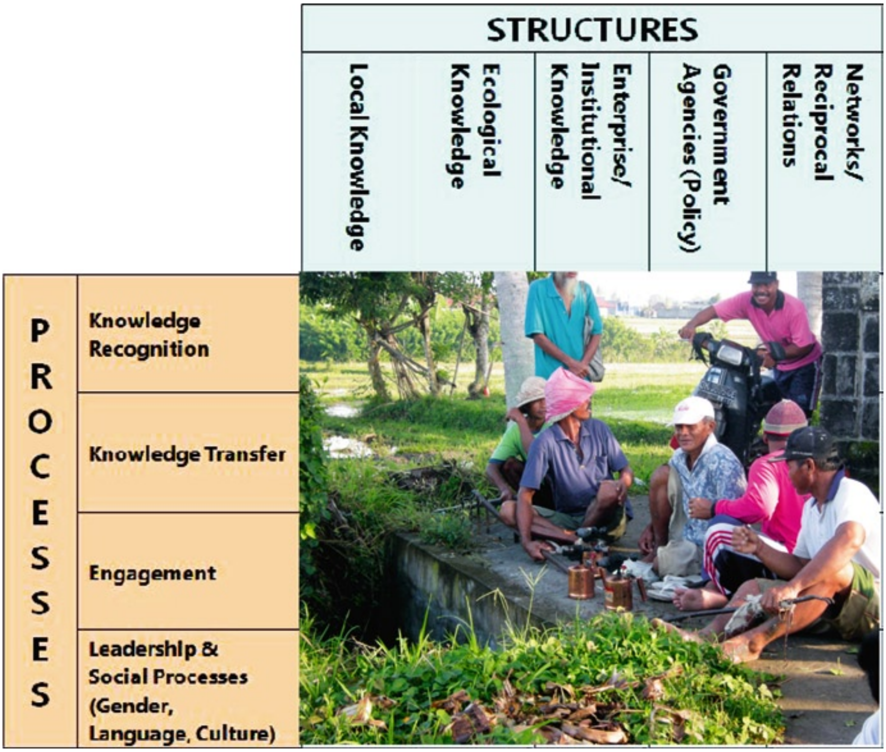

Fig. 12.5 Bridging interactions between farmers from the same region concerning pest eradication activities

kind. For example, if a community member has a contact in government, this could be used to access information or other resources. In the example of the planning activity below, people from different groups come together for community planning activities related to biosecurity. The people come from different regions, and represent government (several levels) and farming sectors, community members and researchers. What brings these people together is their common interest in establishing better management strategies and practices for biosecurity (Fig. 12.6).

These linking interactions are where information and strategies can be discussed, decided and agreement reached on implementation and resourcing. This is facilitated when people in positions of power can be engaged in the process and commitment to outcomes engendered. A meeting such as this is therefore an excellent example of knowledge transfer processes, while gender and leadership issues need to be checked to ensure inclusivity and ownership of outcomes.

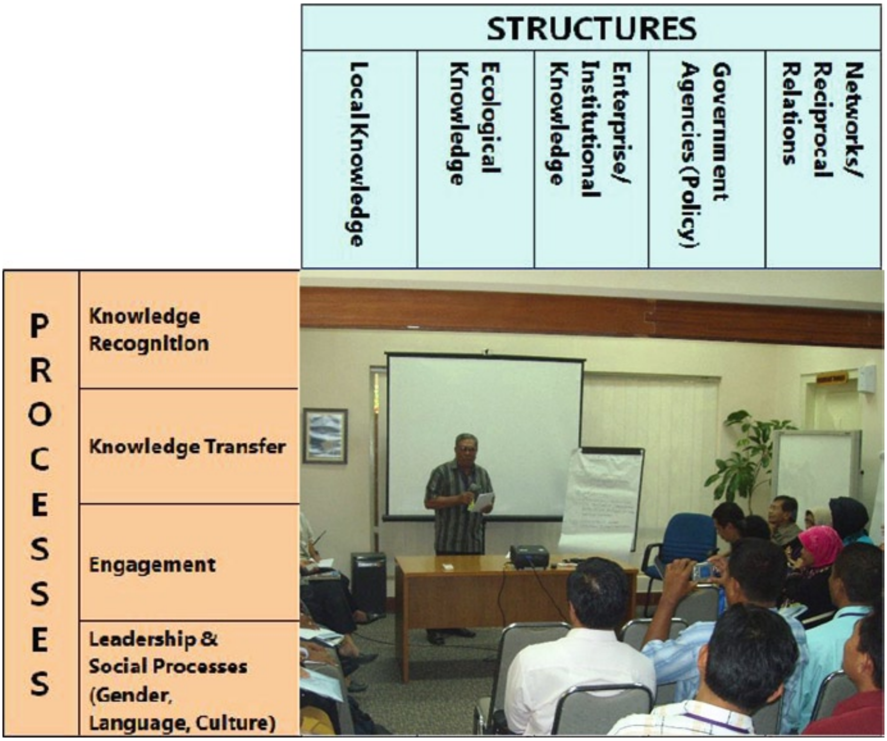

Fig. 12.6 Linking interactions between stakeholders in managing regional biosecurity issues

Conclusion

In a global economy increasingly connected by engagements and partnerships that occur independently of national governments, managing biosecurity effectively becomes an even more complex issue to deal with at legislative, regional government and community levels. The knowledge that science injects into the management of biosecurity processes always and irretrievably needs to be adjusted to account for local conditions. Local knowledge, already in existence in most regions and communities, can assist in these processes of 'tempering' scientific as well as local knowledge for the purpose in hand. However, to assume that because science and local knowledge combined may possess the resources with which a biosecurity risk can be identified and managed is sufficient is fallacious. Managing the risk is the process that brings together all required and relevant resources and this process must be carefully planned. If the guidelines in this book are utilized, the authors are confident that a holistic and integrated strategy can emerge that will address all levels of need in managing biosecurity across borders.

References

Christie, M. (2006). Transdisciplinary research and Aboriginal knowledge. *The Australian Journal of Indigenous Education, 35*, 78–89.

Falk, I., & Kilpatrick, S. (2000). What is social capital? A study of a rural community. *Sociologia Ruralis, 1*(40), 87–110.

Falk, I., et al. (2008). Community management of biosecurity: Overview of some Indonesian studies. *Kritis-Learning Communities, Special Co-publication*, 1–40.

FAO. (2008). *FAO biosecurity toolkit*. Geneva: STDF Workshop on SPS Capacity Evaluation Tools.

Fox, J., et al. (2009). Mapping communities: The socio-ethical dimension of participatory mapping. In R. Fisher, B. Myers, M. Sanam, & V. Tarus (Eds.), *GIS applications for sustainable development and good governance in Eastern Indonesia and Timor Leste*. Darwin: Charles Darwin University Press.

Lansing, S. (2006). *Perfect order*. Princeton: Princeton University Press.

Mudita, I W. (2010). Crossing the community – government border: The case of citrus biosecurity management in West Timor, Indonesia. In I. Falk, M. L. Ndoen, & R. Wallace (Eds.), *Managing biosecurity across borders*. Dordrecht: Springer.

Simons, H., & Usher, R. (2000). *Situated ethics in educational research*. London: Routledge.

Terrell-Nield, C. (1986). Ecotones and community boundaries. *Field Studies, 6*, 407–428.

Woolcock, M. (2001). The place of social capital in understanding social and economic outcomes. *Isuma Canadian Journal of Policy Research, 2*(1), 1–17.

Glossary of Biosecurity Management[†]

A

Abiotic stress (*Cekaman abiotik*) [Bio] Outside (nonliving) factors which can cause harmful effects to plants, such as soil conditions, drought.

Absorbed dose (*Dosis terserap*) [Bio] Quantity of radiating energy (in gray) absorbed per unit of mass of a specified target.

Action research (*Penelitian tindakan*) [Soc] (1) Kind of research methods that aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework; (2) a flexible spiral process which allows action (change, improvement) and research (understanding, knowledge) to be achieved at the same time. Action research is concerned to enlarge the stock of knowledge of the social science community. It is this aspect of action research that distinguishes it from applied social science, where the goal is simply to apply social scientific knowledge but not to add to the body of knowledge.

[†]The compiler of the Glossary of Biosecurity Management is Professor Sang Putu Kaler Surata, one of the team members involved in authoring this book. The Glossary was prepared as a stand-alone publication in both English and Bahasa Indonesian languages in response to the lack of international clarity, consistency and information about terms related to biosecurity. The process and a great deal of detail about the Glossary and its preparation are contained in Professor Surata's Chap. 7 of this volume, and additional detail regarding translation aspects is found in Ms Jayantini's Chap. 8.

Due to its cross-disciplinary and often contested nature, the Glossary of Biosecurity Management draws on a wide range of sources. These are all been cited in the reference list immediately following the Glossary. These references appeared within the text of the Glossary in its original form so as interested readers can see precisely which and whose ideas and research was drawn on in each case. This version can be found at http://ausindobiocom.net/ausindobiocom-archives/publications/book-collections/2010/07/bilinggual-glossary-bosecurity-management/?preview=true&preview_id=1390&preview_nonce=8b2e2baa98. However, the in-text component of the referencing has been deleted in the English version following here in the interest of clarity and readability, as well as to conform to a standard glossary format and style.

I. Falk et al. (eds.), *Managing Biosecurity Across Borders*,
DOI 10.1007/978-94-007-1412-0,

Additional declaration (***Deklarasi tambahan***) **[Bio]** A statement that is required by an importing country to be entered on a Phytosanitary Certificate and which provides specific additional information on a consignment in relation to regulated pests.

Administration (***Administrasi***) **[Com]** The practice of management and leadership.

Adult stem cell (***Sel batang dewasa***) **[Bio]** An undifferentiated cell found in a differentiated tissue that can renew itself and (with certain limitations) differentiate to yield all the specialized cell types of the tissue from which it originated.

Advocacy (***Advokasi***) **[Com]** Various strategies for influencing Decision making within organizations, government and private sector groups which can include lobbying, social marketing, public education activities, community organizing, media campaigns, signature campaigns, and other techniques.

Aerobe (***Aerob***) **[Bio]** A microorganism that grows in the presence of oxygen.

Agroforestry (***Agroforestri***) **[Bio]** (1) A system of permanent land use compatible with local cultural practices and ecological condition, by which both annual and perennial crops are cultivated simultaneously or in rotation, often in several layers, in such a way that sustained multiple-purpose production is possible under the beneficial effect of the improved edaphic and microclimate conditions provided by simulated forest; (2) a collective term of various form of integrated land use (forestry, agriculture, and/or livestock) exist in various hemisphere place, including in developing countries such as Indonesia.

Agrisylvicultural systems (***Sistem agrisilvikultur***) **[Bio]** Agroforestry system in which combining forestry component (woody plants) with the agriculture component (non-woody plant), for example multipurpose trees/shrubs on farmlands, shelterbelt, windbreaks, or soil conservation hedges.

Agrosylvopastural systems (***Agrosilvopastura***) **[Bio]** Combination of woody plants component (forestry) with the agriculture (annual crop) and livestock at same farm management unit, such as forest-gardens, home-gardens, and village-forest-gardens.

Agroterrorism (***Agroterorisme***) **[Bio]** The deliberate act of a person or group against the agricultural industry and/or food supply system, which could include the use of chemical or biological weapons.

Adaptive capacity (***Plastisitas***) **[Soc]** The degree to which the system expresses capacity for learning and adaptation; the degree to which the system is capable to self organization; the capacity of a system to experience shocks while retaining essentially the same function, structure, feedbacks and therefore identity.

Alien species (***Spesies asing***) **[Bio]** (1) Respect particular ecosystem, any species, including it seeds, eggs, spores and other biological materials capable of propagating that species, that is not native to that ecosystem; (2) a species, subspecies, or lower taxon occurring outside of its natural range (past or present) and dispersal potential (i.e. outside the range it occupies naturally or could not occupy without direct or indirect introduction or care by humans) and includes any part, gametes or propagule of such species that might survive and subsequently reproduce.

Alien invasive species (*Spesies invasif asing*) [Bio] An alien species which becomes established in natural or semi-natural ecosystems or habitat, is an agent of change, and threatens native biological diversity.

Anaerobe (*Anaerob*) [Bio] An organism that grows in the absence of oxygen.

Animal (*Satwa*) [Bio] All type of animal natural resource life in land, and/or water, and/or air.

Antagonist (*Antagonis*) [Bio] An organism (usually pathogen) which does no significant damage to the host but its colonization of the host protects the host from significant subsequent damage by a pest.

Anthropogenic (*Antropogenik*) [Com] Human-induced or human-caused, derived from the Greek root *anthropos* meaning "man".

Antibiotic resistance (*Resistensi antibiotik*) [Bio] The ability of a microorganism to produce a protein that disables an antibiotic or prevents transport of the antibiotic into the cell.

Antibiotics (*Antibiotika*) [Bio] A class of natural and synthetic compounds that inhibit the growth of or kill other microorganisms.

Antigen (*Antigen*) [Bio] Any foreign substance, such as a virus, bacterium, or protein, which elicits an immune response by stimulating the production of antibodies.

Antibody (*Antibodi*) [Bio] An immunoglobulin protein produced by B-lymphocites of immune system that binds to a specific antigen molecule.

Antimicrobial agent (*Agen antimikrob*) [Bio] Any chemical or biological agent that harms the growth of microorganisms.

Area (*Kawasan*) [Bio] An officially defined country, part of a country or all or parts of several countries.

Area of low pest prevalence (*Kawasan dengan prevalensi hama yang rendah*) [Bio] An area, whether all of a country, part of a country, or all or parts of several countries, as identified by the competent authorities, in which a specific pest occurs at low levels and which is subject to effective surveillance, control or eradication measures.

Artificial insemination (*Inseminasi buatan*) [Bio] The process in which male gametes, the spermatozoa, are collected and introduced artificially into the female genital tract for the purpose of fertilization.

Asian flu (H_2N_2) (*Flu Asia*) [Bio] Influenzas are identified by the type of haemagglutinin (H_1–H_{15}), which is an antigenic glycoprotein found on the surface of the virus and responsible for binding the virus to the host cell, and neuraminidase (N_1–N_9), which is an antigenic glycoprotein enzyme found on the surface of the virus. A virulent type of influenza, H_2N_2 was first identified in China in late February 1957, the Asian flu spread to the United States by June 1957 where it caused about 70,000 deaths. After 1968, H_2N_2 flu disappeared, but was maintained in laboratories for research purposes. Between October 2004 and February 2005, the College of American Pathologists (CAP), a professional body which sends unidentified samples of various germs to laboratories for identification, accidentally released test kits containing H_2N_2 all over the world and efforts are underway to destroy all the samples.

Audit (*Audit*) [Bio] A systematic and functionally independent examination to determine whether control activities and results comply with documented objectives.

Australian Biosecurity Cooperative Research Centre for Emerging Infectious Disease (*Pusat Riset Kooperatif Ketahanan Hayati Australia untuk Penyakit Infeksi Darurat*) [of animals] Centre that focuses to enhance the national capacity to respond to emerging infectious diseases by developing new capabilities to detect, monitor, assess, predict and respond to emerging infectious diseases which impact on national and regional biosecurity.

Australian Invasive Animal Cooperative Research Centre (*Pusat Kajian Kooperatif Binatang Invasif*) [of animals] Centre focusing on solving invasive animal pest problems through developing commercial outputs, this business partnership combines national and international skills in science, management, commerce and industry.

Australia-Nusa Tenggara Assistance for Regional Autonomy (ANTARA) (*Bantuan Australia-Nusa Tenggara untuk Otonomi Regional*) An Australian Government (AusAid) initiative commit to supporting local governments to promote economic growth, reduce vulnerability, and increase access to quality basic services; in close collaboration with local authorities, ANTARA is working to achieve three objectives, i.e. (1) to improve provincial and district governance, (2) to improve peri-urban and rural income, and (3) to improve access to and quality of basic services; it is has three mandates to pursue these objectives: (1) to build strategies that maximize impact in reducing poverty through improved coordination between AusAid and other development programs, (2) to pilot new approaches to test "what work", and (3) to strategically invest in local and/or international initiatives with potential for impact and replication; how to contact us: ANTARA, Jl. Polisi Militer No. 2 Oepoi, Kupang, Nusa Tenggara Timur, 85111, Indonesia, Tel: 0380 83 3099, Fax: 0380 83 3199, E-mail: info@antarantt.or.id.

Authority (*Otoritas*) [Bio] An entity or person officially designed by the government to deal with matter arising from the responsibilities set forth in the Code.

Avian influenza (*Flu burung*) [Bio] A virus that infects wild birds (such as ducks, gulls, and shorebirds) and domestic poultry (such as chickens, turkeys, ducks, and geese). There is flu for birds just as there is for humans and, as with people, some forms of the flu in birds are worse than others.

Avian influenza (H_5N_1) (*Flu burung*) [Bio] Influenzas are identified by the type of haemagglutinin (H_1–H_{15}), which is an antigenic glycoprotein found on the surface of the virus and are responsible for binding the virus to the host cell, and neuraminidase (N_1–N_9), which is an antigenic glycoprotein enzyme found on the surface of the virus. Because it is generally known to infect birds H_5N_1 is also known as "bird flu". This type of influenza usually does not affect humans, but in 1997 the first case of transmission from a bird to a human occurred during an outbreak in poultry in Hong Kong. The virus caused severe respiratory illness in 18 people, 6 of whom died. Since this initial outbreak, human H_5N_1 infections have been seen in Thailand, Vietnam, and Cambodia during outbreaks in the poultry population.

B

Bark (*Kulit kayu*) [Bio] The layer of a woody trunk, branch or root outside the cambium.

Bark-free wood (*Kayu tanpa kulit kayu*) [Bio] Wood from which all bark, except ingrown bark around knots and bark pockets between rings of annual growth, has been removed.

Baseline data (*Data garis dasar*) Information on a condition or problem before an intervention is implemented.

***Bacillus thuringiensis* (Bt) [Bio]** Bacterium that produces a protein called Bt toxin, a biological insecticide. Bt toxin is used to control insect pests by dusting the crop with Bt bacteria. When ingested, Bt toxin kills certain insect larvae, but is regarded as harmless to humans, pets and most beneficial insects such as bees. Inserting a copy of the Bt gene into plants enables them to produce Bt toxin protein. Such plants can resist some insect pests.

Bactericide (*Bakterisida*) [Bio] Kills or inactivates bacteria. A class of antibiotics that kills bacterial cells.

Bacteriophage (*Bakteriofag*) [Bio] A virus that infects bacteria. Altered forms are used as vectors for cloning DNA.

BaKTI (*Bursa Pengetahuan Kawasan Timur Indonesia*) [Com] BaKTI's role is to collect and disseminate knowledge that is relevant for the development of eastern Indonesia. This applies not only to data, studies and reports, but also to knowledge maintained tacitly in the minds of individuals, which is exchanged in seminars and other events.

Beneficial organism (*Organisme bermanfaat*) [Bio] Any organism directly or indirectly advantageous to plants or plant product including biological control agents.

Bioassay (*Uji hayati*) [Bio] A method of determining the effect of a compound by quantifying its effect on living organisms or their component parts.

Bioaugmentation (*Bioaugmentasi*) [Bio] Increasing the activity of bacteria that decompose pollutants, a technique used in bioremediation.

Biocapacity (*Kapasitas hayati*) [Bio] A measure of the biological productivity of an area. This may depend on natural conditions or human inputs like farming and forestry practices. Biocapacity can also be defined as the area needed to support the consumption of a defined population.

Biodiversity (*Keanekaragaman hayati*) [Bio] (1) All living species that depend on each other as part of a healthy and sustainable environment; (2) the existence of a wide range of different types of organisms in a given place at a given time. The variability among living organisms from all sources including, among other things, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems; and (3) all or any one of ecosystem variety, the variety of species, the genetic variation among members of species, and human cultural variety as manifested in language, belief, land use, art, food preferences, an so forth.

Biodynamic (*Dinamika hayati*) [Bio] Relating to a system of farming that uses only organic materials for fertilizing and soil conditioning.

Bioenrichment (*Pengayaan hayati*) [Bio] Adding nutrients or oxygen to increase microbial breakdown of pollutants.

Bioethics (*Etika hayati*) [Bio] The study of the ethical and moral implications of new biological discoveries, biomedical advances, and their applications as in the fields of genetic engineering and drug research. It considers all living organisms and the environment, from the level of the individual to the biosphere.

Biogeochemical cycle (*Daur biogeokimia*) [Bio] The movement of chemical elements between organisms and non-living components of the atmosphere, aquatic systems and soils.

Bioenergy (*Energi hayati*) [Bio] Used in different senses: in its most narrow sense it is a synonym for biofuel, fuel derived from biological sources. In its broader sense it encompasses also biomass, the biological material used as a biofuel, as well as the social, economic, scientific and technical fields associated with using biological sources for energy.

Biological control agent or Biocontrol (*Agen pengendali hayati atau kontrol hayati*) [Bio] (1) A natural enemy, antagonist or competitor, or other organism, used for pest control; (2) uses a pest's natural enemies to attack and control the pest. We use the word "control" rather than "eliminate" because biological control usually implies that a few pests must remain to feed the natural enemies; and (3) managing pest populations by purposefully manipulating beneficial natural enemies – predatory or parasitic insects that kill pest insects, or microbes that cause insect diseases. See *Bacillus thuringiensis*.

Biological heritage (*Warisan hayati*) [Bio] Ecological relationships, genetic and behavioral information, evolutionary history, and geospatial information.

Biological invasion or Bioinvasion (*Invasi hayati atau Bioinvasi*) [Bio] (1) The naturalization and unintended spread of unwanted organisms in areas where they have not previously occurred naturally; (2) species transferring outside their original area of distribution. In order to define an invader as a non-indigenous species (NIS) it must be demonstrated that the species had not inhabited this area before.

Biological natural resources (*Sumberdaya alam hayati*) [Bio] Biological elements in nature consisted of natural resource of plant and natural resource of animal, together which is along with nonliving element around as a whole form ecosystem.

Biological pesticide or Biopesticide (*Pestisida hayati atau Biopestisida*) [Bio] A generic term, not specifically infinable, but generally applied to biological control agent, usually a pathogen, formulated and applied in manner similar to chemical pesticide, and normally used for the rapid reaction of a pest population for short-term pest control.

Biological productivity or Bioproductivity (*Produktivitas hayati atau Bioproduktivitas*) [Bio] The capacity of a given area to produce biomass; different ecosystems (i.e. pasture, forest, etc.) will have different levels of bioproductivity. Biological productivity is determined by dividing the total biological production (how much is grown and living) by the total area available.

Biological warfare (*Peperangan hayati*) [Bio] The wartime use of biological weapons.

Biological weapon (*Senjata hayati*) [Bio] The weaponization of pathogens, parts of them, or their toxins. This may involve modifying the environmental viability of the organism, its dispersal characteristics, its infectivity, etc.

Biological Weapons Convention (BWC) (*Konvensi Senjata Hayati*) [Bio] The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction (referred to as the Biological Weapons Convention, BWC) was the first multilateral disarmament treaty banning the production and use of an entire category of weapons. It was the result of prolonged efforts by the international community to establish a new instrument that would supplement the 1925 Geneva Protocol. Opened for signature on April 10, 1972, it entered into force March 26, 1975 when 22 governments had finalized their instruments of ratification. It commits the 153 states that are party to it to prohibit national development, production, and stockpiling of biological and toxin weapons and to act to ensure that citizens of those countries likewise do not engage in these activities. However, the absence of any formal verification regime to monitor compliance has limited the effectiveness of the Convention. A protracted process of negotiation to add these missing elements began in the 1990s.

Biomass (*Biomassa*) [Bio] (1) The total dry weight of all organisms in a particular sample, population, or area; (2) the materials derived from photosynthesis (fossilized materials may or may not be included) such as forest, agricultural crops, wood and wood wastes, animal wastes, livestock operation residues, aquatic plants, and municipal and industrial wastes; the quantity of organic material present in unit area at a particular time mostly expressed as tons of dry matter per unit area; organic matter that can be used as fuel.

Biopiracy (*Penjarahan hayati*) [Bio] The misappropriation of knowledge and/or biological material from traditional communities.

Bioprospecting or Biodiversity prospecting (*Bioprospeksi atau Prospeksi hayati*) [Bio] The search for useful genetic and biochemical compounds and materials and related information in nature.

Bioprocessing (*Bioproses*) [Bio] A technique which microorganisms, living cells, or their components are used to produce a desired end product.

Bioremediation (*Pemulihan hayati*) [Bio] (1) Using organisms, usually microorganisms, to remove toxins from soil, air or groundwater. See *Bioaugmentation*, *Bioenrichment*; (2) works which restore or recover lands, waters, naturally occurring systems and habitats.

Biorisk assessment (*Penilaian risiko hayati*) [Bio] The process to identify acceptable and unacceptable risk (embracing biosafety risk, which is a risk of accidental infection) and laboratory biorisk (risk of unauthorized access, loss, theft, misuse, diversion and intentional release) and their potential consequences.

Biosafety (*Keamanan hayati*) [Bio] (1) The development and implementation of administrative policies, work practices, facility design, and safety equipment to prevent transmission of biological agents to workers, other individuals or the environment; (2) the safe handling practices, procedures and proper use of containment facilities to prevent accidental harm caused by living organisms either directly or indirectly to individuals within laboratories or to the environment; (3) the safe use for human, animal and plant health, and the environment, of new biotechnologies; (4) regulate, manage or control the risks associated with the use and release of living modified organisms (LMOs) resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biological diversity, taking also into account the risks to human health.

Biosecurity (*Ketahanan hayati*) [Bio] (1) The protection of a country, region, location's or firm's from economic, environmental and/or human health from harmful organisms; (2) procedures followed or measures taken to safeguard the flora and fauna of a country etc. against exotic pests and diseases; (3) a strategic and integrated approach that encompasses the policy and regulatory frameworks (including instruments and activities) that analyze and manage risks in the sectors of food safety, animal life and health, and plant life and health, including associated environmental risk; (4) effort to prevent, reduce or eliminate the threats, applications and effects of intentional and unintentional misuse of life sciences and technology, while promoting and pursuing beneficial pursuits and uses; (5) measures to protect against the malicious use of pathogens, parts of them, or their toxins in direct or indirect acts against humans, livestock or crops; (6) the implementation of measures that reduce the risk of the introduction and spread of disease agents. Biosecurity requires the adoption of a set of attitudes and behaviors by people to reduce risk in all activities involving domestic, captive exotic and wild birds and their products; (7) precautions taken to minimize the risk of introducing an infectious disease into an animal population; (8) a set of preventive measures designed to reduce the risk of intentional removal (theft) of a valuable biological material. These preventative measures are a combination of systems and practices usually put into place at a legitimate bioscience laboratory that could be sources of pathogens and toxins for malicious use. Although security is usually thought of in terms of "Guards, Gates, and Guns", biosecurity encompasses much more than that and requires the cooperation of scientists, technicians, policy makers, security engineers, and law enforcement officials; (9) a strategic and integrated approach to analyzing and managing relevant risks to human, animal and plant life and health and associated risks to the environment; (10) it has been defined in a New Zealand context is protection from the risks posed by organisms to the economy, environment and people's health through exclusion, eradication and control; (11) the implementation of measures that reduce the risk of introduction and spread of disease agents.

Biosecurity risk analysis (*Analisis risiko ketahanan hayati*) [Bio] The process of risk analysis that follows three main stages, namely the likelihood of hazard identification, assessment of its impact in the event of an incursion or threat and risk management.

Biosecurity threats (*Ancaman ketahanan hayati*) [Bio] Those matters or activities which, individually or collectively, may constitute a biological risk to the ecological welfare or to the well-being of humans, animals or plants of a country.

Biosensor technology (*Teknologi biosensor*) [Bio] The use of cells or biological molecules in an electronic system to detect specific substances. It consists of a biological sensing agent coupled with a microelectronic circuit.

Biosynthesis (*Biosintesis*) [Bio] Production of a chemical by a living organism.

Biotechnology (*Bioteknologi*) [Bio] (1) The application of science and technology to living organisms as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services; (2) the scientific manipulation of living organism, especially at the molecular genetic level, to produce useful product. Gene splicing and use of recombinant DNA (rDNA) are major techniques used.

Bioterrorism (*Bioterorisme*) [Bio] (1) The intentional use of biological and chemical agents for the purpose of causing harm; (2) the malicious use by terrorists of pathogens, parts of them, or their toxins in direct or indirect acts against humans, livestock or crops; (3) terrorism by intentional release or dissemination of biological agents (bacteria, viruses, or toxins); these may be in a naturally-occurring or in a human-modified form.

Biotic stress (*Cekaman hayati*) [Bio] Living organisms which can harm plants, such as viruses, fungi, and bacteria, and harmful insects. See *Abiotic stress*.

Bonding social capital (*Modal sosial mengikat*) [Com] (1) Exclusive social capital refers to the cohesive bonds (strong ties) that facilitate social relations within relatively homogenous social groups (e.g. families, ethnic groups, religious cliques); (2) ties within subgroups of villagers which may maintain a high level of intimacy and trust; (3) characterized by high level of close, closed and density-knit networks and associated high levels of familiar/personalized trust and reciprocity.

Brainstorming (*Curah pendapat*) [Com] A facilitated group discussion whereby members are encouraged to share their ideas about a particular topic, the main purpose of which is to get participants to react to the topic and express ideas in a creative fashion and provide opportunity to gather diverse opinions and generate new ideas, and to learn.

Bridging social capital (*Modal sosial bridging*) [Com] (1) Inclusive social capital refers to the weaker horizontal ties that exist between distant friends, associate or colleagues (e.g. civil rights movement, ecumenical religious organization); (2) relations between members of different such subgroups which involves more sparse ties with people/organizations that are diverse, or heterogeneous. These types of connections relate to generalized trust, beyond trusting relationship with people who are familiar or known.

Brokers (*Perantara*) [Com] (1) Individual or organizational actors who carry many exclusive links, that is, links to groups that would otherwise not be in direct contact with each other; (2) facilitator of information exchange.

Brokering social capital (*Modal sosial pemerantara*) [Com] A quality of individual or special sub-groups, who are able to extract extra social benefit by forming strategic bridges across areas of reduced relational density and thereby mobilize useful resources, access novel information and develop innovative solutions.

Buffer zone (*Zona penyangga*) [Bio] An area surrounding or adjacent to an area officially delimited for phytosanitary purposes in order to minimize the probability of spread of the target pest into or out of delimited area, and subject to phytosanitary or other control measures, if appropriate.

Build capital (*Modal bangunan*) [Com] (1) Any engineered work, for example irrigation canal; it includes the infrastructure that supports the other capitals; (2) local infrastructure. Comprises housing and other buildings; roads and bridges; energy supplies; communications; markets; and transportation.

Bulbs and tubers (*Ubi dan umbi akar*) [Bio] A commodity class for dormant underground parts of plants intended for planting (includes corms and rhizomes).

C

Capacity (*Kapasitas*) [Com] The ability of individuals, organizations and systems to perform functions effectively, efficiently and sustainably. Biosecurity capacity relates to the ability of relevant organizations to perform appropriate functions effectively, efficiently and sustainably in order to protect human, animal and plant life and health, and associated aspects of the environment.

Capital (*Modal*) [Com] Resources invested to create new resources over long time.

Carcinogen (*Karsinogen*) [Bio] A substance that induces cancer.

Carcinoma (*Karsinoma*) [Bio] A malignant tumor derived from epithelial tissue, which forms the skin and outer cell layers of internal organs.

Cell-based therapies (*Terapi berbasis sel*) [Bio] Treatment in which stem cells are induced to differentiate into the specific cell type required to repair damaged or depleted adult cell populations or tissues.

Centrality (*Sentralitas*) [Soc] A quantitative network measure. The degree of centrality indicates how many links a node has. This measure can be applied to individual nodes or the whole network. A high degree of centrality for an individual node indicates that it has many links compared to other nodes. Centrality for the whole network indicates the tendency in the network for a few actors to have many links, e.g. a wheel-star structure.

Center for Eastern Indonesian Studies (CEIS) (*Pusat Studi Kawasan Timur Indonesia*) [Soc] One of the most active multidisciplinary research centers in *Universitas Kristen Satya Wacana*, Salatiga, Indonesia; its activities are developed and conducted throughout Eastern Indonesia covering regions of Kalimantan (Borneo), Sulawesi (Celebes), Maluku (Moluccas), Nusa Tenggara, and Papua.

Certificate (*Sertifikat*) [Bio] An official document which attests to the phytosanitary status of any consignment affected by phytosanitary regulations.

Centre for Agricultural Bioscience International (CABI) (*Pusat Biosains Pertanian Internasional*) [Bio] A non-profit international organization that has been working in invasive species for nearly 100 years.

Chemical pressure impregnation (*Impregnasi tekanan kimia*) [Bio] Treatment of wood with a chemical preservative through a process of pressure in accordance by phytosanitary regulations.

Classical biological control (*Pengendalian hayati klasik*) [Bio] The intentional introduction and permanent establishment of an exotic biological agent for long-term pest control.

Clearance of a consignment (*Pemeriksaan barang kiriman*) [Bio] Verification of compliance with phytosanitary regulations.

Clone (*Klon*) [Bio] A cell, collection of cells or organism containing identical genetic material. Clones are produced from a single parent cell.

Cloning (*Kloning*) [Bio] Technique of creating a group of genetically identical cells or DNA molecules from the mitotic division of a single ancestor.

Code of ethics (*Kode etik*) [Soc] A written system of standards, principles, rules, or guidelines that is used by researchers to guide the ethical conduct of research.

Collaboration (*Kolaborasi*) [Soc] (1) Co-laboring or working equitably with at least one other person on the same project or task; (2) working together with one or more people to achieve something.

Collaborative learning (*Belajar kolaborasi*) [Soc] (1) An umbrella term for a variety of educational approaches involving joint intellectual effort by students, or students and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product; (2) students working in small groups to achieve shared learning goals. It is rooted in the assumption that knowledge is socially constructed by consensus among peers.

Collective action (*Aksi kolektif*) [Soc] The pursuit of a goal or set of goals by more than one person. It is a term which has formulations and theories in many areas of the social sciences.

Commensalism (*Komensalisme*) [Bio] The close association of two or more dissimilar organisms where the association is advantageous to one and doesn't affect the others.

Communicable disease (*Penyakit menular*) [Bio] A disease that is transmitted from person to person through direct contact with an infected individual, the infected individual's discharge, or indirectly through a vector. Many of these diseases can be prevented through the use of protective measures, such as increased sanitation or a high level of vaccine coverage of vulnerable populations.

Commission (*Komisi*) [Bio] The Commission on Phytosanitary Measures Established under Article XI.

Commodity (*Komoditas*) [Bio] A type of plant, plant product, or other article being moved for trade or other purpose.

Commodity class (*Kelompok komoditas*) [Bio] A category of similar commodities that can be considered together in phytosanitary regulations.

Commodity pest list (*Daftar hama komoditas*) [Bio] A list of pests occurring in an area which may be associated with a specific commodity.

Community (*Komunitas*) [Com] (1) A group of people who share common identity or interest whether it be a geographic location, cultural background, occupation, sport, language, age, school or sexuality; (2) a group of people, e.g. a neighborhood, village, or municipal or rural region or a social group with a unifying common interest or trait, loosely organized into a recognizable unit; a vague but useful term. There is often a sense of belonging; (3) comes from the Latin *com* meaning "with or together (implying more than one)" and *unus* meaning "one e.g. many together as one".

Community action (*Aksi komunitas*) A community practice approach characterized by the use of power, influence, and negotiations to achieve change.

Community based (*Berbasis komunitas*) [Com] Works and projects in which community plays an integral role in the collaborative process and creation of work. Shared or community ownership of works often results from such collaborations.

Community capital (*Modal komunitas*) [Com] All resources in community that can be reduced, saved for future use, or invested to create new resources.

Community development (*Pengembangan komunitas*) [Com] A community practice approach to build community by enabling, teaching, and motivating people and local organizations for self-help. It is also referred to as local development or social development.

Community engagement (*Pelibatan masyarakat*) [Com] A structured dialogue, joint problem-solving and collaborative action among formal authorities, citizens at-large, and local opinion leaders around a pressing public matter.

Community based management (*Manajemen berbasis masyarakat*) [Com] The functional control of systems by communities or their representatives. It can and often does, but does not have to, include elements of community ownership, and involvement in day to day operation and maintenance.

Community participation (*Partisipasi komunitas*) [Com] A process of active involvement of local individuals and groups in assessment of needs, planning solutions, creating structures for and implementing solutions and assessing outcomes.

Community planning (*Perencanaan komunitas*) [Com] A community practice approach to community practice involving a rational structured process that includes the setting of goals, objectives, and priorities.

Community practice (*Praktik komunitas*) [Com] Approach to view the community as resource, method, and client, e.g. a Junior League sponsored clean up campaign to improve the neighborhood.

Community structure (*Struktur komunitas*) [Soc] A figurative sketch of a network in certain community.

Competent authority (*Otoritas kompeten*) [Bio] The official authority charged by the government with sector control of biosecurity, including setting and enforcing of regulatory requirements.

Competitor (Pesaing) [Bio] An organism which competes with pests for essential elements (e.g. food, shelter) in the environment.

Competency (Kompetensi) [Com] (1) Can be broadly defined as the ability of a student/worker enabling him to accomplish tasks adequately, to find solutions and to realize them in work situations. This definition fits in with the need for describing competencies and assessing them. Competencies consist of components that are trainable (knowledge, skills) and components that are more difficult to alter (attitudes, believes). In addition, competencies refer to a profession in organizational context; (2) is the ability to perform a specific task, action or function successfully. Incompetence is its opposite.

Compliance procedure (*Prosedur kepatuhan*) [Bio] Official procedure used to verify that a consignment complies with stated phytosanitary requirements.

Concept (*Konsep*) [Soc] Clearly specified ideas deriving from a particular model.

Confirmation (*Konfirmasi*) [Soc] A verification strategy, using multiple approaches to data collection, in which the strengths and weaknesses of the methods are known and counterbalanced to address threats to validity.

Conservation (*Konservasi*) [Bio] Sustainable use and protection of natural resources, including plants, animals, mineral deposits, soils, clean water, clean air, and fossil fuel such as coal, petroleum, and natural gas.

Conservation of biological natural resources (*Konservasi sumberdaya alam hayati*) [Bio] Management of biological natural resources which its usage is conducted wisely to guarantee its supply continuity, with fixed to maintain and increasing quality of variety and its value.

Consignment (*Barang kiriman*) [Bio] A quantity of plants, plant products and/or other articles being moved from one country to another and covered, when required, by a single phytosanitary certificate (a consignment may be composed of one or more commodities or lots).

Consignment in transit (*Barang kiriman dalam transit*) [Bio] A consignment which passes through a country without being imported, and that may be subject to phytosanitary measures.

Containment (*Penahanan*) [Bio] Application of phytosanitary measures in and around an infested area to prevent spread of a pest.

Contaminating pest (*Hama pengkontaminasi*) [Bio] A pest that is carried by a commodity and, in the case of plants and plant products, does not infest those plants or plant products.

Contamination (*Kontaminasi*) [Bio] Presence in a commodity, storage place, conveyance or container, of pests or other regulated articles, not constituting an infestation. See *Infestation*.

Control measure (*Cara pengendalian*) [Bio] Any action or activity that can be used to prevent or eliminate a hazard or reduce it to an acceptable level.

Convention on Biological Diversity (CBD) (*Konvensi Keanekaragaman Hayati*) [Bio] The CBD was signed by 150 government leaders at the 1992 Rio Earth Summit. The Convention is dedicated to promoting sustainable development. It recognizes that biological diversity is about more than plants, animals and micro-organisms and their ecosystems. It is about people and their need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live. It has established three main goals: the conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of the benefits from the use of genetic resources.

Containment (*Pembendungan*) [Bio] The safe methods for managing infectious materials in a laboratory where they are being handled or maintained. The purpose is to eliminate the risk of adverse exposure to harmful agents by laboratory personnel or the outside environment. There are three elements to containment: laboratory practice and technique, safety equipment, and facility design.

Contaminating pest (*Hama pencemar*) [Bio] A pest that is carried by a commodity and, in the case of plants and plant products, does not infest those plants or plant products.

Contamination (*Pencemaran*) [Bio] Presence in commodity, storage place, conveyance or container, of pests or other regulated articles.

Content analysis (*Analisis isi*) [Soc] (1) A research technique for the objective, systematic, and quantitative description of the manifest content of communication. Objectivity is achieved by having the categories of analysis defined so precisely that different persons can apply them to the same content and get the same results. Systematic means, first, that a set procedure is applied in the same way to all the content being analyzed. Second, it means that categories are set up so that all relevant content is analyzed. Finally, it means that the analyses are designed to secure data relevant to a research question or hypothesis. Quantitative means simply the recording of numerical values or the frequencies with which the various defined types of content occur. Manifest content means the apparent content, which means that content must be coded as it appears rather than as the content analyst feels it is intended; (2) any technique for making inferences by objectively and systematically identifying specified characteristics of messages; (3) use of applicable and valid method for making specific inferences from texts to other states or properties of its source; (4) a research tool used to determine the presence of certain words or concepts within texts or sets of texts. Texts can be defined broadly as books, book chapters, essays, interviews, discussions, newspaper headlines and articles, historical documents, speeches, conversations, advertising, theater, informal conversation, or really any occurrence of communicative language; (5) a systematic, replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding; (6) content analysis can be powerful tool for determining authorship, examining trends and patterns in documents and provide an empirical basis for monitoring shifts in public opinion; (7) method of data analysis for narrative data (e.g. texts, transcription) in which the segments of the text are systematically categorized such the segment within each category are similar to each other and are different from segments in other categories. Categories might be preplanned on the basis of theory or conceptual framework (a priori themes) or might emerge during the analysis (emergent theme analysis); (8) involves establishing categories, and systematic linkages between them, and the counting the number of instances when those categories are used in a particular item of text.

Control of pest (*Pengendalian hama*) [Bio] Suppression, containment or eradication of a pest population.

Control point (*Batas pengendalian*) [Bio] A step in a system where specific procedures can be applied to achieve a defined effect and can be measured, monitored, controlled and corrected.

Controlled area (*Kawasan pengendalian*) [Bio] A regulated area which an NPPO has determined to be the minimum area necessary to prevent spread of a pest from a quarantine area.

Conversation analysis (*Analisis percakapan*) [Soc] Based on attempt to describe people's methods for producing orderly talk-in-interaction. It is assumed that the meanings are shaped in the context of the exchange. In conversation analysis, the researcher immerses himself/herself in the situation to reveal the background of practices.

Country of origin of a consignment of plant products (*Negara asal barang kiriman produk tumbuhan*) [Bio] Country where the plants from which the plant products are derived were grown.

Country of origin of regulated articles other than plants and plant products (*Negara asal barang regulasi selain tumbuhan dan produk tumbuhan*) [Bio] Country where the regulated articles were first exposed to contamination by pests.

Cooperation (*Kerjasama*) [Com] A structure of interaction designed to facilitate the accomplishment of a specific end product or goal through people working together in groups.

Cooperative learning (Pembelajaran kooperatif) [Soc] (1) The instructional use of small groups so that students work together to maximize their own and each other's learning; (2) set of processes which help people interact together in order to accomplish a specific goal or develop an end product which is usually content specific. It is more directive than a collaborative system of governance and closely controlled by the teacher. See *Collaborative learning*.

Cooperative Research Centre for Australian Weed Management (*Pusat Kajian Kooperatif untuk Pengelolaan Gulma Australia*) [Bio] This centre seeks to reduce the influx of new weeds from overseas and to integrate agronomy, competitive crop cultivars, biocontrol, herbicides and other management tools to reduce the costs of weeds to agriculture.

Cooperative Research Centre for National Plant Biosecurity (*Pusat Kajian Kooperatif untuk Ketahanan Hayati Tanaman Nasional*) [Bio] Seeking to counteract the impact of emerging pests and diseases through the application of new technology, this centre is creating a national plant biosecurity network by integrating approaches across agencies and jurisdictions. Centrally coordinates plant biosecurity research across all Australian states and territories. Provides leadership in the development, execution and delivery of plant biosecurity research to safeguard Australia's plant industries; ensure food security for Australian consumers; and improve market access for agricultural exporters.

Crop rotation or Crop sequencing (*Pergiliran tanaman*) [Bio] The practice of growing a series of dissimilar types of crops in the same space in sequential seasons for various benefits such as to avoid the build up of pathogens and pests that often occurs when one species is continuously cropped.

Cryopreservation (*Pengawetan beku*) [Bio] The process of freezing biological materials in such way that the materials can be stored for long periods of time, and then thawed for use.

Cultural eutrophication (*Eutrofikasi budaya*) [Com] The process that speeds up natural eutrophication because of human activity.

Cultural services (*Jasa budaya*) [Bio] The non-material benefits of ecosystems including refreshment, spiritual enrichment, knowledge, artistic satisfaction.

Culture (Budaya) [Soc] (1) The way of life of people, including their attitudes, values, beliefs, arts, sciences, modes of perception, and habits of thought and activity; (2) the sum total of the ideas, beliefs, customs, values, knowledge, and material artifacts that are handed down from one generation to the next in a society; (3) a many-layered concept with at least three dimensions: the cultivation of human natural capacities, the intellectual and imaginative products of such cultivation, and the whole way of life of a group or a society; (4) a process that permits the learning of prior generations to have more direct effects on the learning of subsequent generations; (5) a normative system, integral to which are norms, rules, and other indicators of how people in particular roles and in particular places should behave; (6) a dynamic system of sometimes competing beliefs and practices but a system characterized by certain widely shared understandings.

Cultural capital (*Modal budaya*) [Com] The ways people "know the world" and how to act within it as well as their traditions and language.

Cultural heritage (*Warisan budaya*) [Com] Traditional knowledge, life-ways, sacred sites, medicine, art and/or religion.

Cut flowers and branches (*Cabang dan bunga potong*) [Bio] A commodity class for fresh parts of plants intended for decorative use and not for planting.

D

Data (*Data*) [Soc] Information arranged in an organized form.

Database (*Pangkalan data*) [Soc] An organized collection of information, typically, though not exclusively, held in computer and able to be searched in various ways, such as keyword, author, or subject.

Debarked wood (*Kayu terkuliti*) [Bio] Wood that has been subjected to any process that results in the removal of bark. Debarked wood is not necessarily bark-free wood.

Delimiting survey (*Survei terbatas*) [Bio] Survey conducted to establish the boundaries of an area considered to be infested by or free from a pest.

Detection survey (*Survei deteksi*) [Bio] Survey conducted in an area to determine if pests are present.

Detention (*Penahanan*) [Bio] Keeping a consignment in official custody or confinement, as a phytosanitary measure. See *Quarantine*.

Developing countries (*Negara berkembang*) [Soc] Development of a country is measured using a mix of economic factors (income per capita, GDP, degree of modern infrastructure (both physical and institutional), degree of industrialization, proportion of economy devoted to agriculture and natural resource extraction and social factors (life expectancy, the rate of literacy, poverty). The UN-produced Human Development Index (HDI) is a compound indicator of the above statistics. There is a strong correlation between low income and high population growth, both within and between countries. In developing countries, there is low per capita income, widespread poverty, and low capital formation. In developed countries there is continuous economic growth and a relatively high standard of living.

Devitalization (*Devitalisasi*) [Bio] A procedure rendering plants or plant products incapable of germination, growth or further reproduction.

Diagnostic procedure (*Prosedur diagnostik*) [Bio] Any document (e.g. IPPC, EPPO, etc.) addressing one or more specified technical procedures and methods for diagnosis or detection of a specific plant pest or group of plant pests.

Diagnostic protocol (*Protokol diagnostik*) [Bio] Any document (e.g. IPPC, EPPO, etc.) that contains detailed information about a specific plant pest or group of plant pests relevant to its diagnosis. A diagnostic protocol will include diagnostic procedures and data on: the pest, its biology and taxonomy, detection, identification, records, acknowledgements, references, and experts contact information.

Discourse analysis (*Analisis wacana*) [Soc] Analysis builds on both content analysis and conversation analysis but focuses on “language games”. A language game refers to a well-defined unit of interaction consisting of a sequence of verbal moves in which turns of phrases, the use of metaphor and allegory all play an important part.

Disinfectant (*Desinfektan*) [Bio] A substance that destroys harmful microorganisms. According to the Environmental Protection Agency (EPA), a disinfectant destroys 100% of the vegetative (actually growing) bacteria of a certain species under specified conditions. However, disinfection does not include efficacy against fungi, viruses, *Mycobacterium tuberculosis* or bacterial spores (unless specifically tested against those organisms with EPA approved methods).

Dormancy (*Dormansi*) [Bio] A period in which a plant does not growth, awaiting necessary environmental conditions such as temperature, moisture, nutrient availability.

Dose mapping (*Pemetaan dosis*) [Bio] Measurement of the absorbed dose distribution within a process load through the use of dosimeters placed at specific locations within the process load.

Dosimeter (*Dosimeter*) [Bio] A device that, when irradiated, exhibits a quantifiable change in some of the device which can be related to absorbed dose in a given material using appropriate analytical instrumentation and techniques.

Dosimetry (Dosimetri) [Bio] A system used for determining absorbed dose, consisting of dosimeters, measurement instruments and their associated reference standards, and procedures for the system's use.

Dunnage (*Kayu ganjal*) [Bio] Wood packaging material used to secure or support a commodity but which does not remain associated with the commodity.

E

Eastern Indonesian Forum or EI Forum (*Forum Kawasan Timur Indonesia atau Forum KTI*) [Soc] As an independent network, supported by the Decentralization Support Facility Eastern Indonesia (SOfEI); it encourages constructive interaction among multistakeholders in Eastern Indonesia (EI) primarily through sharing knowledge, which the main aim is to encourage development effectiveness in EI; the EI forum and the Eastern Indonesia Knowledge Exchange, known as BaKTI, cooperated in forming 12 cluster in every EI province to strengthen the forum; these are known as "Regional Offices".

Eco (*Eko*) [Bio] A prefix now added to many words indicating a general consideration for the environment e.g. ecohousing, ecolabel, ecomaterial.

EcoART [Bio] A broad field of interdisciplinary arts practice, distinguished from Land Art and Environmental Art by its specific focus on world sensitive ideologies and methodologies. EcoART practice seeks to restore, protect and preserve the world for its own sake, and to mediate human-world relations to this end.

Eco-asset (*Eko-aset*) [Bio] A biological asset that provides financial value to private land owners when they are maintained in or restored to their natural state.

Ecolabel (*Ekolabel*) [Bio] Seal or logo indicating a product has met a certain environmental or social standards.

Ecological footprint (*Jejak ekologis*) [Bio] In a very general environmental sense, a "footprint" is a measure of environmental impact. However, this is usually expressed as an area of productive land (the footprint) needed to counteract the impact; a measure of the area of biologically productive land and water needed to produce the resources and absorb the wastes of a population using the prevailing technology and resource management schemes.

Ecological literacy (*Literasi ekologis*) [Soc] (1) An ecologically literate person as one who understands the basic principles of ecology and is able to embody them in the daily life of human communities; (2) ecologically literate person is one who is a responsible, lifelong learner who strives to improve the human condition and the environment within the context of self, human groups, the biosphere and the ecosphere. This person will find purpose and meaning for life by continuously aspiring to higher levels of balanced growth, in his or her cognitive, affective, psychomotor, reflective, intuitive, aesthetic, social, creative and spiritual capabilities; (3) understanding the basic principles of ecology, which include learning about and understanding how nature works, how our society and economy ("human systems") depend on clean air water, and soil and other resources (products of "natural systems"), and how human interactions with the environment can have both positive and negative impacts on people and the natural world; (4) embodying the principles of ecology in everyday life; (5) consists of three components: the knowledge necessary to comprehend interrelatedness, an attitude of care or stewardship and the practical competence required to act on the basis of knowledge and feeling.

Ecological sustainability (*Keberlanjutan ekologis*) [Bio] The capacity of ecosystems to maintain their essential processes and function and to retain their biological diversity without impoverishment.

Ecologically sustainable development (*Pembangunan berkelanjutan secara ekologis*) [Com] Using, conserving and enhancing the human community's resources so that ecological processes, on which all life depends, can be maintained and enriched into the future.

Ecology (*Ekologi*) [Bio] (1) The study of the interactions of organisms with their environment and with each other; (2) the scientific study of living organisms and their relationships to one another and their environment; the scientific study of the processes regulating the distribution and abundance of organisms; the study of the design of ecosystem structure and function; (3) the scientific study of the distribution and abundance of life and the interactions between organisms and their environment. The environment of an organism includes physical properties, which can be described as the sum of local abiotic factors such as insulation (sunlight), climate, and geology, and biotic factors, which are other organisms that share its habitat. Ecophysiology examines how the physiological functions of organisms influence the way they interact with the environment, both biotic and abiotic. Behavioral ecology examines the roles of behavior in enabling an animal to adapt to its environment. Population ecology studies the dynamics of populations of a single species. Community ecology (or synecology) focuses on the interactions between species within an ecological community. Ecosystem ecology studies the flows of energy and matter through the biotic and abiotic components of ecosystems. Systems ecology is an interdisciplinary field focusing on the study, development, and organization of ecological systems from a holistic perspective. Landscape ecology examines processes and relationship across multiple ecosystems or very large geographic areas. Evolutionary ecology studies ecology in a way that explicitly considers the evolutionary histories of species and their interactions. Political ecology connects politics and economy to problems of environmental control and ecological change. Ecology can also be sub-divided according to the species of interest into fields such as animal ecology, plant ecology, insect ecology, and so on. Another frequent method of subdivision is by biome studied, e.g. Arctic ecology (or polar ecology), tropical ecology, desert ecology, etc. The primary technique used for investigation is often used to subdivide the discipline into groups such as chemical ecology, genetic ecology, field ecology, statistical ecology, theoretical ecology, and so forth. These fields are not mutually exclusive.

Ecological crisis (*Krisis ekologis*) [Bio] Occurs with the loss of adaptive capacity when the resilience of an environment or of a species or a population evolves in a way unfavorable to cope with perturbations that interfere with that ecosystem, landscape or species survival. It may be that the environment quality degrades compared to the species needs, after a change in an abiotic ecological factor (for example, an increase of temperature, less significant rainfalls). It may be that the environment becomes unfavorable for the survival of a species (or a population) due to an increased pressure of predation (for example overfishing). Lastly, it may be that the situation becomes unfavorable to the quality of life of the species (or the population) due to a rise in the number of individuals (overpopulation).

Ecological restoration (*Restorasi ekologis*) [Bio] Is the process of repairing damage caused by humans to the diversity and dynamics of indigenous ecosystems.

Ecosystem (*Ekosistem*) [Bio] (1) The organisms in a plant population and the biotic and abiotic factors which impact on them; (2) a system of environment element representing union totally, and is influencing each other in forming balance, stability, and environment productivity; a dynamic complex of plant, animal and micro-organism communities an their abiotic environment interacting as a functional unit.

Economic externalities (*Eksternalitas ekonomi*) [Com] Costs or benefits that are not borne by the producer or supplier of a good or service. In many environmental situations, environmental deterioration may be caused by a few while the cost is borne by the community; examples would include overfishing, pollution (e.g. production of greenhouse emissions that are not compensated for in any way by taxes etc.), the environmental cost of land-clearing etc.

EcoTECH [Bio] “Earth-friendly” technologies; often utilized in or developed through EcoART practices.

Ecotype (*Ekotipe*) [Bio] (1) A subgroup of a species that has characteristic genetically determined adaptations to its local environment. In some cases individuals belonging to different ecotypes cannot interbreed, for example where accumulated genetic differences are too great; (2) a locally adapted population of a widespread species. Such populations show minor changes of morphology and/or physiology, which are related to habitat and are genetically induced. Nevertheless they can still reproduce with other ecotypes of the same species.

Ecosystem boundary (*Batas ekosistem*) [Bio] The spatial delimitation of an ecosystem usually based on discontinuities of organisms and the physical environment.

Ecosystem services (*Jasa ekosistem*) [Bio] The role played by organisms, without charge, in creating a healthy environment for human beings, from production of oxygen to soil formation, maintenance of water quality and much more. These services are now generally divided into four groups, supporting, provisioning, regulating and cultural.

Effectiveness of treatment (*Efektivitas perlakuan*) [Bio] A defined, measurable, and reproducible effect by a prescribed treatment.

Emergency action (*Tindakan darurat*) [Bio] A prompt phytosanitary action undertaken in a new or unexpected phytosanitary situation.

Emergency plant pest (*Hama tumbuhan darurat*) [Bio] Is a Plant Pest that is determined to meet one or more of the following criteria: (a) It is a known exotic Plant Pest the economic consequences of an occurrence of which would be economically or otherwise harmful for Australia, and for which it is considered to be in the regional and national interest to be free of the Plant Pest. (b) It is a variant form of an established Plant Pest which can be distinguished by appropriate investigative and diagnostic methods and which, if established in Australia, would have a regional and national impact. (c) It is a serious Plant Pest of unknown or uncertain origin which may, on the evidence available at the time, be an entirely new Plant Pest and which if established in Australia is considered likely to have an adverse economic impact regionally and nationally. (d) It is a Plant Pest of potential economic importance to the area endangered thereby and not yet present there or widely distributed and being officially controlled, but is occurring in such a fulminant outbreak form, that an emergency response is required to ensure that there is not either a large scale epidemic of regional and national significance or serious loss of market access.

Emerging zoonosis (*Zoonosis darurat*) [Bio] A zoonosis that is newly recognized or newly evolved, or that has occurred previously but shows an increase in incidence or expansion in geographic, host or vector range.

Empowerment (Pemberdayaan) [Com] The development of the ability (power) to exercise management control over resources and institutions, to own livelihood, and secure sustainable use of resources upon which communities depend.

Endangered area (*Kawasan terancam*) [Bio] An area where ecological factors favor the establishment of a pest whose presence in the area will result in economically important loss.

Entry of a consignment (*Masuknya barang kiriman*) [Bio] Movement through a point of entry into an area.

Entry of a pest (*Masuknya hama*) [Bio] Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled.

Environment (*Lingkungan*) [Bio] All of the external factors affecting an organism. These factors may be other living organisms (biotic factors) or nonliving variables (abiotic factors), such as water, soil, climate, light and oxygen. All interacting biotic and abiotic factors together make up an ecosystem.

Environmental art (*Seni lingkungan*) [Com] A general term referring to art in and/or about the environment. Not necessarily world-sensitive or remedial practice.

Environmental capacity (*Kapasitas lingkungan*) [Bio] A capability of environment to support human life and other life being.

Environmental impact (*Dampak lingkungan*) [Bio] The influence of change at the environment which is resulted from an effort and/or activity.

Environmental literacy (*Literasi lingkungan*) [Com] Includes knowledge of environmental subjects, positive environmental attitudes and pro-environmental behavior.

Environmental pollution (*Pencemaran lingkungan*) [Bio] Is entry of or the including of life being, substance, energy, and/or other component into environment by activity of human being until its quality get down level, causing environment cannot function as according to its function.

Environmental management (*Pengelolaan lingkungan*) [Com] An integrated effort for the purpose of the utilization, regulation, maintenance, supervision, control, rehabilitation and development of the environment.

Environmental impact assessment (*Analisis mengenai dampak lingkungan hidup*) [Soc] Is the process of studying the significant impact of a proposed business or activity on the environment, which is required as part of the Decision making process.

Eradication (*Eradikasi*) [Bio] Application of phytosanitary measures to eliminate a pest from an area.

E-resources (*Sumberdaya elektronik*) [Com] Resources that available electronically. Many resources are provided on a subscription basis via the library, and therefore require password to access them.

Exotic (*Eksotik*) [Bio] Not native to particular country, ecosystem or ecoarea (applied to organisms intentionally or accidentally introduced as a result of human activities). As the code is directed at the introduction of biological control agents from one country to another, the term "exotic" is used for organisms not native to a country. See *Alien species*, *Native species*.

Etymology (*Etimologi*) [Soc] The study of historical changes in the meaning of words.

Ethical (*Etis*) [Com] Relates to set moral principles or values, or theory or system of moral values that guides the behavior of an individual or group.

Ethnobiology (*Etnobiologi*) [Soc] The study of the reciprocal interactions between people and biological organism and of traditional knowledge about these interactions.

Ethnography (*Etnografi*) [Soc] (1) The social scientific study of a people and their culture. This also refers to a qualitative research method in which data are collected through different procedures such as participant observation, interview, and examination of artifacts and records; (2) highly descriptive writing about particular groups of people.

Ethnomethodology (Etnometodologi) [Soc] The study of the "methods" or social procedures, by which people construct reality and make sense of events in everyday life. It seeks to describe methods persons use in doing social life. Ethnomethodology is not a methodology but a theoretical model.

Ethnoscience (*Etnosains*) [Soc] The study of interactions and of traditional knowledge of the physical and biological world. It is a scientific approach to traditional knowledge, based on the work of Harold Conklin among the Hanunoo of the Philippines in the 1950's. Through elicitation of responses to both natural objects such as plants, diseases, soils, and animals, and human activities such as agriculture, scientists developed an appreciation of the coherence of indigenous knowledge systems, their empirical precision, and their attunement to local environmental contexts.

European and Mediterranean Plant Protection Organization (EPPO) (*Organisasi Perlindungan Tanaman Mediteranea dan Eropah*) [Bio] is an intergovernmental organisation responsible for European cooperation in plant protection in the European and Mediterranean region.

Eugenics (*Eugenik*) [Bio] Eugenics involves using principles of genetics to improve humankind.

Evolution (*Evolusi*) [Bio] The long-term process through which a population of organisms accumulate genetic changes that enable its members to successfully adapt to environmental conditions and to better exploit food resources.

Exogenous virus (*Virus eksogen*) [Bio] Caused by factors (as food or traumatic factor) or an agent (as disease-producing organism) which are introduced, produced, or synthesized from outside of the infected organism.

Equivalence (*Kesamaan*) [Bio] The capability of different biosecurity controls to achieve the same health objectives.

F

Field (*Ladang*) [Bio] A plot of land with defined boundaries within a place of production on which a commodity is grown.

Find free (*Bebas mencari*) [Bio] To inspect a consignment, field or place of production and consider it to be free from a specific pest.

Financial capital (*Modal finansial*) [Com] The economic resources available to a community or program; the financial resources available to invest in community capacity building, to underwrite invasive pest management and business development, to support civic and social entrepreneurship, and to accumulate wealth for future community development; stocks of money and savings; comprises access to affordable credit; pensions; welfare payments; grants and subsidies.

Focus group discussion (*Diskusi kelompok terarah*) [Soc] (1) An interactive interview setting in which a small number of respondents (preferably six to eight) engage in discussion in response to a moderator's questions. Focus group sessions generally last between 1 and 3 h and allow in-depth discussion. During the conduct of a focus group, the moderator typically facilitates group discussion on a series about 5–10 open-ended items written on the moderator's "focus group interview protocol"; all of the items on the protocol are related to the focus topic; (2) discussions with four to eight selected members of a community who are chosen for their knowledge and involvement in a specific topic. The group facilitator guides the discussion to focus on gathering information, clarifying community perceptions, and building consensus for a recorded outcome.

Food (*Pangan*) [Bio] Shall be everything originating from biological sources and water whether processed or not, which is designated as cattalos and beverages for human consumption, including food additive material, food raw material and other materials used in the process of preparation, processing and or the making of cattalos or beverages.

Food advertisement (*Iklan pangan*) [Bio] Any information or statement, concerning food in the form of a picture, writing, or another form carried out by various methods for the marketing and or the trade of food.

Food genetic engineering (*Rekayasa genetika pangan*) [Bio] The process involving the transfer of the genes (bearer of the characteristics) of one biological kind to another which is different or similar to derive a new kind which is able to produce a more superior food product.

Food insecurity (*Rawan pangan*) [Bio] A condition in which people lack basic food intake to provide them with the energy and nutrients for fully productive lives. See *Food security*.

Food label (*Label pangan*) [Bio] Any information concerning food in the form of a picture, writing a combination of both, or another form accompanying the food, which is put in, affixed to or constituting part of the food packing.

Food nutrients (*Gizi pangan*) [Bio] A substance or compound found in food consisting of carbohydrates, proteins, fats, vitamins and minerals as well as their derivatives which is useful for the growth and health of human.

Food irradiation (*Iradiasi pangan*) [Bio] The method of radiating food using a radioactive substance as well as accelerators to prevent purifying and decay and to free food from pathogenic microorganism.

Food packing (*Kemasan pangan*) [Bio] The material, used to contain and or pack food, whether directly touching the food or not.

Food production (*Produksi pangan*) [Bio] An activity or process of producing, preparing, processing, making, preserving, packing or repackaging.

Food safety (*Keamanan pangan*) [Bio] (1) Addresses ways to limit the presence of both naturally occurring food contaminates and those caused by cross contamination, and to prevent growth of organisms caused by time/temperature abuse; (2) the condition and efforts required to prevent food from possible biological chemical-contamination and contamination by other objects which may disturb, harm, and endanger the human health.

Food security (*Ketahanan pangan*) [Bio] (1) The condition in which the fulfillment of food for the households is reflected by the availability of sufficient food both its quantity and quality, safe, evenly distributed and within reach; (2) the availability of food and one's access to it. A household is considered food secure when its occupants do not live in hunger or fear of starvation; (3) global food security refers to food produced in sufficient quantity to meet the full requirements of all people i.e. total global food supply equals the total global demand. For households it is the ability to purchase or produce the food they need for a healthy and active life (disposable income is a crucial issue). Women are typically gatekeepers of household food security. For national food security, the focus is on sufficient food for all people in a nation and it entails a combination of national production, imports and exports. Food security always has components of production, access and utilisation.

Food system (*Sistem pangan*) [Bio] Everything which is related to the regulation, development and or supervision on food production activities or process and food circulation until ready for human consumption.

Food transportation (*Transportasi pangan*) [Bio] Shall be any activity or a series of activities in the framework of transferring food from one place to another by whether way or means of transportation in the framework of the production, circulation and or trade of food.

Food quality (*Mutu pangan*) [Bio] The value determined based on the criteria of food safety, nutrition content and trade standard on foodstuffs, eatables and beverages.

Footprint or Ecologically footprint (*Jejak kaki atau Jejak kaki ekologis*) [Bio] In a very general environmental sense, a "footprint" is a measure of environmental impact. However, this is usually expressed as an area of productive land (the footprint) needed to counteract the impact.

Fresh (*Segar*) [Bio] Living, not dried, deep-frozen or otherwise conserved.

Fruits and vegetables (*Buah-buahan dan sayur-mayur*) [Bio] A commodity class for fresh parts of plants intended for consumption or processing and not for planting.

Fumigation (*Fumigasi*) [Bio] Treatment with a chemical agent that reaches the commodity wholly or printing in a gaseous state.

Fungicide (*Fungisida*) [Bio] Substances to kills or inactivates fungi.

G

Gaia hypothesis (*Hipotesis Gaia*) [Bio] An ecological hypothesis that proposes that living and nonliving parts of the earth are a complex interacting system that can be thought of as a single organism.

G8 [Com] The Group of Eight is an international forum for the world's major industrialized democracies that emerged following the 1973 oil crisis and subsequent global recession. It includes Canada, France, Germany, Italy, Japan, Russia, the UK and the US which represents about 65% of the world economy.

Generalist species (*Spesies generalis*) [Bio] Species that able to thrive in a wide variety of environmental conditions and can make use of a variety of different resources.

Genetic disease (*Penyakit genetik*) [Bio] A disease that has its origin in changes to the genetic material, DNA. Usually refers to diseases that are inherited in a Mendelian fashion, although non-inherited forms of cancer also result from DNA mutation.

Genetic engineering (*Rekayasa genetika*) [Bio] Using recombinant DNA techniques and related methods to move one or several genes from one organism to another, to rearrange one or several genes within a cell, or to alter gene-controlled processes. Transferring a DNA segment from one organism and inserting it into the DNA of another organism to modify, amplify, transform and express genetic information. Genetic engineering changes the type or amount of proteins an organism is capable of producing. See *Recombinant DNA*.

Genetically modified organism or GMO (Organisme termodifikasi secara genetis) [Bio] (1) Organisms where in the genetic material (DNA) has been artificially altered, usually by replacing some of the host organism's genes with those of another related or unrelated species. GMOs are often irreproducible in nature. For example, plants can be crossbred with insecticides in order to be more resistant to insect damage; (2) An organism whose genetic material has been altered using the genetic engineering techniques generally known as recombinant DNA technology. Genetic engineering today has become another serious and alarming cause of genetic pollution because artificially created and genetically engineered plants and animals in laboratories, which could never have evolved in nature even with conventional hybridization, can live and breed on their own and what is even more alarming interbreed with naturally evolved wild varieties. Genetically modified crops today have become a common source for genetic pollution, not only of wild varieties but also of other domesticated varieties derived from relatively natural hybridization.

Germ cell gene therapy (*Terapi gen sel nutfah*) [Bio] The repair or replacement of a defective gene within the gamete-forming tissues, which produces a heritable change in an organism's genetic constitution.

Germplasm (*Plasma nutfah*) [Bio] Plants intended for use in breeding or conservation programs.

Global Invasive Species Programme (*Program Spesies Invasif Global*) [Bio] An international partnership dedicated to tackling the global threat of invasive species that aims to conserve biodiversity and sustain livelihoods by minimizing the spread and impact of invasive alien species. It also calls on the scientific community to conduct more desperately-needed research into this topic. See *Invasive species*.

Global dimming (*Peredupan global*) [Bio] A reduction in the amount of direct solar radiation reaching the surface of the earth due to light diffusion as a result of air pollution and increasing levels of cloud. A phenomenon of the last 30–50 years.

Global economy (*Ekonomi global*) [Soc] The emerging international economy characterized by free trade in goods and services, unrestricted capital flows and more limited national powers to control domestic economies.

Global warming (*Pemanasan global*) The observable increase in global temperatures considered mainly caused by the human induced enhanced greenhouse effect trapping the Sun's heat in the Earth's atmosphere.

Globalization (*Globalisasi*) The expansion of interactions to a global or worldwide scale; the increasing interdependence, integration and interaction among people and organizations from around the world. A general term, used since the mid 1940s, referring to a mix of economic, social, technological, cultural and political interrelationships.

Goal (*Sasaran*) [Soc] Goals describe future expected outcomes or states. They are not measurable but provide programmatic direction. They focus on ends (e.g. lower domestic violence rates) rather than means (e.g. provide more shelter beds).

Governance (Kepemerintahan) [Com] Refers to the Decision making procedure – who makes decisions, how they are made, and with what information: the structures and processes for collective Decision making involving governmental and non-governmental actors.

Grain (*Biji-bijian*) [Bio] A commodity class for seeds intended for processing or consumption and not for planting. See *Seeds*.

Gray (Gy) [Bio] Unit of absorbed dose where 1 Gy is equivalent to the absorption of 1 joule per kilogram (1 Gy = 1 $J.kg^{-1}$).

Green manure (*Pupuk hijau*) [Bio] A type of cover crop grown primarily to add nutrients and organic matter to the soil.

Green revolution (*Revolusi hijau*) (1) Advances in genetics, petrochemicals, and machinery that culminated in dramatic increase in crop productivity during the third quarter of the twentieth century; the ongoing transformation of agriculture that led in some places to significant increases in agricultural production between the 1940s and 1960s.

Green washing (*Pencucian hijau*) A derogatory term used to describe companies that portray themselves as environmentally friendly when their business practices do not back this up. Generally applies to excessive use of green marketing and packaging when this does not take account of the total ecological footprint.

Green waste (*Limbah hijau*) Green organic material or green organics, plant material discarded as non-putrescable waste including tree and shrub cuttings and prunings, grass clippings, leaves, natural (untreated) timber waste and weeds (noxious or otherwise).

Green or Sustainable (*Hijau atau Berkelanjutan*) Like “eco”, a word frequently used to indicate consideration for the environment e.g. green plumbers, green purchasing etc., sometimes used as a noun e.g. the Greens.

Greenhouse effect (*Efek rumah kaca*) The insulating effect of atmospheric greenhouse gases (e.g. water vapor, carbon dioxide, methane, etc.) that keeps the Earth’s temperature about 60 °F (16 °C) warmer than it would be otherwise cf. enhanced greenhouse effect.

Greenhouse gases (*Gas rumah kaca*) Any gas that contributes to the greenhouse effect; gaseous constituents of the atmosphere, both natural and from human activity that absorb and re-emit infrared radiation. Water vapor (H_2O) is the most abundant greenhouse gas. Greenhouse gases are a natural part of the atmosphere and include carbon dioxide (CO_2), methane (CH_4, persisting 9–15 years with a greenhouse warming potential (GWP) 22 times that of CO_2), nitrous oxide (N_2O persists 120 years and has a GWP of 310), ozone (O_3), hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride.

Growing medium (*Media pertumbuhan*) [Bio] Any material in which plant roots are growing or intended for that purpose.

Growing period (*Periode pertumbuhan*) [Bio] Time period of active growth during a growing season.

Growing season (*Musim pertumbuhan*) [Bio] Period or periods of the year when plants actively grow in area, place of production or production site.

Grounded theory (*Teori mendarat*) [Soc] (1) A research method that seeks to develop theory that is grounded in data systematically gathered and analyzed; (2) An inductive, theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data. The major difference between grounded theory and other methods is its specific approach to theory development – grounded theory suggests that there should be a continuous interplay between data collection and analysis. Grounded theory approaches are becoming increasingly common in the research literature because the method is extremely useful in developing context-based, process-oriented descriptions and explanations of the phenomenon; (3) involves three stages: an initial attempt to develop categories which illuminate the data; an attempt to "saturate" these categories with many appropriate cases in order to demonstrate their relevance; and trying to develop these categories into more general analytic frameworks with relevance outside setting.

Guidelines (*Panduan*) A statement or other indication of policy or procedure by which to determine a course of action. Guidelines may be developed by government agencies at any level, institutions, professional societies, governing boards, or by the convening of expert panels. Though not necessarily mandatory, the text is generally a comprehensive guide to problems and approaches in any field of activity.

H

Habitat (*Habitat*) [Bio] Environment place of plant or animal able to life and develop naturally; part of an ecosystem with conditions in which an organism naturally occurs or can establish.

Harmonization (*Harmonisasi*) [Bio] The establishment, recognition and application by different countries of phytosanitary measures based on common standards.

Heat treatment (*Perlakuan panas*) [Bio] The process in which a commodity is heated until it reaches a minimum temperature for a minimum period of time according to an official technical specification.

Herbicide (*Herbisida*) [Bio] (1) Any substance that is toxic to plants; usually used to kill specific unwanted plants; (2) a chemical the kills or inhibits growth of a plant. See *Fungicide*.

Hermeneutics (*Hermeneutika*) [Soc] Primarily concerned with the meaning of a text or text-analogue (an example of a text-analogue is an organization, which the researcher comes to understand through oral or written text). The basic question in hermeneutics is: what is the meaning of this text? Interpretation, in the sense relevant to hermeneutics, is an attempt to make clear, to make sense of an object of study. This object must, therefore, be a text, or a text-analogue, which in some way is confused, incomplete, cloudy, seemingly contradictory – in one way or another, unclear. The interpretation aims to bring to light an underlying coherence or sense.

Hermeneutics data (*Hermeneutika data*) [Soc] Data based on how participants make sense or interpret their experiences.

Heuristic (*Heuristik*) [Soc] Relates to exploratory problem-solving that uses self-educating techniques; an educational method in which learning takes place through discoveries based on investigations.

Heuristic research (*Penelitian heuristic*) [Soc] Relates to research that involves self-search, self-dialogue, and self-discovery.

Homeostasis (*Homeostasis*) [Bio] The property of either an open system or a closed system, especially a living organism that regulates its internal environment so as to maintain a stable, constant condition.

Host pest list (*Daftar hama inang*) [Bio] A list of pest that infest a plant species, globally or in an area.

Host range (*Kisaran inang*) [Bio] Species capable, under normal condition, sustaining a specific pest or other organism.

Human capital (*Aset manusia*) [Com] Includes the skill and abilities of people to develop and enhance their resources, and to access outside resources and bodies of knowledge in order to increase their understanding, identify promising practices and to access data to enhance community capital; the status of individuals, comprises the stock of health, nutrition, education, skills and knowledge of individuals; access to services that provide these, such as schools, medical services, adult training; the ways individuals interact with technologies; and the leadership quality of individuals; the skill and knowledge of the individual contained within a community.

Human ecology (*Ekologi manusia*) [Soc] (1) The study of the relationships between individuals, social groups, and their social environments. Systematic study of human (or, as it is sometimes termed, 'social') ecology was initiated by Robert Park and the other Chicago sociologists; (2) human ecology deals with human communities in relation to their environment; (3) an academic discipline that deals with the relationship between humans and their natural, social and created environments. Human ecology investigates how humans and human societies interact with nature and with their environment. Human ecology is variously a sub-discipline of anthropology, psychology, sociology, or ecology. Environmental sociology is a field of sociology which encompasses the interactions between humans and nature/natural environment, but is rooted in the methodological and theoretical canon of sociology. Human ecology is an interdisciplinary applied field that uses a holistic approach to help people solve problems and enhance human potential within their near environments – their clothing, family, home, and community. Human ecologists promote the well-being of individuals, families, and communities through education, prevention, and empowerment. Human ecology explores not only the influence of humans on their environment but also the influence of the environment on human behavior and their adaptive strategies as they come to understand those influences better.

I

Import permit (*Izin impor*) [Bio] Official document authorizing importation of a commodity in accordance with specified phytosanitary import requirements.

Inactivation (*Penidakaktifan*) [Bio] Rendering microorganism incapable of development.

Incursion (*Serangan mendadak*) [Bio] An isolated population of a pest recently detected in an area, not known to be established, but expected to survive for the immediate future.

Indicator (*Indikator*) [Soc] Quantifiable measure of phenomenon, e.g. the number of drunken driving arrests is an indicator of addictions in a community.

Indicator species (*Spesies indikator*) [Bio] Any biological species that defines a trait or characteristic of the environment.

Industrial agriculture (*Pertanian industrial*) [Soc] A form of modern farming that refers to the industrialized production of livestock, poultry, fish, and crops.

Industrial revolution (*Revolusi industrial*) [Soc] A period in the late eighteenth and early nineteenth centuries when major changes in agriculture, manufacturing, and transportation had a profound effect on socioeconomic and cultural conditions.

Inference (*Inferensi*) [Soc] An umbrella term referring to a final outcome of a study. The outcome may consist of a conclusion about, an understanding of, or an explanation for an event, a behavior, a relationship, or a case.

Infestation of a commodity (*Infestasi komoditas*) [Bio] Presence in a commodity of a living pest of the plant or plant product concerned. Infestation includes infection.

Inspection (*Pemeriksaan*) [Bio] Official visual examination of plants, plant products or other regulated articles to determine if pests are present and/or to determine compliance with phytosanitary regulations.

Inspector (*Pemeriksa*) [Bio] Person authorized by a National Plant Protection Organization to discharge its functions.

Institution (*Lembaga*) [Com] (1) Formal and informal rule governing the behavior of human. Institutions include habitualized behavior and rules and norms that govern society, as well as the more usual notion of formal institutions with memberships, constituencies and stakeholders; (2) structures and mechanisms of social order and cooperation governing the behavior of a set of individuals. Institutions are identified with a social purpose and permanence, transcending individual human lives and intentions, and with the making and enforcing of rules governing cooperative human behavior. The term, institution, is commonly applied to customs and behavior patterns important to a society, as well as to particular formal organizations of government and public service. As structures and mechanisms of social order among humans, institutions are one of the principal objects of study in the social sciences, including sociology, political science and economics. Institutions are a central concern for law, the formal regime for political rule-making and enforcement. The creation and evolution of institutions is a primary topic for history.

Integrity of a consignment (*Integritas barang kiriman*) [Bio] Composition of a consignment as described by its phytosanitary certificate or other officially acceptable document, maintained without loss, addition or substitution.

Intended use (*Penggunaan disengaja*) [Bio] Declared purpose for which plants, plant products, or other regulated articles are imported, produced, or used.

Interception of a consignment (*Intersepsi barang kiriman*) [Bio] The refusal or controlled entry of an imported consignment due to failure to comply with phytosanitary regulations.

Interception of a pest (*Intersepsi hama*) [Bio] The detection of a pest during inspection or testing of an imported consignment.

Interdisciplinary (*Interdisipliner*) [Soc] Researchers work jointly, but from each of their respective disciplinary perspectives, to address a common problem. See *Multidisciplinary*, *Transdisciplinary*.

Intermediate quarantine (*Karantina tingkat menengah*) [Bio] Quarantine in a country other than the country of origin or destination.

Internal validity (*Kesahihan internal*) [Soc] The approximate validity with which we infer that a relationship between two variables is causal or that the absence of a relationship implies the absence of cause.

International Standard for Phytosanitary Measures (ISPM) (*Standar Internasional untuk Tindakan Fitosanitari*) [Bio] An international standard adopted by the conference of FAO, the interim commission on phytosanitary measures or the commission on phytosanitary measures, established under the IPPC.

International standards (*Standar internasional*) [Bio] International standards established in accordance with Article X paragraph 1 and 2 of the IPPC.

Integrated pest management (*Pengendalian hama terpadu*) [Bio] (1) A systems approach that combines preventive techniques, non-chemical pest control methods and the wise use of pesticides with preference for products that are least harmful to human health and the environment. It is not the total elimination of pesticides, but an alternate approach to traditional pest control measures. IPM consists of routine inspection and monitoring with treatment only when pests are actually present, thus reducing traditional, routine pesticide application treatment (calendar date sprays) whether pests were present or not; (2) The application of an interconnected set of principles and methods to problems caused by insects, diseases, weeds, (nematodes) and other agricultural pests. IPM includes pest prevention techniques, pest monitoring methods, biological control, pest-resistant plants varieties, pest attractants and repellents, biopesticides, and synthetic organic pesticides. It also involves the use of weather data to predict the onset of pest attack, and cultural practices such as rotation, mulching, raised planting beds, narrow plant rows, and interseeding; (3) an effort to control the level of pest and disease population by using one or more control techniques which are developed into one system, to prevent or reduce economic losses and disruption of ecology; (4) responses to pests and diseases in an agricultural setting, as management rather than control is a more realistic aim; (5) an approach to pest control that utilizes regular monitoring and record keeping to determine if and when treatments are needed, and employs a combination of strategies and tactics to keep pest numbers low enough to prevent unacceptable damage or annoyance.

Intellectual property rights (IPR) (*Hak kepemilikan intelektual*) [Com] Rights recognized as belonging to creators of original creative works and designs that are protected under legislation for period of time.

Introduction of a biological control agent (*Introduksi agen pengendalian hayati*) [Bio] The release of a biological control agent into an ecosystem where it did not exist previously.

Inundative release (*Pelepasan inundatif*) [Bio] The release of large numbers of mass-produced biological control agents or beneficial organisms with the expectation of achieving a rapid effect.

Invasive species (*Spesies invasif*) [Bio] An alien species whose introduction does or is likely to cause economic or environmental harm to human health. See *Alien species*, *Exotic species*, *Native species*.

Invasiveness (*Daya serbu*) [Bio] Ability of a plant to spread beyond its introduction site and become established in new locations where it may produce a deleterious effect on organisms already existing there.

In vitro fertilization (*Fertilisasi in vitro*) [Bio] An assisted reproductive technology in which one or more eggs are fertilized outside a female's body. This technique has been used extensively an animal embryological research for decades, but only since 1978 has it been successfully applied to human reproduction.

International Plant Protection Convention (IPPC) (*Konvensi Perlindungan Tumbuhan Internasional*) [Bio] Is an international treaty whose purpose is to secure a common and effective action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control. The Convention extends to the protection of natural flora and plant products. It also includes both direct and indirect damage by pests, thus including weeds. The provisions extend to cover conveyances, containers, storage places, soil and other objects or material capable of harboring plant pests.

International Union for Conservation of Nature (IUCN) (*Organisasi Internasional untuk Konservasi Alam*) [Bio] Helps the world find pragmatic solutions to our most pressing environment and development challenges by supporting scientific research; managing field projects all over the world; and bringing governments, NGOs, the UN, international conventions and companies together to develop policy, laws and best practice.

Ionizing radiation (*Radiasi ionisasi*) [Bio] Charged particles and electromagnetic waves as a result of physical interaction create ions by either primary or secondary processes.

Irradiation (*Iradiasi*) [Bio] Treatment with any type of ionizing radiation.

J

Justification (*Pembenaran*) [Soc] The empirical evaluation, testing, or confirmation of theory.

K

Kiln-drying (*Tempat pengeringan*) [Bio] A process in which wood is dried in a closed chamber using heat and/or humidity control to achieve required moisture content.

Knowledge transfer (*Alih pengetahuan*) [Com] Knowledge transfer seeks to organize, create, capture or distribute knowledge and ensure its availability for the future user.

L

Laboratory biosafety (*Keamanan hayati laboratorium*) [Bio] Describes the containment principles, technologies and practices that are implemented to prevent the unintentional exposure to pathogens and toxins, or their accidental release.

Laboratory biosecurity (Ketahanan hayati laboratorium) [Bio] Describes the protection, control and accountability for valuable biological material within laboratories, in order to prevent their unauthorized access, loss, misuse, diversion and unintentional release.

Leadership (*Kepeminpinan*) [Com] The task of linking a group/organization with and guiding a group/organization through outside political, technological, economic, and sociocultural forces and institutions. Leaders often focus on an organization's environment while managers often focus on activities inside the organization.

Learning (*Belajar*) [Com] Knowledge about ecosystems can be continuously increased and improved, and thereby governance and management can be updated and adapted to changing conditions.

Learning community (*Komunitas belajar*) [Com] Groups of people, linked through common location or shared interest, collaborate and work together to address the learning needs of their members.

Legislation (*Perundang-undangan*) [Bio] Any act, law, regulation, guideline or other administrative order promulgated by a government.

Linking social capital (*Modal sosial penghubung*) [Com] Vertical relationships bridging social strata within a hierarchy where power, social status and wealth are differentially accessed; it involves ties with people/organizations in power/authority.

Local ecological knowledge (*Pengetahuan ekologis lokal*) [Com] Knowledge held by a specific group of people about their local ecosystems. This knowledge may be a mix of scientific and practical knowledge; it is sites specific and often involves a belief component. Consequently, LEK differs from traditional ecological knowledge in that it often lacks the dimension of historical and cultural continuity.

Living modified organism (*Organisme termodifikasi hidupnya*) [Bio] Any living organism that possesses a novel combination of genetic material through the use of modern biotechnology.

Lot (*Lot*) [Bio] A number of units of a single commodity, identifiable by its homogeneity of composition, origin etc., forming part of a consignment.

M

Management (*Manajemen*) [Com] (1) Either the process of supervision, control, and co-ordination of productive activity in industrial and other formal organizations, or the persons performing these functions; (2) the act of directing and controlling the affairs of a business, organization, or other body to ensure that they operate efficiently and effectively, in order to accomplish agreed objectives; (3) the art, science, and technique of getting things done by deployment of material and human resources in a systematic manner, and monitoring how, and how well, they are done; (4) the running of an organization or part of it. Management has perhaps three main components: an organizational skill, an entrepreneurial sense, and an ability to get the best out of followers; (5) the process of arranging the structures, people, work tasks, and technology to achieve the goals of a group of people.

Mark (*Tanda*) [Bio] An official stamp or brand, internationally recognized, applied to a regulated article to attest its phytosanitary status.

Measure or Metric (*Ukuran*) [Com] Public sector term to describe a standard used to communicate progress on a particular aspect of a programme. Measures typically are quantitative in nature, conveyed in numbers, dollars, percentages, etc. (e.g. $ of revenue, headcount number, % increase, survey rating average, etc.) though they may be describing either quantitative (e.g. sales made) or qualitative (e.g. employee motivation) information.

Microbial insecticide (*Insektisida mikrob*) [Bio] Preparation of living microbes (such as bacteria or fungi) pathogenic to specific groups of insects. See *Bacillus thuringiensis*, *Biological control*.

Microorganism (*Mikroorganisme*) [Bio] A protozoan, fungus, bacterium, virus and other microscopic self-replicating biotic entity.

Mission (*Misi*) [Soc] (1) Concise statement that describes, in motivating and memorable terms, the current top-level strategic goal of the organization. Usually financial-, process-, or customer service-oriented, with a mid-term (3–5 years) horizon, an effective mission is inspiring as well as easily understood and communicated; (2) a short, easy to understand statement that communicates to the public what an agency or program is about.

Mixed methods (*Metode campuran*) [Soc] (1) A type of research design in which qualitative and quantitative approaches are used in type of questions, research methods, data collection and analysis procedure, and/or inferences; (2) a collection or analysis of both quantitative and qualitative data in single study in which the data are collected concurrently or sequentially, are given priority, and involve integration of the data at once or more stages in the process of research; (3) strategies derived from qualitative and quantitative methods are used to a single project; (4) quantitative data collection strategies are used in a qualitative study or vice versa.

Model (*Model*) [Soc] A simplified representation of the real world.

Modern biotechnology (*Bioteknologi modern*) [Bio] The application of (a) in vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) and direct injection of nucleic acid into cells or organelles; or (b) fusion of cells beyond the taxonomic family; that overcome natural physiological reproductive or recombination barriers and that are not techniques used in traditional breeding and selection.

Monitoring (*Pemantauan*) [Bio] (1) Periodic collection and analysis of data on hazards at relevant steps throughout the exposure pathway; (2) the regular and ongoing inspection of areas where pest problems do or might occur.

Monitoring survey (*Survei pemantauan*) [Bio] (1) Ongoing survey to verify the characteristics of a pest population.

Monoculture (*Monokultur*) [Bio] The agricultural practice of cultivating crops consisting of genetically similar organisms.

Multidisciplinary (Multidisipliner) [Soc] Researchers in separate disciplines work independently within their own disciplinary perspective, to address a common problem. See *Interdisciplinary*, *Transdisciplinary*.

Mycorrhizae (*Mikoriza*) [Bio] Fungi that forms symbiotic relationship with root of more developed plants**.**

N

Nangluk merana (*Nangluk merana*) [Com] Avoided pest attack ceremony. This ritual still practiced until today by Balinese farmer in effort to keep harmonious relationship with other living creatures such as pests and insects.

National Plant Protection Organization (NPPO) (*Organisasi Perlindungan Tumbuhan Nasional*) [Bio] Official service established by a government to discharge the functions specified by the IPPC.

Natural capital (*Modal alam*) [Com] Those natural assets that abide in a location including weather, geographic isolation, natural resource, amenities, and natural beauty.

Natural enemy (*Musuh alami*) [Bio] An organism which lives at the expense of another organism in its area of origin and which may help to limit the population of the organism. This includes parasitoids, parasites, predators, phytophagous organism and pathogens.

Naturally occurring (*Terjadi secara alami*) [Bio] A component of an ecosystem or a selection from a wild population not altered by artificial means.

Native species (*Spesies asli*) [Bio] With respect to particular ecosystem, species that, other than result of an introduction, historically occurred, or currently occurs in that ecosystem.

Network (*Jaringan*) [Soc] Sets of nodes or vertices joined together, in pairs by links or edges; it can be used to represent a given system in terms of its localized components, i.e. nodes or vertices, and the relations between those components, i.e. links or edges; examples include social network such as acquaintance or friendship networks and collaboration networks, technological networks such as the internet, the World Wide Web and power grids and biological networks such as neural network, food web networks and metabolic networks.

Network analysis (*Analisis jaringan*) [Soc] Is a method of research for understanding the structure of a system and is based on graph theory and statistics; network analysis focuses on the relations (links or edges) among actors (nodes or vertices), and not individual actors and their attributes. This means that the actors are usually not sampled independently, as in many other kinds of studies.

Non-quarantine pest (*Hama bukan karantina*) [Bio] Pest that is not a quarantine pest for an area.

O

Objective (*Tujuan*) [Soc] A concise statement describing specific, critical, actionable and measurable things an organization must do in order to effectively execute its strategy and achieve its mission and vision. Objectives often begin with action verbs such as increase, reduce, improve, achieve, etc. Whereas the vision and mission statements provide an organizing and mobilizing "rallying cry", objectives translate the vision and mission into measurable and actionable operational terms; (2) clear, realistic, specific, measurable, and time limited statements of actions which when completed will move towards goal achievement.

Occurrence (*Kejadian*) [Bio] The presence in an area of pest officially recognized to be indigenous or introduced and not officially reported to have been eradicated.

Official (*Resmi*) [Bio] Established, authorized or performed by a National Plant Protection Organization.

Official control (*Pengendalian resmi*) [Bio] The active enforcement of mandatory phytosanitary regulations and the application of mandatory phytosanitary procedures with the objective of eradication or containment of quarantine pests or for the management of regulated non-quarantine pests.

Open pollination (*Penyerbukan terbuka*) [Bio] Pollination by wind, insects, or other natural mechanisms.

Organism (*Organisme*) [Bio] Any biotic entity capable of reproduction or replication in its naturally occurring state.

Organization (*Organisasi*) [Com] A group of people united around achieving a common mission.

Outbreak (*Wabah*) [Bio] A recently detected pest population, including an incursion, or a sudden significant increase of an established pest population in an area.

Outcome (*Luaran*) [Soc] (1) The results desired from a process expressed in terms of change from the beginning to ending state, e.g. a reduction of risk factors in kids by 5% or an increase in preventive factors in kids by 5%; (2) is the benefits that result as a consequence of an organization's investments and activities. A central concept within logic models, outcomes occur along a path from shorter-term achievements to medium-term and longer-term achievements. They may be positive, negative, neutral, intended, or unintended. Examples of outcomes include changes in knowledge, skill development, behavior, capacities, Decision making, and policy development.

Output (*Hasil*) [Soc] Commonly applied within the logic model, outputs describe what an organization gets done; e.g. "what we do" or "what we offer" and may include workshops, delivery of services, conferences, community surveys, facilitation, in-home counseling, etc. Outputs lead to outcomes.

P

Packaging (*Paket*) [Bio] Material used in supporting, protecting or carrying a commodity.

Pandemic (*Pandemi*) [Bio] The outbreak of an infectious disease over a large geographical region and affecting a large percentage of the human and/or animal population.

Paradigm (*Paradigma*) [Soc] (1) A conceptual model of person's worldview, complete with the assumptions that are associated with that view; (2) a social construction, a historically and culturally embedded discourse practice, and therefore is neither inviolate nor unchanging.

Parasite (*Parasit*) [Bio] An organism which lives on or in a larger organism, feeding upon it.

Parasitism (*Parasitisme*) [Bio] The close association of two or more dissimilar organisms where the association is harmful to at least one. See *Commensalism*, *Symbiosis*.

Parasitoid (*Parasitoid*) [Bio] An insect parasitic only in its immature stages, killing its host in the process of its development, and free living as an adult.

Participatory action research (PAR) (*Penelitian tindakan partisipatif*) [Soc] Qualitative research that promotes community involvement to identify issues and to find solutions. PAR aims to contribute both to the practical concerns of people in an immediate problematic situation and to further the goals of social science simultaneously. The active collaboration of the researcher and the research participant/respondent is required to accomplish this dual goal. PAR stresses the importance of co-learning as a primary aspect of the research process.

Pathogen (*Patogen*) [Bio] (1) Microorganism causing disease; (2) living organism which can cause disease in another organism.

Pathogenicity (*Patogenisitas*) [Bio] The ability of the virus to produce disease in organism.

Pathway (*Lintasan*) [Bio] Any means that allows the entry or spread of a pest.

Permaculture (*Permakultur*) [Bio] A method/philosophy of working with nature, minimizing energy and chemical use and maximizing biodiversity. A characteristic, but not a necessity, of permaculture, is that it tends to utilize a very large number of species, many times the number of species endemic to a particular area. The effect is to maximize productivity, minimizing farm inputs, while still maintaining genuine sustainability.

Perception (*Persepsi*) [Com] Process by which organisms interpret and organize sensation to produce a meaningful experience of the world. Sensation usually refers to the immediate relatively unprocessed result of stimulation of sensory receptors in the eyes, ear, nose, tongue or skin. Perception, on the other hand, better describes one's ultimate experience of the world and typically involves further process of sensory input. In practice sensation and perception are virtually impossible to separate, because they are part of one continuous process.

Persistence (*Persistensi*) [Bio] Ability of an organism to remain in a particular setting for a period of time after it is introduced.

Pesticide (*Pestisida*) [Bio] (1) A substance that kills harmfull organisms (for example, an insecticide or fungicide); (2) a substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. Pesticides can accumulate in the food chain and/or contaminate the environment if they are misused.

Pest (*Hama*) [Bio] (1) Crop disturbances created by animals, parasites, and weeds (broad sense). Plant disturbances created by animals, such as insects, mites, nematodes, mice, squirrel (narrow sense); (2) any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plants product; (3) any of various organisms, such as fungi, insects, rodents, and plants, that harm crops or livestock or otherwise interfere with the well-being of human beings. Weeds are plant pests that grow where they are not wanted–often on cultivated land; (4) an insect, animal, or plant that is a nuisance. In public health, the word is usually applied to insects and animals that not only are annoying but also compete for nourishment and habitat with humans, food crops, or domestic animals.

Pest categorization (*Kategorisasi hama*) [Bio] The process for determining whether a pest has or has not the characteristics of a quarantine pest or those of a regulated non-quarantine pest.

Pest diagnosis (*Diagnosis hama*) [Bio] The process of detection and identification of a pest.

Pest free area (*Kawasan bebas hama*) [Bio] An area in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained.

Pest free place of production (*Tempat produksi bebas hama*) [Bio] Place of production in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained for a defined period.

Pest free production site (*Tapak produksi bebas hama*) [Bio] A defined portion of a place of production in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained for a defined period and that is managed as a separate unit in the same way as a pest free place of production.

Pest record (*Catatan hama*) [Bio] A document providing information concerning the presence or absence of a specific pest at a particular location at a certain time, within an area (usually a country) under described circumstances.

Pest risk for quarantine pests (*Risiko hama untuk hama karantina*) [Bio] The probability of introduction and spread of a pest and the magnitude of the associated potential economic consequences.

Pest risk for regulated non-quarantine pest (*Risiko hama untuk regulasi yang bukan hama karantina*) [Bio] The probability that a pest in plants for planting affects the intended use of those plants with an economically unacceptable impact.

Pest risk analysis (*Analisis risiko hama*) [Bio] The process of evaluating biological or other scientific and economic evidence to determine whether an organism is a pest, whether it should be regulated, and the strength of any phytosanitary measures to be taken against it.

Pest-risk assessment for quarantine pests (*Penilaian risiko hama untuk hama karantina*) [Bio] Evaluation of the probability of the introduction and spread of a pest and the magnitude of the associated potential economic consequences.

Pest-risk assessment for regulated non-quarantine pests (*Penilaian risiko hama untuk regulasi hama yang bukan karantina*) [Bio] Evaluation of the probability that a pest in plants for planting affects the intended use of those plants with an economically unacceptable impact.

Pest-risk management for quarantine pests (*Pengelolaan risiko hama untuk hama karantina*) [Bio] Evaluation and selection of options to reduce the risk of introduction and spread of a pest.

Pest-risk management for regulated non-quarantine pests (*Pengelolaan risiko hama untuk regulasi hama bukan karantina*) [Bio] Evaluation and selection of options to reduce the risk that a pest in plants for planting causes an economically unacceptable impact on the intended use of those plants.

Pest status in an area (*Status hama dalam suatu kawasan*) [Bio] Presence or absence, at the present time, of a pest in an area, including where appropriate its distribution, as officially determined using expert judgment on the basis of current and historical records and other information.

Phytosanitary action (*Tindakan fitosanitari*) [Bio] An official operation, such as inspection, testing, surveillance or treatment undertaken to implement phytosanitary measures.

Phytosanitary certificate (*Sertifikat fitosanitari*) [Bio] Certificate patterned after the model certificates of the IPPC.

Phytosanitary certification (*Sertifikasi fitosanitari*) [Bio] Use of phytosanitary procedures leading to the issue of a phytosanitary certificate.

Phytosanitary import requirements (*Persyaratan impor sanitari*) [Bio] Specific phytosanitary measures established by an importing country concerning consignments moving into that country.

Phytosanitary legislation (*Perundangan fitosanitari*) [Bio] Basic laws granting legal authority to a National Plant Protection Organization from which phytosanitary regulations may be drafted.

Phytosanitary measure (*Aturan fitosanitari*) [Bio] Any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests, or to limit the economic impact of regulated non-quarantine pests.

Phytosanitary procedure (*Prosedur fitosanitari*) [Bio] Any official method for implementing phytosanitary measures including performance of inspection, tests, surveillance or treatments in connection with regulated pests.

Phenomenological data (*Data fenomenologis*) [Soc] Data based on experience and action.

Physical capital (*Modal fisik*) [Com] The natural capital and man-made resources (including building and equipment) available to community.

Phytosanitary regulation (*Regulasi fitosanitari*) [Bio] Official rule to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests, including establishment of procedures for phytosanitary certification.

Place of production (*Tempat produksi*) [Bio] Any premises or collection of fields operated as a single production or farming unit. This may include production sites which are separately managed for phytosanitary purposes.

Plant (*Tumbuhan*) [Bio] All type of vegetation natural resource, both live in land and in water.

Plant biosecurity (*Ketahanan hayati tumbuhan*) [Bio] The protection of the economy, environment and human health from negative impacts associated with pests, diseases and weeds.

Plant Biosecurity Scholarships (*Beasiswa Ketahanan Hayati Tumbuhan*) Various scholarships are offered by The Cooperative Research Centre for National Plant Biosecurity (CRC NPB) to students wishing to undertake projects in plant biosecurity. Areas of interests include but are not limited to: biology of emergency plant pests, diagnostics, entomology, plant pathology, predictive simulation models, remote sensing, risk analysis, social science and taxonomy.

Plant pest diagnostics (*Diagnostik hama tumbuhan*) [Bio] A process of detecting and identifying a plant pest.

Plant pest detection (*Deteksi hama tumbuhan*) [Bio] The process of finding an organism either in symptomatic or asymptomatic plant material.

Plant pest identification (*Identifikasi hama tumbuhan*) [Bio] A process of ascertaining the taxonomic identity of a plant pest.

Plant products (*Produk tumbuhan*) [Bio] Unmanufactured material of plants origin (including grain) and those manufactured products that, by their nature or that of their processing, may create a risk for the introduction and spread of pests.

Plant quarantine (*Karantina tumbuhan*) [Bio] All activities designed to prevent the introduction and/or spread of quarantine pests or to ensure their official control.

Planting, including replanting (*Penanaman, termasuk penanaman kembali*) [Bio] Any operation for the placing of plants in growing medium, or by grafting or similar operations, to ensure their subsequent growth, reproduction or propagation.

Plants (*Tumbuhan*) [Bio] Living plants and parts thereof, including seeds and germplasm.

Plants for planting (*Tumbuhan untuk penanaman*) [Bio] Plants intended to remain planted, to be planted or replanted.

Plants in vitro (*Tumbuhan in vitro*) [Bio] A commodity class for plants growing in an aseptic medium in a closed container.

Plasmid (*Plasmid*) [Bio] A circular DNA molecule, found outside the chromosome in bacteria, capable of autonomous replication, which typically carries one or more genes encoding antibiotic resistance proteins. Plasmids can transfer genes between bacteria and are the principal tools for inserting new genetic information into microorganisms or plants.

Plasticity (*Plastisitas*) [Bio] The ability of stem cells from one adult tissue to generate the differentiated cell types of another tissue.

PNPM? Mandiri Disadavantaged Areas (*PNPM Mandiri Daerah Tertinggal*) [Com] An innovative pilot program begun by the Government of Indonesia in November 2006 designed to address governance and policy problems in 51 of the poorest districts across the country. The program's three key objectives are: strengthen local participation in development planning, promote private investment and job creation, and increase utilization of effective education, health, and dispute resolution of effective services. The program builds on other successful community development projects, such as the Kecamatan Development Program (KUD) to align bottom-up planning procedures with the newly empowered district governments of Indonesia. For more information on PNPM Mandiri Disadvantaged Areas, please contact: Ministry of Disadvantaged Areas, email: p2dtk@indosat.net.id.

Point of entry (*Titik masuk*) [Bio] Airport, seaport or land border point officially designated for the importation of consignments, and/or entrance of passengers.

Post-entry quarantine (*Karantina setelah titik masuk*) [Bio] Quarantine applied to a consignment after entry.

Pollution (*Polusi*) [Bio] Contamination of the earth's environment with material that interfere with human health, the quality of life, or the natural functioning of ecosystem. Although some environmental pollution is a result of natural causes like volcanic eruption, most is caused by human activities.

Policy (*Kebijakan*) [Com] (1) The outcome of series of decisions and actions by people with varying motivations and differing information; (2) a plan or course of action intended to influence and determine decisions, actions, and other matters.

Political capital (*Modal politis*) [Com] The ability of a group to influence standards, regulations and enforcement of those regulations that determine distribution of resources and the ways they are used. Political capital reflects access to power, organizations, connection to resources and power brokers.

Postmodernism (*Posmodernisme*) [Soc] A contemporary approach which question or seek to deconstruct both accepted concepts and scientific method.

Practically free (*Terbebas secara nyata*) [Bio] A consignment, field, or place of production, without pests (or a specific pest) in numbers or quantities in excess of those that can be expected to result from, and be consistent with good cultural and handling practices employed in the production and marketing of the commodity.

Pre-clearance (*Izin awal*) [Bio] Phytosanitary certification and/or clearance in the country of origin, performed by or under the regular supervision of the National Plant Protection Organization of the country of destination.

Predator (*Pemangsa*) [Bio] A natural enemy that preys and feeds on the other animal organisms, more than one of which are killed during its life time.

Principles (*Prinsip*) [Soc] An elementary proposition, fundamental truth, law or doctrine from which others are derived or on which others are founded. A settled rule of action or a governing law of conduct.

Problem tree (*Pohon masalah*) [Soc] Diagrammatic tool that can be generated with the community and government partners to identify core or underlying problems and their root causes and effects.

Process (*Proses*) [Com] Types of mechanism and linkages that organizations and individuals (reader and community members) use in decision making and collective actions.

Prohibition (*Larangan*) [Bio] A phytosanitary regulation forbidding the importation or movement of specified pests or commodities.

Protected area (*Kawasan terlindung*) [Bio] A regulated area that an NPPO has determined to be minimum area necessary for the effective protection of an endangered area.

Protein (*Protein*) [Bio] A complex biological molecule composed of a chain of amino acids. Proteins have many different functions: structure (collagen); movement (actin and myosin); catalysis (enzymes); transport (hemoglobin); regulation of cellular processes (insulin); and response to stimuli (receptor proteins on surface of all cells).The information for making proteins is stored in the sequence of nucleotides in the DNA molecule.

Protocol (*Protokol*) [Com] A preliminary memorandum often formulated and signed by negotiators as a basis for a final convention or treaty; the records or minutes of a conference or congress that show officially the agreements arrived at by the negotiators; rules for organizational procedures.

Provisional measure (*Ukuran sementara*) [Bio] A phytosanitary regulation or procedure established without full technical justification owing to current lack of adequate information. A provisional measure is subjected to periodic review and full technical justification as soon as possible.

Q

Qualitative (*Kualitatif*) [Soc] Subjective, as opposed to quantitative (measured). Common sources of qualitative metrics are surveys of customers, stakeholders or employees.

Qualitative content analysis (*Analisis isi kualitatif*) [Soc] (1) An approach of empirical, methodological controlled analysis of texts within their context of communication, following content analysis rules and step by step models, without rash quantification; (2) research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns.

Qualitative research (*Penelitian kualitatif*) [Soc] Research that focuses on subjective data that are not easily coded into numbers emphasis is on words and feelings rather than numbers. Qualitative research tends to work with fewer research participants or respondents but analyzes each case on a deeper level. Key qualitative research techniques include focus groups and other observational methods.

Qualifying (*Mengkualifikasi*) [Soc] The process by which quantitative data are transformed into data that can be analyzed qualitatively.

Quantitative (*Kuantitatif*) [Soc] Measured, as opposed to qualitative (subjective). Quantitative measures often come from transactional systems.

Quantifying (*Mengkuantifikasi*) [Soc] Converting qualitative data into numerical codes that can be statistically analyzed.

Quarantine (*Karantina*) [Bio] Official confinement of regulated articles for observation and research or for further inspection, testing and/or treatment.

Quarantine area (*Kawasan karantina*) [Bio] An area within which a quarantine pest is present and is being officially controlled.

Quarantine pest (*Hama karantina*) [Bio] A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled.

Quarantine station (*Stasiun karantina*) [Bio] Official station for holding plants or plant products in quarantine.

R

Raw wood (*Kayu mentah*) [Bio] Wood which has not undergone processing or treatment.

Re-exported consignment (*Pengeksporan kembali barang kiriman*) [Bio] Consignment that has been imported into a country from which it is then exported. The consignment may be stored, split up, combined with other consignment or have its packaging changed.

Reference specimens (*Spesimen acuan*) [Bio] An individual specimens from a specific population conserved in a reference culture collection and, where possible, in publicly available collections.

Refusal (*Penolakan*) [Bio] Forbidding entry of a consignment or other regulated article when it fails to comply with phytosanitary regulations.

Regional Plant Protection Organization (RPPO) (*Organisasi Perlindungan Tanaman Regional*) [Bio] An intergovernmental organization with the functions lay down by Article IX of the IPPC.

Regional standards (*Standar regional*) [Bio] Standards established by a Regional Plant Protection Organization for the guidance of the members of that organization.

Regulated area (*Kawasan teregulasi*) [Bio] An area into which, within which and/or from which plants, plant products and other regulated articles are subjected to phytosanitary regulations or procedures in order to prevent the introduction and/or spread of quarantine pests or to limit the economic impact of regulated non-quarantine pests.

Regulated article (*Barang teregulasi*) [Bio] Any plant, plant product, storage place, packaging, conveyance, container, soil and any other organism, object or material capable of harboring or spreading pests, deemed to require phytosanitary measures, particularly where international transportation is involved.

Regulated non-quarantine pest (*Hama bukan karantina yang diregulasi*) [Bio] A non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated within the territory of the importing contracting party.

Regulated pest (*Hama teregulasi*) [Bio] A quarantine pest or a regulated non-quarantine pest.

Release into the environment (*Pelepasan ke dalam lingkungan*) [Bio] Intentional liberation of an organism into the environment.

Release of a consignment (*Pelepasan barang kiriman*) [Bio] Authorization for entry after clearance.

Replanting (*Penanaman kembali*) [Bio] See *Planting*.

S

Sampling (*Pencuplikan*) [Soc] Selecting unit (e.g. events, people, groups, setting, artifacts) in manner that maximizes the researcher's ability to answer research questions that are set forth in a study.

Sample (*Contoh*) [Bio] Material that is derived from a specimen and used for testing purposes.

Sanction (*Sangsi*) [Com] That which provides someone authority or legitimacy to do something.

Semi-structured interview (*Wawancara semi-terstruktur*) [Soc] Method of obtaining community input with the use of an interview guide mostly composed of open-ended and probe questions done in a conversational manner either with an individual or group.

Sanitizer (*Penyanitasi*) [Bio] Reduces vegetative cells, but not the spores, of bacteria to a safe level as may be judged by public health requirements (by reduction of 99.9% of vegetative bacteria).

Sasi [Com] The spatial and temporal closure of groves, forests, coral reefs and fishing grounds, is a traditional feature of many Moluccan societies; despite increasing domestic and international awareness and praise of this "indigenous resource conservation technology", the institution is in decline in many parts of the Moluccas, and on many islands it is no longer practiced at all.

Secondary data (*Data sekunder*) [Soc] Data that were originally collected at an earlier time by different person from current research purpose, often for entirely different purpose.

Seeds (*Benih*) [Bio] A commodity class for seeds for planting or intended for planting and not for consumption or processing. See *Grain*.

Self organization (*Organisasi diri sendiri*) [Soc] The process by which systems use energy to develop structure and organization.

Semiotics analysis (*Analisis semiotika*) [Soc] Method of qualitative research that is primarily concerned with the meaning of signs and symbols in language. The essential idea is that words/signs can be assigned to primary conceptual categories, and these categories represent important aspects of the theory to be tested. The importance of an idea is revealed in the frequency with which it appears in the text. There are three forms of semiotic analysis, i.e. content analysis, conversation analysis and discourse analysis.

Sensitivity analysis (*Analisis kepekaan*) [Soc] A method used to examine the behavior of a model by measuring the variation in its outputs resulting from changes to its inputs.

Socially/culturally remedial (*Pemulihan secara sosial/budaya*) [Com] Works which seek to change, inform, or mediate cultural/social ideologies and/or beliefs and behaviors.

Social development (*Pembangunan sosial*) [Com] An approach to build community by enabling, teaching, and motivating people and local organizations for self-help, e.g. facilitated self-help. It is also referred to as community development or locality development.

Social indicator (*Indikator sosial*) [Com] A measure reflecting the status of a population (e.g. age range, income level, education attainment), and contextual influences (e.g. social, economic, ecological, and political influences).

Sylvopastural systems (*Sistem silvopastura*) [Com] Agroforestry systems covering forestry component (or woody plant) with the livestock component (or pasture), for example trees and shrubs on pastures, or integrated production of animals and wood products.

Social-ecology (*Ekologi-sosial*) [Soc] (1) A way of integrating the practice of science, the use of technology, and the expression of human values. It draws from any "body of knowledge" in its pursuit of designing activities that result in self-respecting, sensitive and social behaviors which show an awareness of social and ecological responsibilities. The context for action and the subsequent critical reflection on the consequences of those actions need to involve the actor's relationship with the physical environment, the cultural setting and its history, organizational aspects, and an understanding of the constraints and possibilities set by an individual's cognitive processes; (2) the view that environmental problems arise from fundamental social problems, and that they cannot be understood or solved without dealing with problems within society, including economic, ethnic, cultural, and gender conflicts.

Social-ecological system (*Sistem sosial-ekologis*) [Soc] An ecological system intricately linked with and affected by one or more social systems; it can be represented as a social-ecological network by the different attributes of the system that would be used to draw a structural map, e.g. trust, information, power, movement of cattle, contamination, seed dispersal. For each network of particular attributes, we can analyze the properties of the network. The network consists of both human and social nodes and nonhuman or ecological nodes, plus their connections, which represent the various attributes.

Social capital (*Modal sosial*) [Com] (1) Social structures and characterized as a 'public good' and is equal with financial capital, physical capital and human capital; (2) features of social organization such as networks, norms and social trust that facilitate coordination and cooperation for mutual benefit; (3) the connections among people and organizations or the social glue to make things, positive or negative happen; (4) a capability that arises from the prevalence of trust in a society or in certain parts of it. It can be embodied in the smallest and most basic social group, the family, as well as the largest of all groups, the nation, and in all other groups in between; (5) the social norms and relationship that hold a community's social structure together and make it possible for people to coordinate activities in order to achieve common goals; (6) resources embedded in a social structure which are accessed and/or mobilized in purposive actions; (7) the norms and networks that facilitate collective action; (8) generally defined as the series of relationships, networks and norms that facilitate collective action; (9) the network, together with shared norms, values and understanding, which facilitate cooperation or among groups; (10) the essence of social capital is based on quality social connection that bring mutual relationship of trust, reciprocity and cooperation; (11) the cohesiveness of people in their communities (various scales). Comprises relations of trust, reciprocity and exchanges between individuals which facilitate co-operation; the bundles of common rules, norms and sanctions mutually agreed or handed down within societies; the connectedness, networks and groups which may be formal or informal, horizontal or vertical, and between individuals or organizations; and access to wider institutions of society beyond the immediate household or community.

Social learning (*Pembelajaran sosial*) [Com] (1) Learning of individual in social environment by observation and imitation others; learning together to manage together or multiparty processes; (2) the acquisition of social competence that happens exclusively or primarily in a social group. Social learning depends on group dynamics. Social learning promotes the development of individual emotional and practical competence as well as the perception of oneself and the acceptance of others with their individual competencies and limitations; (3) forms of knowledge embedded in local experience; its plastic, local and divergent; its contextualities, and its fragmentation that make it so permeable, so open new ideas.

Social memory (*Ingatan sosial*) [Com] Collective memory/experiences to be used in times of change and uncertainty.

Social network analysis (*Analisis jaringan sosial*) [Com] A quantitative socio-ecological technique that maps and analyses the structural relationships between people in a social network.

Social resilience (*Daya lenting sosial*) [Com] The ability of communities to withstand external shocks to their social infrastructure. This is particularly apposite for resource-dependent communities where they are subject to external stresses and shocks, both in the form of environmental variability (such as agricultural pests or the impacts of climatic extremes), as well as in the form of social, economic and political upheaval (associated with the variability of world markets for primary commodities, or with rapid changes in property laws or state interventions).

Social science (*Ilmu sosial*) [Soc] (1) The systematic study of society and human relationship within society; (2) the study of people living together in groups, families, etc., their customs, activities, etc; (3) it comprises academic disciplines concerned with the study of social live of human groups and individual, including anthropology, communication study, human geography, history, political science, psychology and sociology.

Social vulnerability (*Kerentanan sosial*) [Com] The exposure of groups of people or individuals to stress as a result of the impacts of environmental change. Stress, in the social sense, encompasses disruption to groups' or individuals' livelihoods and forced adaptation to the changing physical environment. Social vulnerability in general encompasses disruption to livelihoods and loss of security. For vulnerable groups such stresses are often pervasive and related to the underlying economic and social situation, both of lack of income and resources, but also to war, civil strife and other factors. For natural ecosystems, vulnerability can occur when individuals or communities of species are stressed, and where thresholds of potentially irreversible changes are experienced through environmental changes.

Society (*Masyarakat*) [Com] The myriad of ways people connect, linked by common interest and characteristic; society can be viewed as a market in which people exchange all variety of good and ideas in pursuit of their interests. Certain people or certain groups of people do better in the sense of receiving higher return for their effort.

Spread (*Penyebaran*) [Bio] Expansion of the geographical distribution of a pest within an area.

Sporicide (*Sporisida*) [Bio] Kills all microorganisms including bacterial endospores, a very resistant form of certain microorganisms, which develop as a means of survival under adverse conditions.

Stakeholder (*Pemangku kepentingan*) [Soc] (1) Internal stakeholders are risk assessors, risk managers and risk communicators employed by the competent authority; external stakeholders are other branches of government and foreign governments, competent bodies, industry, academic communities and public interest groups; (2) parties having an interest in a particular project or outcome.

Standard (*Standar*) [Bio] Document established by consensus and approved by a recognized body that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.

Strategy (*Strategi*) [Com] The way an organization seeks to achieve its vision and mission. It is a forward-looking statement about an organization's planned, use of resources and deployment capabilities. Strategy becomes real when it is associated with: (1) a concrete set of goals and objectives; and (2) a method involving people, resources and processes.

Steady state (*Keadaan tunak*) [Bio] A constant pattern e.g. a balance of inflows and outflows.

Sterile insect (*Serangga steril*) [Bio] An insect that, as a result of a specific treatment, is unable to reproduce.

Sterile insect technique (*Teknik serangga steril*) [Bio] Method of pest control using area-wide inundative release of sterile insects to reduce reproduction in a field population of the same species.

Stored product (*Produk yang disimpan*) [Bio] Unmanufactured plant product intended for consumption or processing, stored in a dried form (this includes in particular grain and dried fruits and vegetables).

Structure (*Struktur*) [Com] Community organization and their informal and formal connections to both government and community leadership.

Supporting service (*Jasa pendukung*) [Bio] Ecosystem services that are necessary for the production of all other ecosystem services e.g. biomass production, production of atmospheric oxygen, soil formation, nutrient and water cycling.

Suppression (*Penindasan*) [Bio] The application of phytosanitary measures in an infested area to reduce pest populations.

Surveillance (*Pengawasan*) [Bio] Active and ongoing collection, analysis and dissemination of data on risks to life and health.

Sustainability (*Kelestarian*) [Com] Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

System (*Sistem*) A set of parts organized into a whole, usually processing a flow of energy.

Systems approaches (*Pendekatan sistem*) [Bio] The integration of different risk management measures, at least two of which act independently, and which cumulatively achieve the appropriate level of protection against regulated pests.

T

Transdisciplinary (*Lintas disiplin*) [Soc] Researchers work jointly using a shared conceptual framework that draws together discipline-specific theories, concepts, and approaches, to address a common problem. See *Multidisciplinary*, *Interdisciplinary*.

U

Urban ecology (*Ekologi urban*) [Bio] The application of the principles of ecology to a study of urban environments. Urban ecologists look at individual areas of the city – natural areas – in the context of the whole city, and focus on the way a population organizes.

V

Validation (*Validasi*) [Bio] (1) A process to determine a procedure's/protocol's fitness for a particular use and includes procedure optimisation and demonstration of performance characteristics and evaluation of sensitivity and specificity; (2) the extent to which an account accurately represents the social phenomena to which it refers; (3) objective demonstration that biosecurity controls are effective in achieving stated outcomes.

Vector (*Vektor*) [Bio] A carrier of an infectious agent.

Venn diagram (*Diagram Venn*) [Soc] A tool for illustrating relationships and relative influence of institutions, issues, or problems related to an area or project.

Verification (Pembuktian) [Bio] Activities that are performed, in addition to monitoring, to determine whether a biosecurity control is or has been operating as intended.

Virucide (*Virusida*) [Bio] Kills or inactivates viruses.

Virulence (*Virulensi*) [Bio] The degree of ability of an organism to cause disease.

Virus (*Virus*) [Bio] An infectious particle composed of a protein capsule and a nucleic acid core, which is dependent on a host organism for replication.

Vision (*Visi*) [Com] A concise statement defining an organization's long-term direction, the vision is a summary statement of what the organization ultimately intends to become 5, 10 or even 15 years into the future. It is the organization's long-term "dream", what it constantly strives to achieve, its "raison d'etre". A powerful vision provides everyone in the organization with a shared mental framework that helps give shape to its abstract future. An effective vision statement provides as concrete a picture of the desired state as possible, as well as provides the basis for formulating strategies and objectives.

Visual examination (*Pemeriksaan visual*) [Bio] The physical examination of plants, plant products, or other regulated articles using the unaided eye, lens, stereoscope or microscope to detect pests or contaminants without testing or processing.

W

Waste (*Limbah*) [Com] A residue from trade and/or activity.

Weeds (*Gulma*) [Bio] Plant pests that grow where they are not wanted–often on cultivated land.

Wild animal (*Satwa liar*) [Bio] All of animal life in land, and/or water, and/or air, which still has its wild characters, both lives freely and is maintained by human.

Wild plant (*Tumbuhan liar*) [Bio] Plant lives in free nature and/or maintained, which still has its pureness type.

Wood packaging material (*Materi kemasan dari kayu*) [Bio] Wood or wood products (excluding paper products) used in supporting, protecting or carrying a commodity (includes dunnage).

X

Xenotransplantation (*Senotransplantasi*) [Bio] Transplant of tissue from one species to another species.

Y

Yame Owa [Com] House for men, in Papua is a final result method trialed over years. The culture of Yame Owa is still practiced and adhered to by the Mee tribe (Mee means 'a true man'), who live in the mountainous areas in the heart of Papua. The tribe settled in Wiselmaren lakes, Kamuu, Mapia, and Siriwo regions; it is uniting idea, feeling, and perspective, and is orientated towards a dialog process to solve problems that occur within community; is a media to socialize the value of culture through communication; it is even considered as a guideline for the Mee tribe to understand the universe, and based on the view of the Mee people that a human being should live, see, think, do and see the future based on strong Yame Owa.

Z

Zoonoses (*Zoonoses*) [Bio] Infectious diseases that can be transmitted naturally between wild or domestic animals and humans.

Index

A

Aboriginal people, 4, 35, 54, 110, 112, 115, 202
Access and benefit-sharing (ABS) system, 25, 33–34
Access to resources, 67, 95, 178
Acts
  Act No. 8 (2005), 78
  Act No. 12 (1992), 76–78, 82, 210
  Act No. 16 (1992), 76
  Act No. 22 (1999), 78, 79
  Act No. 32 (2004), 78, 81
Adaptation, 48, 115, 147, 158, 238, 257, 286
Adat, 35, 54, 59, 226
Adat law, 55
Affirmative action, 62, 178
Agricultural extension, 12, 56, 76, 169, 202
Agricultural industry, 31, 94, 99, 100, 102–105, 110–112, 222–223, 238
Agricultural knowledge, 33
Agriculture, 9–10, 13, 26, 31, 37, 38, 41, 49, 50, 56, 60, 61, 66, 69, 70, 76, 77, 94, 131, 155, 163, 164, 174, 176, 185, 188, 207, 221, 226, 228, 238, 252, 254, 260, 264–265, 268
  cultivation system, 28, 29
  department, 27, 31, 41, 111, 177
  service, 37, 49–51, 56, 61
Agriculture Quarantine Agency of Indonesia (AQAI), 28, 29
ALOP. *See* Appropriate level of protection
Analysis
  statistical, 86, 282
  thematic, 86, 97
Animal, 6, 13, 23, 24, 26–29, 31, 40, 49, 76, 103, 112, 130, 131, 133, 137, 155–156, 158, 165, 216, 239, 240, 243–247, 250, 256, 257, 260, 263, 266, 270, 275, 277–278, 281, 285, 289, 290
  biosecurity, 26
  health, 23, 26
  husbandry service, 49
  products, 28, 137
  quarantine, 28, 29
Appropriate level of protection (ALOP), 27, 288
Appropriate technology, 62
AQAI. *See* Agriculture Quarantine Agency of Indonesia
AQIS. *See* Australian Quarantine and Inspection Service
Arafura sea, 45
Area Freedom, 93–94, 99, 102
Arisan, 171
AusIndoBIOCOM. *See* Australian-Indonesian Biosecurity Community
Australia, 3, 4, 6–10, 14–16, 30–32, 35, 49, 54, 65, 75, 86, 93–94, 96, 102, 109–111, 114, 116, 118, 130–132, 134, 138, 159, 194, 200, 202, 205, 206, 208, 218, 223, 225, 226, 240, 252–253, 258
Australian-Indonesian Biosecurity Community (AusIndoBIOCOM), 7, 129, 130, 132, 134, 140, 237
Australian Quarantine and Inspection Service (AQIS), 31, 94, 111, 112
Autonomy, 36, 37, 41, 45–47, 50, 53–56, 60, 77–78, 104, 209, 221, 226, 228, 280
  and dependency, 36, 37, 62, 105, 187, 192, 196
  regional, 36, 41, 46, 60, 77, 78, 221, 226

Avian influenza, 6, 40, 49, 240–241
Awareness, 5, 15, 30, 77, 85, 94, 97–99, 129–133, 137, 139, 163, 165, 168, 173, 175, 177, 178, 190, 199, 200, 202, 205, 219, 222, 284, 285
  public, 77, 94

B
BA. *See* Biosecurity Australia
Badan Karantina Pertanian Indonesia (BARANTAN), 28, 29, 40
Banda Sea, 45
Banjar, 173
Barnabas Suebu, 56, 59
Beale Panel, 32
Biak, 48
Big business, 57–58, 81
Bilingual publications, 16, 145–160
Biodiversity, 6, 13, 16, 30, 33, 46, 53, 62, 112, 130, 131, 136, 157, 171, 175, 176, 226, 242, 244, 264, 276
  conservation, 34, 171, 175, 176, 244, 251–252
  related knowledge, 33, 197
Biological control, 6, 170, 241–243, 247, 259, 269, 270, 272
Biological incursions, 94, 97, 99, 102, 104, 105
Biosecurity, 3, 23, 45, 65, 93, 109, 129, 145, 163, 183, 199, 215
  agencies, 94, 97–99, 103–105
  approach toward, 77
  capacity, 23–24, 38, 40–41, 60, 130–132, 246–247
  challenges, 78
  community, 66–75, 110–112, 130, 156, 222
  continuum, 31, 32
  definition of, 12, 13, 75–76, 133
  to enhance, 82, 140, 192, 217, 218, 224
  issues, 6, 11, 15, 27, 30, 31, 47–53, 66–75, 78, 98–99, 104, 105, 111, 123, 131–133, 139, 192, 196, 217, 224, 226, 228, 229, 235
  local, 66, 104, 192, 224, 229
  management, 4, 24, 46, 65, 95, 109, 129, 145, 164, 184, 200, 220
  management strategy, 205, 234
  policy, 24, 26–32, 38–41, 46, 51, 53, 75, 88, 111, 132–133, 221, 228
  practice, 93–105, 119, 164, 225–226
  risk analysis, 140, 155–156, 245
  toolkit, 23
Biosecurity Australia (BA), 31
Bioterrorism, 28, 245
Bond/bonding, 42, 86, 95, 98–100, 157, 169, 221, 227, 230–233, 246
Bonding social ties, 169, 246
Borders
  checkpoints, 98, 104
  community-government, 65–88
  cross, 15, 30, 65, 66, 132, 136, 138, 139, 146, 148, 149
  issues, 7–8, 11, 65
  physical, 7, 65, 88, 207, 216–217, 222
  social, 8, 65, 66, 86, 88, 93–105, 207, 215, 222
  unseen, 79–83, 88, 222
Borrowing, 146, 150, 155
BPOM. *See* Food and Medicine Protection Body
Bridge/bridging, 132, 138, 146, 150, 169, 172, 204, 207–208, 211, 223, 225, 227, 230, 246
Bridging
  bonding and linking, 42, 95, 221, 231
  social ties, 95
Bubble up, 96, 105
Budwood
  indiscriminate use of, 71
  requirement, 74
  shortage, 71, 74
Bufo marinus, 11, 102
Bugisnese, 47–48

C
California mixture. *See* Lime and sulphur mixture
Calque, 146, 147
Cane toads *(Bufo marinus)*, 11, 102
Capacity building, 2–3, 57, 60–61, 112, 114, 118–119, 132, 135, 220, 261
Caring for country, 10, 93
Cartagena protocol, 30
Cattle, 52, 285
CEDAW. *See* Convention on the Elimination of all Form of Discrimination against Woman
Centre of Animal Quarantine, 28
Centre of Information and Biosafety, 29
Change, 5, 24, 52, 67, 94, 113, 130, 150, 164, 184, 201, 216
  management, 15
Chemical
  pesticide, 170, 243
  substances, 51
China, 24, 69, 75, 130–131, 239–240

Citrus, 3–4, 11, 15, 49, 65–88, 94, 130–131, 191, 200–201, 206–208, 218, 222
  cultivation, 66, 70
  greening (*see* Huanglongbing)
  growers, 73, 75, 78–80, 84, 86
  hybrids, 70–71
  industry, 80, 82, 87, 88, 222
  intensification project, 70, 82
  pests and diseases, 73, 78, 207, 209
  species, 69–71
Citrus greening (Huanglongbing), 71, 94
Citrus phloem vein degeneration (CPVD), 49, 71, 73
Citrus vein phloem degeneration (CVPD). *See* Huanglongbing
Cocoa, 50, 57, 58
  plantation, 50, 58
Cocoa pod borer (CPB), 58
Codex alimentarius, 26–28
Collaborative, 8, 35, 54, 96, 111, 113, 114, 124, 131, 138, 140, 205, 218, 223, 237, 240, 248, 249, 252, 271, 274, 276
  research, 8
Common purpose, 15, 17, 132, 199, 200, 211, 220, 231, 233
Communal right, 55
Communication, 9, 11, 15, 17–18, 23, 24, 31, 36–38, 56, 61, 67–68, 93, 98, 101, 115, 116, 118, 121, 132, 133, 139, 146, 148–150, 153, 155, 159, 166, 168, 172–174, 176, 179, 200–205, 207–210, 223, 224, 227, 246, 251, 282, 286, 290
Community, 4, 25, 45, 65, 93, 109, 129, 146, 163, 183, 199, 216
  action, 131, 138, 248
  affairs, 67
  based, 95, 103, 104, 109–112, 138, 183, 199–201, 210, 249
  biosecurity, 66, 73–75, 222
  capital, 129, 133, 169, 249, 267
  definition of, 95
  development, 113, 138, 169, 202, 218, 249, 261, 280, 284
  engagement, 85, 86, 95, 96, 114, 117, 131–132, 202, 222, 249
  forest, 55
  highland, 66–69, 84, 222
  interests, 68–69, 165
  leaders, 61, 117, 121, 226, 287
  learning, 171
  life, 67, 69
  management, 8, 9, 11, 13, 65, 77, 96, 109–112, 114, 116, 117, 121, 124, 131–133, 136–140, 155, 156, 163–179, 199–211, 217, 219, 220, 223, 224, 228
    and governance, 14–16
  members, 10, 11, 14, 16, 67, 84, 86, 94, 96, 110, 112, 121–123, 131, 174, 175, 178, 179, 192, 193, 196, 200, 201, 206, 209, 210, 225–227, 234, 281
  network, 176
  participation, 7, 14, 36, 84, 87, 119, 129, 138, 169, 179, 210, 222, 224, 249
  participation from, 76–77
  planning, 59, 138, 234, 249
  practices, 4, 37, 138, 248, 249
  processes, 131
  scoping study, 96–97
  structure, 7–8, 15, 131, 172, 193, 199, 200, 249
  systems, 96
Community Discussion Body (BAMUS), 172
Confidence, 78, 85, 119–121, 168, 171–174, 179, 204, 207–208, 227
Conflict area, 14, 47, 174
Convention on the Elimination of all Form of Discrimination against Woman (CEDAW), 166
Coordination problem, 29–30, 34
Copyright, 33, 35
Corn, 52, 185, 197
Council of Food Security, 29
CPB. *See* Cocoa pod borer
CPVD. *See* Citrus phloem vein degeneration
Crop
  cultivation, 51, 76, 210
  failure, 188, 195–196
Crop protection, 76–79, 210
  measures, 76–77
  system of, 79
  technical aspects of, 76
Cross-border communication, 15, 146, 148, 149
Cultivation, 69–71, 76, 185, 187, 190, 197, 253
  citrus, 70
  crop, 51, 76, 210
  extended, 70
  intensified, 70
  mandarin, 70–71
  swidden, 69

Cultural
complexities, 164
expressions, 32
inheritance, 179, 224
Culture, 4, 8, 24, 29, 34, 46, 48, 53–56, 115, 116, 120, 140, 146–149, 156, 164, 167–169, 179, 187, 201, 204, 216, 226, 229, 253, 260, 282, 290
Culture and religion differences, 169
Culture identity, 15, 175, 204
Custody, 29, 254
CVPD. *See* Citrus phloem vein degeneration

D
DAFF. *See* Department of Agriculture, Fisheries and Forestry
Dasa Wisma, 171
De-centralisation, 104
Decentralization. *See* Regional autonomy
Decision making process, 26, 30, 52, 173, 176, 201, 259
Department of Agriculture, Fisheries and Forestry (DAFF), 27, 31, 111
Development, 6, 24, 45, 66, 96, 109, 130, 157, 163, 185, 199, 218,
paradigm, 24–26, 30, 32, 35, 41, 46, 139, 221, 226
planning deliberation, 36
Dewan Perwakilan Rakyat Papua (DPRP), 54, 55, 62
Diaphorina citri, 74
Digital technologies, 121, 123, 199, 202–204
Diplodia rot, 70, 73, 75, 80–81, 84
Directorate of Quality and Standardization, 29
Diseases, 4, 25, 52, 65, 94, 112, 130, 158, 164, 184, 200, 218
Distrust, 84, 86, 210–211
Diversity, 13, 15, 25, 30, 34, 95, 102, 112, 137, 138, 209, 216, 239, 242, 244, 250–251, 256, 257, 271
Division of labor, 188–190
Domestic and public rules, 167
Domestication, 8, 49, 103, 139, 147, 156–158, 167, 177, 240, 245, 263, 264, 277, 284, 290
DPRP. *See* Dewan Perwakilan Rakyat Papua
Dutch, 29, 51, 69
Dutch-colonial era, 29
Dysfunctional bureaucracy, 36, 37

E
Eastern Indonesia, 6, 9, 13, 15, 35, 54, 109, 132, 134, 136, 148, 163–179, 183, 185, 188, 206, 218, 228, 241, 247, 255
Ecology/ecological, 8, 26, 33, 45, 52, 58, 61, 62, 112, 113, 133, 135–136, 139, 140, 155, 167, 171, 187, 214, 229, 231–233, 238, 242, 245, 255–258, 262, 263, 265, 267, 269, 272, 284–286, 288
balance, 52, 171
knowledge, 33, 112, 272
Economic sustainability, 10, 109, 111–114, 183–197, 224, 225, 256
Ecosystem, 52, 133, 146, 176, 216, 238, 239, 242, 243, 250, 253, 256–259, 266, 270–272, 274, 280, 286, 287
Effective strategies for managing biosecurity across borders, 8
Emotional place attachment, 101, 102, 105
Empowering women, 169, 175–176
Empowerment capacity, 62, 168, 175–176
Engagement, 8, 10, 25, 46, 47, 85, 86, 95, 96, 102–104, 110, 111, 114, 116–118, 120, 123, 124, 131–132, 137–139, 168, 184, 195, 202–204, 209, 216, 217, 222, 229–231, 235, 249
Enterprise, 8, 14, 15, 17, 18, 86, 109–124, 152, 178, 201, 208, 223, 227, 229, 232
Enterprise/entrepreneurship, 14, 15, 17, 18, 62, 86, 109–124, 152, 178, 201, 208, 223, 227, 229, 232, 2618
Environmental impact, 52, 129, 244, 255, 259, 262
Environmental science, 4, 12
Equitable sharing of benefits, 25, 251
Equivalence, 147, 151, 154, 156, 260
Eradication, 7, 29, 39, 40, 49, 76, 81, 86, 88, 94, 110, 124, 138–140, 173, 175, 188, 200, 223, 233, 234, 239, 245, 252, 259, 274, 275
Estate Crop Service, 50, 58
Ethnographic techniques, 97, 190
Europe, 24, 114, 260
Exchange, 23, 67–69, 93, 94, 98–100, 102–105, 114, 117–118, 132, 133, 140, 155, 160, 165, 176, 194, 200–201, 204, 206, 211, 223, 241, 246, 252, 255, 285–287
informal information exchange, 69
information exchange, 23, 67–69, 98–100, 104, 105, 117–118, 155, 176, 206, 246
mutual exchange, 67, 285–286

Experiential practice, 99
Export certification, 29, 94
Expression of folklore, 33, 34

F

FAO. *See* Food and Agriculture Organization
Farmers, 3–4, 6, 12, 15, 37, 39–41, 47, 49–54, 57, 58, 60–62, 65, 71, 73, 78, 79, 85, 102, 131, 164, 167, 169, 171, 174, 175, 177, 184, 186–193, 195, 206–210, 218, 221, 227, 228, 233, 234, 273
Feminist theory, 167
Food, 4, 23, 47, 69, 93, 110, 130, 145–160, 163, 183, 217
Food and Agriculture Organization (FAO), 8, 13, 23, 26, 27, 31, 35, 39, 41, 75–76, 130, 137, 155, 220, 269
Food and Medicine Protection Body (BPOM), 29
Food labels and advertisement, 29
Food rebellion, 185
Food safety, 13, 23, 26–30, 76, 137, 155–156, 158, 195, 226, 244, 262
  quality and nutrient, 28
Food security, 5, 6, 9, 10, 13, 16, 29, 30, 49, 51, 52, 55, 60, 62, 93, 130, 136, 145–160, 163–165, 171, 173, 184, 187, 190–192, 195–197, 217, 218, 221, 225, 226, 250, 252–253, 261, 262
Food security body, 29
Foreignization, 139, 147, 156
Forest conversion, 52
Forest management, 55
Formal, 14–16, 67, 69, 85, 86, 98, 113, 118, 124, 133, 138, 146, 156, 167, 174, 178, 179, 189, 200, 201, 205, 211, 217, 225, 226, 228, 230, 243, 249, 268, 272, 286, 287
Foxtail millet, 189, 191, 195, 196
Freeport Indonesia, 49
Fruit flies *(Bractocera)*, 7, 49, 94, 98
Function, 8, 23–25, 27, 31, 35–38, 40, 41, 50, 54, 55, 57, 59, 62, 77, 101, 102, 105, 139, 147, 154, 163, 203, 206, 221, 226, 238, 240, 246–247, 249–250, 256, 257, 259, 268, 272, 273, 280, 281, 283
Functional place attachment, 101, 105

G

Gadang, 61
GBM. *See* Glossary of Biosecurity Management
Gelael, 57
Gender, 5, 8, 9, 95–97, 138, 163–179, 188, 190, 224, 229, 234, 285
  equality, 166, 168, 178
  issues, 163–179
General Directorate of Livestock, 28
Genetically modified organisms (GMOs), 13, 28, 30, 76, 263
Geographic Information System (GIS), 10, 207, 209, 210, 227
Globalization Impact, 65, 131, 165
Global Positioning System (GPS), 10, 112, 203
Global warming, 4, 52, 73, 264
Glossary, 5, 6, 16, 17, 129–140, 155, 156, 223, 237–290
Glossary of Biosecurity Management (GBM), 130, 132–134, 136, 139, 140, 155–159, 223, 237–290
GMOs. *See* Genetically modified organisms
'Go-organic' program, 51
Governance, 3, 7–8, 10, 14–18, 27, 30, 32, 35–39, 46, 47, 53, 56, 57, 62, 66, 87, 96, 112–116, 123, 131–133, 183, 200–202, 210, 219, 220, 226, 240, 252, 264, 265, 271, 280
Governance systems, 96
Government, 4, 25, 47, 65, 93, 110, 136, 154, 164, 184, 200, 217
  affairs, 67
  agencies, 7, 9, 39, 75, 94, 97, 100, 111, 191, 207, 229, 266
  autonomous, 77, 78
  bodies, 37, 38, 77
  central, 36, 51, 52, 54, 59, 62, 77–78, 82, 185, 186
  claim, 80
  local, 36, 38, 49, 50, 56, 62, 67, 70, 71, 73, 75, 77–79, 81, 84, 85, 87–88, 171, 188–189, 200–201, 209, 222, 226, 228, 240
  modern, 67
  policy, 76, 80, 82, 87, 164, 177, 200
  program, 37, 67, 70, 74, 174, 178
  regional, 78, 177, 235
  regulations, 28–30, 35, 40, 51, 75, 76, 81, 87, 93, 210, 222
  traditional, 9, 11, 67, 70, 171, 172
Government Regulation No. 6 (1995), 210
Governor of Papua, 49, 59
GPS. *See* Global Positioning System

Gradual and availability principles, 56
Graft, 71, 74, 81–83, 87, 88, 222
  grafted seedling, 71, 74, 81–83
  grafting, 71
  transmitted, 71, 87
Grassroots, 10, 30, 37, 96, 132, 220, 230
Green revolution, 4, 79, 164, 186, 187, 227, 264–265
Green revolution trap, 187
Group process, 175

H
Hand-held technology, 5, 10
Harmony, 54, 168, 175, 266, 273
Heritage, 9–10, 33, 55, 84, 87, 111, 210, 242, 253, 264
HLB. *See* Huanglongbing
Household economy, 193, 196, 225
How science can better impact at the community level, 4
Huanglongbing (HLB), 71–75, 80, 82, 84, 85, 88, 94, 222
  free from, 71, 80, 94
  pathogen of, 71, 74
  symptoms of, 71–73
  unobservable symptom of, 74
  vector of, 71, 74
Human capital and natural capital, 168
Hunger rescue, 187

I
IAS. *See* Invasive Alien Species
ICT. *See* Information and communication technologies
Identity, 4, 24, 53, 66, 93, 109, 129, 150, 164, 184, 199, 215
Imbi, 57, 58
Import certification, 29
Import Risk Analysis (IRA), 27
Incentives to act, 15
Incursions, 7, 39, 40, 65, 75, 77, 87, 94, 97, 99, 102–105, 110, 114, 118, 121, 129, 131, 138, 174, 194, 200, 201, 205, 222, 245, 268, 275
India, 24, 86
Indigenous, 4, 26, 45, 93, 110, 136, 168, 187, 200, 221
  Australians, 4, 9, 93, 112, 118, 200, 205, 206
  community, 55, 110, 112, 114, 120, 206
  knowledge, 26, 30, 32–35, 41, 45, 51, 54, 55, 113, 117, 118, 136, 193, 221, 229, 260
  land right, 52
  ranger, 35, 111, 112, 117, 200, 205
Indonesia
  3, 24, 45, 65, 109, 130, 146, 163, 183, 200, 218
Indonesian constitution, 34, 166
Indonesian law, 29
Indonesian provinces, 29
Indonesian territory, 29, 30, 40, 76
Inequality, 11, 168, 179, 224
Informal, 14, 15, 67, 69, 98, 121, 133, 146, 178, 217, 230–232, 251, 268, 286, 287
Information, 6, 23, 59, 67, 94, 116, 133, 145, 164, 188, 200, 224
  about pests and diseases, 73
  exchange, 23, 67, 69, 99, 117–118, 176, 206, 246
  provision, 99, 100
Information and communication technologies (ICT), 116, 119, 123, 202, 208
Innovation, 32, 34, 37, 168, 169
Insecticide, 9, 50, 241, 263, 272, 276
Inspection
  at entry points, 29
  at exit points, 29
Institutional knowledge, 8, 210–211, 229
Institutional resources, 210–211, 217
Integrated approach, 13, 23–24, 31, 35, 39, 41, 54, 77, 131, 137, 155–156, 221, 226, 244, 245
Integrated cooperation, 165–166
Integrated pest control, 39–40, 169–171
Integrated pest management (IPM), 73, 76, 78, 79, 164, 170, 269–270
  farmer field school (FFS) of, 73, 78, 164
Integrated strategy for managing biosecurity, 235
Intellectual Property Right (IPR), 34, 55, 270
Interactions, 10, 14, 48, 60–62, 66, 95, 96, 98, 104, 114, 116, 122, 200, 202, 203, 207, 217, 221–222, 228–235, 252, 254–257, 260, 264, 267, 270
Interdisciplinary approach, 38, 39
Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC GRTKF), 33
International context, 8–9
International law, 26–28
International Plant Protection Convention (IPPC), 8, 26, 29, 53, 94, 270
Interventions, 11, 85, 124, 131, 163, 196, 216, 218–220, 223, 241, 286
Invasive Alien Species (IAS), 28, 29

Involuntary measures, 98
IPM. *See* Integrated pest management
IPPC. *See* International Plant Protection Convention
IPR. *See* Intellectual Property Right
IRA. *See* Import Risk Analysis
Isolation, 29, 67, 80, 86, 101, 104, 268, 274

J
Jakarta, 37, 48–49, 51, 52, 56, 57, 185
Japan, 24, 263
Javanese, 47–48, 185, 186
Jayapura, 46–48, 57–59

K
Kabupaten, 36, 37, 46, 78
Kamoros, 45
Kemili, 60–61
Kentucky Fried Chicken, 57
Ketahanan hayati. See Biosecurity
Ketahanan pangan, 29, 157, 159, 262
Kewang, 35
Knowledge, 9–11, 32–35, 45–62, 114–116, 123, 129–140, 145–160, 183–197, 200–202, 231–233
  availability, 57, 60–61
  local, 5, 8, 24–26, 30, 32–36, 39–41, 45–62, 85, 94–95, 102, 104, 109–111, 119, 132, 159, 183–197, 200, 217, 218, 221, 223–229, 231–233
  management, 12, 113–118, 184, 201, 203, 208, 210–211, 225
  outsider, 39, 84, 85, 166, 174, 176–177
  recognition, 9, 114, 117, 201, 211, 229
  systems, 26, 30, 35, 54, 113–117, 119, 120, 123–124, 159, 199, 201–202, 211, 223, 225, 227, 229, 260
  transfer, 7–9, 60, 66, 95, 110, 113, 117, 132, 140, 145–160, 164–166, 168, 170, 173–174, 176–177, 184, 190, 192, 193, 197, 199, 202, 209, 211, 223–225, 227–228, 234, 271
Kumbe Kurik project, 51

L
Land right, 35, 52, 55
Language, 15, 33, 67, 115, 132, 133, 145–160, 204, 209, 227
  and cultural borders, 146, 147, 160, 224, 227
  and ethnic groups, 15
Leadership, 7–8, 53, 55, 114, 132, 133, 135, 169–172, 175, 226–227, 233, 234
  formal leadership, 67, 179, 189
  traditional leadership, 171, 179, 189, 233
Learning, 78, 109–124, 140, 199–211
  partnerships, 109, 114, 118–121, 124
Legal framework, 13, 23–42, 62, 220
Legislation, 28, 31, 41, 47, 55, 221, 270, 271, 278
Lifestyle, 34, 94, 96, 100–102, 105, 171, 172, 184, 192, 196, 224
Lime and sulphur mixture, 75, 81
Linking social ties, 95
Link/linking, 37, 42, 67, 86, 95, 103, 117–120, 122, 131, 132, 134, 221, 225–231, 233–235, 271, 274, 281
Literal translation, 146, 147, 156
Livelihood, 6, 10, 52, 71, 94, 100–102, 105, 169, 171, 173, 177, 184, 186, 191, 192, 200, 258, 264, 286
Living modified organisms (LMOs), 13, 28
LMOs. *See* Living modified organisms
Local
  communities, 7, 8, 10, 11, 25, 30, 34, 39, 41, 52, 62, 66–75, 84, 87, 88, 97–99, 102–105, 109–111, 114, 117, 123, 169, 174, 176–177, 185, 190–193, 196, 197, 199, 200, 207, 209, 210, 221, 222, 224–229
  food, 57–58, 62, 185, 190–192, 195–197, 224–225
  government, 36, 38, 49, 50, 56, 62, 67, 70, 71, 73, 75, 77–79, 81, 84, 85, 87–88, 171, 188–189, 200–201, 209, 210, 222, 226, 228, 240
  and indigenous knowledge, 30, 35, 41, 54, 118, 229
  knowledge, 5, 8, 24–26, 30, 32–36, 39–41, 45–62, 85, 93–95, 102, 104, 109–111, 119, 124, 132, 159, 183–197, 200, 201, 217, 218, 221, 223–229, 231–233, 235
  parliament, 36
  rice, 49, 50, 62
Lumbumg Pangan (food producer center), 175–176

M
Maize, 84, 191, 195, 196
Majelis Rakyat Papua (MRP), 54, 55, 62

Management, 6–18, 65–88, 109–124, 131–133, 136–140, 150, 163–179, 188, 199–211, 225, 228, 233–235, 240, 245, 250, 258, 269, 272, 288
 biosecurity, 4, 7, 9–11, 13, 16–18, 24–26, 31, 46, 47, 52, 54, 57, 61–62, 65–88, 99, 109–124, 133–137, 139, 164, 177, 179, 184, 185, 191, 192, 200, 201, 205, 209, 210, 222, 224, 226, 229, 232, 233
 community, 8, 9, 11, 13–16, 65, 77, 96, 109–112, 114, 116, 117, 121, 124, 131–133, 136–140, 155, 156, 163–179, 199–211, 219, 220, 223, 224, 228–229
 cross-border, 65, 132
Mandarins
 cultivars of, 70, 82
 decline of, 69–73, 79, 84
 flourishing of, 69
 history of, 69, 84
 mandarin cultivation, 70
 mandarin (cv.) Keprok Soe, 70, 82, 84
 mandarin planting, 74, 84
 soe mandarins, 70
Manokwari, 47–51, 56, 60
Manokwari rice, 47, 49–50, 57, 58
Mapalus, 166
Medfly (Ceratitis capitata or Mediterranean fruit fly), 94, 103
Medicinal knowledge, 33
Merauke, 46, 47, 51–52
Merauke Integrated Food and Energy Estate (MIFEE), 51
Migrant, 52, 58, 185, 186, 191
Mimosa pigra, 6, 110
Mindmanager, 97
Minister of Agriculture (MoA), 28–29, 38, 49, 51–52, 70, 77
Mixed method
 multistrand, 86
MoA. *See* Minister of Agriculture
Mobile learning (M-learning), 18, 199–211, 225
Mobile technologies, 199–211, 225
Modulation, 147
Moluccan, 47–48, 284
Moluccas, 35, 45–46, 54, 247, 284
Mozes Kilangin, 49
Mulia, 46
Multi-disciplinary, 10, 16, 18, 117–118, 133, 140, 218, 247, 269, 273, 288
Musrenbang, 36, 230
Musyawarah Perencanaan Pembangunan, 36
Mutual
 exchange, 67
 helpfulness, 67

N
Nairn Report, 32
National Community Empowerment Program, 168, 173–174, 280
National level policies, 28–30, 34
National Plant Protection Organizations (NPPOs), 27, 252, 273, 281
Natural resources, 55, 67, 111, 164–165, 167, 239, 243, 250, 254, 274, 279
Networks
 communication, 68–69, 207–209
 office, 82
 social, 67, 69, 86, 93–96, 98–100, 102–105, 133, 164, 167, 196, 206, 225, 233, 274, 286
New development paradigm, 24–26, 30, 32, 35, 41, 46, 139, 221
New knowledge, 4, 39, 93, 95–98, 100–105, 132, 159, 169, 196, 201, 207–208, 218, 225, 227
New technology, 10, 130, 164, 196, 210, 211, 225, 252
Non Government Organizations (NGOs), 7, 8, 13, 16, 18, 27, 39, 136, 169, 174, 177, 178, 185, 217, 228–229, 270
Non-organic and organic Fertilizer, 51, 170, 171, 186
Northern Australia, 4, 6, 10, 15, 30, 49, 93, 132, 134, 200, 206, 208, 223, 225, 226
Northern Territory, 35, 54, 112
North Moluccas, 45–46
NPPOs. *See* National Plant Protection Organizations
Nursery
 certified nursery, 81, 82
 officially recognized nursery, 80
 uncertified nurcery, 82
 unofficial nurseries, 80
nVivo, 97

O
Organizational structure, 57, 165, 172

P
Palm sugar, 187, 189–190, 195–196
Papua, 35, 45–62, 134, 165, 169–172, 176, 177, 185, 220, 228, 247, 290

Papua Barat Province, 46, 49–50, 53, 59
Papua New Guinea, 6, 46–48
Papua People's Assembly, 5, 55
Papua Peoples Representative Council, 54
Papua Province, 45, 50, 54–56, 59
Paradigm shift, 38, 79
Participation/participatory, 5–6, 10–12, 14, 25, 36, 62, 65, 76–78, 84, 87, 96, 97, 99, 103, 105, 134–135, 140, 170, 173–175, 179, 188, 192, 202, 210, 219, 223, 224, 226, 229, 231, 280
Participative methodology, 5, 218
Participative research methodology, 5
Participatory practice, 219
Partnerships, 7, 11, 17, 31, 32, 62, 78, 109–124, 130, 131, 140, 191, 200, 201, 207, 210, 223, 228, 235, 240, 264
  in social learning, 86, 109–124
PBM. See Perencanaan Bersama Masyarakat
PDA. *See* Personal digital assistant
Pedagogy, 119, 205, 206
Peraturan Daerah Khusus (Perdasus), 55
Perencanaan Bersama Masyarakat (PBM), 59–60
Personal digital assistant (PDA), 10, 203, 205
Pest and Diseases issues, 4, 9, 164
Pest control, 39–40, 51, 169–171, 174, 242, 243, 247, 269–270, 287
Pesticide, 28, 50, 51, 60, 76, 167, 170, 171, 227, 243, 269, 276
Pests, 7, 11, 26, 39–40, 47, 50, 51, 58, 60–61, 94, 124, 131–133, 170–171, 188, 191, 238, 239, 242, 243, 247, 249–254, 258–261, 268–270, 273–279, 286–288
  invasion, 11, 188
  observer, 61
  resistance, 51
Pests and diseases, 4–7, 9–13, 16, 25, 29, 52, 65, 66, 73, 74, 76–80, 87, 94, 100–103, 105, 118, 130–132, 135–137, 158, 164, 165, 169, 174–176, 184, 185, 188, 189, 191, 193, 194, 196, 200, 206–210, 222, 225, 228, 252, 269
  accidentally introduced pests and diseases, 76, 81, 87, 222
  control of, 66, 139–140, 169, 174, 252
  destructive pests and diseases, 66, 70–71, 78–79, 81
  devastating disease, 80
  dissemination of, 76
  distribution of, 4, 76, 135
  eradication of, 76
  existence of, 85
  graft transmissible diseases, 81
  information about, 73, 209
  introduction of, 52, 76
  management of, 7, 76, 118, 132, 207, 228
  mild disease, 80–81
  official pests and diseases, 80, 81
  phytophthora disease, 70
  prevention from entry, 76
  quarantine pests and diseases, 28, 40, 47, 76
  spread of, 10, 12, 158, 244, 245, 250, 252, 276–279
  unofficial pests and diseases, 80, 81
  vector transmitted diseases, 71
PIAPH. *See* Product Integrity, Animal and Plant Health
PIC. *See* Prior informed consent
Plant
  biosecurity, 3–18, 26, 86, 109–124, 133, 136, 163, 183, 200, 205, 210, 223, 252–253, 279
  fish and animal quarantine, 28, 29
  health, 23, 26, 31, 74, 158, 244
  protection, 28, 29, 40, 50, 281
  quarantine, 28, 29, 76, 279
Planting material
  transportation of, 81
Plant pests and diseases, 4, 9–11, 13, 52, 130–132, 135, 136, 140, 164, 187, 193, 206–208
Policy, 23–42, 53–56, 75–79, 184–186, 226–229, 280
  biosecurity, 24, 26–31, 38–41, 46, 51, 53, 75, 87–88, 111, 132–133
  development, 39, 42, 104, 177, 221, 275
  direction, 76, 77
  government, 37, 66, 76, 80, 82, 87, 164, 177, 200
  mainstream, 77
  making, 8, 24, 25, 27–32, 35–38, 41, 47, 53–55, 77, 221, 226
Political compromise, 45
Position of woman in society, 168
Poverty, 9, 13, 49, 52, 56, 59, 136, 167, 171–172, 174, 178, 240, 254
  alleviation, 16, 57, 59–60, 130, 168
Pre-border management, 7, 32
Prior informed consent (PIC), 25
Problem solving, 138, 171, 173, 249, 266

Process, 7–10, 14–15, 25–30, 35, 36, 39, 52–56, 59, 78, 96, 98, 110–115, 120, 124, 131–135, 138, 146, 150–152, 157–160, 170, 175, 189–193, 200–202, 208–211, 216–227, 229–235, 239, 244, 245, 249, 253–257, 261–266, 271–273, 275, 276, 279, 281, 284–289
Product Integrity, Animal and Plant Health (PIAPH), 31
Professional practice, 122
Propagation
  vegetative, 71
Public
  awareness, 77, 94
  health, 13, 171, 277, 284
  participation, 62, 77, 228
  policy, 24–26, 139
  service, 53, 56–57, 268
Puncak Jaya, 46

Q
Qualitative research methodologies, 96, 190, 260, 284
Quarantine, 7, 23, 28–31, 38–40, 47–49, 71, 74, 76, 85, 94, 98–99, 104, 111, 252, 254, 269, 274, 275, 277–280, 282, 283
  inspections, 71, 98–99, 111
  pests and diseases, 28, 38, 76
Quarantine and Biosecurity Policy Unit, 31

R
Raden Ajeng Kartini, 166
Rangers, 35, 54, 111–113, 116–118, 121, 123, 124, 200, 205
Ratification, 30, 34, 243
Reciprocal relations, 103, 105, 228–230
Reciprocity, 67, 80, 86, 95, 98, 103, 105, 205, 209, 228–230, 246, 260, 285–286
Recognition of prior learning (RPL), 121, 208
Regional autonomy, 36, 41, 46, 66, 77, 78, 221, 226, 240. *See also* autonomy
Regional communities, 114, 117, 119, 184, 202
Regional Development Budget, 36
Regional Plant Protection Organizations (RPPO), 27, 283
Regions, 3, 5, 9–11, 13, 17, 18, 24, 25, 27, 30–32, 36, 41, 45–62, 66, 67, 69–73, 75, 77–82, 84–88, 94, 98, 99, 101, 102, 104, 105, 109–124, 130–132, 136–138, 140, 146, 158–160, 163–165, 177, 184–188, 191, 193–197, 200–204, 207, 215, 217–219, 221–224, 226, 228, 233–235, 240, 244, 247, 248, 255, 258, 260, 275, 283, 290
Regulatory system, 25
Rejection, 29, 36
Relationship, 4, 24, 30, 31, 33, 36, 42, 50, 54, 58, 85, 86, 95–97, 99, 100, 103, 109, 111, 112, 114–119, 121, 122, 132, 149, 164–166, 168–169, 174–176, 178, 183, 190, 192, 202, 205, 207, 210, 221–223, 225, 226, 228, 242, 246, 256, 267–269, 271, 273, 285, 286, 288
Relationship building, 119
Religious organization, 172, 246
Remote communities, 111, 116, 118, 200, 205, 206
Rencana Strategis Pembangunan Kampung (RESPEK), 59–60, 62
Residential tourism, 194, 195, 197
RESPEK. *See Rencana Strategis Pembangunan Kampung*
Risk
  amelioration, 6, 7
  return approach, 31
Role of women, 148, 164–166, 168–169, 174
RPL. *See* Recognition of prior learning
RPPO. *See* Regional Plant Protection Organizations
Rural, 59, 110, 118, 119, 138, 163, 164, 166, 167, 169, 174, 190, 192, 218, 240, 248
Rural area, 59, 163, 166, 167, 190, 192

S
Sago, 61, 62, 185
Sanitary and Phytosanitary agreement (SPS agreement), 27–28
Sasi, 35, 54
Scheduling, reporting and accountability, 178
Science knowledge, 5, 140
Scientific knowledge, 4, 33, 85, 111, 117, 139, 153, 229, 231–233, 237, 272
Scientific texts, 152, 154, 155, 160
Scientific translation, 145, 147, 153–154, 157, 159
Sea water intrusion, 52
Second class, 168, 178
Secrecy, 81, 83, 84, 87

Seedling, 9, 49, 71–74, 79–85, 87, 88, 164, 167, 200–201
  business, 80, 82
  distribution, 71, 74, 79, 83, 87, 88
  grafted, 71, 74, 81–83
  importation, 71
  infected, 81
  labeled grafted, 82
  production, 71, 74, 81
Sekolah Lapang Pengendalian Hama Terpadu (SLPHT) (Integrated Pest Control Field School), 164, 170, 171
Self-image, 179
Seram Sea, 45
Shadow of men, 178, 179, 224
Shared identity, 14, 84, 95
Shared pest burden, 188
Sharing, 25, 33–34, 67, 93, 103, 116, 118–121, 123, 132, 134–135, 138, 140, 150, 159, 176, 201–205, 223, 233, 250, 251, 255
  based on mutual exchange, 67
  for free, 67
  resource, 67
Smuggling of Genetic Resources, 28
Social
  activities, 12, 14, 164, 165, 202
  borders, 8, 65, 66, 86, 88, 93–105, 207, 215, 222
  capital, 42, 86, 109, 119, 157, 165, 168, 169, 175, 176, 179, 193, 197, 205, 221, 224, 227, 246, 271, 285
  change, 96, 99–105, 116, 164, 167, 184, 192
  networks, 67–69, 86, 93–96, 98–100, 102–105, 133, 164, 167, 196, 225, 226, 233, 274, 286
  partnerships in learning, 86, 109–124, 223
  processes, 219–220, 229, 230
  science, 12, 93, 95, 131, 133, 134, 136, 139, 155, 216, 237, 248, 268, 276, 279, 286
  structure, 114, 179, 219–220, 285
  system, 10, 135, 140, 183, 285
Social-ecological systems, 135, 285
Social ecology/ecological, 133, 135–136, 140, 229, 231–233, 285
Solutions for effective management of biosecurity
Sorghum, 189, 191, 195, 196
Sorong, 48
Sound science and policy, 31, 225–226
Source language (SL), 145–147, 150–152, 154–160, 224
Source of knowledge, 39, 60, 61, 193
Soybean, 52
Special autonomy, 45, 47, 50, 53–56, 60, 228
Special Regional Regulation (SRR), 55
SPS agreement. *See* Sanitary and Phytosanitary agreement
SRR. *See* Special Regional Regulation
Stakeholders, 11, 16, 18, 30, 31, 35, 39, 41, 50, 54, 109, 111–117, 119, 120, 122–124, 132, 139, 199, 200, 202, 210, 219, 226, 235, 255, 268, 281–282, 287
Strategy (to manage biosecurity effectively), 5, 8, 9, 16–18, 25–26, 30, 42, 47, 51, 53, 58, 62, 81, 105, 111, 112, 114, 115, 121, 131, 132, 135, 140, 155, 163, 169, 177, 178, 183, 186, 191, 215–221, 225–229, 231–235, 250, 274, 287
Structure, 7–10, 14–15, 30–32, 35–38, 40, 42, 54, 56, 57, 59, 78, 96, 97, 111, 113–114, 116–118, 120, 121, 124, 131–133, 138, 139, 150, 165, 167, 172, 175, 179, 183, 189, 190, 193, 199–202, 210, 219–221, 223, 225, 226, 229–231, 233, 238, 247, 249, 256, 268, 272, 274, 281, 285–287
Stuctural barriers, 166
Subsistence farmer, 57
Sugarcane, 52
Surveillance, 29, 32, 94, 111, 183, 189, 205, 239, 278, 288
Sustainable
  farming land protection, 51
  lifestyle, 171
  livelihood, 111, 119, 168, 169, 176, 187
  socialization, 178
Systems, 10, 25, 45, 67, 76, 109, 132, 144, 165, 183, 222
Systems failure, 99

T

Tacit knowledge, 193, 194, 200, 201
Target language (TL), 145–147, 150–160, 224
TCEs. *See* Traditional cultural expressions
Technical Barrier to Trade agreement (TBT agreement), 27
Technical knowledge, 33, 169
Technical translation, 153–156

Technology, 10–12, 18, 24, 51–53, 62, 121, 123, 130, 131, 136–140, 155, 164, 173, 174, 177, 196, 199–211, 244, 245, 252, 255, 263, 270, 272, 284, 285
Ties. *See also* Social, capital
  bonding, 86, 95
  bridging, 86, 95
  linking, 86, 233–234
Timika, 47–49
Timor Island, 35, 54, 134, 177, 183, 185, 186, 191, 200, 206–208
TK. *See* Traditional knowledge
TL. *See* Target language
Torajan, 47–48
Tourism, 6, 93, 94, 97, 100, 104, 117, 131, 164–165, 173, 192, 194, 195, 197, 208
  industry, 173
Traditional
  approach, 23, 39
  country, 4
  cultures, 24, 34, 46
  land owners, 93
  leadership, 61, 67, 171, 233
Traditional cultural expressions (TCEs), 34
Traditional knowledge (TK), 32–35, 55, 62, 115, 117, 133, 140, 196, 229
Trainers, 120–122
Training, 7, 10, 62, 71, 109, 110, 112–114, 116–124, 132, 134, 140, 164, 169–172, 174–176, 178, 194, 205, 208–209
  and education, 170–172, 174
  frameworks, 109–110, 113, 117–124
  and skills recognition framework, 118, 124, 223
Translation, 5, 13, 15–18, 25, 29, 35, 54, 77, 132, 136, 145–160
Transmigration, 49–50, 185
Transmigration area, 50–51, 166, 174, 176–177
Transposition, 147
Treatment, 3, 15, 29, 50, 58, 81, 84, 94
Tristeza, 80, 82, 88, 222
Trust, 11, 60, 62, 83–86, 95, 98–100, 103, 105, 111, 116, 122, 176, 194, 202, 205, 226, 228, 230
Two-way dialogue, 98

U

Ug99, 6
Ulayat right, 55
UN Convention on Biological Diversity (UN-CBD), 8, 25, 27, 34–35, 38, 46, 53
Unilateral decision, 52
United Nations Convention on Biological Diversity (UN-CBD), 8, 25, 27, 34–35, 38, 46, 53
United Nations for Environmental Protection (UNEP), 8, 27

V

Village Development Strategic Plan, 59
Village level, 51, 57, 59, 171, 179
Vocational education and training, 119

W

West Papua, 45, 46
West Timor, 3, 6, 11, 12, 65–88, 134, 177, 183, 200, 206–208
  citrus in, 66
  climate of, 75
  community in, 84
  highlands of, 12, 66–68, 72, 73, 81, 83, 87, 200, 222
  people of
  soil of, 70
WHO. *See* World Health Organization
Willingness to act, 11, 15
WIPO. *See* World Intellectual Property Organization
Woman, Welfare and Empowerment/*Program Kesejahteraan Keluarga* (PKK), 166, 170–175, 179
Women's communication, 168
Women's leadership, 170–173, 179
Women's right and obligation, 167
Word of mouth, 98
Work based learning, 120
Working across knowledge borders, 9–11
Workplaces, 114, 118, 120–124, 168, 174, 202, 208, 210, 211
World Bank (WB), 7, 13, 14, 40, 41, 59, 136, 167, 168, 176, 184
World Health Organization (WHO), 8, 27
World Intellectual Property Organization (WIPO), 32–34
World Organisation for Animal Health (OIE), 26
World Trade Organization (WTO), 25–29

X

Xanthium strumarium, 11