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COMMUNITY MANAGEMENT OF BIOSECURITY

ENGLISH LANGUAGE EDITION

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Editors
Ian Falk
Kaler Surata
Kutut Suwondo

Technical editing, proofreading and translation
Bronwyn Myers, Sri Jayantini, Joanna Karam,
Ruth Wallace

Australian CRC for National Plant Biosecurity

Charles Darwin University

Eastern Indonesia Knowledge Exchange

Universitas Kristen Satya Wacana

Universitas Mahasaraswati

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Technical Team:
Marthen Luther Ndoen
Ferry F. Karwur
Theofransus Litaay
Yoga Aji Handoko
Trifosa Widoningsih
Learning communities develop around a broad range of issues and regions. A research partnership between Indonesia and Australia has developed to investigate the community management processes and structures of plant biosecurity in northern Australia and eastern Indonesian communities. This project developed not only an understanding of the learning communities that operate in local areas but their connections to macro scale decision making bodies. The researchers have developed a powerful community of practice that is working to deepen their understanding of the relationships and management systems that inform community processes. This approach has also been an opportunity to engage local communities in identifying, managing and analysing plant threats and responses to those threats.

Through the project's initial international forum and subsequent development work, the participants developed a series of papers that explore the ideas around community management of biosecurity and the community processes that inform plant and disease management. These papers point to future development of the research and its connection to policy and practice across countries and discipline areas. The Learning Communities: International Journal of Learning in Social Contexts is proud to present these papers in a bilingual co publication with Kritis; Journal of Interdisciplinary Development Studies. We look forward to the development of the work across regional, disciplinary, workplace and community boundaries.
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World population growth has accelerated since the start of the twentieth century. The global population will probably approach 10 billion in 2050 and should by that time have leveled off, according to a study by UNESCO. The question is: will there be enough food for everybody in the future? Meeting the world’s needs between now and the year 2050 would not seem beyond the bounds of possibility, if two challenges are met: the goal of sustainable development and the elimination of poverty.

Over 50 years ago, forty-four countries officially created the United Nations Food and Agriculture Organization (FAO) with the ambitious goal of feeding the planet. However, the finding of the World Food Conference in 1974 was that there were still 800 million undernourished people on the planet, world prices remain high, stocks in the main exporting counties are at their lowest level, and we are alerted to the threat of a world shortage.

According to certain ecologists, natural resources will not be adequate to meet the needs of the world population in 2050. Food security is then to be defined in terms of permanent access by all to the foodstuffs necessary for a healthy and active life. However the world must face the terrible challenge of balancing the growing number of human beings and their needs against the natural resources essential to their development. The choices made in the next 10 years will determine in large measure the future possibilities of inhabiting the planet. The collision between the number of human beings and the resources they need will become increasingly sharp.

One of the key factors likely to impact on world food security is the virtually universal drop in fertility levels in developing countries, which leads some to say that the challenges facing humanity are no longer demographic. They are rather ecological, economic and political in nature. Bearing that in mind then it is necessary to increase the role of higher education in sustaining the food resilience program through the approach of plant biosecurity.

Indonesia is well known for being rich in natural resources, mineral resources as well as human resources. Due to the high population, approaching 240 million people, Indonesia is currently facing a tough challenge of providing adequate and appropriate food for its people. There is another dimension of the above mentioned challenge; that is, Indonesia is so diverse in ethnic groups and cultures. There are more than 300 ethnic groups across the country’s 17,000 islands. One can consider that for each of these ethnic groups there must be a local indigenous practice that is beneficial for promoting a food resilience program, at least within the local region.

It is then the role of higher education institutions to explore the local indigenous practices and knowledge, and develop it to overcome the food security problems. The mission of Indonesian higher education institutions are namely education, research, and community development. Following these missions the institutions should be able to support the
people as well as the government in providing food resilience programs. We use the term, food resilience, 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 higher education institutions should be empowered to accomplish this task, and one of the priority topics is plant biosecurity. The Directorate General of Higher Education will provide adequate research funding to the higher education institutions, on a competitive basis, and one of the priority topics is plant biosecurity. At the same time the institutions could conduct a community development program by educating the people, of both the young and older generation, in how to sustain food resilience programs through plant biosecurity measures.
Plant biosecurity in a shrinking world

One of many consequences of increasing ‘globalisation’ in the early 21st century has been an enhanced appreciation of the need for improved ‘biosecurity’, a term relevant to community health and welfare; to animal health, and to plant health in the production systems which sustain life.

The principles of biosecurity are common and may be applied to all classes of ‘pest’ organism, including bacteria, fungi, viruses, insects and weeds. Good surveillance, to prevent ingress by a pest organism if at all possible; preparedness for an incursion by an unfamiliar organism; a diagnostics capability in order that the identity of the organism may be confirmed rapidly, and the ability to initiate a rapid response in order that the potential spread of the pest be limited.

Biosecurity challenges to agriculture and to the communities which it sustains are felt by all countries and communities, poor and rich. The Unites States is no exception: “As the United States faces biological warfare for the first time and ponders the consequences of growing genetically modified crops, a largely unnoticed biological attack is underway; actually, it has been under way for centuries and shows no signs of slowing. Non-indigenous species – animals, plants, and microorganisms occurring beyond their natural geographic ranges – are flowing into this country at a remarkable rate...From coast to coast, there is hardly a place in the country untouched by invasive non-indigenous species” (National Research Council, 2002).

Whether pests and diseases reach across borders from other countries or whether they come from other parts of one’s own nation the costs are to human life, where the impact of pests and diseases is on food supplies and, consequentially, on health and well-being. The impacts can be striking at a national level in dollar terms, for example, the costs of invasions by plants, animals and microorganisms in the USA has been estimated at $US137 billion per annum (Pimentel et al. 2000).

In times past, breaches of biosecurity were sometimes conscious, sometimes less so. To take one example, introduction of plants as horticultural oddities and/or importation of plants as contaminants in fodder in the nineteenth and twentieth centuries both contributed to the fact that Australia is home to all of the world’s worst weeds (Holm et al.1977), yet none are native to the continent. In the twenty-first century the possibility that future breaches of biosecurity may form part of a deliberate campaign of biological warfare necessitates critical evaluation of the ways in which communities, industries, regions and nations can best defend themselves.

The shrinking world of today has exacerbated biosecurity challenges as against the, temporally, larger world of former times. For the invasive species of the early 1800s, for
example, the timeframe for inter-continental travel was such that viability of many pests and diseases would be severely impaired before a destination was reached. Distance was, in itself, an element of defense.

In the early 2000s any species can be transported to anywhere in the world within one day.

Defending borders in this situation is a mammoth task. In the USA, the Department of Agriculture’s Animal and Plant Health Inspection Service has resources to conduct spot checks of less than 2% of all shipments at airports, seaports and land borders (National Research Council, 2002). Such checks cannot be a reliable barrier to unwanted entrants.

In more complex jurisdictions the challenge is greater still. Plant health regulations in the European Union (EU), for example, cover trade in plants and plant products between Member States and between Member States and other countries (Ebbels, 2003). In May 2004 the number of Member States rose from 15 to 25 and others await entry. The EU must deal with a greatly enlarged geographic spread and with new Member States who may not have enjoyed the robust economic conditions and regulatory environment experienced by the original members. As administration of the EU and its institutions becomes increasingly complex, devising biosecurity protocols which provide for rapid, effective action becomes ever more difficult.

Writing on biosecurity, leading agriculturalist Professor MS Swaminathan has stated “We have no time to relax. Eternal vigilance is the price of a stable, prosperous, and productive agriculture” (Dil, 2005). If developed countries, including the USA and the EU, find the administrative and economic costs of vigilance a burden, for the nations of the Third World, which face major nutritional, health demands and other demands, vigilance to promote biosecurity in a shrinking world is a formidable challenge indeed.

The international community has been responding to the challenge in several ways. For example, the International Plant Protection Convention (IPPC) a multilateral treaty for plant protection, dates from 1951. A revised text for the IPPC came into force on 2 October 2005 (FAO, 2005). Support has grown rapidly in recent years. One hundred and sixty two governments are parties to the Convention, the Federated States of Micronesia being welcomed in July 2007.

International, regional and national arrangements for plant protection are covered by the IPPC with the aim of securing common, effective action to prevent the spread of, and introduction of, pests of plants and plant products which are potentially detrimental to biodiversity and to biosecurity, and to promote their control. The Convention is recognised by the World Trade Organisation (WTO) as the source for international standards applying to phytosanitary measures which influence trade.

In this context, intensified international interest in biosecurity is leading to improved assessment and management of the risk presented by invasive alien species (Baker et al. 2005).

Important as international and national regulations are to promoting the biosecurity cause they are not, in themselves, an adequate response. A more holistic approach is required and New Zealand, a nation of 4.1 million people, provides an excellent model to
demonstrate the benefits of involvement of national and regional government with industry and, significantly, the broader community.

A lead agency, Biosecurity New Zealand, was established in November 2004 (Biosecurity New Zealand, 2005). The need for collaboration and cooperation to develop partnerships based on transparent transactions and excellent communication has, subsequently, been strongly identified. A Biosecurity Ministerial Council, established in January 2005, comprises representatives of all interested sectors and provides advice to the Minister, who ranks third in the New Zealand Cabinet. In addition, a Biosecurity Strategic Unit has been established to develop a performance measurement framework for the biosecurity system, with the objective of allowing participants and stakeholders to assess the effectiveness of the system.

The National Centre for Advanced Bio-Protection Technologies, established in February 2003, encourages leading plant protection scientists to develop management strategies that use biological interactions or attributes to bring about effective control of weeds, pests and diseases. Finally, the New Zealand Biotron, a ‘state-of-the-art’ facility which offers independently controlled environments above and below ground, has been developed to facilitate understanding of the interactions between pest organisms, their hosts and the broader environment (National Centre for Advanced Bio-Protection Technologies, 2005).

Australia, a near neighbour of New Zealand, is also developing a comprehensive biosecurity approach. The National Biosecurity Strategy, sub-titled ‘Biosecurity: a shared responsibility’, (Plant Health Australia, 2005) again highlights the importance of partnerships in dealing with this global problem.

In the front line is the Australian Quarantine and Inspection Service (AQIS), a federal government agency with a budget of $A300 000 000 a year; a staff of 3000 and the tasks of administering border controls; post-entry quarantine and export certifications. AQIS implements and administers border control arrangements which aim to prevent the introduction, establishment and spread of human, animal and plant pests and diseases.

The activities of AQIS are carried out offshore (pre-border), at border and post-border, should an incursion occur. This ‘quarantine continuum’ is actively supported by governments, federal and state, and is promoted to industry and the general community.

While the Australian government is responsible for developing and implementing national policy, states and territories deal with disease control and eradication within their own borders. Soil and plant testing laboratories in different states, for example, now have a legal requirement to manage risk associate with the transport of soil and plant samples (Rayment, 2006).

Several bodies provide the coordination which is essential to an effective biosecurity effort. These include the Office of the Chief Veterinary Officer (1995); the Office of the Chief Plant Protection Officer (1997) and two companies, Animal Health Australia (1996) and Plant Health Australia (2000) which are strongly supported by industry and government agencies. These organisations develop and implement policies and protocols in support of national biosecurity. Their activities are complemented by scientific effort.
Commencing in 2005-06, the Australian government made available $1 684 000 for four years to establish a Centre of Excellence for Risk Analysis. The Centre carries out research to develop risk analysis methods for general use by the Australian Government. In particular, it will enhance Australia’s capacity to assess risks and the science applied to the Import Risk Analysis (IRA) process, itself strongly biosecurity related.

Opened in 1985, the Australian Animal Health Laboratory (AAHL) is a major facility of CSIRO Livestock Industries. The facility provides for safe handling and containment of animal disease and plays a vital role in maintaining Australia’s ability to diagnose exotic and emerging animal diseases.

Australia also has significant biosecurity capability through its Cooperative Research Centre (CRC) model, developed to promote cooperation across common research areas; to share resources and develop critical mass; to overcome institutional barriers; to strengthen the involvement of industry in research and development; to increase the uptake of innovation by end-users, and to effect a change in research culture. Involving universities, federal and state government research agencies, universities and, in many cases, private industry, CRCs have a life of seven years with second or even third terms of support being possible.

Four CRCs currently contribute to biosecurity research, development, education and training.

- Cooperative Research Centre for Australian Weed Management (2001) [www.weeds.crc.org.au](http://www.weeds.crc.org.au) 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.
- Australian Biosecurity Cooperative Research Centre for Emerging Infectious Disease [of animals] (2003) [www.abcrc.org.au](http://www.abcrc.org.au) Enhancing 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 is the focus of this Centre.
- Cooperative Research Centre for National Plant Biosecurity (2005) [www.crcplantbiosecurity.com.au](http://www.crcplantbiosecurity.com.au) 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.

The vision of the Cooperative Research Centre for National Plant Biosecurity (CRCNPB) is “to be a world leader in generation, development and delivery of plant biosecurity science and education”, while the mission is “to foster scientific collaboration and engage stakeholders to deliver plant biosecurity technologies which reduce risk and ensure sustainability of Australia’s plant industries” (Cooperative Research Centre for National Plant Biosecurity, 2005).
The CRCNPB aims to build scientific capability through programs that deal with preparedness and prevention; diagnostics; surveillance; impact management and post-harvest integrity. These reflect the pre-border, at border and post-border approaches to which reference has been made above.

Delivery and adoption of science outputs is of paramount concern to the Centre. A major challenge will be to deliver an effective education, training and communication strategy which will engage policy makers, policy implementers and the community at large.

In the shrinking world it is vital that the international as well as national communities are engaged.

As a contribution to this engagement, in 2007 the CRC for National Plant Biosecurity supported a research project to examine the roles which communities in Indonesia and Australia might play in identifying and managing pests and diseases of plants. As part of this research an International Summit was held in Bali from 24-26 May. The Summit was opened by Satyro Soemantri Brodjonegoro, Director General for Higher Education in Indonesia, who also gave a keynote address in support of the cooperation between Indonesia and Australia to advance biosecurity and pointing to the need for additional joint research endeavours to achieve this objective.

It is in this spirit of cooperation that this combined, bilingual edition of *Krritis* and *Learning Communities* has been prepared. The theme of the work reported in the journal points to the similarities of approach to biosecurity problems in eastern Indonesia and in northern Australia. Collaboration by experts in both countries, employing similar methods to deal with similar biosecurity problems, has already made a positive contribution to the management of pest organisms.

Such cooperation, improving the effectiveness of defence against biosecurity threats, is of particular importance in areas where poverty and related issues of health are problems. This is the case in many Indigenous communities in northern Australia and in most parts of eastern Indonesia where joint research is taking place. In these areas pests and diseases impact directly on people’s food supply and socio-economic well-being. Where poverty is widespread even the smallest change in quality and/or quantity of food supply can affect individuals and communities to a greater extent and in a more immediate way than is the case where food supply is cushioned by greater wealth. Conversely, contributions to improved biosecurity can be seen to deliver greater benefit than may be the case where the impact of biosecurity breaches is less immediate.

The support which has been given by both countries to the International Summit, to this journal and to the on-going program of biosecurity research and development will enhance the strong scientific and community links which exist between two good neighbours, Indonesia and Australia.

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COMMUNITY MANAGEMENT OF BIOSECURITY: OVERVIEW OF SOME INDONESIAN STUDIES

Professor Ian Falk
Charles Darwin University, Australia

Dr Sang Putu Kaler Surata
Universitas Mahasaraswati, Bali, Indonesia

Mr Wayan Mudita
Universitas Nusa Cendana, Kupang, West Timor, Indonesia

Ms Eka Martiningsih
Universitas Mahasaraswati, Bali, Indonesia

Dr Bronwyn Myers
Charles Darwin University, Australia

Abstract

‘Plant Biosecurity’ is a set of measures designed to protect a crop, crops or a sub-group of crops from emergency plant pests at national, regional and individual farm levels (Plant Health Australia, 2005). This research asks what ‘set of measures’ can communities adopt that will assist in the identification and management of the plant pests and diseases that affect their food supplies and livelihoods? How can these measures, or strategies, be described and how can communities engage with the issues and knowledge about plant biosecurity in sustainable ways? Rephrased, the question for this research is: How do communities acquire new knowledge and develop new strategies for identifying and managing the plant pests and diseases that affect their food supplies and livelihoods?

Literature scans and preliminary discussions between Indonesian and Australian institutions and communities about biosecurity established an urgent need to understand its intricacies and applicability, especially in relation to community management of biosecurity. The term ‘biosecurity’ is relatively new in Indonesia. In order to increase knowledge of ways communities can engage and manage plant biosecurity effectively, a mixed methods quantitative and qualitative study was conducted in three diverse sites involving a total of 185 respondents. Quantitative analyses at a coastal village in West Timor (Site C) showed that Biosecurity awareness, knowledge, and actions are related to social capital. Social capital variables involved in the relations are unique for each of these biosecurity aspects. The results of qualitative analyses showed that local (and Indigenous) knowledge is a vital factor in the way communities view biosecurity, and indeed the ways they can engage with new knowledge and practices associated with managing pests and diseases. However, local knowledge is only one part of the story. The actual structure of a community – its organizations and network connections – and the processes the leadership engages across those structures – make a lie of the apparent similarities in community governance structures, such as the Desa (village) and Banjar (sub-administrative body) with their respective Heads. This has potentially dramatic impacts on engagement and management of new knowledge and strategies. The study shows that there is a clear need for additional research into the relationships between the
processes and structures of communities and the ways new knowledge and outside knowledge are acted upon. This is shown to be especially important in relation to how policy on plant biosecurity can be implemented effectively.

Introduction

There is high potential for incursions of Emergency Plant Pests (EPPs) and diseases between Indonesia and Australia because of their proximity. Successful eradication of an incursion depends rapid identification of the initial incursion and rapid subsequent effective eradication procedures. Both identification and eradication, in Indonesia and northern Australia, present opportunities for proactive cooperation between local communities, government agencies and NGOs to develop risk mitigation strategies. An opportunity exists to engage local communities to manage both the source and pathway for plant threats. In response, the Australian Cooperative Research Centre for National Plant Biosecurity (CRC NPB) has commissioned project work to model the role of local communities in the identification and management of such threats.

Preliminary literature reviews and collaborative work between Indonesian and Australian institutions and communities exploring issues, strategies and models of community management of biosecurity indicates that there is an urgent need for research to understand the intricacies and applicability of this concept, and the research of which this paper provides an overview is a start to that process. The term biosecurity is relatively new in Indonesia, implying a virtual non-existence of the concept in current policy documents, educational curricula or research endeavours. A concerted research effort exploring, in an integrated and holistic way, the wide range of aspects involved in managing national and cross-country plant biosecurity, would help to establish the knowledge base and models needed to develop and contribute to suitable policies, strategies, support systems and community-based practices in areas of interest for both Indonesia and Australia. These efforts should benefit Indonesia and Australia equally, both in the short and the long term.

This paper provides a report on the first stage of the research funded by the Cooperative Research Centre for National Plant Biosecurity (CRC NPB) based in Australia. It was conducted over 2006-7 and involved three diverse sites, two in Bali, one in West Timor outside the city of Kupang. The researchers employed a mixed methodology and a representative subset of the data is presented in this overview.

Literature review

The central question being addressed is: How do communities acquire new knowledge and develop new strategies for identifying and managing the plant pests and diseases that affect their food supplies and livelihoods? The focus is on ‘community’, the ‘acquisition of new knowledge’, ‘developing new strategies’, ‘identification’ and ‘management’. While it is important to bear in mind that the object of these foci is in the cause of enhanced biosecurity outcomes, the science of biosecurity is not the main concern here. Rather, the concern is with how communities identify new and often scientific knowledge that is relevant to their situations, the role of leadership in that process and how they...
manage the change processes necessary for them to deal with problems as they arise. It is therefore an applied and very practical topic, but one that, as it turns out, is subject to being caught in the crossfire of relevant disciplinary bases, and this matter is reflected in the literature review that follows here. More detail is given in other papers, including the literature analysis authored by Bronwyn Myers, in this volume.

Emergency plant pests (EPPs) are defined as known exotic plant pests with potential to have adverse economic impacts (http://www.crcplantbiosecurity.com.au). The focus is on biosecurity as found in farming systems, both for income generation and subsistence, with direct economic impacts on livelihoods. However, the unit of analysis is the ‘community’, with resultant involvement of economics, community development and regional development, the latter especially relevant for the diverse geographic, socio-cultural regions where biosecurity is likely to be an issue. The policy environment is therefore complex but vital and highly implicated in this research. Key stakeholders clearly also include farmers (broad acre and subsistence), scientists, nature conservation managers, urban dwellers (gardeners, travelers) and policy makers. Many if not all of these stakeholder groups are also members of their own communities, and the term community can be applied to various groupings.

Community

Broadly, ‘Community’ refers to a group of people who share a common identity or a special interest (Kenny, 1994; Langone & Rohs, 1995). ‘Community participation’ can be defined as 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 (Shiffman, 2002; Zakus & Lysack, 1998). It is sometimes assumed that a community is any single network of people who carry out activities around a common purpose, such as an internet interest group. However, this is insufficient when we look at the communities of place which are our unit of analysis in this research. We therefore define communities as being located in a particular shared place, and consisting of networks of networks. In other words, a community of place is more complex than a single network, it has members with multiple identities, roles and aspirations, who belong to a number of networks within their own community and others.

Community capacity, resources and capitals

Sustainable development at the community level utilizes the capacity that already lies in a community. It is dependent on the community identifying and investing in six forms of resources, or capitals: natural, cultural, human, social, built and financial (Flora, 2004, Garnett et al 2007). Flora (e.g., 2004) provides a useful framework for understanding these various components of a community that might be drawn on in the way a community might engage with and act on information about plant pests and diseases.
Natural capital includes environmental health (e.g. soil conservation) and landscape diversity, and promotes sustainable land productivity. Cultural capital is a human construction that includes perceptions and knowledge systems, and affects the definition of problems. Human capital is driven by demographic trends, and the skills and capacity of the population. Natural, cultural and human capitals make up the “base” of the community in terms of resolving environmental issues (Flora, 2004). For a community to develop in a sustainable way these forms of capital are transformed into high levels of social, built and financial capital (Flora, 2004).

The transformation of these six forms of capital into sustainable and productive outcomes occurs through community cooperation. Plant pests and diseases have direct impacts on natural capital, often causing reduced crop yield, reduced biodiversity and adversely altering fire regimes. In addition, management practices can have good or bad effects on the sustainability of the economic life of the community and its members, and of course on the environment. The processes, dynamics and organizational structures of a community are therefore central to understanding how new information and knowledge is received, understood and acted on by members of any community. ‘Community development’ is a term used to embrace the multitude of ways in which community resources can be put towards achieving collectively beneficial outcomes. That form of community capital referred to above as ‘social capital’ underpins effective community development, along with its networks and interactive processes, now summarised.

Resources are made available for use in achieving a community’s socio-economic outcomes through the interactive processes involved in the production of social capital. Far from being just one of the capitals available for use in a community, the process of social capital formation is in fact the mill that grinds the social and economic order into place each and every moment of each and every day (Falk & Harrison, 1998; Falk & Kilpatrick, 2000). Each time and place (site) of interactivity has its own purpose and because the achievement of different purposes requires different inputs, the features of the interactive ‘ties’ will differ. That is, different resources in different configurations are required at different times and different places to achieve particular purposes.
Local and traditional knowledge and management practices

Christie (this volume) points to the importance of traditional knowledge in effective and sustainable management of pests and diseases. “In Aboriginal philosophy, language, place and identity are always strongly linked” (p. 49 this volume). Identity is a crucial aspect of people’s knowledge of the world and the natural environment around them. “Knowledge comes from place and relates people to place in their everyday lives” (ibid, p. 50). Karetji (this volume) calls this a ‘bounded rationality’. This knowledge, at least in the context of Australian Indigenous people who are the subject of Christie’s work, is distinctive in a number of ways: “Traditional laws and acceptable practices that govern knowledge use are local and need to be understood and negotiated at the local level” (p. 50). As has been noted earlier, there have been occasions in history, such as the Green Revolution, where sound indigenous knowledge practices were over-ridden in the interests of ‘superior’ outside Western science and economics. Sometimes this proved to be beneficial, but at other times it proved disastrous. Lansing (2006) documents the Balinese example where indigenous knowledge practices in water management systems of the rice paddies were replaced by western science, economics and technology. The heavy use of fertilizers and pesticides, coupled with changes to the irrigation system resulted in widespread environmental damage as well as crop failure, large scale pest plagues and resulting food shortages and severe poverty. In the face of this failure, the indigenous knowledge practices were surreptitiously reestablished and the situation soon improved.

Myers (this volume) provides additional information. She cites Wellhausen (1970) who estimates that 40% of agricultural land is cultivated by farmers using “traditional” techniques. Most of these farmers have failed to benefit from technological advances in farming practice because of lack of knowledge of, or access to, these technologies, resistance to adoption, or because of negative social consequences of their adoption (Trutmann et al. 1996). Farmers’ perceptions of plant disease generally differ markedly from those of scientists, evidence of different knowledge practices or cultural capital. For example, the poor adoption of Integrated Pest Management (IPM) by rice farmers in south Tamil Nadu, India, is partly attributable to the social values that include acceptance of crop pests and diseases as inevitable (Muthuraman & Mangal Sain 2004).

Christie (this volume) takes the discussion a step further by pointing to a significant role for indigenous knowledge in biosecurity processes. He argues that,

[t]he way ahead begins with a more formal recognition of the value of having Aboriginal people on their country, looking after it and keeping it healthy. The potential cost of a biosecurity disaster should motivate governments to provide financial and infrastructure support to people on country, especially in high risk areas. (Christie, this volume, p. 53).

While making a point about the value of indigenous knowledge, this quotation is important for approaches to management, a discussion about which now follows.

Management approaches

In Australia, to take one example, there is a growing recognition of the role of indigenous knowledge as a tool for managing biosecurity issues, as evidenced by Christie’s (this volume quote which concluded the previous section. Looking back a few years allows a broader view of successful approaches to pest and disease management. These can only be mentioned here but are dealt with more fully in Myers (this volume). By and large,
successful approaches are not those that are mandated, but based on engagement and participation between the farmer, policy and scientist stakeholders. However, it is reasonable to assume that a mix of mandated and voluntary approaches may also work, as often policy precedes action. Integrated Pest Control (IPC), according to the United Nations Food and Agricultural Organization (FAO) definition (FAO, 1968), implies that economic thresholds are established to determine the need for control measures, and natural mortality factors are recognized and enhanced (Brader, 1979).

Integrated Pest Management (IPM) more accurately describes most responses to pests and diseases in an agricultural setting, as management rather than control is a more realistic aim. 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 1960’s. IPM was a breakthrough in national policy because of its referral to natural processes (including conserving natural enemies) and because it aimed to educate and empower farmers (Winarto, 1995). Farmer Field Schools (FFS) have been successful in empowering farmers to develop biocontrol practices since the early 1980’s (Williamson 1998, Nelson et al, 2001). Following from FFS, the Community Integrated Pest Management (CIPM) Programme in Asia has the aim of ‘making farmers experts’ and decision makers (Winarto, 2004). FFS and CIPM programs have resulted in a gradual change in farming practices in several countries in Southeast Asia, with increases in farmers’ technical understandings and enhancement of their creativity, dignity and self-confidence (Winarto, 2004).

It is emerging that, for any management strategy to be effective, it must be both collaboratively executed and have a strong knowledge base supported by appropriate legislation. The knowledge, as we have seen already, should take account of the local, traditional or indigenous knowledge that prevails in a community concerning biosecurity. This is not to deny the large amounts of knowledge available through science. The trick, if we may call it that, is in finding the best solution to the local pest and disease identification for that community. Of necessity, this must involve a process that allows a valuing of both the local and the ‘outsider’ knowledge.

Once again, Christie’s work (this volume) provides us with the link: The second step the government agencies must take after deciding to invest in the engagement of Indigenous knowledge work in biosecurity, is to begin negotiations in each place to find the best most sustainable but most flexible structures for collaboration, which engage and support the traditional governance structures which are still in place, while at the same time fulfilling the information needs of the government... (Christie, this volume, p. 53)

Of course, this process of engagement means that the first stop must be to consult the community leadership so as to work with them in understanding how the local governance structures might be brought to bear on the problem at hand.

**Leadership and governance**

Instrumental in any transformation or change are various kinds of leadership, and five kinds can be discerned in the literature. **Trait theories** distinguish between the characteristics of leaders from non-leaders. The focus of this group of theories is on the leader rather than the organisation or contextual influences at the site of the leaders’ activities or the leadership intervention (Gardner, 1988). **Leadership as behaviours**
highlights the functions, tasks or behaviours of the leader and assumes that if these functions are carried out competently, and members behaved rationally, the organisation will prosper (Fairholm, 1998; Leithwood & Duke, 1999; Sergiovanni, 1996). The notion of leadership style runs through this. The four best known so-called leader styles are directive/autocratic, participative-democratic, abdicative/laissez-faire and supportive/human relations (Schermerhorn, 1996, p. 325).

The third set of literature on leadership is Contingent leadership which focuses on leader behaviour and situational attributes concerning how leaders respond to the unique circumstances or problems they face (Bolman & Deal, 1991). Here, there is a greater allowance for the significance of context, but the relationship is still one of a single leader and their context. The fourth group of leadership theories is a catch-all for some established strands of theory and research. There is transactional leadership (Bass, 1985) that sees leaders as helping their followers to achieve outcomes through adjusting tasks, rewards and structures. Charismatic leaders (e.g., Conger 1991) are those who inspire followers by engaging in special leader–follower relationships. Transformational leadership (e.g., Gardner 1988) is leadership which inspires people to do more in reaching performance goals and includes features outlined by Schermerhorn (1996, p. 332) as vision, charisma, symbolism, empowerment, intellectual stimulation and integrity.

Fifth and finally, there is Enabling leadership. Enabling leadership (Falk, 2003; Falk & Mulford, 2001) has emerged as a contemporary leadership theory and construct. Enabling leadership puts the focus on the leadership processes themselves as implicated in a specific event related to strategic change. Leadership here is seen not to be the exclusive domain of one person but is rather constructed as a jointly owned, or collective, approach to managing a specific set of events identified by a common purpose. Its unit of analysis is therefore on the specific leadership event, or intervention sharing a common purpose, and its associated shared envisioning activities rather than on any single individual’s vision. The notion of enabling leadership provides the most appropriate basis for the research reported here, which concerns interventions in community life with people who then become engaged in those interventions. It is the most appropriate because leadership is seen as a collective set of attributes dependent upon the purposes and outcomes of the intervention in hand.

Governance and leadership are closely interlinked in communities, as it is often those who are regarded as leaders in a community who control the local government, semi-government and private organisations and other clubs and associations which together make up the ‘governance structure’. For example, political reforms in Indonesia since 1998 establishing ‘regional autonomy’ as a policy force have increased the autonomy of local-level institutions and representative councils have been elected in all Indonesian villages so that the village head is no longer the sole authority in the community (Antlov 2003). An examination of the World Bank-supported Urban Poverty Project (Fritzen 2005) found that the more democratic procedures for selecting local leaders to manage project funds resulted in slightly lower domination by local elite, but more importantly, to a greater degree of commitment to serving the poor and greater participation by the poor in the project. Beard and Dasgupta (2006) examined participation in a poverty alleviation project in Indonesia and described two distinct forms of collective action: the first based on community cohesion, stable social relationships and adherence to social hierarchy and the second based on a shared desire for social change. Both forms were important for
positive project impacts for beneficiaries but only the second had potential for social transformation.

From the overview of some of the relevant literature above, we now move to summarise the methodology for the research.

Methods

As established in Falk and Guenther (2007), a ‘mixed methods’ approach serves many functions in research. First, it ‘fill in the gaps’ of one method or the other, but has far greater benefits. Methods can be combined in a variety of ways: a) through the ‘quantitization’ (Tashakkori & Teddlie, 1998) of qualitative data (for example collating and counting recurrent themes in the qualitative data) in order to add ‘legitimacy to the researchers’ conclusions’ (Onwuegbuzie & Teddlie, 2003, p. 356); b) by accessing complementary quantitative data from within the same sample (for example through use of quantitative survey instruments complementing interview data) in what could be described as a ‘concurrent triangulation strategy’ (Creswell, 2003) and may incorporate ‘multilevel mixed sampling’ (Kemper et al. 2003, p. 287) and c) by drawing on data that comes from outside the purposive sample frame (for example using national or large sample surveys on related topics) to compare the ‘accessible population’ with a ‘target population’ possibly for the purpose of ‘identifying the population to which a finding can and cannot be made’ (Johnson & Christensen 2004, p. 244-245). This approach uses what is sometimes referred to as ‘sequential mixed methods sampling’ (Teddlie & Yu, 2007). The literature describes several other ways of looking at different mixed methods approaches (e.g. Tashakkori & Teddlie, 1998; Miller, 2003; Tashakkori & Creswell, 2007), all of which allow researchers to on the one hand make deductions from empirical data (most often the quantitative data) while at the same time testing these deductions with the inferences that emerge (most often from the qualitative data)—and vice versa—to both test hypothesis and build theory (Erzberger & Kelle, 2003). This combination effectively validates the findings of both data sources, a strategy which was employed in the research reported here.

Three sites were identified according to a set of criteria related to diversity of economy, location and relevance to biosecurity issues. For example a site was chosen in the heart of the tourist zone of Bali, partially to capture information about the passage and knowledge of tourists (2.5 hours flying time to Darwin, Australia) and partially because of the response to these issues by the local community. Another site was identified from a remote, rural region of Bali whose core activities revolved around agriculture and the ways agricultural produce found its way to markets locally and nationally. The third site was in the savannah region of eastern Indonesia outside Kupang, West Timor. It was selected because of similarity to environments of northern Australia, close proximity to Australia with links by air and shipping and so high potential for transmission of environmental pests. It also represents diversity in farming and cropping activities and subsequent market access responses.

Data was gathered from 185 interviews (Site A: 85, Site B: 47, Site C: 53) using many of the mixed methods noted above, including formal interviews, informal open-ended interviews, closed questionnaires and observation. These were tailored for the different audiences of community leaders, farmers, tourists, policy personnel and women. Interview data were transcribed first in Balinese and Indonesian (according to the
language of the original interview). The resulting quantifiable data were analysed in a variety of different ways, including the use of standard statistical packages and techniques. The qualitative components from interviews conducted face-to-face as well as from the open-ended sections of questionnaires were analysed using thematic analyses (e.g., Boyatzis, 1998; Silverman, 2001) with guidance from Onwuegbuzie and Teddlie’s (2003) idea of a “intrarespondent thematic matrix to determine the relationship among the meta-themes (p. 359)”.

Frameworks such as Flora’s (Flora, this volume and as cited above) ‘capitals’ framework were applied to selected passages of conversation to elicit deeper levels of possible meanings, and certain linguistic techniques related to the kind of conversation analysis based on ethnomethodology (e.g., Boden, 1994) were used in the same exploratory and confirmatory fashion. Finally, it is noted that the data were analysed on a site-by-site basis, then the data was subjected to a cross-site analysis as well (often called a cross-cutting analysis), and this is the structure in which they will be reported in the next section of this paper.

**About the sites**

**Balinese communities**

The governance and leadership of Balinese communities is based around the ‘Banjar’, which is the smallest unit of local government management. A Banjar is also an open area building used for meetings, performances and storage of costumes and musical instruments – remembering arts and music and their performances play a central role at all levels of Balinese society and culture. The leaders are called Heads of Village (Kepala Desa) and Heads of Traditional Customs and Law (or as named below, ‘community’) (Kepala Adat) respectively. The structures of the two communities in question can be pictured as follows:
Figure 2: Comparing governance structures of Site A and Site B

Site A: Tourist strip in Bali
This community is among the top three beach destinations for tourists in Bali. Figures here are taken from the Indonesian central bureau of statistics referred to as BPS here. Site A has an area of 305 hectares varying between two and 10 metres above sea level. The more-or-less permanent population is 3331 of which more than half (57.4%) work in the retail sector, selling goods such as wood carvings, clothing, artwork, place mats and decorations of various kinds to tourists (BPS, Badung, 2006). The tourist population itself has fluctuated in the last few years since the bombings at Kuta and Jimboran. BPS (2005-6) notes that the total tourist numbers for Bali in 2005 were 1,388,984 and in 2006 1,262,537, but figures for this site are not available.

In Site A, two distinct clusters of respondents were interviewed: the people from the community itself – community leaders, women, youth and others,

*The community*
Interviews were conducted with two community leaders, two government leaders, two from the youth leadership group, two from the women’s leadership group, 33 community members and five outsiders.

*The tourists*
Thirty nine (39) tourists were interviewed. As noted in the Methods section of this paper, the interview schedule for the tourists was tailored for this group and differed in several respects from the schedules for the communities. The tourists were drawn from a wide
range of nationalities and age range as follows:

- Europe four, Japan one, Malaysia three, Australia 12, Thailand four, USA two, Taiwan one, Russia two.
- Ages were as follows: 17-25 yrs 17, 26-35 yrs 6, 35 yrs and over 16. The results of the interviews are reported in the results and findings section of this paper.

**Site B: Remote, rural and agricultural: Bali**

Site B is, for Bali, a remote and rural area with a strong agricultural base. It is located close to the central mountains about two hours drive from the Provincial capital of Denpasar and has an area of 1,200 hectares. The population is 7,829 of which approximately two thirds (64.9%) who work in the agricultural sector (BPS, Bangli, 2006). Here, agriculture is a majority wetlands rice, but with a good representation of other mixed crops such as coffee, cocoa, corn and livestock such as chickens and cattle.

Interviews were conducted here with two community leaders, one government leaders, three from the youth leadership group, three from the women’s leadership group and 38 community members.

**Site C: West Timor: Kupang**

The research conducted at this site is also reported more fully elsewhere in this volume. The following is a summary of that report.

Site C is a coastal village about 16 km to the East from the town of Kupang along the main road of Kupang-Atambua-Dili. Kupang is the largest city in West Timor and the capital of East Nusa Tenggara Province. To the North of the village is Kupang Bay, to the East is Tanah Merah Village, to the South is Oelmasi Village, and to the West is Mata Air Village. Site C is easily accessible from Kupang by means of rural transportation service or between towns using provincial buses. The inter-town bus terminal, where buses from district capital throughout West Timor are pooled, is located in the village.

For the purpose of this study, three villages were initially proposed as candidate sites, one West Kupang District, one in the Central Kupang District, and one in Sulamu District. Kupang is the largest city in Timor island and the capital of East Nusa Tenggara Province. A visit to each village was arranged in early April 2007 to meet village leaders and to carry out rapid appraisals on village structure, cropping systems, and potential pests and diseases threatening crops cultivated in each village. Based on the diversity of ethnic and social structure, cropping systems and the diversity of pests and diseases, Site C village was selected as the study site. A more detailed study was then carried out during April-May, 2007. The results of this study, in the form of preliminary findings, were discussed in an International Summit on Plant Biosecurity in Sanur, Bali, in late May 2007.

The selected site is in the Oesao-Pariti Plain, the second most important coastal plain for rice production in West Timor after the Besikama Plain in the Southern coast of Belu District. Being located in a coastal plain, the area of the village of 94.79 km² is mostly flat. Going south toward the inland, the topography becomes undulating and hilly. The village receives moderate 1,481 mm annual rainfalls and 120 annual rain days. Water for rice field irrigation is provided by the Dendeng Dam and since 2003 from a much larger Tilong Dam located in Oelmasi Village. Rice field is the most dominant land use in the village (44.6 km²), followed by dryland mixed perennial and annual crops (25.0 km²),
and dryland annual crops (24.8 km²). The remaining area consists of settlement, shrub
lands, and mangrove forest along the coast.

The village (Site C) was established around 1816-1820 when the Dutch Colonial
Government set up Rotinese settlements to protect Kupang from attack by the Meto
people. The population of the village in 2006 was 6,389 persons within 1,321 households.
Considering the village area of 94.79 km², the geographical population density was 361
persons/km² or 75 households/km². No data are available on ethnic composition of the
population but, according to the Village Head, the major ethnic group is the Meto,
followed by the Rotinese, then the Savunese. There are also minor ethnic groups, among
which the most prominent are the ex-refugees from East Timor, the Florinese, and the
Javanese.

The research in Site C employed both primary and secondary data. For the purpose of
primary data collection, two visits occurred in March and April 2007, one to introduce
the study team members to and have discussion with village leaders concerning the
methodology and schedule for primary data collection. Based on this discussion, a survey
protocol was developed. The primary data included surveys of a stratified random sample
and interviews of a purposefully selected group of respondents. Secondary data included
village documents which were obtained from the Village Office and sub-district, and
district statistics which were obtained from Kupang District Office of the Central Agency
of Statistics.

Pest and disease identification was mainly based on symptoms of damage and signs of
pest organisms and pathogens found on a particular crop. Laboratory assessment was
carried out only when direct field identification was doubtful. When a laboratory
assessment was required, voucher specimens were assessed in the Laboratory of Crop
Pests and the Laboratory of Crop Diseases in the Faculty of Agriculture, Nusa Cendana
University, Kupang.

Interviews were carried out with the aid of questionnaires. Separate questionnaires were
designed for each category of respondents (i.e. farmers, non-farmers, village leaders, and
village institution leaders). The questionnaire was designed according to an integrated
questionnaire structure for measuring social capital as used by Grootaert et al. (2004). It
is assumed that awareness of community members about biosecurity issues, like other
social issues, depends on knowledge and mutual understanding and collective action
among community members (Schuller et al. 2004).

Based on the work of Grootaert et al. (2004) and Schuller et al (2004) above, three social
capital variables were selected for measurement: Awareness, Knowledge and Actions.
These are explained more fully in the paper by Mudita (this volume). Data resulting from
interviews were coded and along with the secondary data were then tabulated with help
of spreadsheet software. Data analyses were carried out by means of cross tabulation and
descriptive analysis. A more detailed inferential statistical analysis for the primary data
resulting from farmer interviews was also performed to find out any relationship that
might exist between various social capital variables of Awareness, Knowledge and
Actions and characteristics of the community with awareness of, knowledge on, and
action taken upon plant biosecurity issues. The results of such analysis is summarized in
the results section of this paper along with the regression equations for each variable, but
reported more fully in Mudita’s paper in this edition of the journal.
From the above overview of the methodology, data, techniques and sites the paper now moves to a report of the results of the analyses, first by site and second by cross-cutting analyses. The section ends with a synthesis of these findings.

**Results and discussion**

*Introduction and overview*

The results from all three sites show the levels of knowledge and awareness of identification and management of plant pests and diseases at three sites. The analyses disclose the underpinnings of how communities acquire and assimilate new knowledge and the strategies used. All of these analyses are aimed at furthering understanding of how strategies can be deliberately developed collaboratively with communities to assist with identification and management of plant pests and diseases, and so positively impact on their food supplies and wider socio-economy.

**Bali**

**Site A: Tourist strip, Bali**

*The community*

It was found that the majority of the community members are not yet aware that pests and diseases are able to spread through various means such as wind, water, food and via human agency. In addition, community members by and large do not know that pests and diseases can come from outside their region and, conversely, that they can also disseminate to other regions. One respondent said that he has never heard anyone become sick after eating imported fruits, while another reported never having seen insects or caterpillars inside imported fruits. Several respondents assured the interviewee that fruit imports have been given preservative before sent. Another respondent expressed the belief that pests and diseases in imported fruits are ‘insulated’ before sent to other countries. However yet another respondent noted the possibility of pests and diseases coming from outside as well as disseminating regionally from where they were grown. According him, grasshoppers are readily dispersed within the region because they are present in estafette and so not easily observed.

A second result concerned leadership. The real leadership in communities comes from the Bendesa Adat and Kelian Adat community leadership, because they were chosen by the community, and they operate on bottom up approach. There is BAMUS which has a role for bridging between government leadership and community leadership so there is a balance between top down and bottom up approaches. Its existence ensures that the majority of local community members are involved in many collective activities such as cleaning the river and the environment, and participating in various traditional customs. Both the youth organization at village level (namely Karang Taruna) and Banjar level (namely Sekaa Teruna) are organizations that are seen to exert a strong influence on the community because they conduct regular meetings and carry out activities at regular times.

The various opportunities to find work in Site A result in many people from outside the community coming to live there. This generates a measure of social crises in the areas of housing, health, theft, deception and other criminal activities. One of the negative impacts
from rapid and sometimes unorganised settlement has been the spreading of dengue fever. In the year 2007 this Site A and two other villages in Subdistrict Kuta were specified as the area with the highest dengue fever infection level in Bali. The migration flow has, however, generated an interest on the part of the local community to take more interest in caring for their places, especially because they feel ‘outsiders’ are increasingly competing with them for employment opportunities. This matter has seen a push from the local community to make various regulations to limit the participation of ‘outsiders’ in policy and decision making. This is evident in the data through the tendency of local community members not to involve outsiders in social structures and processes.

Finally, mostly local community members are involved actively in many collective activities such as cleaning the river and the environment, and participating in various traditional customs. Both youth organization at village level (namely Karang Taruna) and banjar level (name Sekaa Teruna) are organizations that are seen to exert a strong influence on the community because they conduct regular meetings and carry out activities at regular times.

The tourists
The tourist interviews were analysed and the results are reported, against the respective interview questions 1-7, in the table below. The questions are listed first to assist the reader:

1. Are you interested in the issue of pest and diseases that can be brought through travel across countries?
2. Do you realize that one who travels from one place to another place is at risk to spread out diseases?
3. Are you quite familiar with the term Emergency Plant Pest (EPP) incursion?
4. What kind of souvenirs that you like best to bring to your country after holiday in Bali? Exotic plants, or pets (animals) or artificial souvenirs you can buy in art shop?
5. Have you experienced a serious diseases infected yourself or one of your family members?
6. Do you bring any products such as food, electronic, medicine, or other from your country?
7. Do you think that awareness to the quality of food that we eat is important? Whether the foods are safe enough to be consumed?
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<th>Age Range</th>
<th>Nationality &amp; No.</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
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<tr>
<td>Japanese 2</td>
<td>Interested</td>
<td>Ye</td>
<td>Yes. Internet.</td>
<td>mall statue, knitted material, clothes, made from wood, rock.</td>
<td>No.</td>
<td>Medicine</td>
<td>Yes.</td>
<td></td>
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<tr>
<td>Thailand 1</td>
<td>Interested</td>
<td>Ye</td>
<td>Yes. Internet.</td>
<td>Art works: small statue, knitted material, clothes, made from wood, rock.</td>
<td>No.</td>
<td>Sauce.</td>
<td>Yes.</td>
<td></td>
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*Table 1: Tourist interviews: Summary of responses to questions*
Most respondents expressed an interest in biosecurity issues. All report an awareness that people can carry host materials with them as they travel. Approximately half report an awareness of the term ‘Emergency Plant Pest (EPP)’ and as having that awareness from the internet. As can be seen from answers to the remaining questions, a wide variety of the materials from which the souvenirs are made of plant materials such as wood (including bamboo and rattan which often contain borers), knitted fabrics and grasses (handbags and string). High on the list of things they bring into the country and which therefore have the potential to import risks are plant products in the form of food stuffs such as snacks, instant (and often fresh) food. Given that there are no restrictions on the carriage of plant materials within Indonesia itself, the issue of domestic tourism is an important possibility to explore further in terms of transmission of pests and diseases around different regions.

Site B: Remote, rural and agricultural: Bali

Analyses of the interviews from the rural and agricultural site produced these results: As is the case for Site A, the majority of community members in Site B are not yet aware that pests and diseases are able to be spread by various means such as wind, water, food and human. Most of them do not know that pests and diseases can come from outside their region and, conversely, can also disseminate to other regions. But here we asked farmers several special questions. Interestingly, most respondents related that they solved this problem by conducting ritual ceremonies in many temples, with prayers for God to help bring back a balance to the proportion of pests and diseases. Meanwhile a few of them try to control pests and diseases in different ways: by using chemicals; by drying out rice fields; spreading salt or kitchen ash and destroying dead crops. While they expressed the belief that these ways were enough, and effective in controlling pests and crop diseases of paddies, unfortunately, they have not as yet succeeded in controlling the pests and diseases of dryland crops: banana and cacao trees have been attacked by pests and diseases which are not yet controllable. The disease of bananas cause the symptom which is known as ‘mati daha’ because the banana palm wilts and dies before bearing fruit, while in cacao it causes the fruit ossify and its seed to be destroyed.

The government leadership in site B is shown to be somewhat weaker because most policy and decision making that is done is not obeyed by community members, for example in providing rice and cattle for community members. On the other hand, community leadership in site B is very strong, because these members were chosen by the community and work based on a bottom up approach. The Village Advisor Institution (Badan Penasehat Desa or BPD) that is expected to be the link between governmental leadership and community leadership does not function. As a result there is no institution to act as a bridge between both forms of leadership (governmental and community).

The accumulated effect of the above results in low community participation in activities led by government leadership. On the other hand, community participation is high if the agenda comes from the community leadership organisation. The Head of the Village (Kepala Desa) is also seeking to become a member of a political party, resulting in an assessment by community members that policy generated by him was more oriented towards private and party-political interests rather than for public interest. There is no
youth organization at the village level, and the youth organization at Banjar level is relatively weak: meetings are scarce, as is any other form of collective activity.

Site C: West Timor: Kupang
The research conducted at this site is reported more fully elsewhere in this volume. The following is a summary of the results and findings.

Leadership
Regarding leadership, it was found that the leadership in the village consists of formal and informal leadership. The formal leadership consists of two bodies, namely the executive body and the legislative body. The executive body is headed by the Village Head who is elected directly by the village community members on a five-year term. The Village Head is assisted by the Village Office Secretariat headed by the Village Secretary and consisting of division of Government Affairs, Development Affairs, and General Affairs. Under the village office, there are sub-village officers and neighbourhood officers dealing with the day-to-day affairs of the community members. The legislative body, called the Village Council, is headed by the Council Head. Members of the Village Council are also elected on a five-year term from among village non-formal leaders, i.e. among traditional, religious, community leaders, women leaders and youth leaders among others. Both formal and non-formal leaderships are intertwined when it comes to the consultation that has to be carried out in decision making.

Figure 3: Site C Village leadership structure

Biosecurity and social capital
As explained in the section at the section about of Site C methodology, biosecurity awareness, knowledge, and actions in Site C Village are related to social capital. Social capital variables involved in the relations are unique for each of these biosecurity aspects. The following are the summary statements and regression equations for each variable, and the reader is reminded that the detail around these is explained in greater depth in Mudita (this volume):

1. **Awareness** of the presence of crop pests and diseases was greater if community members had:
(a) More collective actions,
(b) Greater communication engaged in by members of the community and
(c) More information sources were accessed by them.

Regression equation for Awareness: 
\[
\text{AWARE} = 0.37520 + 0.04506 \times \text{ACTS} + 0.06027 \times \text{COMS} + 0.03946 \times \text{SINFO},
\]
\[r^2 = 0.97\] and \[C(p) = 6.67\], where AWARE= index of awareness to the presence of crop pests and diseases, ACTS= number of collective actions and cooperation involving members of the community, COMS=number of communications made by members of the community, and SINFO=number of information sources accessed by members of the community.

2. **Knowledge** regarding crop pests and diseases was greater with:
(a) Greater number of groups joined by a person in the community,
(b) More collective actions and cooperation involving members of the community,
(c) More institutions contacted to obtain particular information and
(d) Less time required to arrive at the sources of required information.

Regression equations for Knowledge: 
\[
\text{KNOW} = 0.25517 + 0.02843 \times \text{GRPS} + 0.05790 \times \text{NETS} + 0.04377 \times \text{ACTS} - 0.01118 \times \text{TINFO},
\]
\[r^2 = 0.97\] and \[C(p) = 1.86\], where KNOW= index of knowledge regarding crop pests and diseases, GRPS=number of groups joined by a person in the community, NETS=number of institutions contacted to obtain a particular information, ACTS=number of collective actions and cooperation involving members of the community, and TINFO=time required to arrive at the sources of required information.

3. **Actions** taken to manage crop pests and diseases were greater when:
(a) More groups were joined by a person in the community,
(b) More communications were made by members of the community and
(c) Less time was required to arrive at the sources of required information.

Regression equation for Actions: 
\[
\text{ACTION} = 0.38007 + 0.05547 \times \text{GRPS} + 0.05210 \times \text{COMS} - 0.0412 \times \text{TINFO} + 0.12043 \times \text{FINFO},
\]
\[r^2 = 0.92\] and \[C(p) = 1.66\], where ACTION= index of actions taken to manage crop pests and diseases, GRPS= number of groups joined by a person in the community, COMS=number of communications made by members of the community, and TINFO= time required to arrive at the sources of required information.

Other results from Site C
(1) Extension officers and other farmers in the farmer group are important sources of information regarding plant biosecurity for people in Site C village. The most important process of learning involved in the transfer of knowledge regarding crop pests and diseases are direct observation and putting the results of this observation directly into practice. Group discussion is also an important source, but this is usually done only when a serious threat has been posed by a particular plant pest or disease.

(2) Chemical insecticides and fungicides are currently used excessively to control pests and disease in Site C village. Some farmers are aware of other more environmentally
friendly techniques, but do not use these because the consumers prefer pest and disease free products rather than those free of pesticides. Excessive use of chemical pesticides may hinder biosecurity efforts by promoting resistant strains of pests and pathogens, and by suppressing populations of natural predators. Reduced use of chemical pesticides may be encouraged by demonstrations of the effectiveness of alternative practices and through greater awareness among farmers and consumers of the dangers of excessive pesticide use.

(3) Some farmers submerge the bark of the albizia tree *Albizia chinensis* (called ‘Nangkai’ in local dialect) and citrus leaves in the rice fields to control armyworm, but further investigations are required to prove how effective these indigenous practices are in controlling the target pest and other pests.

**Cross-site**

**Quantitative**

A cross-site quantitative analysis has not been possible to date. It is, however, scheduled to take place in the following months and be incorporated in subsequent publications.

**Qualitative**

A. An analysis using Flora’s ‘community capitals’ framework

Readers are reminded that Flora (see this volume) has provided a model of community capitals. In this section of the data, we report how this has been used as an analytic technique to portray the ways in which social capital has potential as a community capacity (effectiveness in community problem solving or change management) in the detection and management of plant pests and diseases. A selection of the results of the interviews and analyses that focus on the structure and dimensions of social capital interactivity from the two Balinese sites are reported. Through the first analysis, we show how social capital is central to getting a job done, solving a problem, disseminating new knowledge and so on. This is followed up by an analysis of the social capital structures and processes in the two communities.

**Social capital and other capitals at work in interactive productivity**

The two pieces of data analysed in this section show different events where the role of social capital is exposed. The events came from two different questionnaire items and were gathered from face-to-face interviews.

**Analysis of sustainable activities**

The first data sample is in response to the question in italics at the top of the table, with the answer in the left column and the notation regarding the forms of capital drawn on in the interactive productivity in the right column.
Question: What institution/organizations (private or public) have continuously implemented a particular program here?

<table>
<thead>
<tr>
<th>Transcript answer</th>
<th>Commentary</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the last three years, we have carried out collaborative work with several hotels here to conserve the local river and do some tree planting. Besides that, we have cleaned up our environment. The hotels with their staff work with the community. Sometimes the hotels assist the village and give money to buy seed for the trees and other things needed to help clean up the environment.</td>
<td></td>
</tr>
<tr>
<td>IS THIS ORGANISATIONAL CAPITAL? SOCIAL CAPITAL BUILT CAPITAL, FINANCIAL CAPITAL NATURAL CAPITAL BUILT CAPITAL HUMAN CAPITAL SOCIAL CAPITAL BUILT CAPITAL SOCIAL CAPITAL FINANCIAL CAPITAL NATURAL CAPITAL</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Transcript segment 1 with capitals commentary

There are 15 occurrences of capitals here, spread across 6 types. Only political capital is missing, and it could be argued that this is implicit in the precursor to the description, in that one could anticipate a high level of political persuasion and engagement might be necessary in order to establish this initiative. At least the influence of the political component cannot be ruled out. The above passage illustrates the role of social capital in the collaboration that is involved in the local river project. The project is a partnership between the community on the one hand, and business and industry on the other hand. The analysis using the framework of Flora’s capitals identifies conceptual categories as they are referred to in the narration of the event. The agency for interactive productivity (getting things done) is social capital. Social capital events are where the human capital of ‘staff’ can be utilised. The collaborative events (social capital) are where the resources
of the hotels (built and financial capital) can be harnessed by the community. The common purpose is quite a complex one – the restoration and sustaining of a river’s ecosystem, yet it is only through building in opportunities (events) where social capital (getting together) is harnessed that these other resources (financial, human, built and natural capital) can be released for the community’s benefit.

*Analysis of unexpected difficulties with activities*

In this second piece of text analysed against Flora’s ‘capitals’ framework, we ask a different question about what and why a particular event did not work out how it was intended. In asking a question such as this we can learn about the ways interactivity about a common purpose can be impeded, as well as the influences on its effectiveness and impact.

**Question**: Could you tell me about one example of an activity or project which you at first hoped would succeed but it did not turn out how you expected. *Why* did this happen and *what do you see as the solution?*

<table>
<thead>
<tr>
<th>Transcript answer</th>
<th>Commentary</th>
</tr>
</thead>
<tbody>
<tr>
<td>An example is when the community was informed . . . . . . . . . . . . . . . . . . . . . .</td>
<td>SOCIAL CAPITAL</td>
</tr>
<tr>
<td>about a meeting regarding information-sharing . . . . . . . . . . . . . . . . . . . .</td>
<td>SOCIAL CAPITAL</td>
</tr>
<tr>
<td>about diabetes disease. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .</td>
<td>HUMAN CAPITAL</td>
</tr>
<tr>
<td>This is an important meeting, . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .</td>
<td>SOCIAL CAPITAL</td>
</tr>
<tr>
<td>containing valuable knowledge . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .</td>
<td>HUMAN CAPITAL</td>
</tr>
<tr>
<td>so that people can keep healthy . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .</td>
<td>HUMAN CAPITAL</td>
</tr>
<tr>
<td>On the intended day, there is a death and the meeting is postponed because people are engaged . . . . . . . .</td>
<td>SOCIAL CAPITAL</td>
</tr>
<tr>
<td>with the cremation ceremony. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .</td>
<td>CULTURAL CAPITAL</td>
</tr>
<tr>
<td>It was moved to another day. But, unfortunately though the information is important, only 11 came out of 30 participants expected. The main problems are the community owns their business and activities . . . . . . .</td>
<td>FINANCIAL CAPITAL</td>
</tr>
<tr>
<td>Using this example to guide us, we need a higher level of organisation . . . . . . .</td>
<td>ORGANISATIONAL CAPITAL</td>
</tr>
<tr>
<td>and ways of getting the people together . . . . . . . . . . . . . . . . . . . . . . . . . .</td>
<td>SOCIAL CAPITAL</td>
</tr>
<tr>
<td>in order for there to be a greater awareness of diabetes. . . . . . . . . . . . . . . .</td>
<td>HUMAN CAPITAL</td>
</tr>
</tbody>
</table>
There are 12 items of capital in this sample, spread across five different types out of a possible eight (assuming we count organisational capital as another form of capital). In planning for the non-successful event, only two kinds of capital are noted – human and social, though others cannot be ruled out. In the events that caused the lack of success (a death in the community) there are three types of capitals noted. This very different ‘take’ on a common purpose shows how, when social capital events are less productive (poor meeting attendance) the community fails to gain new knowledge. The meeting would have provided an event where a collection of people could network about a common purpose of diabetes. The lack of a well-attended meeting means that the human capital (knowledge about diabetes) cannot be put into action. The cremation ceremony (Cultural capital) and the pressures of business (Financial capital) are parallel activities which provide alternative means of social capital building and use, although in this case they detract from the meeting (social capital) event that allows the diabetes information to be circulated more effectively. Moreover, the data here show how these capitals are drawn on during the act of interaction, but also that their nature is defined by the particular purpose: Not all the resources are useful – seeds obviously are, so is money. The type of human capital for the purpose of the restoration and sustaining of the river in the form of ‘staff’ and ‘knowledge’ is also formed from the purpose in hand. That is, social capital provides the mechanism through which the work in a community (or anywhere else) is accomplished.

The problem that triggered the selection of these pieces of text for analysis was our perception that it is usually inadequate to look for a single thing as a cause or solution to a problem. The real situation is inevitably complex: interconnected and single ‘things’ are inseparable in the act of social interaction. Social interaction at the level of data (answers to interview questions) is seen here to be as important as the interactions these micro-examples build into – large scale social and community activities involving interactions such as partnerships, meetings, collaborations and relationships between people of a less formal kind. Finding a ‘simple’ way to portray and then manage this complexity in terms of a strategy or model for change management is part of the task of this research.

B. The Structure/Process analyses across two sites
The paper in this volume by Surata reports more fully on this aspect of the two Balinese sites and readers are referred there for further information.

C. The role of women in the community management of biosecurity
The paper in this volume by Martiningsih on the role of women in the community management of biosecurity provides detail on interviews conducted with women in the two Balinese sites (A and B) on this topic.
**Synthesis**

The most significant themes that have emerged as a result of cross-site and within-site analyses are presented here and other information is presented in other papers in this volume.

The following section focuses on the acquisition of new knowledge, and the capacity to develop management strategies.

The four key themes to emerge are:

1. **Leadership and governance**
2. **Interaction between local and ‘outside’ knowledge**
3. **Nature of networks**
4. **Policy: top-down, bottom-up**

1. **Leadership and governance**
   In the communities studied, leadership is certainly an issue in how new knowledge is received, understood and acted upon. However, it is not just a question of ‘strong’ leadership or ‘democratic’ leadership that produces the results, it is the way the leadership is embedded in and interacts with the governance structures of each community. That is, to develop a model of community approaches to biosecurity, we must take account of the governance structures in the community, analyse the leadership capacity, then see how these qualities interact – leadership and governance structures. The ‘process’ and structures’ described in the current research will provide a basis for future activities based on a participatory research model to allow reflection and input into information gathering studies. Conventional understandings of leadership and governance do not explain these processes and structures.

2. **Interaction between local and ‘outside’ (including scientific) knowledge**
   In all cases and sites, local and traditional knowledge was shown to have an important role in existing, effective pest and disease management. The results indicated that interaction of the local knowledge with the outside or new knowledge (including ‘scientific’ knowledge) is a vital factor in how community members take on board new information and act upon it. If the knowledge from outside is seen as top down and intrusive, it will be counterproductive, and it can be seen how this aspect of the findings supports the role of leadership/governance in achieving biosecurity outcomes. On the flip side of this situation is the way the outsider knowledge can be more effectively applied by understanding local knowledge and conditions. Indeed, there are a number of documented examples of how local knowledge assisted in or informed the outsider knowledge, and for example traditional herbs and medicines.

3. **Nature of networks**
   Networks are the conduits through which knowledge and information can flow. Networks are the only means by which new knowledge or information is acquired (learned) and acted upon. Moreover, there are data showing how the bridging networks that link community members with resources via connections with, for example, politicians, are conduits for resources both ways, and conduits for information that both top-down and
bottom-up people can use. In the coastal village in West Timor (Site C), a greater involvement of community members in pest and disease identification directly in the field is found to be important as the basis for improving their awareness and knowledge of plant biosecurity and at the same time developing better strategies for the necessary actions required in dealing with the possibility of threats resulting from the arrival of new pests and pathogens and the outbreaks of the currently existing ones. As can be seen from this example, the qualities of the local networks are what will determine whether new knowledge will be ‘noticed’ or regarded with sufficient importance to be fitted into daily life and incorporated into a daily routine. This aspect of network functioning – the way identities of local people influence effective engagement with and the transmission of knowledge and its uptake into daily practice, is a vital area for further research.

4.  Policy: Top down, bottom up?
Running through all the above, but established as a theme in its own right, is the importance of interactions between all levels of stakeholders in the particular process. The theme sees the importance of looking beyond the easy typification of a top-down, bottom-up dichotomy. The data show that, when policy personnel at all levels have genuine concern for a particular issue, and when ‘grassroots’ people provide circumstances where opportunities for mutual understandings and advancement can occur, there will be improvements to the way new information and knowledge is received and acted on, and needs of these stakeholders are more likely to be met.

Summary, conclusions and implications:

The paper has provided an overview of a year-long introductory study in Indonesia and Northern Australia whose purpose was to identify the ways in which communities learned about, and learned how to manage, the plant pests and diseases affecting their food supplies and so the wider community socio-economic well-being. This overview is complemented by other papers in this volume which provide more detail on various sections and analyses of the overall research.

The research found that the first step in the development of a strategy or model of community approaches to biosecurity is to take account of both the governance structures in the community and the processes that facilitate action between community members. Then the precise nature of the leadership capacity for any particular intervention can be established. Knowledge is at the core of any community intervention related to managing plant biosecurity. Local, traditional and indigenous knowledge should be valued, as they have a history of taking account of unique local environmental and geographic factors. Locally held knowledge, including traditional knowledge, will interact with new knowledge as deemed relevant to the particular intervention to achieve change.

However, knowledge is only one aspect of what is required to bring about sustainable change. Learning the required knowledge is the other. Learning always occurs through networks. Networks are both the means through which local and outside knowledge engage with each other, and the practical means by which change and development occurs. Both knowledge and identities are involved in network transactions for change. Change, however, requires people to alter the way they see themselves: if existing roles,
responsibilities and linkages are to be changed sustainably, then people must adjust their self-perceptions (and their perceptions of others with whom they interact) in order to incorporate the ‘new them’ into their world picture, otherwise new behaviours will not become entrenched, and ‘old ways’ will re-emerge. The difficulties associated with the phenomenon of ‘transfer of learning’ are well-known, but have not so far been articulated in terms of identity change. The importance of identity in learning and change found in this research points to a gap that needs filling. Finally, many interactive complexities associated with ‘getting things done’ through policy at a community level are fuelled by the powerful dichotomy of ‘top-down/bottom-up’. The research indicates that when policy mixes with knowledge brokers (local people and scientists, for example) along with ‘grassroots’ community people in exchanges with a common purpose, change and learning occurs for all parties.

In summary the findings of the research include:

1. 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.

2. An urgent need for new models 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.

4. Biosecurity research capacity in eastern Indonesia needs identifying, supporting and developing to be fully effective.

Implications for further research stemming from our discussions are phrased as questions:

1. What are models of leadership and governance that effectively mediate Western and local knowledge systems?

2. What is it about effective interactions between (a) Western and (b) local/indigenous/traditional knowledge systems that can improve the impact of scientific knowledge?

3. We know knowledge is transmitted through networks, so what are ‘good’ (effective and efficient) networks, how can they be identified, and how can existing ‘good’ networks be used more effectively?

4. What models best describe the policy and community level interactions that result in effective pest and disease management in communities in eastern Indonesia?

We stress, finally, the importance of ‘interaction’. It is not a single factor, such as leadership or governance per se, that makes a difference, but their respective qualities and the ways they interact with each other. Local (including traditional) knowledge can interact with ‘outside’ knowledge to produce productive change. Networks are formed from interactions and finally, the success of any initiative, strategy, model or research outcome depends not simply on good science or good policy, but on ensuring each of these interacts with each other productively. Productive interactivity, its nature and structure, must therefore form a significant theme underlying the future research set out.
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SOCIAL CAPITAL AND COMMUNITY PROBLEM SOLVING
COMBINING LOCAL AND SCIENTIFIC KNOWLEDGE TO
FIGHT INVASIVE SPECIES

Prof. Cornelia Butler Flora
Charles F. Curtiss Distinguished Professor of Sociology
Director, North Central Regional Center for Rural Development
Iowa State University
Ames, IA, USA

Abstract

Globalization has greatly speeded up the movement of goods, services, money and people, as well as pests that threaten food supply and the environment. Invasive organisms may thrive because they are free from their natural competitors and enemies in a foreign environment. Early detection of incursions is crucial for control and possible eradication. Detection often relies on local communities, with their knowledge of what is “normal” in terms of natural capital in order to notice the “abnormal” in terms of difference in plant communities. By using early detection of invasive species and working with the scientific community they can develop mechanisms of control and eradication of a variety of invasive species. An important aspect of scientific knowledge transfer is often regarded as being based in universities, which is not to suggest a diminished role for other important bodies such as non-government organizations (NGOs). However, it is the role of universities particularly that is examined here. The community capitals framework allows us to mobilize local resources and combine them with external resources for a vital economy, social inclusion and a healthy ecosystem.

Introduction

Ecosystems are increasingly vulnerable to invasions by non-native organisms. Island ecosystems have always been vulnerable to natural disruptions, such as storms and volcanoes. Wind and birds have brought new pests that have changed ecosystems through the introduction of new plant and animal diseases and resulting changes to competitive interactions. The actions of human beings speed up the rate at which new species, pests and diseases are introduced to ecosystems. Climate change creates more extreme weather events, and may provide new conditions for pests to thrive. And human commerce is accompanied by the introduction of new pests, both consciously (as the introduction of kudzu in the South of the United States or rabbits in Australia) or inadvertently, as pests were part of shipments of seed (as with Russian thistle in the U.S.) or just passengers on pallets or in shipping containers.

Ecosystem health is a part of the triple bottom line components of economic, social and environmental accountability: a vital economy and social inclusion (Flora, 2001). While invasive species most directly effect the ecosystem, and through that the economy, social
inclusion is also a critical part of responses to, and impacts of, invasive species. Often it is those who are excluded in a variety of ways from society’s resources who have the best view of what is actually happening at the ground level. By increasing social inclusion and building on the resources of local communities, it becomes easier for society as a whole to identify and respond to potential threats. By investing in community capitals, local communities and the scientific community can collaborate to increase the triple bottom line. The community capitals framework has been demonstrated to be helpful in addressing systems issues such as biosecurity (Flora, 2001) and ecosystem health (Flora 2004a; Gutierrez-Montez, 2005)).

While others have used different capitals in considering livelihood strategies (Bebbington, 1999; DIFD 1999, 2000, 2001; Carney, 1998; Pretty, 2000, 1998), our practice and scholarship has found that consideration of these seven capitals is critical in making sure that programs are both sustainable and effective. We take the sociological science of social facts view of Durkheim (1902, 2001) of these capitals, seeing that at the community level these are more than the sum of individual attributes. Thus, you explain how individuals behave based on their attitudes and characteristics, and you explain how communities behave by looking at their structures and their collective histories.

Community Capitals

All communities have resources that can be reduced, saved for future use, or invested to create new resources. When those resources are invested to create new resources over a long time, we refer to them as “capital”. The capitals are both ends in themselves and means to an end. Only with a dynamic balance among the capitals and investments in them can sustainable strategies emerge to address the emergent threats of invasive species in a global economy and a changing climate.
Natural Capital

Natural capital refers to those natural assets that abide in a location including weather, geographic isolation, natural resources, amenities, and natural beauty. Water, soil and air – their quality and quantity – are a major building block of natural capital, as is biodiversity (Costanza, et al. 1997). Invasive species may damage endemic biodiversity, which can then impact on the landscape, water quality and even water quantity. Dying forests, as in the U.S. where the emerald ash beetle is decimating ash forests, contribute to global warming. Rural development activities influence natural capital, often negatively, decreasing long term development. Natural capital in turn determines the limits as well as opportunities for human action. As different groups, based on ethnicity, gender, and class, have different access and control over natural resources, the effective identification and control of invasive species requires that access to natural resources is maintained for traditional users who know what is normal and what is not.

By building on local and scientific knowledge, partnerships of community members, public officials, and scholars hope to develop healthy ecosystems with multiple community benefits, where human communities act in concert with natural systems, rather than simply to dominate these systems for short term gain (Ostrum, 1990; Ostrum et al. 1994). Early detection and control of invasive species can help assure multiple and inclusive community benefits. And, most importantly, by utilizing a neutral convener around detecting and managing invasive species, communities and scientists can help those with conflicting uses of natural capital find common ground.

Cultural Capital

Cultural capital reflects the way people “know the world” and how to act within it as well as their traditions and language. It includes cosmovisión (spirituality and how the different parts are connected), ways of knowing, food and language, ways of being, and definition of what can be changed. Very often local people will have multiple terms for stages of plant and forest growth which reflect an intimate understanding and close observation of these growth stages and enable these people to give an early warning that a situation is abnormal and an exotic pest may be present. That ability to see differences is very important in identifying the possible presence of a new pest or condition.

Cultural capital influences what voices are heard and listened to, which voices have influence in what areas, and how creativity, innovation, and influence emerge and are nurtured. Hegemony privileges the cultural capital of dominant groups (Bourdieu 1986, Flora, et al., 2004). Monitoring the condition of community capitals allows excluded groups to negotiate with the cultural capital of dominant groups, as the local groups have the key knowledge necessary to promote change.

When scientists and change agents are successful in investing in cultural capital, cultural differences are recognized and valued, and ancestral customs and languages are maintained. By investing in maintaining diversity in culture, biodiversity and different ways of approaching change can be utilized to enhance all the capitals. Biodiversity
enhances human capital by providing a varied landscape and potential plants and animals for human curing and consumption, cultural capital by maintaining native species of sacred uses, social capital by providing pleasant places to gather together, and political capital to justify maintaining habitat.

Human Capital

Human capital includes the skills 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 capitals. Formal and informal education are investments in human capital (Becker, 1964; Schultz, 1961, 1963, 1964). Human capital also includes health and leadership. Gender roles often result in men and women learning about different aspects of their environment. The gendered aspects of human capital are important to acknowledge (Flora and Kroma, 1998).

Arguably, universities and major research centers in some parts of the world and the scientists connected with them, often think of themselves as the major creators of high level human capital, transferring knowledge from scientists to those who will benefit from using it. However, addressing human capital for rural development and biosecurity requires a much more nuanced role than the expert transferring knowledge that has been generated from the scientists or their faculties. Instead, university investment in human capital for rural development includes identifying the motivations and abilities of each individual to improve community capitals, increase the skills and health of individuals to improve levels of community capitals, and recombine the skills and motivation of the community to a more sustainable collective future. In particular, when partnering with local communities to enhance biosecurity, it is important to transfer knowledge based on what is already there, acknowledge the special place of local knowledge and the complimentarity with scientific knowledge in order to promote biosecurity.

Social Capital

Social capital reflects the connections among people and organizations or the social glue to make things, positive or negative, happen (Coleman, 1988; Portes and Sessenbrenner, 1993). It includes mutual trust, reciprocity, groups, collective identity, sense of a shared future, and working together (Putnam, 1998, 1995; 1993a, b). It is extremely important for creating a healthy ecosystem and a vital economy (Triglia, 2001; C. Flora, 1995, 1998a, 2000; J. Flora, 1998).

Bonding social capital refers to those close ties that build community cohesion. Bridging social capital involves loose ties that bridge between organizations and communities (Narayan, 1999; Daasgupta and Serageldin (2000). A specific configuration of social capital – entrepreneurial social capital (ESI) is related to community economic development (Flora and Flora, 1989; 1993; Flora, et al., 1997). ESI includes inclusive internal and external networks, local mobilization of resources, and willingness to consider alternative ways of reaching goals.
University investments in both bridging and bonding social capital in a development context are often a key entry point for participatory rural development. It is important, however, for universities to understand that entering with high levels of bridging social capital that brings access to a wide variety of resources can actually impede the building of bonding social capital and lead to clientelism. When outsiders provide resources to a community without the community determining how those resources can contribute to sustainable development, any traditional dependency on political parties and politicians, based on personal relations of one or two people, may be simply transferred to the scientists involved. It is best for universities to begin working for biosecurity in areas where there is some bonding social capital, as shown in previous experience of local action for the common good and, through bridging social capital, help build flexible and porous boundaries that can increase inclusion. Social capital can be a key vehicle of cutting transaction costs in linking local and scientific knowledge to control and eradicate invasive species.

When universities invest in both bridging and bonding social capital in their relationships to communities, those communities and regions demonstrate improved initiative, responsibility, and adaptability. Universities in many settings around the world are moving from the scientist observing change or the expert advising change to recognize that all research is an act of social change, and that their actions can positively or negatively impact in these interventions. In particular, the way they connect with communities and serve as links to other institutional actors can be key to project success. Indicators of a balanced increase in bridging and bonding social capital include a shared vision (which takes time and trust to develop), building first on internal resources (which means the community has together determined existing assets that can be turned into capitals for participatory rural development, looking for alternative ways to respond to constant changes (rather than the one solution of a certain investment to solve everything), the loss of the victim mentality (feeling overwhelmed by globalism or climate change), and loss of a cargo cult mentality (where the community waits for an outside investment to rescue them).

Political Capital

Political capital reflects access to power, organizations, connection to resources and power brokers (Flora, et al. 2004). Political capital is the ability of a group to influence standards, regulations and enforcement of those regulations that determine the distribution of resources and the ways they are used. When a community has high political capital, its people have the collective ability to find their own voice and to engage in actions that contribute to the well being of their community.

In many countries, political capital has been commonly defined as the power to disrupt or stop something from happening, or to get specific goods from a central authority (Aiger, et al. 2001). As the exclusion of groups decrease through increasing bridging and bonding social capital, their power of negotiation, particularly in identifying allies that share their vision for a sustainable rural future with increased biosecurity, grows. Indicators of increased political capital to which any university can contribute through participatory rural development include organized groups working together for
biosecurity, local people knowing and feeling comfortable around powerful people, including scientists and government functionaries, and local concerns becoming part of the agenda in the regulation and distribution of resources related to increasing biosecurity. Often universities focus on the technical or mechanistic means to increase biosecurity and further development, which serves to mask or obscure the fundamentally political nature of the development process. By the university helping rural residents engage in the discussion of policy issues around biosecurity, and avoiding support of particular candidates, political capital, which is essential for decisions to change at all levels, can be built and used for biosecurity and rural development.

**Financial Capital**

Financial capital refers to 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. Financial capital is often privileged and dominates evaluation schemes, because it is easy to measure. There is a tendency to monetize other capitals, rather than considering the reverse: money gained from natural resource destruction or child labor results in the decline of natural and human capital. Money that is spent for consumption is not financial capital. Money that is put aside and not invested is also not yet financial capital. It must be invested to create new resources to become capital. Universities can help identify and create sources of financial capital within rural areas. Linking biosecurity to financial capital can help legitimize the activities undertaken by local people as scouts for invasive species and as actors to control them.

Financial capital includes remittances (Landold 2001), savings (particularly by increasing efficiency through better management, credit (Siles, et al. 1994; Wilson, 2000), increasing the skills of workers, use of technology and better regulations), income generation and business earnings (by increasing human capital through skills and social capital through more integrated value chains) (Lorenz, 1999, Mollering, 2002; Talmud and Mesch, 1997), payment for environmental services, loans and credit, investments, taxes, tax exemptions, user fees, and gifts/philanthropy. Often universities view rural communities as bereft of financial capital, but, particularly with increasing globalization of the labor force, out-migrants can organize to invest in their communities in a way that is cumulative for rural development.

Bridging social capital can enhance financial capital (Grannovetter, 1973; 1985). Universities can use a number of measures of successful investment in financial capital to create an appropriately diverse and healthy economy and to increase biosecurity. These include reduced poverty, increased business efficiency, increased economic diversity, and increased assets of those who live in the community. Universities should develop indicators of changing economic conditions with the communities, as very often externally imposed indicators may hide the extraction of wealth that has over the centuries impoverished many rural people.
Built Capital

Built capital includes the infrastructure that supports the other capitals (Flora, et al. 2004). It includes such diverse human-made objects and systems as sewers, water systems, electronic communication, soccer fields and processing plants. And it includes the kinds of scientific equipment needed for the identification and eradication of some invasive species.

Built capital can enhance or decrease the quality of other capitals. An example of such potential for both enhancement and degradation is a rural water system, which can run sewage into the stream the community depends on for drinking water, or provide for appropriate and cost-effective sewage treatment (Flora, 2004). Further, it can determine access to the other capitals by different sectors of the community.

Universities involved in rural development research and practice can use the following indicators of the positive impact of build capital. Rural physical infrastructure enhances other community capitals when it serves multiple users (human capital), it can be locally maintained and improved (human and financial capital), it links local people together equitably (bonding social and cultural capital), and it links local people, institutions and businesses to the outside (bridging social and financial capital).

Spiraling Down

Universities often provide evidence that the loss of one capital can lead to disinvestment in other capitals (Waquant, 1997). In particular, decline in natural capital, which is often triggered by invasive species, has been linked to decreased financial capital (lowered productivity and income), decreased human capital (out-migration and illness), decreased cultural capital (loss of bio-diversity and village rituals), and decreased social capital (as there is increased inequality). In rural development situations, universities often come in at what seems like a whirlpool of capital destructions. University actions often are based on technological fixes (a form of built capital) in hopes of at least stemming the downward spiral. By addressing only the immediate threat of invasive species, sustainable actions to increase the community’s ability to respond to future biosecurity threats will not occur.

Spiraling Up

However, our research (Emery and Flora, 2006) suggests that built capital is not the first investment necessary to reverse the downward spiral. We have found that investment in both bonding and bridging social capital, including accepting the time it takes to build trust and reciprocity, is often a key entry point. And a particularly effective way to build social capital is to work with diverse groups in the community to strengthen youth (human capital). But to reverse the spiral, the university as participatory rural development practitioner must have the patience to build trust and reciprocity through doing what they say they will do (often done best through a constant and well-connected rural presence) and giving local people a way to reciprocate in a way that maintains their dignity and meaning.
Conclusions

Biosecurity is not achieved by science and technology alone. The increasing vulnerability of local landscapes to invasive species requires on-going mobilization of all community capitals in order to have sufficient agility for prompt and effective responses. Bridging social capital among communities can serve as an early alert that can mobilize local residents and scientists to work together to experiment with and implement appropriate remedial action. But when all the capitals are invested in, including cultural capital so that local populations understand that they do not have to accept crop and forest destruction as inevitable, scientist-community partnerships can increase biosecurity for a healthy ecosystem and a vital economy with a high level of social well-being (Flora, 2003).

References

http://www.ag.iastate.edu/centers/rdev/pubs/flora/empower.htm


Abstract

The practice of agriculture is ancient and ancient man had close spiritual connections with nature. In Indonesia, traditional practices for management of plant pests and diseases promoted agro-ecosystems with a balance of natural predators. Pesticide applications began to be promoted in the early 20th century. By the 1990’s there were proclamations to adopt Integrated Pest Control (IPC) systems, incorporating one or more control measures to control the levels of pest populations and disease infestations. Effective pest and disease control measures through IPC require cooperation by community members (particularly neighbouring farmers), distributors of seed and crop propagation material, and government agencies.

Introduction

Agriculture, according to estimates, has been carried out for about 10,000 years. Agriculture, and also losses due to pest and diseases are recorded in holy books, such as Veda and the Holy Bible, and also written in books in Ancient Greek (6th to 2nd century BC) and Ancient Roman (1st to 7th century AD).

Agriculture is also an ancient activity in Indonesia, especially Java. Although rice is known to have originated from India, the forefathers of Javanese cultivated rice date from before the arrival of Indians. Terms used in rice culture have not originated from Sanskrit language (van der Veer, 1948). Also, on the walls of Javanese temples, for example Borobudur (9th century AD), coconuts are depicted, as a proof that coconut was already widely cultivated at that time (Reyne, 1948).

Unity with Nature

The forefathers of Indonesian, as for Eastern people in general at that time, felt that they belonged to nature. Human beings could not be separated from nature. They were not permitted to cut trees without reason, especially large trees which were considered to have connections with water sources. They respected animals, for example, calling the tiger “grandfather” (kyaine) and calling the snake “root” (oyod) (Triharso, 1978).

These ancient people tried to have good relationships with their surroundings, and they deemed many elements of the natural environment to have supernatural forces, so people respected them. Large trees were said to be guarded by gods. People were not permitted
to catch fish from restricted water springs, and those who did not obey and ate the fish
would die. They believed that lowland (sawah) rice was the incarnation of Dewi Sri, who
is considered to be the goddess of rice. She is the wife of Batara Wishnu. Dry land rice is
the incarnation of Dewi Tisnowati, the lover of Batara Guru (van der Veer, 1948). Based
on this belief people treated rice plants with honour. The same belief is found in South
Kalimantan among the Dayak tribes (Saniman, 2003). People of Timor Tengah Selatan
regency has a similar belief, i.e. that sandalwood trees are incarnations of a daughter of a
king (Sa’u, 2006). In Sumba, tops of hills, where the jungle should be maintained, are
said to be the palace of Marapu (gods) (Lasi, 2002).

Agriculture is the people’s way of life. Through agriculture their activities are linked to
their surroundings, including links with weather and climate. They carried out their
cultivation according to Pranata Mangsa, a phenology which uses plants and animals as
dicators. Pranata Mangsa was introduced for the first time in 1855 by Paku Buwana
VII, the King of Surakarta (Wisnubroto, 1999). Up until the present day in the villages of
Java puppet (wayang) performances are displayed, following the story of Pecahing
Watugunung, expecting that the drought will stop (Wisnubroto et al., 1983). In the
isolated hinterland of Sumba, farmers carry out farming activities according to an
agricultural calendar which is very similar to the Javanese Pranata Mangsa (Retno
Nuningsih, 2006).

Unfortunately such holistic thoughts and systems were considered to hinder development.
Since it is difficult to solve large problems as a whole, Rene Descartes (1596 – 1650),
who is considered the father of modern philosophy, proposed a method to break big
problems into smaller parts, and start by tackling the easiest part. This approach leads to
specialization. If the process goes too far it becomes difficult to find holistic solutions and
we have only partial knowledge. With partial knowledge we try to give answers to many
problems. In this way, solutions are always incomplete and each solution may create new
problems. Now many people are aware that most problems are man made. In the
discipline of plant pathology we have the so called iatrogenic diseases (iatron = medical
doctor). These are diseases resulting from doctor’s advice for controlling a certain disease.

**Pests, diseases and weeds**

The term “pest” is sometimes confusing. We have “pest in wide sense” and “pest in
narrow sense”. Pest in wide sense is equal to omo in Javanese, which covers crop
disturbances created by animals, parasites, and weeds. In “Crop Cultivation System”
(Sistem Budidaya Tanaman) in Law No. 12, 1992, published by Government of Republic
of Indonesia, pest in wide sense is called “Plant Disturbing Organism” (Organisme
Pengganggu Tumbuhan = OPT). Pest in a narrow sense covers plant disturbances created
by animals, such as insects, mites, nematodes, mice, squirrel, wild boar. In this respect
losses due to insects are the most important ones, including losses due to viruses for
which insects are a vector of spread. Plant diseases may be due to fungi, bacteria or
viruses, and susceptibility to disease is usually increased by stress due to unfavourable
environmental factors such as temperature, humidity, drought, or mineral deficiencies.
Our forefathers treated pest and diseases holistically. They thought that rice pests and diseases were incarnations of the ghost giant, Kala Gumarang, who disturbed Dewi Sri. Kala Gumarang became a wild boar due to the curse of Batara Wishnu. Because the wild boar, the incarnation of Kala Gumarang, was still disturbing Dewi Sri, the boar was killed by Batara Wisnu with an arrow (van der Veer, 1948). Farmers in Java sometimes walk around their rice field with a torch in the night. The flame of the torch attracts insects, so they will be burned. People are not permitted to kill the “sawah” snake, because this snake is a mouse eater, and not poisonous. Birds preying on insects should not be killed, instead farmers used sounds to frighten these birds. Crabs which make holes in rice field dikes are eaten by heron-like birds (blekok, cangak). By following these practices biological balances in the rice fields can be maintained.

With the progress of technology in the beginning of the 20th century the application of pesticides increased tremendously. With progress in genetics, plants highly resistant to pests and diseases have been developed. Advances in technology and genetics stimulated a kind of arrogance among people that by applying pesticides and with resistance in crops, pests and diseases would be easily eliminated. However since the beginning of these developments there were scientists who reminded people that to “clean-up” insects and parasites is not wise. They were of the opinion that insects, fungi, and weeds should be let live, so that biological balances would not be disturbed.

Specialization, which continued to intensify, promoted a departure from attention to the management of pests and diseases. Under the present education system, most scientists studying plant diseases do not have sufficient knowledge of plant pests. Consequently, it is difficult to get a complete understanding of the causes of crop losses.

**Techniques in the control of plant pest and diseases**

In the Law No. 12, 1992, on *Crop Cultivation System*, and in Government Regulation No. 6, 1995, on *Crop Protection*, it is written that crop protection should be carried out by Integrated Pest Control (IPC) or *Pengendalian Hama Terpadu (PHT)*. The techniques could be divided into five groups, (1) Pest and disease control by government regulations (eradication, quarantine); (2) Cultivation of resistant cultivars; (3) Control by cultural practices; (4) Biological control; and (5) Chemical and physical control.

Integrated Pest Control (IPC) is 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. In Government Regulation No. 6, 1995, it is written that crop protection should be carried out by prevention, control, and eradication. In IPC the execution of the techniques should be integrated. Besides that, efforts should be carried out through cooperation of farmers, gardeners and society.
Role of the community

Pests and diseases do not know borders, whether it is plantation borders, village borders, or national borders. If, for example, a farmer carries out pest or disease control while the surrounding farmers do not apply that control, the effort of the first farmer will be compromised, especially in the control of flying insects, wind-borne fungal diseases, and insect-borne virus and bacterial diseases. Examples include control of leaf blight (*Phytophthora infestans*) of potato, blister blight (*Exobasidium vexans*) of tea, and huanglongbing or greening disease (*Liberibacter asiaticus*) of citrus (Semangun, 2005, 2007).

A distributor of potato seed tubers who is not controlling the quality of his product seriously will distribute different kinds of potato viruses, e.g. leaf roll, potato virus X and potato virus Y. In club root of cabbage, less responsible seedling distributor use infested soil to fill the polybags, so the seedlings will infest many good soils of farmers, and the disease organism (*Plasmodiophora brassicae*) can persist in soil for years. To limit the dissemination of pest and diseases through planting materials (seed, tuber, young plants) the government has created seed certifications. This agency should pay attention to the purity of seeds, and also to observe the health of seeds. At present the attention of the public to seed certification should be improved, among the farmers buying the seeds as well as the distributor supplying the seeds.

It should be known that long distance transport of plant pests and diseases are carried out by men themselves, because they transport the causal agents together with their hosts. Plant disturbing organisms, or in Indonesian *Organisme Pengganggu Tumbuhan* (OPT) which should be attended by quarantine service is called *Organisme Pengganggu Tumbuhan Karantina* (OPTK) or Quarantine Plant Disturbing Organisms. The purpose of Quarantine is to prevent the transportation of OPTK in plant material and its packing material. The increase in both the quantity of plant material being transported and the speed of transportation has created major challenges to quarantine officers. But, although these officers work hard, with strong support of national as well as international regulations, their work could be in vain without the support of community. For this purpose awareness of community processes is needed. For example, quarantine officers are not permitted to open luggage of ship or airline passengers. If passengers are aware of quarantine issues they are more likely to voluntarily show plant materials carried by them to the quarantine officers. In certain countries quarantine officers use trained dogs to find plant materials smuggled in luggage.

Many important plant pests, diseases, and weeds in Indonesia are from other countries originally, e.g. leaf miner (*Lariomyza huidobrensis*), golden cyst nematode (*Globodera rostochiensis*), leaf blight (*Phytophthora infestans*) of potato, leaf rust (*Hemileia vastatrix*) of Arabica coffee, blister blight (*Exobasidium vexans*) of tea, and the weeds, lantana (*Lantana camara*) and water hyacinth (*Eichhornia crassipes*).

Domestically there are important pests which spread from island to island, crossing sea barriers, e.g. huanglongbing (*Liberibacter asiaticus*) of citrus, clubroot (*Plasmodiophora brassicae*) of cabbage, and the perennial weed, *Chromolaena odorata*.
Indonesia is making a serious effort to prevent the arrival of foreign plant diseases, which might create serious losses here. The most important one is South American Leaf Blight (SALB, *Microcyclus ulei*) of rubber, which is still limited in South and Central America, blue mould (*Peronospora tabacina*) of tobacco found in Australia, Europe, and America, *Cocoa swollen shoot* virus of West Africa, *cadang-cadang* viroid of coconut in the Philippines, and *white leaf* (*hoya blanca*) of rice in Central America.

If a new pest, disease, or weed is found in a certain location, it is hoped that the diseased plants will be eradicated as soon as possible. For this purpose support of the community is necessary. Beside the willingness to report as soon as possible, people of the infested location should be willing to sacrifice their plants, even though the plant might not yet express the disease symptoms. Many times people would not allow their plants to be eradicated because they were still in production, although, based on government regulations, compensation could be given to the owner.

In the case of SALB, for example, if the symptom is found in a certain location, all rubber trees should be sprayed with herbicides from the air to drop their leaves. The following days the dropped leaves should be sprayed with a strong fungicide, for example pentachlorophenol (Semangun, 1996, 2005).

There are several examples of successful eradication of newly introduced plant diseases. Citrus canker (*Xanthomonas campestris* pv. *citri*) entered Florida (USA) in 1913 and successfully eradicated, so that by 1926 Florida was free from citrus canker. Successful eradication of citrus canker was also reported from South Africa, Australia, and New Zealand (Laville, 1977; Persley, 1993). Coffee leaf rust (*Hemileia vastatrix*) entered Papua New Guinea three times, in 1892, 1903, and 1965, and was successfully eradicated. However the new incursion in 1985 was detected too late, the disease had already spread widely, and that eradication campaign was unsuccessful (Semangun, 2002). It is indeed true that eradication is good for diseases which spread relatively slowly, as in the case of the two disease examples mentioned above. It will be especially difficult to eradicate new diseases with air-borne spores.
Conclusions

1. In general, successful control of pests, diseases, and weeds needs cooperation of members of community, especially farmers. Integrated pest control needs cooperation of the planters. Control exclusively with pesticides requires the least cooperation.

2. With the progress of transportation, the danger of the spread of plant pests and diseases in plant materials has increased tremendously. Quarantine, foreign as well as domestic, will only be successful if supported by the community, through their awareness of the purpose of quarantine.

3. It is hoped that responsible suppliers of planting materials, and also farmers, will pay more attention to certification.

4. Pest, disease and weed eradication needs the support of the community through willingness to report if they detect new suspected symptoms. Members of the community, especially farmers, should be made more familiar with symptoms of foreign pests and diseases threatening their crops.

References


Abstract

Australia’s north coast is extensive, sparsely populated mostly by Aboriginal people, and vulnerable to incursions by pests and diseases from countries to the north. The North Australian Quarantine Service (NAQS), within the Australian Quarantine and Inspection Service (AQIS), works with Indigenous communities to detect and report any incursions to state agencies. This surveillance work is crucial to Australia’s agricultural and pastoral sector. Sustainability and expansion of this surveillance by Indigenous groups is dependent on formal recognition of the value of Indigenous knowledge systems, and engagement with Indigenous communities in this endeavour.

Introduction: Biosecurity along the northern coast of Australia

The thousands of kilometres along the northern coast of Australia have only one major urban centre, the city of Darwin, which has a population of 100,000. The rest of the coast is sparsely populated, and it comprises the traditional lands of many different Aboriginal groups. Many of these Aboriginal groups remain on their ancestral land, continue to speak pre-European Australian languages, and continue to practise their traditional religion, art, and music, and traditional hunting and gathering practices in the environment. This paper is about these traditional knowledge practices and the ways in which the Australian Government has tried to enlist those knowledge practices for their work on biosecurity.

Three states share the northern Australian coastline: Western Australia, the Northern Territory, and Queensland. Much of the northern coast is very inaccessible, some of it because it is flat and flooded for up to six months a year, and some because it is mountainous and rugged. It is generally not suitable for agriculture, so it has few roads and little of the history of European development and dispossession which can be found in Australia’s southern states.

Because of its proximity to Indonesia and other countries to the north, the risk of plant and animal pests arriving is often considered high. It has been estimated for example, that a single incidence of foot and mouth disease would immediately cost Australia $8 billion and 37,000 jobs would be lost, and eradication would cost another $6 million per day (Munro, 2007). Feral pigs and water buffalo are common along the north coast and if foot and mouth became established in the feral herds, eradication would take a long time if indeed it were possible.
Government responsibility to manage biosecurity in Northern Australia is under the control of a department in the federal Australian Government in Canberra, called the Australian Quarantine and Inspection Service (AQIS) which sits within the Department of Agriculture, Fisheries and Forestry. Within AQIS there is a small department called the Northern Australian Quarantine Service (NAQS) which is involved in border activities, scientific surveys, monitoring, and public awareness, working with Aboriginal people across the Top End of Australia. NAQS is involved in detecting pests through surveys and reporting, but not in community level management of pests. When a plant pest is found, NAQS notifies the Office of the Chief Plant Protection Officer (OCCPO) in Canberra. OCCPO then notifies the states, and the state agencies are responsible for dealing with the incursion.

The risk area could be roughly considered to be a 20 km wide zone running along the coast of Northern Australia including Western Australia and Queensland. The risk is from exotic plants, animals including insects, diseases carried by insects, and other diseases of plants and animals.

Because the task of keeping watch over such a large area of sparsely populated land is impossibly large, AQIS implements risk assessment practices, to develop best structures and strategies. Risks are considered in terms of particular species and particular geographical areas.

A list of high risk species has been developed. It includes fruit flies, mosquitoes and other insects, various plant diseases, animal pests and diseases, and weeds.

Risk categories are classified according to

- How they arrive – whether by wind, foreign fishing boats, mosquitoes.
- The chance of their establishing themselves in the local environments
- The chance of the pest or disease spreading to affect agricultural land and crops

AQIS has also developed categories of high risk areas. For example for plant pests, the Torres Strait, and areas around Darwin are high risk. Darwin has the highest risk of plant pests arriving with air and sea passengers, whereas the Torres Strait area is at high risk of incursions because cyclonic activity may introduce pests from New Guinea. (There are no banana or mango plantations in Cape York because the risks of infection being established in far north Queensland and spreading south are too great.) Other areas like the north Crocodile Islands, the north Wessel Islands and East Groote Eylandt are also considered to be high risk areas because foreign fishing boats often come ashore there.

In all the high risk areas, except for Darwin, there are very small populations of mostly Aboriginal people who live in small communities along the coast and on islands. This means that in most of the area along the northern coast, the Australian government needs to collaborate with Aboriginal people in their biosecurity work. Some coastal areas are cared for by local Aboriginal sea and land ranger groups. These people are involved in land care and sea care, in fire management over the vast areas which burn during the dry season, and they are increasingly involved in working with cultural and environmental tourism groups.
More recently the ranger groups have become involved in biosecurity through:

- The collection of blood samples from pigs and buffaloes, and sending them to AQIS for analysis.
- Debris management, mostly wood washed up on beaches which may harbour pest species. Here they look for termites and send samples to AQIS.
- The collection of mosquitoes, and larvae, particularly those species which could carry dengue fever. The rangers set up traps in the swamps and catch larvae for testing.
- Trapping of fruit flies to be sent to AQIS for identification.
- Reporting unusual ant species, weeds, and plant diseases.

In places where there are ranger groups, the government’s work is much easier because, through the rangers, they have access to local knowledge and infrastructure (roads, tracks, boats, 4-wheel-drive vehicles). However, much of the coastline is unpopulated and many of the communities do not have ranger groups, so negotiations for access and support are more difficult in some places.

**Aboriginal knowledge and the ecology in northern Australia**

The population of Australia is about 20 million, of whom 400,000 are Aboriginal. Most Aboriginal people on the northern coast speak traditional Australian languages and little English. Each language is seen by its owners to belong to particular areas of land. People who share land and language are said to belong to the same clan or tribe, although the ways in which Aboriginal languages divide people up into groups is very complex. While they speak many different languages, they do share some key aspects of their social, religious, economic and political practices.

Aboriginal creation stories are not stories about how the world was made. They are stories about how the world took on its shape and character as we know it, as the creating ancestors moved across the land and sea singing, crying, dancing, fighting, performing rituals, and leaving signs of their work in the shapes of the land, the hills and rivers, the rocks and waterholes, the species, and the different groups of people and their languages and social, religious and economic practices.

As the ancestors moved across the country, they changed their languages as they came to each new place, so in the Aboriginal world there are many different languages. To be able to speak your traditional language strongly and clearly, and to sing its songs, and tell its stories, is a key part of knowing your environment, and an important sign of your rights and authority to speak on behalf of particular areas of land and their histories and the species they contain.

In Aboriginal philosophy, language, place and identity are always strongly linked. Often noticeable features of an area of land or sea are taken as the identifying totem of a particular group. As with Balinese culture, where not only is it the case that what holds to
be true in one village, may not hold to be true in another, but it is those very differences in situated truth which produce Balinese identity (Lansing 1974).

The situated nature of Aboriginal knowledge give rises to some distinctive understandings of the nature of knowledge which I will outline below. In Aboriginal philosophy, knowledge is seen to come out of the routine practices of everyday life and makes those practices possible. Knowledge is more associated with embodiment than with one’s head or brain. Knowledge is something you do, rather than something you have. For example the Yolgu word ‘to know’, carries the meaning of knowing how to do something, rather than knowing about something.

Knowledge comes from place and relates people to place in their everyday lives in what Karertji (2007) calls a ‘bounded rationality’. When it is abstracted and generalized, as in a government database of pest species, it loses some of its connectedness, its accountability and its local usefulness.

Aboriginal knowledge is owned. People with rights to land have rights to tell its stories. The right people must tell the story, it is not free for everyone to tell, but owners can give permission for their stories to be used by others under particular conditions. Traditional laws and acceptable practices that govern knowledge use are local and need to be understood and negotiated at the local level. They often work in quite different ways from Australian laws covering intellectual property.

Aboriginal knowledge is collective. It is owned and performed by groups of people, and embedded in languages, social practices, structures, and performance traditions, as well as in the physical features of their land, its species, and other ‘natural’ phenomena. Social groupings are constituted through shared knowledge, and Aboriginal identity depends as much upon practices of exclusion – ‘I am who I am because I know what you don’t know’ – as it does upon sharing and inclusion.

Aboriginal knowledge is responsive, active, and constantly reconfigured. Creation stories are constantly renewed, and often refer to introduced species which have not been in North Australia for a long time. For example the island of Milingimbi was visited for hundreds of years by trepangers from the north, from an area known today as Udjung Pandan or Macassar. The Macassans brought the tamarind tree which grows in many places along the north coast, and Aboriginal creation stories refer to the island’s beach as created by a totemic barramundi which turned into a giant tamarind tree still standing today.

In the twentieth century, most of the Aboriginal people in Australia, including along the northern coast, were brought in from their traditional lands and settled in communities – mostly Christian missions, cattle stations and government outposts. Still today, most Aboriginal people live in communities which are not on their traditional land, and which are governed by community councils which do not reflect traditional systems and practices of governance. This causes ongoing problems for Aboriginal people trying to keep their traditional cultures alive. For example, a community council may be happy to grant a government department like AQIS access to remote places to do biosecurity surveillance, but the traditional custodians of the land may not be represented on the
council, so under traditional law the council has no right to grant access. These local government structures sit awkwardly between the national and the clan-family levels, and exercise a sort of ‘power-oriented’ practice mediating between the national/international ‘principles’ (above them), and the ‘purpose orientation’ of the traditional owners caring for country on ancestral land (below them). (See Fig 1 in Karetji, 2007)

In places such as Bali, the subak represents a traditional administrative structure which can respond effectively and authoritatively to approaches from the state and national governments (Lansing 2006). In other places in Indonesia however, the situation may be more like that in northern Australia where bureaucratic systems have been mapped over traditional governance structures, and marginalized them. The Balinese may therefore be in a better position to engage their traditional knowledge practices in the regional and national work of biosecurity than other Indigenous peoples in other parts of the archipelago.

The coming together of two knowledge traditions for biosecurity work

Much of the knowledge work which Australian Aboriginal people do is invisible to the authorities, and much of the knowledge work which the agencies do is hidden from the traditional owners of the land. Collaborations between traditional knowledge and government knowledge always involves a good deal of misrecognition. However, there continues to be considerable good will between AQIS and Aboriginal groups, some interesting collaborations have emerged, and much work is going on to strengthen those collaborations.

James Scott’s book Seeing like a State (1998) talks about how the work of nation building depends upon certain practices of making and using knowledge which inevitably involve ignoring other forms of knowledge. In particular, forms of knowledge which can be absorbed into a wider system are valued, and thus receive more recognition and more funding. Knowledge which is local, intuitive, or unable to be expressed in words is relatively devalued. But it is often highly significant. Scott uses the contrast between the general knowledge of navigation with the particular knowledge of piloting. Each time a large ship approaches a port anywhere in the world, the controls are handed over to a local knowledge holder known as the pilot. What the pilot knows are the local cycles of winds and tides, throughout the year and throughout the day, the local traffic conditions, hidden rocks and currents—not to mention the local politics and economies of the port. Some of the pilot’s knowledge could be abstracted and made useful elsewhere, but generally its value is its complete specificity, its embeddedness in this particular waterway at this particular moment. Some of it could be verbalized, while some of it is incomunicable. This sort of practical, intuitive knowledge is always at work while Aboriginal people are out on their land ‘caring for country’. It is a rich and significant knowledge often tied to religious and political practice, expressed through very complex languages, and incomprehensible and irrelevant to most white Australians.

Yet this knowledge is key to the observation of subtle changes to the biota in an expansive environment, for example changes to bird populations and movements,
changes in the marine environment and its resource. The local knowledge of Aboriginal
people even make it easier for them to understand and predict the behaviour of foreign
fishermen who have their own bounded rationality, their own ancient understandings and
practices around the Arafura Sea whose shores they share with their Aboriginal
neighbours. So despite the deep impenetrability of their knowledge to a western
knowledge practice, Aboriginal people are in a much better position to discover and
report threats to biosecurity than the handful of botanists, entomologists and plant
pathologists who try to cover the high risk areas with occasional very expensive
expeditions.

Aboriginal Sea Rangers are in a better position to find foreign fishing vessels and the
plants, mosquitos, and termites they may leave behind, than are the very expensive
survey planes which fly the coast looking for foreign boats. The problem is how to get the
government agencies to recognise, support, benefit from and pay properly for Aboriginal
knowledge. Ranger groups have recently been lobbying the federal government in
Canberra unsuccessfully for a greater role in marine surveillance (Munro 2007). It seems
that national security reasons may explain part of the government agencies’ reluctance to
give more responsibility for biosecurity surveillance to ranger groups. It is not only the
Aboriginal people, but the government itself who uses secrecy as a political strategy.
Karetji’s analysis of the Indonesian context points to a similar phenomenon where
national stakeholders are sometimes reluctant participants in reforms proposed
internationally and embraced locally ‘because of the resulting shifts in power structures’.

Lansing (2006) wrote about the traditional ways in which Balinese people organised their
water at the local level which allowed its distribution to be equitable from the top of the
mountain to the sea. Along rivers in Bali, small groups of farmers meet regularly in water
temples to manage their irrigation systems as they have for a thousand years. Over the
centuries, water temple networks appear to have expanded to manage the ecology of rice
terraces at the scale of whole watersheds. While each group focuses on its own problems,
a global solution has nevertheless emerged which optimizes irrigation flows for everyone.
Clearly there was no ‘top-down’ implementation. Bali’s water temple networks emerged
from a self-organizing process. Furthermore, those informal, organic systems were
threatened when international development projects started working at the larger scale,
ignoring the sensitive ongoing collaborations which had evolved to succeed at the very
local level over many generations.

Similar practices for the intergenerational transmission of Australian Aboriginal
ecological knowledge work are also under threat by a national and international
bureaucracy which may fail to recognise them. Just as the state agencies are careful about
who has access to their information, so do Aboriginal people have quite complex systems
of access to land and knowledge which the state agencies need to recognise and access if
collaborations are going to work and traditional knowledge practices kept alive.
Knowledge is a social as well as a political phenomenon. Often the people in charge of
the small local councils on Aboriginal communities are not the owners of the beaches and
islands which are biosecurity ‘hot spots’. Some Aboriginal people live in very remote
areas which don’t have government or nongovernment originations to negotiate on their
behalf. The work of surveying and reporting plant pests is completely bound up in the
work of negotiating access and permission, and establishing good relationships for ongoing dialogue and communication.

Every location has a different network of ownership and custodianship, a different history of colonization, a different relation to local state and federal government, different configurations of natural, social, political, human, built and financial capital (Flora, 2007), a different configuration of biosecurity risk and different problems of access and surveillance.

Conclusion

It is difficult to imagine two more different settings for biosecurity work. Bali is fertile, intensively farmed, densely populated and enjoys regular rain. Northern Australia is more like West Timor – mostly arid, mostly unfarmable, sparsely populated with an intense wet season and a long dry season each year. In the dry season fires sweep across the land, and Aboriginal people have complex techniques for managing biodiversity through the careful use of fire. So the strategies for biosecurity in Australia and its northern neighbours may well be quite different, however sharing ideas and experiences we may find significant common ground.

In sparsely populated Northern Australia, it is extremely difficult to control an incursion of a serious pest over such vast areas. However NAQS demonstrated ongoing efforts between the government agencies and Aboriginal land owners to improve biosecurity practices and create paid work for remote Aboriginal communities. NAQS has taken seriously the need to build trust and reciprocity (Flora, 2007) as a first step to community level biosecurity work.

The way ahead begins with a more formal recognition of the value of having Aboriginal people on their country, looking after it and keeping it healthy. The potential cost of a biosecurity disaster should motivate governments to provide financial and infrastructure support to people on country, especially in high risk areas.

But it is not quite as simple as that. Aboriginal social and political organization is complex and flexible. Many places don’t have ranger groups and where they do, the rangers may not belong to the right groups to be able to get access to land or observations. The second step the government agencies must take after deciding to invest in the engagement of Indigenous knowledge work in biosecurity, is to begin negotiations in each place to find the best most sustainable but most flexible structures for collaboration, which engage and support the traditional governance structures which are still in place, while at the same time fulfilling the information needs of the government in Canberra.

This entails efforts to support the sustainability of ancient knowledge practices and the cultural, economic and political practices which sustain them. As in Indonesia these Australian Aboriginal knowledge resources are ‘not yet seen as a significant national asset’ (Karetji, 2007).
As Kareti argues, the international, national and local agendas don’t need to be aligned for communication to work effectively to maintain biodiversity, and the better the communication works, the better the chance of each group understanding the agendas of the others.

References


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1 A notable exception is the Larrakia people who are the traditional owners of the land around Darwin and whose experience of colonisation is such that young Larrakia children today grow up speaking Aboriginal English.

STRUCTURE AND PROCESS IN FACILITATING COMMUNITY ACTION IN BALI

Dr. Sang Putu Kaler Surata
University of Mahasraswati, Denpasar, Indonesia

Abstract

Both the structure of community leadership and organizations, and the processes they undertake in pursuit of a common purpose, can have a positive or limiting role in facilitating working relationships and collective community action. These findings are the result of the exploration of the structure and processes at work in two communities in Bali, referred to as villages A and B. Data were collected through interview and informal conversations with the local leadership figures and many other community members. In village A there is an ‘institution of deliberation’, called Badan Musyawarah (BAMUS) in Indonesian. This institution acts as a bridge between government leadership and community leadership. BAMUS plays an effective role in maintaining the synergy between top down and bottom up approaches and strategies. However, village A faces a ‘problem’ in that the outsiders living in this area are almost equal in number to the indigenous population. This fact highlights the need for developing a strategy to optimize the balance between structure and process in order to integrate the outsiders and insiders in collective action. In village B, there is also an institution of deliberation, however, this institution does not work effectively for the community. The status quo remains because there is no institution that balances the activities and decision-making of government leadership and community leadership. The results suggest that, at this site, there is a tendency for the top down (government leadership) approach not to complement the bottom up (community members) approach. Therefore, it is suggested that it is critical to develop strategies to strengthen both structure and process in facilitating community action.

Introduction

Hindu communities in Bali have several traditional organizations. Neighboring families group themselves to work collectively in community organizations called banjars. Banjars operate on the principle of mutual understanding as well as helping each other to finish different projects. Some banjars unite themselves into a bigger community and form a village (desa) surrounded by some public places such as a traditional market or a meeting hall. A special tower in the community centre is the place for the kulkul, which is a wooden drum. The kulkul is an old communication tool which is still used to spread basic information long distances between Balinese communities, schools and community health centres. Either the banjar or the desa constitute the basic government unit and have a spirit of communalism and democracy as well. All decisions are made on the basis of community consensus. A desa has at least three temples –Puseh Temple, Desa Temple, and Dalem Temple that symbolize the unity of three Hindu Respected Gods for each function of creating, maintaining and destroying the world. Another well-maintained
Balinese association is the subak, the agricultural organization for irrigation that controls water flow and usage among its farmer members. This is another communal organization within a Balinese community.

Many scientific surveys as well as media publications demonstrate an interest in presenting banjar, subak and other traditional Balinese organizations as important, but only a few discuss structure and process within those traditional organizations. In fact, both structure and process play critical roles in facilitating collective community action. Falk et al (2006) has found the potential benefit of structure and process as essential factors in facilitating relationships and productive collective action. Lansing (2006) finds that networking within many Subak Temples in Bali not only provide practical benefits in managing the water system but also in the management of rice paddy pests and diseases. This paper is intended to explore the structure and process of local leadership within two Balinese communities as they potentially affect community effectiveness in pest and disease management.

**Literature review**

According to Woolcock (2002, p22), social capital provides “the norms and networks that facilitate collective action”. This capital includes horizontal and vertical association among people, including social working relationships within and between groups which effect the community’s productivity and prosperity. Ostrom (2000) states that social capital not only includes communication and interaction but also the risk of conflict as well.

Flora (2004) mentions that there are seven capitals, i.e. political, cultural, financial, natural and human capital. Social capital is also claimed to facilitate collective action to provide shared benefits (Woolcock, 1998; Isuma, 2001). A community that has high potential for social capital will be able to work collectively for achieving their goals (Krishna, 2003).

Structure in this research refers to the organization of government leadership as well as community leadership that determine the obligation and authority of each person within the organization. Process constitutes the mechanism of decision making by particular organizations. Both structure and process co-create each other (Boden, 1994). Co-construction occurs when the process of interaction creates structure and, simultaneously, the structure creates the process. For example in village A, the need to integrate government leadership and community leadership resulted in the establishment of a new institution, known as BAMUS, in which the members are government leadership, community leadership and community people. The existence of BAMUS facilitates decision making processes with both top-down and bottom-up approaches. Structure and process therefore play essential roles in collective action. The structure of an organization defines role in transforming those five capitals to goals, such as food, jobs, prosperity, schools, growth of economy, clean environment, decrease in crime, and better health. In turn achievement of these goals will support the development of capitals. On the other hand, some unexpected outcomes, such as, pollution, increase in crime and social conflict, may decrease the capitals (Pretty, 2003).
Process is an interaction between co-participants. Interaction can be between people or things (for example, computers and reference books). The output of interactions is often in the form of text, conversation or non-verbal communication, inspired by the aim, value, and purpose that is tied to the participation of people (Falk and Ballati, 2004). In addition, process encourages changes (Falk & Kilpatrick, 2000). Changes include knowledge acquisition, skills and capacity to obtain new attitudes and values (Bloom, 1956). Finally, the role of leadership is inseparable from the existence of structure and process in collective action to transform various social capitals for the sake of collective goals. Leadership is often defined as those who have more strength, yet it is also defined in more general sense as facilitating successful collaboration among those who bring changes in communities, groups and organizations (Bergstrom et al., 1995). Furthermore, Langone and Rohs (1995) insist that an individual in the environment of a community will not be able to control a group of people. Thus, leadership is divided among many individuals at different times, depending on the situation and skills required.

**Research method**

This research utilizes qualitative methods (Creswell, 1998) to study the organization, structure and process of making decisions in relation to the organization of two local communities in Bali. Semi-structured interviews (Fontana, 2002) are used and the data is analyzed based on forms of conversation analysis (Silverman, 1998).

The research in Bali was undertaken in two villages, referred to as Sites A and B. Site A is a coastal tourist village, about 10 km northwest of a major city. This village is 305 hectare in area. This site is used for several purposes: for houses and tourist accommodation such as hotels, bungalows and resorts (199 ha), dry fields (88 ha), and rice paddy (irrigated rice fields) (8.7 ha). The remaining area is used for public facilities such as streets, schools and cemeteries. Site A and change throughout population at the end of 2005 was 3331 persons, more than half (57.4%) of whom earn money from trading and industries (Central Statistic Bureau of Badung Regency, 2006).

Meanwhile, Site B village is located in the country side of Bangli Regency, about 60 km northeast of Denpasar. The village is 1200 ha, used for gardening (778 ha), rice paddies (176 ha), dry land (91 ha), house yard (48 ha) and public facilities. The population is 7829 and more than half (64.9%) work on farming land and looking after cattle (Central Statistic Bureau of Bangli Regency, 2006).

The inhabitants of Sites A and B each form a ‘community’, either because of common characteristics – such as religion, language and tradition- or because they were born in the same place and live together (ABS, 2002; Ridjal, 2006; Trianto, 2006). For the sake of ease of reading, in this paper is the term community leadership is shortened to CL, and these are the people who are elected by community members. Government Leadership is abbreviated to GL. These people’s work is based on government policy.

Data were collected over two months, April to May 2007, with in-depth interviews of people in local leadership, either government or traditional leadership and informal
community leadership as well. The questions were based on aspects of leadership, decision making and problem solving, as well as on the working relationships with government institutions, community self-help, the general situation of the village and youth organization, and community participation in collective action.

Besides utilizing in-depth interviews to gather qualitative data, data were also gathered for quantitative analysis using a structured questionnaire, a combination of open and close questions that were given to selected community members. This method was utilized in order to characterize the representatives by age and employment. The questions given to the interviewee included information about land ownership, pest and crop diseases, communication and level of relationship within the family and others, and also the participation in collective work. There were 123 interviewees, consisting of local people, outsiders and tourists (Table 1). The quantitative data will be reported in separate paper.

Table 1. Qualitative data sets collected from Sites A and B for research into the role of community in the management of biosecurity

<table>
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Results

**Government Leadership and Community Leadership**

The structure of government leadership at site A consists of a village head who is assisted by a general secretary and several assistants while at the level of sub village (banjar), a village head has three assistants, called kaling. A village head is not elected by community members but is directly appointed by local regency government, while kaling are appointed by government upon the agreement of community.

The structure of community leadership at site A consists of a traditional village head (bendesa adat) who is assisted by a secretary (penyarikan), treasurer (petengen), and general affairs officer (kasinoman). The traditional sub-village head (kelian suka duka) takes care of family events and coordinates communal activities for mutual benefit. Such events include various traditional ceremonies to be held because of marriage, birth, tooth filing, family shrine activities and death. Community leaders are elected by community members. At site A, as in other Balinese villages, there are three temples that are used for
religious purposes by the community. These are always called the Dalem Temple, Puseh
Temple and the Desa Temple.

A unique feature of Site A is that there is an institution that acts as a bridge between
government leadership and community leadership. This ‘institution of deliberation’ is
called the Badan Musyawarah, or BAMUS (refer to Figure 1A below). Members of
BAMUS include community leaders, village heads, head of the community
empowerment institution, all of the environment heads, the traditional Banjar head and
some community representatives.
The structure of government (GL) and community leadership (CL), with and without institute of deliberation (BAMUS). Lurah is the head of GL at village level located in an urban area, while kepala desa is the same position as lurah located in the rural area; kaling and kadus are heads of GL at banjar level, kaling located in urban and kadus in rural areas; bendesa adat is the chief of CL at village level while kelian suka-duka at banjar level.

Meanwhile, the structure of GL in site B consists of a village head assisted by a general secretary and several administrative departments. At the level of sub village (banjar), a village head is assisted by a sub-village head for each sub-village. There are 10 sub villages. Both the village head and sub-village head are elected by the community. However, a sub-village still needs approval from the government after the election.

The structure of community leadership at site B is divided into 10 traditional village heads, 1 head for each banjar. It is similar to the structure at site A, the head is assisted by secretary (penyarikan), treasurer (petengen) and news teller (kasinoman). There is no coordinator for those 10 traditional village heads as shown in Figure 1B. It also demonstrates that there is no institution that has the purpose of balancing the activities and decision-making between government leadership and community leadership. That balancing is not achieved although there is a Village Counselor Committee established in this village. The members of this committee are a community person, political party representatives, teachers and priests.
There are 5 traditional villages (Figure 1B) at site B, namely Manikaji, Karangsuung Kaja, Karangsuung Kelod, Tampuagan and these are coordinating with each other, because of they share one Dalem Temple and cemetery.

**Bottom-up and top-down processes**

At Site A, government policies are adopted with the approval of BAMUS. The village head here always coordinates with BAMUS whenever new policies are proposed. For example, the policy concerning ‘outsiders’ (residents and visitors who were not born in the community) and the prevention of dengue fever. One of the new activities that has been conducted by the Community Empowerment Institution at Site A is a training program involving unemployed youth who are interested in working in the tourist industry. The first group to complete this training has found jobs in hotels, restaurants and other tourism facilities.

Meanwhile, community leadership has also succeeded in coordinating the construction of a multifunctional building named Wiswa Budaya. Planning for building construction began at regular meetings (paruman), usually held every 35 days at the level of banjar. After discussion in paruman, the idea was discussed at meetings (Samuan Tiga) held three monthly. These meeting are attended only by members of BAMUS and the priest. The decision is finalized at Samuan Tiga Agung, a routine meeting usually held before Nyepi Day (Silent Day). All of the family heads of the traditional community (670 families) in Site A village have to attend the meeting. The policies adopted at the meeting require the members to comply. The multi-function Wiswa Budaya was built in two and a half years with a budget of 3.5 billion rupiah (approximately $ US 400,000) and serves as the office of village community crediting, kindergarten and meeting hall, among other purposes.

At the same time in Site B, the government policies as well as decisions of GL at the village level are implemented without any prior consultation with community members, since there is no institution that acts as a “bridge” between GL and CL. This lack of consultation threatens the implementation of government policies at the community level. In fact, the existence of Badan Penasehat Desa (Village Counselor Committee) neither involves the members of CL nor works optimally for the community. In this case, the top-down approach is not properly equalized or balanced by the bottom-up structures and processes. The community has not established a mechanism that provides a forum for participation in making decisions and for overseeing the implementation of policy implementation.

Furthermore, the implementation of the policies becomes more difficult since the community does not fully trust GL. This lack of trust is evident in the data, and is exemplified in the case of the government funding for looking after cattle. This government funding is not distributed through a forum to select the community members to tend the cattle. It was decided by GL without any advice to, or consultation with, the community. Information about the right to look after the cattle was not widely circulated. The information was restricted to either individuals or groups in the GL (in the level of
village). This case differs from the previous policies taken by CL and decided at community meetings (paruman) in which community members were given some opportunity to look after cattle.

Some policies of CL in Site B Village, on the other hand, have been effectively implemented. It is evoked by the pattern in decision making utilizing a bottom-up approach which is firstly socialized at community meetings (paruman) and then the decision is made in the next meeting after getting the approval from the whole community. The social sanction, kasepekang (the sanction of community exclusion in various community activities), strongly influences the community members, therefore, they are anxious not to defy the collective decision which has been made through paruman. The effectiveness of CL at this site is evident through the success of building a particular place for traditional music (gamelan) named Bale Gong. The community worked cooperatively then collected about Rp 65 million (approximately $US 7500) for the building. It was a self-funded building that was the result of effective implementation of a balanced top-down and bottom-up approaches.

A similar example occurred in another village within Site B about three years ago when the community celebrated a major temple festival in Dalem Temple with a self-funded budget of Rp 250 million (approximately $US 29,000).

Discussion

The case of CL in both sites demonstrated a multi-layered governance systems that can match social and ecological structures and processes operating at different spatial and temporal scales (Folke et al., 1998b; Berkes et al., 2003). It also showed flexible, learning-based management systems that can deal with the change and uncertainty inherent in social-ecological systems (Olsson et al., 2007)

Structure and processes in Site A village are effective in “problem solving”. However, Site A faces a ‘problem’ in which the outsiders living in this area are almost equal in number to the indigenous inhabitants. The existing structure and processes are more focused on top-down and bottom-up synergy with the local community. This fact suggests the need for developing a strategy to optimize the balance between structure and process in order to simultaneously integrate both the outsiders and insiders in collective action. One of the strategies is to develop social capital mainly in the form of a set of bridging interactions. The research outcomes of Sangina et al. (2007) showed that social capital in the form of structure and bridging interactions have a high capacity for solving conflict, that in many cases were ended through mediation and negotiation between groups.

Meanwhile, it was found that there was imbalance between CL and GL in Site B Village. There was harmonious synergy in which top-down and bottom-up approach implemented dynamically in both structure and process for CL, that on the other hand, it did not occur for GL. As a result, it has lead to a negative perception of GL. Apparently this phenomenon does not only emerge in Indonesia, but other countries as well. Falk et al. (2006) found that there is also negative perception from the community to the Australian
government in terms of consistency, clarity and transparency. The results of this research confirm those also found by Berkes (2002) and Bawden (1994), that the leadership in Site B demonstrates that the structure of a particular institution is able to threaten the process of self-organization which includes commitment and local initiative, yet a part of it still encourages diverse thinking and ideas as well as contributing to overcome the environmental problems. There is a tendency that GL is centralized, simple and big scale, therefore those categories of authority do not have the capacity to respond flexibly (Ostrom, 1988). On the other hand, the structure of CL is poly-central and will encourage more innovation and experimentation. At the same time it also provides opportunities for individuals and organizations to explore diverse ideas in order to enhance problem solving potential (Imperial, 1999).

The research therefore indicates that it is important to develop a model or strategy that allows others to plan and implement a synergy of structure and process in either GL or CL to facilitate collective action. Both research sites illustrated the need to identify capacity and needs of a community in facilitating collective action. The appropriate strategy will empower the community to utilize existing strengths to address needs (Craig, 2005). The need for such an approach is supported by Evans (2007) who stated that synergy will be easier to strengthen in a community that is formed on egalitarian social structures. Olsson et al. (2007), suggests that GL, as a part of the central governmental authority, should create a space to promote the process of self-organization and collaborative learning. The ability to self-organize seems to be a critical characteristic in developing flexibility in a social ecology system such as found in these Balinese communities (Berkes et al., 2003; Gunderson and Holling, 2002).

**Summary, conclusions and implications**

The findings emphasize the mutually enriching relationship between structure and process. The leadership that is reflected in BAMUS in Site A Village encourage the emerging synergy between top-down and bottom-up approaches in making decisions for collective action, and therefore such a body (structure) would form part of a model or strategy where planned interactions (processes) would assist in harmonizing the dynamics of top-down/bottom-up forces to achieve more effective responses to change. This need is confirmed by the lack of such a body in Site B, where there is no such organization that acts as a mediator between GL and CL. Site B also lacks a set of planned processes for achieving harmonisation of top-down/bottom-up, resulting in an *ad hoc* set of outcomes depending on the event. Put another way, the emerging results suggest that, at this site, there is a tendency for the top-down approach not to be properly equalized or balanced by the bottom-up approach. Thus, it does not effectively facilitate collective action.

Findings about structure and process have strong implications for community-based management of biosecurity. To effectively manage biosecurity at the community level, community collective action is required in preventing incursions and spread, decreasing the threat, and managing the impact of new diseases against human, animals and plants as they occur naturally, deliberately, or coincidently (Murch et al., 2005). The effectiveness of community management of biosecurity is determined by a synergy between top-down and bottom-up approaches. Finally, it is obvious that structure and process in the
community determine the level of synergy of top-down and bottom-up approaches. In order to develop a model or strategy to promote effective biosecurity management, a community development plan would need to be developed. First, this plan would audit existing structures and processes. Then a comprehensive plan to address any imbalance in structure and process for that community would be collaboratively developed. Such a plan would be based on the community’s existing capacity, including its local wisdom and indigenous knowledge.

Flora names seven capitals *i.e.* social, human, natural, cultural, financial and political capital. Not included in these capitals is the existence of organizations in the community as a resource or capital. It is clear that the existence and nature of organizations in communities provide a basis for developing a management plan for biosecurity. I tentatively propose a new form of capital, *i.e.* ‘organisational capital’ at this early stage of the research. Its importance in this research and its lack of explicit mention in Flora’s work clearly indicates the need for more research about this component of the findings.

References


A COMMUNITY APPROACH TO BIOSECURITY IN A REMOTE AUSTRALIAN REGION

Paul Royce
Charles Darwin University, NT, Australia

Abstract

‘How do communities engage with new knowledge?’ This is the research question posed by a PhD student based in an irrigable agricultural community, grappling with concepts of community engagement and participation in biosecurity.

Every community is different and as such, relies on unique and distinct methods to transfer information across all areas of its population. Local residents and organisations within these communities can access new knowledge through fairly traditional and predictable mediums such as brochures, detailed reports, the internet, newspaper articles and the radio, while others prefer a more personal means of exchange. Because of the size, diversity and transience of its population, local people living within this northern Australian community depend more on their social networks and personal relationships to provide trusted and reliable sources of information. As a result, this research project will explore the key concepts that connect both Indigenous and non-Indigenous people and the manner in which shared ideas, knowledge, experience, energy, cultural beliefs and traditions build the capacity of individuals, groups and the community to address local issues. Initial research results provide a detailed description of how new knowledge is (or is not) exchanged across different community sectors in order to learn from one another and instigate change.

Introduction

In 2005, Charles Darwin University teamed with a primary industries association from an irrigable agricultural community to receive funding from the Cooperative Research Centre for National Plant Biosecurity to support a doctoral study on ‘Biosecurity through Community Engagement’. The project commenced in February 2006 and aims to determine the most effective manner in which local people living in and visiting the community learn, exchange information and take up new knowledge using the principles of community engagement.

This article will provide a brief overview of the preliminary findings and emerging themes from this research with a particular focus on the way in which information and new knowledge is gathered and shared within six different sub-groups in the town. These include people associated with primary industry, government departments, Indigenous groups, tourism as well as young people and other local residents. The project will also

3 Biosecurity refers to those strategies and actions that reduce the risk of a biological incursion (insects, disease and/or vegetation) impacting on a specific area at a local, regional, state or national level.
apply the theoretical concepts of community engagement and learning communities to support these findings together with a detailed review of literature in the areas of community, social capital, informal learning and communities of practice. Conversations, observations, interviews and community participation will provide a particular insight into how local people engage new knowledge through their involvement in local activities, relationships and the capacity to work independently or together to achieve a common goal.

The town on which this research is based is located in the north-eastern corner of Western Australia and has a diverse population of some 6,000 people\(^4\), 35\% of which identify as Indigenous\(^5\) (Taylor, 2003). Though the area is remote (in terms of its proximity to the state’s capital city of Perth), the area maintains several local industries (agricultural, government, Indigenous, mining, service and tourism) that provide significant employment opportunities in a range of different skilled and unskilled areas. There are three distinct climatic seasons including the dry\(^6\), the build up\(^7\) and the wet\(^8\), which greatly influences the level of tourist and agricultural activity. As a result, the town has a transient population with some industries specifically relying on a short-term work force in the dry season (fruit picking, tree planting and hospitality) while others have a high turnover of staff as employees gain short term\(^9\) experience in an isolated area that may elevate future career prospects (teachers, police officers or other government employees).

Though the town supports a transient population, it also maintains a strong sense of community, which is typified by the establishment of close relationships between individuals and groups, participation in neighbourhood activities and the communal attitudes of reciprocity\(^10\), partnership and collective action\(^11\). As such, local people have immediate access to information, particularly through their social networks, though many are selective as to where they source new knowledge and the credibility they deem it to have. More importantly however, information needs to be of interest or relevant to the livelihood or lifestyle of local people before it is taken up and interpreted as new knowledge, which is particularly relevant in the area of biosecurity.

Even though there are significant resources and information available about biosecurity, local people tend to show minimal interest in the surveillance and reporting of biological threats in the region. This is especially evident when comparing the strong participation of local people in programmes to eradicate cane toads (*Bufo marinus*) as an

\(^{4}\) This number doubles in the (dry) tourist season

\(^{5}\) This figure is expected to be higher as Indigenous people relocate to the town from outlying communities during the wet season while many (transient) others are not recorded by traditional (government) forms of data/statistical collection.

\(^{6}\) April to September – warm days, cool nights and no rainfall (tourist and primary growing season)

\(^{7}\) October and November – very hot, humid conditions with the possibility of rainfall

\(^{8}\) December to March – warm temperatures with tropical/monsoonal rainfall

\(^{9}\) Two years is the common length for a posting

\(^{10}\) In this setting, reciprocity refers to an informal though mutually beneficial exchange of positive actions that can bring about increased levels of public good and social cohesion.

\(^{11}\) High community participation in local initiatives such as sporting groups, volunteer fire brigades, school committees, environmental organisations and social events.
environmental strategy, compared with weak participation in those proactive measures intended to reduce the risk of other biological incursions in the immediate and broader agricultural district. Though there have been a number of biosecurity strategies in place over a period of time, the local region has encountered regular biological incursions (of differing levels of seriousness) over the past ten years; the last being in late 2007.

**Literature Review**

This project focuses on the theoretical positions of community engagement and learning communities to determine the most appropriate means to connect and activate a small but very diverse population. In doing so, attention will concentrate on the critical concepts of community, social capital, informal learning and communities of practice.

Assigning a definitive meaning to community can be somewhat challenging as the concept is broadly used by many individuals and institutions in a range of different contexts (CDCP, 1997; DSE, 2006; Hashagen, 2002; Ife, 2002; Mistry, 2007). In its most uncomplicated form, community 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 (de Beer and Sewanepoel, 1998; Henderson & Thomas, 2002; Hooper, 2006; Howarth, 2001; Ife, 2002; Kenny, 1999; Muirhead, 2002). However, community is much broader than a simple collective of people and relates more to the interactions and connectedness that occurs between individuals and groups. It can also be a space where people establish relationships and social networks based on their shared interests, experiences and relations (Kenny, 1999) and develop a specific sense of belonging, value, identity and acceptance by others (Ife, 2002; Muirhead, 2002; Wills, 2001). Community also refers to the ability of its members to have any number of individual and collective needs met through its local resources (Kenny, 1999; Muirhead, 2002). Parisi, Grice, Taquino and Gill (2002) recognise that the effectiveness of a community to meet these needs is central to its ability to maintain and enhance the wellbeing of a local population. However, all communities are not homogenous and can only address local issues with the specific social resources (or social capital) available (Brough et al., 2006; Ife, 2002; Kilpatrick & Abbott-Chapman, 2005; Parisi et al., 2002).

There are many different views of what social capital is and what it does (Kilpatrick & Abbott-Chapman, 2005). The OECD recognises it to be those “networks, together with shared norms, values and understandings, which facilitate cooperation within or among groups” (cited in Edwards, 2004, p.5). Though there is some debate over its definition, many agree that the essence of social capital is based on quality social connections that bring mutual relationships of trust, reciprocity and cooperation (Cuthill, 1999; Edwards, 2004; Fukuyama, 1999; Henderson & Thomas, 2002; Kilpatrick & Abbott-Chapman, 2005; Productivity Commission, 2003; Stone & Hughes, 2002). These strong social networks therefore provide greater opportunities for individuals and communities to access and utilise local resources to achieve a varying degree of specific, collective and mutually beneficial goals (Bregendahl & Flora, 2002; Fukuyama, 1999; Kilpatrick & Abbott-Chapman, 2005; Schuller, 2001; Stone & Hughes, 2002). Such an approach complements the idea of learning communities whereby groups of people, linked through
common location or shared interest, collaborate and work together to address the learning needs of their members (Kilpatrick et al., 2003).

With access to greater skills, knowledge and experience, learning communities enable new partnerships to be established that increase the capacity of the community to shape and manage its own future while promoting community regeneration, social cohesion and social, cultural and economic development (Kilpatrick et al., 2003; Kretzmann & McKnight, 1993). There are distinct parallels between learning communities and Wenger’s concept of Communities of Practice (1998), in that individuals have the opportunity to grow and learn from their social interaction with others and “engage in a process of collective learning in a shared domain of human endeavour” (Wenger, 2006, p.1). Communities of practice therefore develop around issues or activities that are important to local people, and result in practice and engagement reflecting what is real and important to its members (Wenger, 1998).

These perspectives of community, social capital and learning communities are central to the concept of community engagement, which can be described as a process of working with groups of people who are linked by geographic proximity, special interest or similar circumstance to address issues affecting their specific and communal well-being (CDCP, 1997; DSE, 2006; Hashagen, 2002; Mistry, 2007). They also recognise that local populations are diverse, which promotes the establishment of unique partnerships that encourage an open exchange of information and differing points of view. As a result, community engagement can present opportunities to establish various and new relationships between local people, groups and organisations that in turn, provide a platform for increased community learning, improved access to private and public resources and instigate change in policy, programmes and practice to achieve common goals (CDCP, 1997; DSE, 2006; Hashagen, 2002; iPlan, 2004; Tamarack, 2003). It is these views of community, social capital, learning communities and community engagement that provide the theoretical framework for this study.

**Methods**

This project is expected to conclude in early 2009 and as such, this paper will report on the progress of preliminary research findings rather than an overview of the larger study. Qualitative research will form the overall methodological basis for this project however, as a collective case study (Stake, 2005), initial attention has so far focused on the experiential knowledge of six sub-groups within the community and the social, cultural, political and economic factors (CDCP, 1997) that influence the manner in which individuals from within these groups gather and share new knowledge.

As a result, the initial data collection process has adopted a bricoleur approach (Stake, 2005) whereby a number of different methodologies have been considered to determine the most effective learning styles amongst people in the community, particularly those associated with primary industry, Indigenous groups, tourism, government departments as well as young people and other local residents. For example, interviews with Indigenous adults and Indigenous young people occurred in an outdoor, group setting involving food, general discussion and the support of an interpreter rather than the more
purposive style of interview that was used with government officers, primary producers, local residents and tour operators.

This paper will therefore draw on the data collected during the initial thirty one interviews of this project as well as some of the notable points to come from eighteen months of community observation, conversation and participation.

Phase 1 – Community Mapping and Literature Review
A community mapping exercise has been undertaken to describe and identify the local human and material resources, in particular the local people (socio-economic, demographical, cultural and ethnic characteristics), location (geographic boundaries), social connectors (shared values, interests, motivating forces) and power relationships (communication patterns, formal and informal lines of authority and influence, stakeholder relationships and resource flows) (CDCP, 1997). Much of this has been done through the observation, conversation and participation in community activities, groups, organisations and neighbourhoods.

Literature relating to community engagement and learning communities has provided a clear contextual and theoretical framework for this study. The combination of a mapping exercise and a literature review has been used to inform the direction and design of the project and triangulate data collected in phase two of the project.

Phase 2 – Data Collection
Data has been collected over an eighteen month period using interviews, observations, conversations, community participation and a review of relevant documents, reports and journals. Input and feedback from local people has been central to this project and reflects a range of effective models of learning and knowledge transfer across the community.

A minimum of forty five interviews will be held with up to ten representatives from each of the six specific sub-groups. To date, thirty one interviews have been completed with forty five people (across all target groups), which has provided detailed information about the social networks and effective learning techniques within each. This information will form the main basis of the project data.

Interviews with local residents and young people as well as those associated with primary industry, government agencies and tourism have been undertaken on an individual basis while discussions with Indigenous artists and Indigenous young people have been in a group setting. A further fourteen interviews have been scheduled with local school students (of varying ages), local Indigenous women, teachers, primary industry, backpackers and tourists (at caravan parks).

Phase 3 – Data Analysis
Data gathered collected from interviews, observations, conversations and community participation has been analysed during the data collection phase. Conversational analysis has been an important tool during this research with audio recordings (of interviews) allowing for a detailed qualitative description of the social interactions, structures and practices that exist within the local community (Perakyla, 2005). Once the data collection
process is complete, nVivo software will be used to ensure all key themes are identified in order to determine the most effective manner in which different groups in the community take up new knowledge and share information.

Though there is no definitive conclusion to draw from the analysis as yet, the data collected over the past eighteen months suggests three emerging themes that impact greatly on the manner in which information and knowledge is transferred across the broader community.

**Results and Discussion**

In order to arrive at the preliminary results in this report, a thematic analysis (Aronson, 1994; Boyatzis, 1998) was undertaken using techniques suggested by Perakyla (2005) and Silverman (2001). As such, data has been collected and analysed over the past eighteen months using active observation, conversation, interviews and participation in community activities, events, organisations and neighbourhoods.

Thirty one interviews have been completed out of an expected total of forty five. Eight have been with local residents, seven from tourism\textsuperscript{12}, six from primary industry, five with Indigenous people\textsuperscript{13}, four government officers and one young person\textsuperscript{14}. Those interviewed all have varied family and personal backgrounds, have lived in the town for mixed periods of time and maintain diverse professions and roles in the community. While there are some similarities across all six sub-groups, there are very few variations in the data collected from local residents, primary producers and government officers.

Of those non-Indigenous people interviewed, only one (young person) has lived in the area since infancy though was absent for the final three years of schooling. This indicates, together with data collected through observation and conversation, that the vast majority of local non-Indigenous residents have come into the town from other communities, many as individuals or single family units as opposed to extended family groups. Alternatively, almost all Indigenous people interviewed were born in the town and have lived in the community ever since. Two young people were born in a neighbouring town but all have vast family networks in the area and maintain significant cultural ties to the region.

While many non-Indigenous people come to the area to take advantage of work opportunities in local agricultural, mining, tourism, government and service industries, many choose to stay longer in the area because of the unique lifestyle they can lead. A warm climate year-round, regular employment, an abundance of water, quality fishing, picturesque landscapes, peaceful settings and good camping are a number of reasons why people remain in the region longer than originally anticipated. However, for Miriuwung

\textsuperscript{12} Including five tour providers and two tourists
\textsuperscript{13} Including two individual interviews, one group interview with six Indigenous artists/art workers and two groups of Indigenous young males
\textsuperscript{14} Though data collected from interviews with two groups of Indigenous young males is relevant to the sub-group relating to young people
people, living in the community is not a choice based on lifestyle comforts but more because of the strong connection to cultural protocols, spiritual beliefs and traditional laws, which generates a deeply ingrained sense of ‘belonging to country’ (or attachment to the land) (Jacob, 1991). This has been clearly demonstrated by the high respect assigned to elders from within the local Indigenous community (and some aspects of the non-Indigenous community), recognition of local protocols as well as the continuous relationship with traditional stories, laws, beliefs and culture that have existed in the region for up to 50,000 years (Jacob, 1991). As a result, Indigenous people are quite notably the most stable and least transient population group in the community.

The preliminary data collected during the initial eighteen months of this project has provided a significant amount of information. Below are the three main themes to emerge from this study thus far.

*The Importance of Social Networks*

One of the first and most notable themes to emerge from the study is the important role that social networks play in the lives of local people. Even with a fluid population, one of the more obvious conclusions to draw from the data is the existence of an overwhelming sense of community. Local people acknowledge the area to be close knit and welcoming, which allows social networks to develop around a number of different common connectors. The workplace provides a focal point for people to meet as do recreational activities, community groups, family gatherings and children’s interests (schools, sports and child care). However, even though these settings bring people together, there are a number of other specific personal characteristics that enable individuals to develop close and bonding ties with one another. For example, people tend to form friendships because they have like-minded social, moral or ethical attitudes, similar life experiences, family relations, comparable ages or longevity in the town or a similar interest in sports or outdoor activities such as fishing, camping, boating or four wheel driving. For non-Indigenous people who originate from other localities, these friendships offer the close bonded relationships that they would otherwise get from immediate family members if they remained in their original community. They recognise that these close ties and friendships are not only essential for an individual’s social and mental sustainability, they also bring about much broader feelings of reciprocity, cooperation and trust throughout the town.

*Information exchange and alcohol consumption*

One of the key features of the community, (particularly but not exclusively amongst non-Indigenous men within local service, tourism, mining and primary industries) is the close link between social gatherings (and therefore the informal and formal exchange of information) and the consumption of alcohol. One local organisation (though there are bound to be others) maintains an open policy whereby any customer entering their premises after 4pm is to be offered a beer. Customers and staff recognise this to not only be an appropriate way to relax at the end of the working day, but also as a highly valued
opportunity to informally build relationships and find out the latest news within their industry and the town.

Similarly, several residents recognise that much of their networking and information exchange occurs at the public bar or at industry meetings held in the late afternoon or evening whereby alcohol consumption is considered to be an essential aspect of a gathering. One resident said he would not attend morning meetings primarily because they “only served tea” (pers. comm., 2007) while another commented on regularly attending industry lunches that conclude when the public bar closes for the evening. One particular grower is said to have ‘missed out’ on so much information because he didn’t consume alcohol and therefore did not maintain the same social networks as others in the agricultural industry. Input from local women does not indicate the same distinct link to work-related alcohol consumption, but still recognise that ‘catching up for a few drinks’ or ‘a night out with the girls’ to be an important aspect of living in the community, maintaining strong social networks and gathering new knowledge.

Community and social capital
Many residents believe the close sense of community, together with the town’s remote location and an enduring ‘last frontier’ mentality, strengthens an underlying philosophy of pooling local resources to ‘get the job done’. Many people volunteer their time and skills along with physical and financial capital to any number of sporting groups and/or community organisations while also participating in local activities such as the agricultural show, concerts, festivals, street parties, public forums and sporting events. These activities have far reaching social, cultural, political and financial benefits (CDCP, 1997; Hashagen, 2002) and reinforce the idea that local people are just as likely to ‘help out’ or ‘give something back to the community’ as they are to simply attend functions for their own enjoyment, satisfaction or personal gain. Kilpatrick and Abbott-Chapman (2005) recognise that the quality of social interaction between local members is pivotal in developing social capital, which in turn, increases the likelihood of positive communal outcomes and social change being achieved within rural and remote populations. There is evidence to suggest that these same qualities exist within this community and that social capital, it is assumed, will be relevant in this study (though such an assumption will be further tested as the research progresses).

Interesting to note however, that even though there are many examples of social connection within the community, there still exists a distinct level of division between Indigenous and non-Indigenous people, particularly towards Indigenous people living on the site of the original Indigenous reserve17. Even with recent rulings by the National Native Title Tribunal (NNTT, 2006) recognising the existence of Indigenous tenure of local lands18 and the formation of the Ord Enhancement Scheme (a partnership agreement between Yawoorroong Miriuwung Gajerrong Yirrgeb Noong Dawang

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17 A community reserve was established by the state government on the outskirts of the town to house Indigenous people in the late 1960’s. This reserve was significantly under resourced and was returned to Indigenous people in the 1980’s.

18 Native Title acknowledges that specific Indigenous groups maintained traditional links to certain lands and water before European settlement and provides opportunities for compensation, access and/or ownership.
Aboriginal Corporation\textsuperscript{19} and the WA state government) (MG Corporation, 2008), recognition of Indigenous people and Indigenous organisations is still not considered significant by an obvious number of non-Indigenous people, particularly when referring to local knowledge and systems of learning. A reason for this may lie in the region’s colonial past whereby traditional lands were acquired by non-Indigenous people and their associated industries (mining, agriculture and tourism) without consultation, recognition or compensation to local Miriuwung people (Powell, 1998).

Though this disparity is most notable in the relationships between Indigenous\textsuperscript{20} and non-Indigenous people in general, there are examples of distinct intentional and unintentional division amongst other sub-groups whereby people primarily (but not always) source and share knowledge and information from within their own peer groups and networks. Tourists link up with other tourists, government workers with other government workers, growers with growers, young people with other young people and so on.

\textbf{Accessing Information}

A second notable theme, particularly with reference to social capital, is the way in which local people exchange information and acquire new knowledge (Kilpatrick and Abbott-Chapman, 2005). For many, close personal relationships and networks enable information to be transferred most effectively by word of mouth. For Indigenous people\textsuperscript{21}, this is especially central to the transfer of traditional knowledge, protocols, laws, customs and beliefs within the community. According to one elderly artist at the local Indigenous art centre, all of the knowledge she carries is put on to a canvas as a record of the contemporary and traditional stories from the region. A young arts worker provided an interpretation of why oral and visual story telling is significant amongst local Indigenous people:

\begin{quote}
“It’s almost like going to school… it is a stepping point. People go to uni and step up (in society) when they graduate. These guys have to step up to become the next elders and have to know all these things before they can become or be recognised as an elder. And that is very important. It’s just like getting a degree” (pers. comm., 2008).
\end{quote}

Though somewhat different by comparison, non-Indigenous groups also depend heavily on personal contacts and conversations to access information. For example, tourists are reliant on information provided by tour operators and other travellers so as to enhance the quality of their holiday experience. In particular, discussions are regularly held in informal settings in caravan parks and backpackers about the prospect of short-term work opportunities, scenic sites to visit, the best accommodation houses to stay at, the cheapest restaurants and bars to attend or the road conditions between one town and the next. Similarly, work colleagues and associates gather on a Friday afternoon for a beer to discuss the latest issues in their specific industry, while local young people learn from one another as to where to catch the best barramundi\textsuperscript{22}.

\textsuperscript{19} Miriuwung Gajerrong Corporation or MG Corp.
\textsuperscript{20} From the reserve
\textsuperscript{21} Particularly those living on the site of the original reserve
\textsuperscript{22} A popular recreational estuarine fish found in the northern parts of Australia
Making information credible

Though word of mouth is relied upon heavily to share local information, not all material however, is as openly accepted with the same degree of credibility. For example, local people are relatively conscious of who they source and accept information from and tend to be more reliant on those they have existing relationships with or others with some recognised level of ‘street credibility’ in the town. Shire employees, elected members (local, state and commonwealth), business owners, government officers and/or long term residents may hold specific and/or influential roles in the town, but may not necessarily be viewed with any great level of confidence by local people. Apparently, position alone does not automatically mean that the provision of information (whether it be factual or opinion) has any more influence than that provided by others. Certainly, those who have a proven ‘track record’ or actively contribute to the betterment of the community (either because of personal conviction or professional position) are viewed favourably and assumed to hold levels of influence. Others who appear to be vocal but relatively inactive or (perceived to be) motivated by self interest, are not offered the same level of respect.

Government departments as sources of information

Though many assume that government departments have significant resources at their disposal, it appears that local people from all groups (other than those working in government departments or connect with them as part of their employment) do not recognise them as being a significant source of knowledge and expertise. It seems that these agencies are seen more on the periphery with few local people actively seeking new information on issues such as models of best practice, potential funding opportunities, research and development or the latest in technology. Government departments are far more likely to try and access local people (rather than local people access government departments) by providing generic information on specific government activities and programmes through the distribution of pamphlets, reports, journals and media releases.

However, local people seem to be more likely to source information from individuals they trust rather than rely on more formal means of information exchange. For instance, local growers tend to contact other local growers to discuss issues such as crop types or best farming practice rather than perhaps the local department of agriculture. This is not necessarily because there is distrust of government agencies (though certain actions by some departments may affect this) but rather a lack of relationship with the organisation and those working within it. For many, government departments are only contacted within relatively formal structures when there is a specific regulatory or legislative need to be fulfilled. For example, a local supplier reported to only contact the department of agricultural when his latest shipment of seed needed to pass through quarantine.

There are exceptions to this however. There are some government employees who are specifically and purposely contacted by local people because they have developed close relationships outside their work environment. In these cases, individuals are not only recognised for having some level of competence but also because their social networks extend beyond a professional setting. This is particularly demonstrated by the senior sergeant at the local police station who makes a deliberate effort to walk around the town (in uniform) whenever possible to provide opportunities to meet and establish new or
different relationships with local people. Similarly, newly arrived police officers and teachers tend to join local sporting groups or attend significant sporting events in order to establish informal relationships with other community members, especially local Indigenous families. In other cases, those government employees, who are also long term residents with established networks in the community, are specifically targeted by local people when information is sought from their respective government departments.

The benefits of personal contacts and communication
Local people from all groups recognise that establishing and maintaining personal contact with a range of different social and professional networks to be critical to the success of their current employment and livelihood. One long term resident recognised that her ability to be effective in the work place can be directly attributed to her capacity to generate and gain local support, interest and participation in issues relevant to her role as a government employee and the broader community. For her, it is about “face to face community contact rather than sitting in an office, sending emails and mailing out pamphlets. There’s not much joy in having a conversation with a brochure” (pers. comm., 2007).

Another local resident recognised that a number of people have the capacity to engage with others and instigate change. In her view, these people have:
“the ability to draw people in, talk to them and make them aware (of community issues) and get their support. Doesn’t matter what it is… you can do anything if you get out and talk to people. It’s all about education. Once you explain what it is you want to do, why you are doing it, how you are going to do it, who else is doing it, then it becomes a personal thing. Others get involved because you have spoken to them personally” (pers. comm., 2007).

Information Connected with People’s Area of Interest
The third theme to emerge from this research is the distinct link between an individual’s motivation to engage new knowledge or information and their personal interest in an issue (or the potential for an issue to have an impact on their livelihood or lifestyle). Local people are provided with significant amounts of public information through pamphlets, community noticeboards, mail deliveries, displays, local, state and national newspapers, community forums, government publications, radio, television as well as the internet.

However, there is an assumption (particularly amongst government departments) that because material is made publicly available, local people will take up information on their own accord and retain it as new knowledge. Evidence would otherwise suggest that most people undertake a very brief assessment of such material (a quick flick through) and discard it if it does not contain any points of interest. Though information produced by local organisations seems to gain greater attention than government departments, a significant amount is still being produced without any analysis of the effectiveness of distributing such material. A number of people have commented that “if something was

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23 In terms of outcomes achieved
really that important, then someone will tell them about it… eventually” (pers. comm., 2007).

Knowledge and biosecurity
The effectiveness of the current (more formal) approach to providing information to the community is particularly evident in the area of biosecurity. At present, the local agricultural region maintains Area Freedom status\(^ {24} \), which is vital to the sustainability of the local agricultural industry as well as a large number of people whose livelihoods depend (directly or indirectly) on the continuous sale of local produce to regional, state, national and international markets. If for example, an incursion of an exotic insect such as Mediterranean Fruit Fly\(^ {25} \) (ceratitis capitata) was detected at a local mango property, the region would risk losing its Area Freedom status, which would mean the immediate cessation of all exports from the area until quarantine and regulatory agencies were satisfied that the contaminate had been contained and eradicated. Such actions could result in the potential cancellation of lucrative markets in both Australia and overseas, which would impact greatly on the livelihood and lifestyle of many people in the community. The biggest concern for local growers is that most incursions occur when local people, businesses (hotels, supermarkets, restaurants) and/or tourists bring contaminated food products into the region from outside, which subsequently infects local crops.

One of the principal aims of the local agricultural industry and associated government departments is to raise the profile of biosecurity in order to preserve the region’s Area Freedom status. To do this, a number of strategies have been implemented to increase community awareness through the distribution of pamphlets, installation of road signage, publishing of newspapers articles, the monitoring of insect traps and interviews on regional radio. As well as this, government agencies maintain strict controls on the movement of plant material into the region, which is reinforced by quarantine checks at the airport and nearby state border while honesty bins enable tourists to dispose of fruit and vegetables purchased outside the local area.

However, even with these measures in place, local growers have suffered a number of biological incursions over the past ten years, which indicates that the concept of ‘biosecurity’ still remains relatively foreign to people in the town other than those associated with the agricultural industry. While local growers tend to be well informed about biosecurity, people in other sub-groups have limited awareness of biosecurity and the scale of biosecurity activity currently in place. Though many people, particularly those who have lived in the area for longer periods of time, acknowledge that there are some restrictions on for example, the movement of plant products into the region, they do not necessarily know why. This would indicate that even though there is some basic knowledge of biosecurity (instigated by others), this knowledge does not fully translate

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\(^{24}\) The district is free from many of the biological pests found in other growing areas of Australia, which means products grown in the region can be exported to other localities with out the application of strict quarantine restrictions

\(^{25}\) or Medfly lays its eggs in ripening fruit, causing accelerated decomposition and making it unsuitable for sale as larvae in the fruit can be transported to other sites, hatch and contaminate those regions (Broughton, et.al, 2004).
into an understanding of why these initiatives are required or the consequences that may be felt by the community if an incursion was to occur. In other words, though there is some knowledge of biosecurity as a concept (albeit limited), there is minimal interest or motivation to convert this knowledge into community action.

Low levels of knowledge about biosecurity and the implications this may have for the broader community indicates a number of critical points. Firstly, that local people involved in agriculture are most likely to take up new knowledge and information about biosecurity because their livelihood and lifestyles are most at risk of a biological incursion. The loss of Area Freedom status would significantly impact on the income of local growers as national and international markets would no longer accept food products from the region if it was suspected to have biological contaminants. The fact that information is not readily taken up beyond the agricultural industry may suggest that local people view biosecurity with limited personal interest and, more importantly, believe it to be the responsibility of the agricultural industry and government agencies to address. Above all, it may be assumed that a biological incursion will bear little threat to the lifestyles of local people not engaged in agriculture. Considering that quality of life is one of the primary reasons why people choose to stay in the area longer than expected, it appears that very few have considered what effect an incursion may have on their immediate physical, social, economic or cultural environment let alone that of the broader community.

The plight of the cane toad
Keeping in mind the broader community’s limited appreciation of biosecurity and the impact a biological incursion may have, it is interesting to view local people’s approach to cane toads. With a main incursion front some 100km away, a great number of local people have invested considerable time, energy, skills and finances into two distinct community groups attempting to stop (or at least slow) the progress of the cane toad. Every weekend, groups of twenty to thirty volunteers drive the necessary two hours east to monitor and catch as many of the amphibians as possible.

‘Toadbusting’ has become successful as an eradication procedure. It has amassed a significant amount of physical and financial resources while developing specific links with Indigenous training programmes, young people in local schools and education displays in public venues. This initiative also maintains high involvement and participation with local businesses, the Shire council, state and commonwealth government departments, tourism, mining and agricultural industries, Indigenous groups and other residents all actively contributing to address this regional issue. However, when it comes to more immediate, invasive and costly biological pests such as the medfly, salvinia26 (salvina molesta), or silver leaf white fly27 (bemisia tabaci), local people seem

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26 One of Australia’s worst aquatic weeds, salvinia’s invasive qualities have the ability to choke waterways and impact significantly on the environment and economies of communities (CRC AWM, 2003)

27 One of the world’s most invasive arthropods, silver leaf white fly damages crops by producing honeydew as it feeds, which causes mould to grow on leaves and contaminate fruit (CSIRO, 2007)
to show little interest even though the repercussions of such are far greater (and personal contributions much less) than that attributed to the cane toad.

So what is it about toadbusting that encourages local participation over and above other biosecurity initiatives? A long history in northern Australia and significant media attention, together with the fact that cane toads are relatively visible and easily recognisable, provides them with a very high profile. Toadbusting (as a biosecurity strategy) has also been presented as a family or collective activity that encourages people of all ages and from all walks of life to make an active contribution to protecting the environment. For example, individuals invite friends, families, neighbours and others within their social networks to participate in toadbusting activities which makes the event as much a social gathering as it does a biosecurity initiative. This appears to be one of the main differences between toadbusting and other biosecurity strategies in that cane toads (as well as being unattractive to look at) have been specifically identified as a threat to the habitat and livelihood of local land and aquatic animals, and thus the state of the local environment. Participating in or donating to a toadbusting event therefore becomes a personalised activity that encourages local residents to be actively involved in preserving the surrounding environment, which in effect, is ‘giving something back’ to their community.

Such a distinction seems to be an important factor in the success of the toadbusting strategy and suggests that local people recognise that the surrounding wetlands, floodplains, river systems and grasslands are relevant to their way of life. It would also appear that local people have made the link between an incursion of cane toads and the potential loss of the local environment, which would impact on the activities they enjoy in their leisure time. In other words, biosecurity has become a lot more personal as the impending cane toad incursion becomes a very real and visible threat to those recreational, social and lifestyle pursuits that are so central to living in the community. For example, the favourite fishing spot may no longer hold any fish, local swimming holes may lose their appeal when inundated with cane toads while camp sites may not be as attractive when the natural wildlife is missing.

Though biosecurity is recognised as a whole of community issue (ABCRC, 2003; Rohan, 2002; DAFWA, 2005), local people do not tend to play an active role in the surveillance of local areas and reporting of biological anomalies. Initial research suggests that local people have not made the same connection between a biological incursion as they have with the more tangible cane toad and the potential impact these may have on individual and communal livelihoods and lifestyles. It is expected that further research will explore this and other such challenges in greater detail and provide some indication as to what factors motivate local people to not only source and retain new knowledge but also actively participate and address local issues.

**Synthesis**

The town appears to maintain a solid sense of community and social capital, which is reflected in the formation of social networks and close personal relations between local people. Though information flows readily within these networks, there is evidence to
suggest that new knowledge does not always cross from one population group to another particularly well, which tends to highlight a level of intentional and unintentional difference amongst specific sectors of the community. Indigenous people and Indigenous organisations most notably go unrecognised as do local Indigenous histories, culture, beliefs and knowledge of traditional lands. Similarly, but probably more discreetly, is the distinct manner in which groups access and share information from within their own networks. This in itself raises questions as to whether concepts of inclusivity specifically suppress or enhance the exchange of information and new knowledge, which is typically demonstrated in the area of biosecurity.

Even though there are considerable information and awareness strategies available, most knowledge and activity relating to biosecurity remains primarily with those people situated in the agricultural industry and associated government agencies. The fact that a number of biological incursions have occurred in the area reinforces the idea that the concept of biosecurity is still relatively foreign to a majority of local people. As such, the opportunity for a bipartisan and informal exchange of biosecurity information does not yet exist between the agricultural industry and other people living in and visiting the area.

As close networks and personal relationships tend to generate more effective means of gathering new knowledge, it would seem that greater attention may focus on providing more personal relationships between local people and biosecurity (and those agencies providing information about it). In other words, this relationship appears to be relatively limited with local biosecurity strategies seen more in isolation from community activities rather than being part of them. For example, the dissemination of biosecurity information relies primarily on formal methods of information exchange (such as pamphlets and reports) as opposed to public domains (agricultural shows, markets, the rodeo and shopping centres) where local people can gather to identify and develop relationships with local issues and meet those people (government or otherwise) involved in agriculture and biosecurity. As a result, greater attention may focus on the manner in which information is provided to local people rather than rely on the volume, content and availability of biosecurity material. It is expected that local people will not find interest and relevance in biosecurity regardless on how many brochures appear in their post office box. Local people may however, be more likely to gather new knowledge about biosecurity by engaging in meaningful conversations and participating in activities relevant to their own personal circumstance, which can bring about change in their attitude and their actions.

**Conclusion**

This paper provides an overview of the preliminary findings of a PhD research project in a northern Australian agricultural community, which aims to determine “How communities engage with new knowledge?” Concepts of community, social capital, informal learning and communities of practice support the data collected from six specific sub-groups and the manner in which information and new knowledge is exchanged using the principals of community engagement.
Three distinct themes have so far emerged from preliminary findings and recognise the importance of social networks, the value in developing strong linkages with others and that personal interest is a key factor in motivating local people to take up information as new knowledge. The close personal relationships that exist in the town provide a significant network of trust, partnership and reciprocity amongst local groups and the broader population, which is typified by a solid communal ethos of community participation. Though there are a number of different and specific means by which local people access and source information, it appears that communication resulting from social networks is the most effective for local people. However, evidence also suggests that local people are more likely to learn and take up new knowledge if information is of particular interest or specifically relevant to their livelihood or lifestyle.

This is especially highlighted in the area of biosecurity. As a region with Area Freedom status, significant resources have been invested in maintaining an agricultural area free from the biological pests found in other Australian growing districts. Though biosecurity information is readily available in many different mediums, it appears that people involved in agriculture are primarily interested in implementing proactive strategies to reduce the threat of a local incursion. Even though local people actively respond to the prospect of a cane toad incursion, very minimal interest has been attributed to addressing other more immediate and damaging biological pests. One of the reasons for this may lie in the fact that biosecurity has in the past, been associated with the agricultural industry and not viewed as a whole of community issue. To most, it seems that a biological incursion would impact on regional crop production and leave a limited impression on the personal lifestyles or livelihoods of the town’s greater population. This would suggest that local people have not formed any personal or applicable relationship with biosecurity and are therefore reluctant to be engaged in such strategies other than those involving cane toads.

These results indicate a number of implications for the local area. One of the most obvious is that local people have not adopted an active view of biosecurity regardless of the information available in the community. Reasons for this are varied though most likely relate to the fact that the vast majority of biological threats are perceived to have limited relevance to local people. Cane toads are an exception primarily because they are an identifiable and tangible threat to the immediate and broader environment and thus, the lifestyle of local people. The challenge then for those in the agricultural industry (including associated government departments) as well as the broader community, is to create and adopt new forums of relevant information exchange that actively engage local people.

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Abstract

This paper aims to identify and discuss the role of Balinese women in collective activities for community empowerment in two villages in Bali. The two sites are Legian (Site A) and Peninjoan (Site B). Information was collected using questionnaires and interviews with female leaders and other women in the two villages.

There are high levels of participation in community activities by women in both villages. Women are actively involved in social, cultural, spiritual, tourism and agricultural activities. However the capacities of women involved in community empowerment at Site A are higher than those at Site B. This is demonstrated by the success of the PKK (program for women to improve family welfare) at Site A, where the women have independently implemented a collective program for the eradication of mosquitoes carrying dengue fever. This activity involves the on-going clearing of laneways as an activity from the women, by the women, for the women. At Site B, participation of women in collective activities is still low. There continues to be failure in leadership in various women’s activities, which are only implemented if they are pushed directly by the government. The women of the community depend on direction from traditional male leadership for implementation of village activities.

Female leadership exists in the organizational structure known as the PKK (Family Welfare and Empowerment). This organization usually sits below, or shadows, male leadership at the ‘lurah’ (village) or ‘banjar’ (hamlet) level. The wives of the Lurah and Banjar are automatically appointed as leaders of the respective levels of PKK. At Sites A and B decisions made by the PKK are still dependent on agreement from the lurah or banjar head. Women have potential in various aspects of social capital, but unfortunately this is often overlooked as women are subordinate to men within the community. This is apparent in various leadership structures such as BAMUS (Badan Musyawarah), the institution which coordinates between community administrative and traditional leaders at Site A and BPD (Village Representation Agency) at Site B. Women are not represented in either of these organizations. Women in these locations need to be encouraged and empowered to strengthen women’s organizations and increase women’s involvement in decision-making.
Introduction

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 where women have been successful natural resource managers (Nakatani, 1997; Walhi, 2007). In Bali, the role of women in almost all aspects of life is irrefutable. Women play an important role in social, cultural, spiritual, agricultural and domestic activities. According to Suryani (2006), it is essential that women realise that they are the ones responsible for fulfilling their obligations. Research by Meinzen-Dick and Zwartveen (2003) shows that women have enough spare time to be able to participate in social activities and develop networks and use this time for these purposes of transferring knowledge and information. Women always have time to meet and have a 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 organisational structures and decision-making at the village or hamlet levels. 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. According to Flora (2007), empowering the community to overcome their problems should be an on-going effort. This is particularly important in this era of globalisation which has brought on rapid developments in the movement and exchange of goods, services, money and communities. Globalisation means increased movement of pests and diseases in plants, animals and humans. If this issue is not taken seriously, food security and environmental balance could be threatened over the long term. To empower communities to address community problems requires making use of the existing social capital strengths that has developed among individuals or groups who have mutually beneficial relationships. Principals of cooperation already exist within communities, including in Bali where it is demonstrated by the Balinese irrigation system (sistem subak) and other traditional systems (suka-duka) which all demonstrate systems of community equality (Pietra 2006). This article aims to identify and expand on the participation and role of women within society, so it can be used as capital to contribute to future community empowerment in the area of biodiversity conservation.

Literature review

Developing a Definition of Social Capital

Economics, sociology and politics experts define social capital in various ways. In general, the concept of social capital has been developed in two main streams they are, socio-anthropology and organisational politics and economics (Vipriyanthi 2007). Coleman (1990) believes that social capital is a human centred attribute of social structure. Social capital adheres to social structures and is characterised as a ‘public good’ and is equal with financial capital, physical capital and human capital. This is expanded on by Adler and Woo Kwon (1999) who state that because social capital is for the public good, it is not owned by any particular person but depends on all members of a
network. The shared nature of public good tends to make individuals indifferent to ensuring its sustainability and most rely on others to ensure its preservation.

Community knowledge and understanding (community capital) are or can be directed to determining actions for addressing community problems. The community capital framework allows the use of local resources and integrates these resources with resources from outside to create a vital economy, social inclusion, and a productive environment. Additionally it was stated, that to empower communities to care about their issues we can use the developing social resources of individuals or groups that have a mutually beneficial relationship. These principles are actually already familiar to communities as demonstrated in the culture of ‘gotong-royong’ (mutual cooperation within the community), ‘tepo saliro’ (empathy), the Balinese system of water control, ‘pela gandong’ (in Ambon), Jagong (in eastern Java), and traditional community systems in Bali which all indicate a level of equality. These phenomena clearly demonstrate that Indonesian and Balinese cultures already have a high level of social capital (Pietra, 2006). Within ‘eastern’ societies, Balinese communities are recognised as having high capacity in terms of social norms. In this situation, community capital can be used to mobilise communities to create a new social order where traditional community systems can be modernised to increase community participation and empower local communities.

The World Bank (1998) gives a more specific definition for social capital, stating that it is the social norms and relationships that hold a community’s social structure together and make it possible for people to coordinate activities in order to achieve common goals. Woolcock and Narayan (2000) have a similar view, stating that social capital is the norm and networks that make it possible for members of a community to work together. These community networks are a result of the presence of politics, law and organisational structures and development therefore requires a forum between government, community and private sectors which together can identify and achieve common goals. In this context, social capital acts as a bridge between groups.

Social capital can strengthen groups, communities, traditions, villages and nations, being one of five pillars of a pentagon describing the foundations of community empowerment for sustainable livelihoods. Each of the five corners of the pentagon represents an area of strength. They are physical capital, financial capital, human capital, natural capital and social capital. The five pillars must be present equally to achieve sustainable livelihoods (Pietra 2006). Flora (2007) however, divides community capital into 7 assets. They are physical, financial, cultural, political, human, social and natural assets. Human resources include skills and abilities of people to develop and increase their own resources, to access resources and to increase knowledge and identification of social norms and access to increase community capital. Often men and women learn about different aspects of their working environment. It is important that different facets of human capital are respected (Flora and Kroma 1998). Flora (2007) also states that community empowerment for problem solving must be on-going; particularly in an era of globalisation that has brought rapid change with increased movement and exchange of goods, services, money and communities. This phenomenon can lead to the movement of pests and diseases which affect animals, plants and humans. If this is not taken seriously, it could threaten food security and even potentially lead to environmental imbalance over
the long term. According to Falk (2007), if we look back at global events such as global warming, we can see human activities that have impacted on things such as water availability and thereby impact on the food security of communities. To overcome these issues there needs to be increased community concern and understanding at community and leadership levels. Flora (2007) adds that the best approach to community empowerment is a local approach so that identification of problems and their solutions are appropriate to the local situation.

The Role of Balinese Women

Women (particularly Hindu women in Bali) already fill a special role in the domestic household, a role in family lives, in spiritual and religious life, social life and in the agricultural sector (Pendit 2002). Suryani (2006) states that in these roles women feel that they have rights and fulfil 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. Within the culture of daily Balinese (Hindu) life, women must ensure the appropriate use and storage of household items. Kitchen equipment may not be used for other activities such as washing. Eating equipment is put in a specific place and may not be mixed with items for other activities (particularly with items used for prayers). This also applies for allocation of rooms within the household. For example, the living room, kitchen, laundry and bedrooms are in specific locations. If viewed as a health strategy, all of these actions explicitly address natural resource conservation. Besides fulfilling their private role, some women also have duties within the public arena such as careers and social networks (Indrayoga 2006).

Increased awareness amongst Balinese women will broaden their horizons and improve the capacities of Balinese women overall, protecting cultural identity and empowering the community (Suryani, 2006). Within the workplace, Balinese women only hold middle to low positions and very few ever make it to executive positions where they have decision-making powers.

Within spiritual practices, women have specific roles during ceremonies and many activities are done in cooperation with men. Through their role in spiritual life women already undertake activities that indirectly contribute to conservation of natural resources. These can be seen in the ceremonies of ‘Tumpuk Uduh’ to give thanks for plants, ‘Tumpuk Uye’ for animals and ‘Tumpek Landep’ for metal objects (Sudarsana 2005).

According to Indrayoga (2006), the most crucial women’s issue is how to improve the position of women in society. He goes on to say that inequality between men and women is only due to a way of thinking, particularly men’s attitude that women are of a lower status. This attitude has persisted so long that even women have come to see themselves as second class humans. So how do we change this attitude so that women can be considered equal to men? Hindu teachings actual provide a strong foundation for creating gender equality between men and women. A guarantee for equality, destroying the predication that women are second to men, is written in the Weda (the Hindu holy book), where it is one of the basic lessons in ethics (Pendit 2002). According to one expert on
women’s issues, Sudarsana (2006), it is these ethical teachings that determine the social order of Hindu communities, creating a harmonious community life. Nowhere in the Weda is there any reference to dominance or subordination of either gender. Furthermore, discourse around the issue of gender equality is becoming louder throughout most of the world. The demand for equality is highly noble and humanistic, because through this demand, women have been given more confidence to speak out and to realise 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. Principles of equality and harmony between men and women must be based on a sincere and heart felt belief according to the relevant norms of the society. In Hinduism, there are also the ‘swadharma’ teachings which say that the lives of all creatures in nature reflect activities that are dynamic, balanced, harmonious and compatible. If this swadharma is altered by humans for the sake of progress and technology, this is the same as changing the consciousness, balance and harmony of nature. This would cause imbalance or disharmony and will have a negative effect on the character, morals and behaviour of humans leading to unavoidable destruction.

Ardhana (1994) says that there are two major problems that currently grip Bali; problems associated with human capital and natural capital. According to Pietra (2007), these are two pillars of social capital which guarantee development and community empowerment for sustainable livelihoods. If people, particularly the Balinese, no longer have a system of values or social structure to govern relationships between humans, between humans and nature, and between humans and God, then Balinese culture will be wiped out. A feeling of cultural ownership which supports community empowerment will fade (Pietra 2007). This notion is supported by Suryani (2006), who states that harmony in life should be nurtured so that life is not only for working but also for creating good relationships with others.

Pietra (2007) discusses several phenomena that occur within the village that restrict the community’s unique ability for self development, contribution to nation-building and development of the local culture of the village. However these strengths within the local community will play a role in facing globalisation and economic liberalisation. 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 organise 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 organisations and communities, between friends, associations or colleagues (for instance, human rights movement, seminar or
professional network). 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).

Many women are active in agricultural activities particularly those activities that require perseverance and attention to detail, such as seed raising and harvesting. In Ndop, Cameroon, women are also heavily involved in agricultural activities which contribute to improving family welfare (Fonjong and Athanasia 2007). In Ndop women actually play a larger role in agriculture than men and the income they derive from farming has a greater effect on household income.

Below is an interesting example of the successful community empowerment through women’s involvement in integrated pest management. There are two women: Romini, who is an active member of the Integrated Pest Control Field School (SLPHT); and Sunani, who is not a member of SLPHT. Romini is 45 years old, has four children and relies on rice farming to make a living. Romini’s husband is a becak (pedal cab) driver who works outside the house almost every day, leaving Romini to do almost all of the work in the rice fields. Rice growing is not difficult for Romini as she has been involved in farming since she was a child. The income from her husband’s becak driving is not enough to support the family. The family has only 750m2 of flooded rice fields so Romini needed to find a way to improve productivity. After joining the Integrated Pest Control Field School from 1995 to 1996, Romini was better able to prepare the soil in an environmentally friendly way and produce good results. By reducing the use of non-organic fertilisers and chemical pesticides and replacing these with organic fertiliser and biological control of pests, she has been able to increase productivity of her rice field by almost 100% and reducing her pest control costs by 50%.

Since this success, Romini 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 fertilisers are no longer used by farmers in Romini’s area.

However, the story is different for Sunani who has never participated in the SLPHT, but has learnt environmentally friendly land preparation from her family and neighbours who already used these techniques. From the example given above, SLPHT is 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 an effort for public health.

Methods

Research was conducted in two villages. The first village was Legian (Site A) in Kuta subdistrict, Badung district and the second was Peninjoan (Site B), Tembuku subdistrict
in Bangli district. Site A is a tourist rural community, where the majority of the community are engaged in businesses associated with tourism. Site B is an agricultural village, where the majority of the community is involved in farming activities.

Women from PKK (Family Welfare Empowerment) group and females from the youth group ‘Sekeha Teruna Teruni’ were interviewed. Information was collected over four months from April to June 2007. Questions in the interviews were about leadership structures, decision-making mechanisms, problem solving, women’s group empowerment, community participation in group activities, communication at the family level and with other people in the community.

Qualitative methods (Creswell 1998) were used to identify and extrapolate the role of women using semi-structured interviews (Fontana 2002) and data were analysed based on discourse analysis (Silverman 1998). In-depth interviews were conducted with 28 respondents including 18 people from Site A and 10 from Site B.

In addition, three of the respondents from each site were chosen randomly and interviewed further regarding the role of women in collective activities and participation in group empowerment in the two villages.

**Results**

*Women’s Leadership*

In terms of leadership within the government (village administration) in Kelurahan Legian and Kelurahan Peninjoan women already have an umbrella organisation, the PKK. The PKK exists at the Kelurahan (village) and Banjar (hamlet) levels and sits beneath the village and banjar heads respectively (Figure 1).

In general, the wife of the Lurah (village head) automatically becomes the head of the PKK at the Kelurahan level and likewise for the wife of the Banjar head at that level. At the two research villages, the PKK consists of PKK Head, secretary, treasurer and several sections which usually represent the different areas of activity of the PKK program. PKK programs are known as ‘Dasawisma’ and consist of: (1) Pancasila (the 5 basic principles of the Republic of Indonesia) teachings and implementation, (2) collective community work, (3) food, (4) clothing, (5) home management, (6) skills training, (7) health, (8) developing a cooperative life, (9) environmental conservation, and (10) health planning.
As an organisation, PKK has 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 activities which involve local government or traditional leadership, the PKK must consult with the male leaders in the community.

At the traditional village leadership level at Sites A and B, there is also an informal women’s group that is led by a woman known as the ‘Krama Istri’. With a model similar to that of the more formal government structures, the leader of this group is generally the wife of the male traditional leader. The Krama Istri has a larger role in religious and cultural activities, such as religious ceremonies at the local temple (e.g. Kahyangan Tiga) and in funeral ceremonies.

At Site A there is a community structure known as ‘BAMUS’, which acts as a bridge between the village’s government and traditional structures. Women are not represented within the leadership structure of BAMUS. This was revealed during the in-depth interviews, 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”.

This statement raises concern that women’s interests will not be accommodated. There is no equivalent structure to BAMUS at Site B.

At Site B, traditional leadership has more influence than the formal government leadership. In sites A and B women still have little role in decision making because the
structure of women’s organisations dictates that all decisions must be made by male-led organisations. Women’s groups must consult with men’s groups but not the reverse.

Women’s Participation
Site A has a heterogenous community with almost half of the inhabitants originating from outside of the village. The majority of people have livelihoods associated with tourism and therefore the community is highly mobile. At Site A, there are some economically productive groups forming but unfortunately they are poorly organised. These groups have formed due to common interests and a common location. These groups include the local traders, women giving massages on the beach, and handicraft seller groups.

According to one informant, these groups are sometimes formed only to make it easier to get credit from the bank. Besides the economically productive groups, groups also form between people with a common hobby such as a sport or art. Interestingly, in Site A, women all have a common awareness and concern about environmental cleanliness, particularly keeping urban laneways clean. This awareness has arisen as a result of a previous outbreak of dengue fever. From that experience all members of the PKK in all the banjars of Site A created a cleanliness competition which is judged weekly. Locations are evaluated by members of the PKK who have already become cadre for dengue fever eradication. Each banjar has 5 cadres 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 indicates that women already have skills to independently manage their local environment for the sake of their collective interests.

The majority of the community at Site B are farmers, and women are often involved in farming activities. Women’s involvement in farming includes seed raising, planting, crop maintenance, harvesting through to post harvest activities. 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 agency of the community when visiting the community. It is important for women to understand pest control as they are involved in farming activities. Besides being involved in farming, women have previously formed economically productive groups such as a group for women making crisps from chicken’s feet, another for making jack-fruit crisps and a group for pig rearing. These groups developed quickly as they were given on-going support from the Department of Industry. But as soon as this support ceased, many more small enterprises arose with similar products and competition became too high between products so now none of them are productive anymore. According to Ibu Darni (secretary of the PKK at Site B) this was because, in addition to reduced market access with the excess competition, it became increasingly difficult for members of the groups to divide their time between activities with the group and their individual interests so that group activities were often neglected. There are also several machines and pieces of equipment supplied by the government that are not used because the group activities are not running. This is an indication of the lack of ability of women to guide a functional group in this village as group members still prioritise their private activities over group activities. All collective activities must still be done in coordination with men’s groups particularly with traditional leadership.
In Legian and Peninjoan, communication between women is frequent and in-depth interview results showed that the relationship between women within their village is very close. This is indicated by the close relationships between female relatives, friends and others in the community. The relationship is based on frequent visits to each others homes, via phone and through mail.

**Discussion**

There is some difference in the ways that Site A and Site B express their capacity to achieve collective goals. One example of this difference is the success of the women at Site A in motivating members of their group to undertake sustainable collective activities such as the successful dengue fever eradication program. Women at Site B on the other hand have 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 in Site B are also very low. The majority of respondents in Site B only completed high school and most work as farmers. According to Awan (2005), the meagre income of farmers is insufficient to meet the families’ basic needs and the community of Site B is classed as having a poor quality of life. This low 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 the opinion expressed by Collier (1998) who says that social capital emphasises the close relationship between social capital and human capital. Social capital can overcome opportunistic issues, thereby facilitating collective actions. Women at Site B prefer to implement activities in accordance with the policies of government and village leaders. As a result, women at this site can be said to be passive. This was demonstrated by the failure of women at Site B to guide their own collective activities. The ability of individuals to understand their common interests and goals is still very low as also described 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.

This phenomenon demonstrates that there is a lack of understanding amongst the women at Site B regarding the importance of social capital and working together for common goals. As a result, women at Site B, are greatly in need of support to empower them and help them understand common interests, common problems and increase their awareness of the environment. Women should also be made aware that they do not only have social obligations but also have the right to improve their collective well-being. Suryani (2006) states that there needs to be increased awareness among the women of Bali to increase capacities in Bali 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 of Site A appears to be more expressive and more capable of independently managing their collective activities than that at Site B. 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 of Site A originate from outside of the village (BPS 2006). This may be a result of the leadership
structure at Site A where they have the slogan “Legian United” which has been a trigger for Legian to work and have collective activities to achieve common goals.

The disparity in the decision-making powers of men and women indicates a need for organisational strengthening of women’s groups. It is hoped that 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 organisations 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 organise 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 organisational situation of a community.

Available data indicate that women at both Site A and Site B have frequent communication between families, between friends and with business colleagues. This represents an opportunity for women to exchange information. This information is an asset that allows the formation of networks which in the future may strengthen the tie between members of the community to improve their ability to recognise, 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 neighbours.

**Synthesis**

According to Suryani (2006), women should not continue to see themselves as victims of inequality. They need to demonstrate to the community that women have abilities equal to those of men. By demonstrating their success in getting an education, running a household and participation in community activities, community members, particularly men will automatically begin to not only see someone as a ‘woman’ but as a capable person.

The structure for women’s leadership, the PKK, is a means for beginning to empower women at the village and Banjar levels, to increase understanding of their rights and obligations, to recognise 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, constant communication and success in forming groups to address common interests, so that these things can develop and become social capital for biosecurity.

It must be recognised that women’s roles in collective village activities within the 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 and men’s groups need 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 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.

Summary, Conclusions and Implications

Results of this research show that women are already organised to address their interests at the village and banjar levels within the structure known as the PKK. However, the position of women in this organisation is effectively only a shadow to the male leadership. Women do not yet have any real authority to make decisions. Women are not yet represented in the coordination organisations such as BAMUS in either Site A or Site B and their interests are therefore not accommodated.

Women actually play quite a large role in collective activities but continue to be in the shadow of men. Women have some experience in group organisation for improving wellbeing, but this is not being maximised 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. 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 and perhaps even for addressing the issue of biosecurity.

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Abstract

A range of community processes contribute to the development and implementation of management practices of plant pests and diseases. The effectiveness of these processes is greater in communities with high social capital, including strong cooperative relationships within the community, and between the community and external agencies. Historically, farmers (including subsistence farmers, farmers of broadacre crops, and pastoralists) have been the producers of this type of knowledge, empowered with dignity and confidence to experiment with farming practices. Developments in the past century, particularly the Green Revolution, have seen technological interventions imposed on farmers. In relation to the control of pests, and diseases, applications of synthetic organo-chemicals were advocated for “revolutionary” improvements to yields in broadacre crops. The limitations and harmful environmental impacts of this approach have subsequently led to a range of “evolutionary” changes in processes for research into pest and disease management practices. There has been growing recognition of the value of farmer participation in research into pest management practices, particularly for more effective implementation. In Asia during the past thirty years, programmes such as Farmer Field Schools and Community Integrated Pest Management have focused on increasing farmers’ ecological knowledge to equip them to improve their pest and disease management. Through these approaches farmers are more likely to make management decisions and tailor practices in response to their observations and understanding of ecological processes rather than to follow a prescriptive management package. This discussion paper describes some of the processes underlying the development of pest management practices in Southeast Asia and various stakeholders (including farmers, scientists, community, government) that influence this development.

Introduction

This paper describes some of the community processes that contribute to the management of plant pests and diseases, particularly in rural areas of Southeast Asia. Plant pests and diseases have wide ranging impacts; impacts on agricultural productivity, from broadacre farming and pastoralism to small plot subsistence farming and hunter gathering, but also impacts on biodiversity conservation, home gardens and aesthetics. The management of plant pests and diseases is largely through farming practices however the processes contributing to the development and implementation of these management practices involve a range of stakeholders. These processes and the roles of the various stakeholders in their development will be discussed in this paper. In particular, changes in recent decades in the roles of farmers and scientists in various systems are described with some
evaluation of the impacts of these changes on the empowerment of farmers and the efficacy of the implemented practices.

“Community” is commonly accepted to mean a group of people who share a common identity or a special interest (Kenny 1994). “Community participation” can be defined as 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 (Shiffman 2002, Zakus and Lysack 1998). Community processes, in particular management processes, can be viewed in terms of six types of community capitals; natural, cultural and human capital which can be transformed into social, political, and financial/built capital (Flora 2004). A community’s social capital is a measure of the ability of community members to secure benefits through their membership of social networks, such as local associations and non-formal groupings (Grootaert 2001).

Communities have the strongest chance for sustainable development if they have strong social capital, with moderately high levels of both bridging (relationships with external agencies) and bonding (relationships within the community) elements (Flora 2004). Similarly, rural livelihoods and integrated conservation and development (ICDP) projects can be examined within a similar framework (Bebbington 1999, Garnett et al. 2007). Community processes for developing and implementing management of plant pests and diseases will be discussed within a community capitals framework.

This paper aims to provide a synthesis of previous studies of approaches to pest and disease management and a bibliographic resource for a project entitled Development of a community-based model for the management of EPP (Emergency Plant Pests) incursions, funded by the Cooperative Research Centre for National Plant Biosecurity and running 2006-2009. This paper focuses on cropping systems in Southeast Asia but includes some comparisons outside this region and this type of management system.

Emergency plant pests are defined as known exotic plant pests with potential to have adverse economic impacts (http://www.crcplantbiosecurity.com.au). The focus of this paper is farming systems, both for income generation and subsistence, with direct economic impacts on livelihoods. Stakeholders include farmers (broadacre and subsistence), scientists, nature conservation managers, urban dwellers (gardeners, travelers) and policy makers.

This discussion paper describes community processes for pest and disease management and some methodologies for their evaluation. The discussion of processes and roles includes accounts of some traditional knowledge and management practices for pest and disease management, current systems of integrated pest management systems, current processes for the development of knowledge and management systems, and the roles of a range of stakeholders in the development and implementation of pest management systems.

Generally stakeholders aim to manage established plant pests and diseases in order to minimise the negative impacts on crop yields and the environment. Success of this type of management strategy can be measured relative to economic threshold levels of infestation. The aim may realistically be eradication only for recent or small incursions of
exotic pests and diseases. In this discussion paper the focus is on the social processes that can contribute to the development and implementation of management practices.

Discussion

(i) Plant pest and disease management within a community capitals framework

Sustainable development at the community level is dependent on the community identifying and investing in six forms of capital: natural, cultural, human, social, built and financial (Flora et al. 2004, Garnett et al. 2007). Natural capital includes environmental health (e.g. soil conservation) and landscape diversity, and promotes sustainable land productivity. Cultural capital is a human construction that includes perceptions and knowledge systems, and affects the definition of problems. Human capital is driven by demographic trends, and the skills and capacity of the population. Natural, cultural and human capitals make up the “base” of the community in terms of resolving environmental issues (Flora 2004). For a community to develop in a sustainable way these forms of capital are transformed into high levels of social, built and financial capital (Flora 2004). Social capital is highest where tenure is stable, clear and equitable, governance is fair and effective, and interventions are appropriately sequenced across multiple scales and levels of governance (Garnett et al. 2007). Built capital may include the trade off of natural for built capital. Financial incentives are a major driver for changes in practices. Garnett et al. (2007) argues that financial incentives are especially important if belief-based constraints have become ineffective, and environmental payments are most effective if administered through contractual arrangements linked to measurable targets and milestones (e.g. though payment for environmental services arrangements).

Plant pest and disease management may be considered within a community capitals framework. Community cooperation is required for the effective management of plant pests and diseases. Plant pests and diseases have direct impacts on natural capital, often causing reduced crop yield, reduced biodiversity and adversely altering fire regimes. Management practices can have additional negative environmental impacts, such as pesticide residues or altered fire regimes with increased exposure and loss of topsoil. Human capital may be measured as skills and may appear to be low in small rural communities (Flora 2004), particularly if formal education levels are low. Management practices are largely in the hands of farmers. Although most farmers are generally not highly educated they may have insights into ecological processes and possess considerable skills for developing appropriate and effective management practices. The roles of farmers and scientists in developing management practices are discussed in more detail below.

Social capital within a community may consist of bonding and bridging capital. Strong bonding social capital means strong cooperation within the community but it may be associated with suspicion of “outsiders” and/or the development of cliques and divisions in the community (Flora 2004). Bridging social capital refers to links with agencies and individuals outside the community. Strong bridging social capital can reduce the chances
of a few dominant individuals controlling interactions with outsiders (Hernandez 2003). However, if bridging capital is too strong outside interests may control community activities. The most successful systems for developing management practices for plant pests and diseases for the greatest benefits to livelihoods and sustainable community development (described below) appear to be based on local conditions, capacity and ownership (natural, human and cultural capital) and have developed cooperative relationships between farmers (bonding social capital) and between farmers, scientists and local government agencies (bridging capital).

(ii) Processes and Roles

Traditional knowledge and management practices – perceptions intrinsic to human and cultural capital

“For centuries, traditional farmers have developed diverse and locally adapted agricultural systems, managing them with ingenious practices that often result in both community food security and the conservation of agrobiodiversity. .. Traditional agrosystems and associated plant diversity are the result of a complex coevolutionary process between natural and social systems, resulting in strategies for ecosystem appropriation” (Altieri 2004).

Wellhausen (1970) estimated that 40% of agricultural land is cultivated by farmers using “traditional” techniques. Most of these farmers have failed to benefit from technological advances in farming practice because of lack of knowledge of, or access to, these technologies, resistance to adoption, or because of negative social consequences of their adoption (Trutmann et al. 1996). Traditional agrosystems may have advantages, including minimizing risks, providing dietary diversity and maximizing returns with low technology and limited resources (Altieri 2004). Traditional farming systems may incorporate effective preventative pest control practices within traditional mixed cropping systems, such as those of traditional Mayan farmers in Guatemala (Morales and Perfecto 2000). The biological diversity within such systems usually promotes an active population of natural enemies, potentially keeping pests and diseases to a tolerable level.

Although traditional mixed agricultural systems minimised the risks of pests and disease, there are also examples of traditional methods of manipulation of natural predator populations to promote biological control. One of the earliest examples is that of weaver ant husbandry in Vietnamese citrus orchards for protection from insect pests (Barzman et al. 1996).

Farmers’ perceptions of plant disease generally differ markedly from those of scientists, evidence of different perspectives or cultural capital. Farmers of the central African highlands related plant diseases to environmental factors that promote the pathogen (such as rain) and management strategies are based on prevention by managing for conditions that promote plant heath rather than by treating disease symptoms (Trutman et al. 1996). The poor adoption of IPM by rice farmers in south Tamil Nadu, India, is partly attributable to the social values that include acceptance of crop pests and diseases as
inevitable, due to fate, and resulted in lack of promotion of IPM by existing rural community institutions (Muthuraman and Mangal Sain 2002).

In summary, there may be marked differences between farmers’ perceptions and scientists’ perceptions that need to be recognized and accommodated in designing and implementing effective plant pest and disease management practices.

**Integrated Pest Control and Integrated Pest Management**

Integrated Pest Control (IPC), according to the FAO definition (FAO 1968), implies that economic thresholds are established to determine the need for control measures, and natural mortality factors are recognized and enhanced (Brader 1979). Integrated Pest Management (IPM) more accurately describes most responses to pests and diseases in an agricultural setting, as management rather than control is a more realistic aim. Control might be attempted where small incursions have been identified and targeted.

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 1960’s. IPM was a breakthrough in national policy because of its referral to natural processes (including conserving natural enemies) and because it aimed to educate and empower farmers (Winarto 1995).

Economic threshold levels (ETL), as measured by pest numbers or extent of disease infestation, can be a trigger for the use of various management practices, including the application of pesticides. Some prescriptive management systems recommend application of pesticides on predetermined dates. ETL provide a more informed basis for pesticide applications. However, interpreting thresholds within a framework of ecological processes and interactions can enable the farmer to tailor practices to maximize crop yields, while minimizing damage to natural enemies and minimizing pesticide applications.

Mangan and Mangan (1998) compared the effectiveness of two different models for pest management in rice in China. The Farmer Field School (FFS) model of training, based on Ecology-Based IPM paradigm, was more effective than another model based on an Economic Threshold IPM paradigm. The former resulted in farmers increasing their understanding of crop ecosystems whereas the latter increased farmers’ knowledge of prescriptive pest and disease management practices. Rice farmers in the Philippines and Nepal (Price and Gurung 2006) had limited knowledge of crop pests, for example having difficulties in identifying the lifecycles of insects. These farmers benefited from learning more about entomology and using this knowledge to inform management decisions, rather than following prescriptive recommendations for crop pest management.

In summary, effective strategies for managing plant pests and diseases incorporate an integrated approach to ecological processes.
Roles of farmers and scientists in development and implementation of pest management practices

“For thousands of years farmers have been the “producers” of knowledge, the primary innovators and experimenters in food-crops farming. The freedom to carry out experimentations and strategies in their world of crop farming has been the basis of their dignity and self confidence” (Winarto 2004).

In the past, there have been relatively few studies of the knowledge of crop diseases held by traditional farmers (Bentley and Thiele 1999), although more recently there is some recognition of the value of farmer-scientist collaboration. Engaging farmers as collaborators in research into farming systems is referred to as farmer participatory research (FPR). Collaboration may be sought particularly during problem definition and setting research objectives. The many benefits of this process include tailoring of practices to users’ needs and location, and greater likelihood of implementation of the guidelines developed (see review in Fliert and Braun 2002). Likewise, in pest management, farmer involvement as research collaborators promotes both the development of practices that are practical and culturally appropriate and the implementation of improved practices (Nelson et al. 2001). Bentley (1994) claims that FPR has not been successful because it has not led to the development of new technologies or techniques. He describes the creative genius of farmers as innovators through history but outlines limitations to the process of collaborative research by farmers and scientists. It could be argued that this definition of research was too narrow and so the assessment too harsh. Successful collaborations of farmers and scientists have been noted in the bibliography assembled by Bentley and Thiele (1999). For example, Mak (2001) reports the successful introduction of a new rice variety into a Cambodian mixed agricultural system was due to experimentation by farmers using novel inputs, a collaborative process of farmers and researchers involving sequential learning and social change.

Genuine collaboration between farmers and scientists is a challenge in developed and developing countries. Bentley (1994) describes barriers to FPR, including social distance and fundamentally different styles of observation and experimenting (little shared cultural capital). The greatest success of FPR, Bentley (1994) observed, has been in setting research agendas and where researchers are dedicated to FPR in the long term. Participatory methods are routinely used by NGOs in Indonesia. There is a danger that apparently participatory methods can be used merely to validate a facilitator’s agenda, giving a false impression of bottom-up processes. In such cases, participatory methods may fail to “become a tool for the identification and transformation of structural problems” (Fakih et al. 2003). Fakih et al. (2003) identified the following prerequisites for conducting participatory rural appraisal (PRA) for social transformation: embedding in deeper educational process for liberation from potentially dehumanizing forms of development, allowing marginal groups to speak about taboo subjects, exposing injustice in the system, and becoming a vehicle for social change. Potential limitations of participatory processes can be partly overcome by developing a shared cultural capital, such as can be achieved through interactive field training modeled on understanding ecological processes (e.g. Farmer Field Studies, see below).
Agricultural systems and the impacts of pests within those systems include complex interactions of ecological and cultural processes. An understanding of these processes and interactions is needed to successfully implement biological control and IPM. The 1989 Indonesian National Integrated Pest Management Program was a marked change from transferal of “knowledge packages” to education of rice farmers through “knowledge transmission” (Winarto 1995).

An approach called the Farmer Field School (FFS) has been successful in empowering farmers to develop biocontrol practices since the early 1980’s (Williamson 1998, Nelson et al. 2001). Integrated Pest management FFS, based on farmer participatory environmental education, resulted in better pest management than a “No early spray” intervention, a simple rule approach (Price 2001). The FFS approach is based on recognition of farmers as key decision makers in pest management and on the facilitation of a discovery-learning process. FFS activities are based on growing a healthy crop, making weekly observations, conserving natural enemies and, when necessary and possible, manipulating ecological processes to maximise crop yield.

FFS training has led to reductions in pesticide applications and promotion of natural enemies (e.g. ADB 1996). Williamson (1998) describes the case of Pakistani farmers trained in FFS later demonstrating the damaging effects of pesticides on natural enemies in a cotton crop to pesticide salesmen and neighbouring farmers. Similarly, vegetable farmers in the Philippines trained in FFS relied less on information from pesticide salesmen and more on their own experiences. The FFS approach also gives farmers the motivation and confidence to apply skills to new pests. For example, Kenyan FFS vegetable farmers used observations of pesticide effects on natural enemies to investigate an unfamiliar podboring pest in dry beans (quoted in Williamson 1998).

The process of developing the training materials for the FFS has been a participative one. For example, in Vietnam a season long training program on rice blast disease was developed based on the FAO IPM program. The field guide was developed through a series of iterations, first based on input from pathologists and extension specialists, and then translated and adapted by FFS facilitators and participating farmers. Training included field experiments testing resistance of rice varieties and the major cultivation methods affecting disease (planting density and nitrogen application), simulations modeling the spread of disease in resistant and non-resistant varieties, card games illustrating the concepts of crop resistance and disease virulence, and discussions and games to reinforce knowledge of the environmental conditions that promote disease. The FFS curriculum and the training for facilitators have been refined with input from facilitators, participating farmers and researchers (Nelson et al. 2001).

In the Peruvian Highlands potato is a staple crop and by 1990s about 15% of the crop was lost to late blight each year (Nelson et al 2001). A baseline survey in northern Peru in 1997 (Ortiz et al. 1999) 90% of farmers identified late blight as a most important problem. Although most were aware of the weather factors that promoted the disease, only 9% were aware that it is caused by a pathogen and most (88%) were not able to distinguish late blight lesions from other foliar lesions (Ortiz et al. 1999). At this time standard
management practice for both subsistence and semi-commercial farmers was 6-7 spray applications per year, applied without protection, using dithiocarbamate-type fungicides classified by the US Environmental Protection Authority as probable human carcinogens (EPA 1999). FFS studies were established but differed from those for rice farmers in Vietnam (Nelson et al. 2001). Unlike the Vietnamese farmers, the Peruvian farmers had not participated in FFS before the development of the pest management FFS. The Peruvian FFS curriculum was developed through a collaboration of farmers and extension workers to include a range of farming practices especially maintenance of high seed quality. Activities covered a similar range to those of the rice FFS however modifications to the activities and learning games were altered to reflect differences in epidemiology of the two diseases: rice blast results from focal infestations and potato blast can be maintained on other hosts with widespread general infestation in the new crop (Nelson et al. 2001).

Following from FFS, the Community Integrated Pest Management (CIPM) Programme in Asia has the aim of “making farmers experts” and decision makers (Winarto 2004). FFS and CIPM programs have resulted in a gradual change in farming practices in several countries in Southeast Asia, with increases in farmers’ technical understandings and enhancement of their creativity, dignity and self-confidence (Winarto 2004).

There are many modes of communication of the results of investigations into best practice for pest management. Scientists write formal peer-reviewed papers, extension officers may produce plain language fact sheets and other pictorial information, and farmers generally spread information by word of mouth and demonstration to neighbours. The FFS usually result in the production of a poster that summarises an “agroecosystem analysis”, observations of the factors affecting the crop (Nelson et al. 2001). The poster is used as a tool for recording observations, communicating this information to neighbours and incorporating this information into planning processes.

Participatory experimentation can be combined with presentation of climatic conditions, disease infestation and farming practices in a Geographic Information System to understand and predict the impacts of pest management systems (Nelson et al. 2001). Participatory GIS (Rambaldi et al. 2006) encourage participation of farmers, increasing and enabling the integration of farmers’, scientists’ and extension officers’ knowledge, and promoting the development of culturally and environmentally appropriate pest management practices.

In summary, processes which increase human capital can be effective in plant pest and disease management. For example, through Farmer Field Schools, farmers are empowered by increased knowledge and participation in effective pest and disease management.

Community processes in plant pest and disease control - components of social capital

Grootaert (1999) found evidence that local social capital, defined as household membership in local associations, makes a significant contribution to household welfare. Furthermore, long-term benefits of high social capital can be attributed largely to high
heterogeneity (mix of gender, ages, ethnic background, wealth) in membership of local associations and the active participation in decision making by the members.

Ecological sound management practices are traditionally passed down the generations, in some cases by local stewards or mythical figures in the local culture (Birkes et al 2000). In some traditional management systems local ecological knowledge is used to interpret and respond to resource availability, in some cases encoding new management systems in the ethical and cultural beliefs (Birkes et al. 2000). Communities may respond to pest and disease incursions through regulatory action at a localized scale, with restrictions imposed by local authorities. In the Philippines, following the demonstration of improved management for pest control and reduced pesticide use through the FFS, the mayor of Atok town banned all advertising of chemical insecticides in his municipality (Cimatu 1997).

Winarto (1995) describes the “top-down” approaches of Indonesian government policy associated with the Green revolution, with dependence on high technology input in the form of packages of high-yielding rice varieties, fertilizers and pesticides on heavily subsidized credit. Although achieving higher yields, Indonesian farmers were anxious about infestations that were now common. In this situation rural communities had lost power to make decisions about alternative management systems or practices and the communities were dominated by external agencies, had lost much of their decision-making power and had dwindling social capital. The subsequent development of participatory programs such as FFS increased social capital by promoting confidence in community members, and cooperation within the community and between the community and external education facilitators.

Leadership and governance

“Changes within the Indonesian government and changing relations between the government, civil society and the private sector are opening up new spaces for negotiation – and conflict” (Thorburn 2004).

In the 1960’s the Indonesian government introduced the general Education Program to boost rice production, followed in 1980’s by Supra Insus program which focused on intra- and inter-group cooperation to implement ten technical innovations (Muktasam and Chamala 2001). Consequently a range of community groups were formed to address issues such as health, poverty alleviation and women’s development. Most groups contributed little to community learning and community development because of six key factors: top-down dominance, targeting approach, misuse of incentive, absence of issues, lack of coordination, and misperception of the group roles and development program (Muktasam and Chamala 2001). Factors associated with groups that promoted sustainable rural community development included less formal action learning processes, learning from the field (bottom-up learning), and continuous community and organizational learning (Muktasam and Chamala 2001).

Political reforms in Indonesia since 1998 have increased the autonomy of local-level institutions and representative councils have been elected in all Indonesian villages so
that the village head is no longer the sole authority in the community (Antlov 2003). An examination of the World Bank-supported Urban Poverty Project (Fritzen 2005) found that the more democratic procedures for selecting local leaders to manage project funds resulted in slightly lower domination by local elite, but more importantly, to greater degree of commitment to serving the poor and greater participation by the poor in the project.

Beard and Dasgupta (2006) examined participation in a poverty alleviation project in Indonesia and described two distinct forms of collective action: the first based on community cohesion, stable social relationships and adherence to social hierarchy and the second based on a shared desire for social change. Both forms were important for positive project impacts for beneficiaries but only the second had potential for social transformation.

Shiffman (2002) presented an analysis of community participation in the successful Indonesian family planning program that began in 1969. This program was initiated and promoted by the Indonesian government agency, BKKBN, and promoted through community engagement. Shiffman (2002) described many factors that contributed to the success of this program. The government’s involvement (through BKKBN) was successful for many reasons. The program was operating within an authoritarian political system with the support of President Suharto and the freedom to undertake new initiatives without concern for public approval. Other factors related to engagement with various influential leadership networks, including (i) co-option of the nation’s most powerful women’s organisation, PKK, with active members and a leadership structure that extended from the wife of the Minister for Home Affairs to wives of village chiefs, (ii) provision of incentives for family planning groups, such as microcredit for cottage industries, (iii) numbers of family planning groups became a measure of performance in the priority area of “population” identified by the Ministry of Home Affairs, (iv) enabling of field workers to take on strategic roles as village family planning group members became self-managed, and (v) assistance with support and implementation through other Ministries and women’s organisations. This state initiated program was strengthened because it was a response to community needs and was shaped by community preferences and structures. For example, delivery of contraceptives varied with province: through informal village leaders in West Java, through a member of village head’s staff in Central Java and through the banjar leader in Bali (Shiffman 2002). In this way the program responded to the communities’ cultural capital.

Parallels with delivery of primary health care

Crop pests and diseases and their treatment are often viewed by farmers in a similar way to human sickness and ailments, i.e. as inevitable problems for which there may be a treatment (Muthuraman and Mangal Sain 2002). There are parallels between the principles of integrated pest management and the community processes underlying human health programs. Primary health care may be viewed in a similar context to the agroecosystems context used for IPM (Peden 2000), with environmental, cultural, political and social factors influencing the development, implementation and impacts of management practices.
The importance of multi-level participation in effective community programs is illustrated in many examples from the health sphere. A successful program of primary health care has been operating in Banjarnegara Regency in central Java since the 1970s. It has combined “the resources and commitment of local government with the flexibility and innovation of the private sector into a quasi non-government organisation Yayasan Pembangunan Pengembangan Sosial Ekonomi (Suwandono 2003), and engaged the participation of some 4000 volunteers across 279 villages (Haliman and Williams 1983). Suwandono (2003) has attributed the success of this program to leadership provided by key policy makers and health managers, and a systematic process through which community groups participated in planning, implementation and budgeting of the program. Similarly, effective collaboration between the health sector, community organisations, and community members is essential to the success of programs in tuberculosis care (Maher et al. 1999). In these health programs, as in IPM, community engagement is essential for effective and expanding implementation of improved practices.

Roles of the general public

The general population has a range of influences on the identification of pests and diseases and the development of management systems. People traveling are potential vectors for the movement or spread of pests, diseases and weeds. Urban and rural dwellers can play a significant role in the spread of weed species and plant pests and diseases (e.g. Meyer and Florence 1996) and have a potential role in arresting that spread given sufficient awareness (Anderson et al. 2003). Communities in remote locations in northern Australia are trained to identify and report incursions to Northern Australian Quarantine Service (NAQS).

The attitudes of consumers and farmers to the potential hazards of pesticide use can create pressure to reduce pesticide use in pest management. Studies of consumers in USA have indicated a moderately high level of concern over the safety of pesticides but recognition of the necessity for some pesticide use (Dunlap and Beus 1992), and that trust in information about pesticides was a significant predictor for perceptions of safety but not acceptability (Coppin et al. 2002). Increasing concern amongst farmers of USA regarding safety of pesticides from 1940s to 1990s was illustrated in the changes in imagery used in chemical advertising (Kroma and Flora 2003).

International agreements/ cooperation and national and local policies and regulations

When pests and diseases cross international borders, international cooperation has taken the form of conventions followed by publication of journals (Ling 1974). Perhaps the earliest formal efforts in international cooperation were in 1881 in Europe in response to grape phylloxera introduced into France from America about 20 years earlier. A conference held in Switzerland resulted in an international agreement to impose quarantine regulations to prevent further introductions and the spread of existing infestations (Ling 1974). Various European publications were established over the next 30 years for dissemination of information relating to prevention of the spread of plant
pests and diseases. Throughout history there have been many organisations, agreements and publications set to address problems of pests and diseases, particularly those that cross international boundaries (Ling 1974). Many have been reorganized and divided into groups with a regional focus; for example for locust control in Africa and the division into regional sections in 1971 of the International Organisation for Biological Control of Noxious Animals and Plants (IOBC) (Ling 1974). Ling (1974) also reviews the roles and achievements of international agencies (such as the UN’s FAO, WHO and UNDP) and international research institutes (such as International Rice Research Institute, IRRI) in developing and disseminating information about the biological control of pests in crops.

The Northern Australian Quarantine Service (NAQS) has a mandate to identify incursions of pest, diseases and weeds in the coastal area of northern Australia, from Broome in the west, to Cairns in the east, including the Torres Strait (http://www.daf.gov.au/aqis/quarantine/naqs). NAQS engage with remote Indigenous communities and employ community members to monitor sections of this area. NAQS also works with Australia’s nearest neighbours to map changes in pest, disease and weed infestations in Indonesia, New Guinea and neighbouring islands.

(iii) Methods for evaluating processes, and indicators of success

Many studies (some outlined below) have evaluated educational intervention programs for improved pest and disease management but few studies have assessed the community processes outside these intervention programs. Winarto (2004) used observations and in-depth interviews of participants and non-participants in an IPM program in his ethnographic field work to discover the mechanisms and processes leading to changes in knowledge and practices, to gain understanding of local meanings, and to contextualize findings.

Evaluation of educational intervention programs generally includes assessments of farmer knowledge before and after the program. Nelson et al. (2001) described baseline surveys of farmers from which to measure impacts on farming practices, inputs, yields, farmers’ knowledge and application of their understanding of the ecological processes they observe in their fields to management decisions. Price (2001) describes a methodology for assessing farmers’ entomological knowledge and changes in the knowledge base through different interventions. Price emphasizes the importance of understanding the farmers’ knowledge base, which often illustrates the perspective or cultural capital of the group. Ideally, the existing knowledge base and nomenclature is understood and used to develop new participatory environmental education interventions. The scientific system can serve as a road map to describe the existing farmer knowledge base rather than to subsume it.

Evaluation has a potential role in informing adaptation throughout the course of the program. Evaluation in participatory systems is an essential part of the on-going adaptation of the FFS program (van de Fliert and Braun 2002).

Sustainability of action research or educational intervention beyond the period of formal activities is highly desirable. This sustainability may be manifested in continued
implementation of new management practices, expansion of their application, or continued refinement of these practices. Potato varieties resistant to late blight had proven successful in trials in FFS in Peru. The subsequent planting of these varieties was a measure of success: the resistant varieties were planted by 35% of participating farmers as well as 10% of non-participating farmers, a flow on benefit to the wider farming community (Nelson et al. 2001). Feder et al. (2004) evaluated FFS and found that although participating farmers used less pesticide and gained some knowledge, there was no significant diffusion of knowledge to other farmers.

Training of technical personnel in pest and disease management from developing countries has been a role of UN agencies (Ling 1974). Evaluation of this type of training may be crudely measured by the later employment of those trained; for example 85% of people trained in pest control in 1960-1970 remained employed in locust control and plant protection in 1971 (FAO 1971). Evaluation of factors relating to the translation of this training into improved pest management is more complex and challenging. This evaluation could include assessment of the appropriateness (culturally, socially, environmentally) of the training materials, training methods and the personnel chosen for training, the subsequent engagement of trainers with farmers and policy makers, and the range of constraints (e.g. institutional, cultural) to using training to influence management practices.

Mangan and Mangan (1998) carried out a longitudinal study of the effectiveness of two models of farmer training for pest and disease management, with interviews before, immediately on completion of, and several years after the training. Effectiveness was measured in terms of the consistency and correctness of responses, completeness of responses, use of pesticides, and yields after training.

*Indicators of success*

Success of the processes of developing pest management systems are evident in implementation and capacity of the farmers, scientists and agencies/institutes involved, as well as efficacy of the improved practices. Indicators or measures of success can include increased farmer participation, increased crop yields and reduced inputs (especially seeds, nutrients and chemicals). Desirable increases in farmer participation include greater engagement as well as greater numbers of participating farmers. Nelson et al. (2001) describes increased farmer participation in FFS both through rapid increase in the number of farmer groups participating, increased geographical range of application, and through adoption by farmers of experimental methods and use of these to improve disease management strategies. Farmers were enthusiastic about having greater understanding of a plant disease which had been “dangerously mysterious”.

Empowerment of farmers as informed decision makers is a feature of the more successful processes for improved pest and disease management, such as FFS, described in this paper. Corbett and Keller (2005) evaluate a framework for analyzing empowerment. They describe an assessment of a Participatory Geographic Information System however this evaluation methods could be adapted to evaluate empowerment through IPM programmes.
Implementation of improved practices has been demonstrated to be promoted by farmer engagement. Positive farmer participation has benefits in terms of increased dignity and self esteem of farmers as well as greater ability of farmers to adapt practices to changing environmental conditions, pest populations and crop varieties. Through FFS, farmers were able to evaluate management practices using parameters such as nitrogen inputs as well as observations of crop health (Nelson et al. 2001).

Indicators of success of the processes of development and implementation of pest and disease management practices include effective farmer participation, increased capacity of farmers to observe and understand ecological processes, adjustment of management practices in response to changing conditions, and evidence of these indicators beyond the period of intervention programs.

**Summary, conclusions and implications**

Farmers were the original investigators of management systems for pests and diseases in crops. With technological developments, such as the Green Revolution, scientists and policy makers usurped that role and farmers were increasingly given prescriptions for crop management. In the past thirty years there have been greater opportunities for farmers to play an active role in the development of management practices: through Farmer Participatory Research (FPR) and Farmer Field Schools (FFS) in developing countries and Landcare in Australia.

The advantages of these participatory programs include:
- Farmer input into research design leads to development of practices that are more appropriate culturally and economically and presented in ways that are consistent with farmers’ perceptions and belief systems.
- Greater ownership by farmers increases implementation
- Increased farmers understanding of ecological processes equips them, and gives them confidence, to adapt practices according to current observations including maximizing natural enemies and minimizing chemical applications.
- Farmers working with extensions and research staff can become strong advocates for improved management practices, potentially influencing other farmers, government agencies and politicians

Key elements of successful participatory programs for developing and implementing pest and disease management practices are:
- Participation and active engagement of local land and resource managers (farmers and community members) and external agencies with relevant expertise (building social capital).
- Recognition and incorporation of existing knowledge systems and perspectives (cultural capital) of communities and potential collaborators including scientists, local government officers and policy makers.
- Enhancing knowledge base of farmers, and scientists, particularly in ecological processes through observations and experimentation in the field.
Empowerment of farmers to make management decisions on the basis of observations, ecological knowledge and assessments of costs and benefits of a range of management practices.

International cooperation for controlling the spread of plant pests and diseases is established between northern Australia and the nearest neighbours. Success is dependent on sustained cooperation and goodwill.

Evaluation of success of pest and disease management practices in terms of crop yields is relatively straightforward. Elucidation and evaluation of the key processes for successful identification and management of pests and diseases are more elusive. Key processes include:

- Farmer participation in the identifying research questions, designing research and implementing and evaluating improved practices
- Increasing ecological knowledge of farmers and researchers
- Raising awareness of issues relating to pests and diseases amongst farmers, general public, policy makers

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Abstract

This paper seeks to present a multiparadigmatic approach to development in Indonesia using biosecurity and community development as examples of how priorities and agendas of different development groups or communities can be interlinked in order to meet the expectations and perspectives of each group jointly. This differs from a single paradigm approach which professes to be inclusive, but in actual fact is oriented towards reaching the objectives and output which serve only one perspective, i.e. that of the funder or planner.

The paper serves to emphasize the importance of communication strategies not as a one way process of “enlightenment” from providers to beneficiaries, but as multidimensional processes of knowledge recognition and exchange. This includes support towards internal rationalization and effective negotiation between stakeholders.

Here it is argued that it is not only important to be aware of the existence of a variety of paradigms shaping the way different development communities interact. More important is to build an appreciation between development communities that each of these paradigms hold true for their respective communities and linking between paradigms rather than forcing context based rationale to follow broader, unbound rationalities.

This paper is far from being a complete work but instead seeks to encourage further studies and exploration in order to develop more effective and democratic communication strategies. As thoughts originally presented as a seminal paper, it is hoped that the ideas presented can be further elaborated and strengthened with input and perspectives from more Indonesian as well as global experiences.

28 The writer wishes to acknowledge input and guidance received from Associate Prof. Michael Christie and Prof. Ian Falk. Valuable insights and comments were also generously provided by members of the Center for Eastern Indonesian Studies, Satya Wacana Christian University (DR. M. Ndoen, DR. D. Manongga, DR. F. Karwur, T. Litaay, R. Siahianenia, D. Zacharias and D. Palekahelu).
Introduction

For countries such as Indonesia, the issue of bio-security\(^{29}\) has yet to be seen not only in terms of protecting the bio-diversity of this immense archipelago, but also as a strategic approach to support Indonesia's drive towards long term political and economic stability. Indonesia was one of the first countries to ratify the Convention of Biological Diversity (August 1994)\(^{30}\) as well as being in the forefront of nations apparently serious about biodiversity with its National Biodiversity Strategy and Action Plan\(^{31}\). Despite these past and ongoing efforts, Indonesia has an increasingly dismal record in terms of maintaining and protecting its natural resources. The title of a box in a 2001 World Bank report highlighting Indonesia’s environmental issues is appropriately titled: “Megadiversity Country with a Mega Crisis”\(^{32}\). According to this report, Indonesia is “the world’s most biologically diverse country”, however this “megadiversity” is facing a “mega crisis” primarily due to habitat loss which the report directly correlates with a reduction of plant and animal populations. Kompas\(^{33}\) on the 4th of May, 2007, published an article highlighting Indonesia as the world’s record holder (courtesy of the Guinness Book of World Records) for rate of deforestation (2% annually or 51 km\(^2\) per day).

Clearly there is a mismatch between the stated intentions of the Government, the principles Indonesia is adhering to in international conventions, and the actual conditions within the country. This inconsistency is an important element to consider in constructing a framework to improve biosecurity (and consequently, food security) in Indonesia. This paper seeks to highlight the different development paradigms influencing the direction and agenda of different stakeholders and development actors in Indonesia, and how a better understanding of these paradigms might be used to effectively tackle environmental issues throughout the country.

Poor maintenance of agreed biosecurity systems during the centralized government system of the New Order era provides a number of sad examples in which Indonesia was unable to secure its biodiversity. A vast number of plant varieties have been lost already. If the future of Indonesia's bio-wealth is to be secured, the role and participation of communities is a key factor to consider. This paper looks at how the launching of the

\(^{29}\) In this context “biosecurity ” is used by the author as a descriptive term denoting “protection of, or securing biodiversity” within the Indonesian archipelago. We have become aware that “biodiversity”is also frequently used as a term to denote protection programs (eg quarantine programs at national borders) seeking to prevent biological invasions eg bird flu, SARS, weed invasions.


\(^{31}\) http://www.bappenas.go.id/index.php?module=ContentExpress&func=display&ceid=827&meid=

\(^{32}\) Idem to footnote 4.

\(^{33}\) Leading daily newspaper in Indonesia.
country's National Community Empowerment Program\textsuperscript{34} provides an opportunity to inform communities about the importance of biosecurity and at the same time to collect and channel relevant local knowledge. Also emphasized is the important role facilitators of community development can play as portals (or channelers) of knowledge - and why this is important if Indonesia seeks to develop a knowledge based economy anchored by a strong and effective policy on biosecurity.

**Literature Review**

As a study of interaction between various development paradigms, Sardan (2005:53) says “...the problem concerning the articulation between levels such as 'macro/structures' and 'micro/social strategies' is still wide open...” and this is where this paper seeks to expand on strategies and structures in Indonesia affecting the country’s development. Such strategies and structures are influenced mainly by the communication occurring within and between levels. Therefore increased effectiveness in communication processes should support increased effectiveness of interaction between levels. We can relate this to Habermas’ theory of communicative action in the context of development in Indonesia where the effectiveness in negotiation and rationalization processes between development actors will affect the effectiveness of the development process to be implemented. These components of communicative action can also be linked to the approach and theory of discourse analysis where the development process in Indonesia arises through discourse between developers.

In *Development as Freedom* Amartya Sen concludes that to be strategic, development must no longer be seen as a simple linear process (Sen, 1999). Sen elaborates on three words in his concept “Development as Freedom” to illustrate the fact that there are many elements that must be continuously considered and cultivated to implement meaningful development. Unfortunately, most academics see research as an abstraction, which often contributes to current problems in development. Abstraction and empirical reality tend to oversimplify the reality of development processes allowing researchers to prove the ‘truth’ of theoretical words and discourse which form the concepts that have been developed. Yet these concepts only remain true if all else is constant, a condition rarely to be found in development.

As a result, actors in development have been placed into different levels. The theoretical approach directed at development actors such as that proposed by Mosse and Lewis in their book “*Development Brokers and Translators: The Ethnography of Aid and Agencies*” focuses on individuals as “social actors who are actively developing social, political and economic roles as a result of a state weakness to press for rationalisation in their region and use of patron-client relationships to reduce the confusion of the state’s intervention and control efforts” (2006:11). Mosse and Lewis also discuss development brokers, who are generally seen as a bridge between developers and community (2006, 13). All parties involved in development come up with interpretations which are

\textsuperscript{34} Information on this program, otherwise known as PNPM – Program National Pemberdayaan Masyarakat, can be obtained through the following link: \url{http://www.pnpm-mandiri.org/index.php?option=com_content&task=view&id=25&Itemid=47}
“performative” because they tend to modify the world in accordance with their own world perspective (Bruno Latour, 1996:194-195). This emphasises the importance of research into developers and the way they operate because it is the perspective of these developers which influences development practices in Indonesia. Although there has been much research into development practitioners, as King (2004) states in his paper: “…the absence of sufficient and sustained critical work on the new development architecture in sites in the south leaves much of the agency consensus unchallenged. It is vital that national researchers, think tanks and knowledge networks in the South engage with the structures and modalities that have emerged and explore in detail, at both the macro and institutional levels, their implications for the ownership of knowledge and of the development project more generally.”

It is the responsibility of national (i.e. Indonesian) researchers to continue to think critically about development structure in Indonesia. So far, international aid organisations have not been sufficiently “challenged” to increase awareness that development knowledge expressed in development projects does not just belong to development implementers and international organisations, but also emerges from, and thus belongs to, local stakeholders. This is an area for further development of theories and research.

Jorgensen and Phillips (2004:60) quote Barret (1991) who states that hegemony “is a process used to create lower forms of awareness without any effort to assist in reducing acts of violence or coercion”. According to this theory, the use of verbal icons in development such as ‘good governance’, ‘gender mainstreaming’ and ‘indigenous peoples’ in the very least creates differences between those that have command of these terms and are able to engage effectively in development discourse and those stakeholders or communities who cannot. This practice also places such concepts or icons to become aims or objectives in themselves rather than building joint comprehension of what is meant by these words and how they relate to local constructs. More work is needed to further examine the use of development discourse and how, epistemologically, this creation of a new discipline is or can be subverted into becoming a colonizing practice where development terms become “mechanisms of power” (Foucault, 1977:102) that are idealogical constructs rather than rules derived from norms (Foucault, 1977:106). According to Laclau and Mouffe, “this creates a group in the political process which becomes a topic of discourse” (Jorgensen & Phillips, 2004: 62), and which become the subject of development targets that through regulation of development delivery, are governed by rules derived from the “sovereignty” of the funder and described as the verifiable indicators of activities and output, such as minimum participation rates of women in a meeting. These rules are often applied without considering local norms to determine the timing or conditions of a meeting which can ensure meaningful participation of women in different contexts/communities.

According to this perspective, the need to reach a common resolve for any development process as defined by Todarro is increasingly difficult to achieve because the discourse arena for development is constantly changing and introducing new jargon and terminology. Anyone who wishes to become absorbed into development in Indonesia will soon be drawn into the discourse trap that has been created by international development
agencies and translated and used by national development agencies into various acronyms and term. For example, the term ‘good governance’ has been translated to “tata pemerintahan yang baik” whilst others have used the term ‘governansi’35 to replace the Indonesian word for governance36, that is ‘pemerintahan’. In other situations people have chosen not to translate these terms at all and just use the English term. ‘Gender Mainstreaming’ is sometimes translated to ‘pengarusutamaan jender’ which is probably just as alien to the majority of Indonesians as it is to people who do not speak Indonesian. Much work is needed to look at what is meant semantically by such words/terms and what local alternatives exist which could be used to convey intentions, as have already been conducted for example by Christie and Greatorex (2006) on the Yolgnu Aborigines (Northern Territory, Australia). In their work they compared the perceptions and construction of social capital to the norms and values existing in this particular tribe. Somehow it is this terminology, verbal icons or field of discourse of development that determines if someone is “accepted, rejected and negotiated in the discourse process” (Jorgensen & Phillips, 2004:82). This depicts how someone can come to be accepted (or excluded) within development circles. For local communities in Indonesia to be accepted in development circles requires negotiation processes to “introduce” and correlate existing norms and practices with international principles. For instance, in South Sulawesi, the Bugis tribe37 say “Taro ada, Taro gau”38 which literally translates as “place words; place actions” meaning: “what is stated must be carried out”, a local norm that implies the same values inherent in the term “akuntabilitas” (accountability) which has been introduced almost as a new concept to the region deemed necessary if Indonesia is to attain “good governance” (whatever this term is also meant to imply in the minds of local stakeholders). Thus a greater recognition of existing local norms through more studies and research could provide a wealth of preexisting concepts to utilize in development discourse.

The sphere of discourse which emerges within a particular group through the command and configuration of concepts will produce development paradigms. Chambers describes the development paradigm as “a coherent and mutually supporting pattern of concepts, values, methods and action amenable to wide application”39 (Chambers 1994:2), In his article Chambers argues that there are new development paradigms which have 4 levels of interaction, being 1) normative, 2) conceptual, 3) empirical and 4) practical. Through this new paradigm Chambers attempts to overturn ‘normal professionalism’ to become ‘new professionalism’ where the power relationships are altered so that:

“…putting the last first in client selection, professional values, research methods and roles. Clients for ‘new professionals’ are those who are poor and

35 See http://www.gtzsfdm.or.id/documents/dec_ind/o_pa_doc/Penjelasan_kesepakatan.pdf
37 A “tribe” of over 3.5 Mill. persons according to SIL ethnologue originating from South Sulawesi (http://www.ethnologue.com/show_language.asp?code=bug)
38 Recorded from an interview with Rashid and Nursyamsul, Makassar, 18 Oct. 2007
39 This definition differs from Kuhn’s definition of the paradigm: “Universally recognised scientific achievements that for a time provide model problems and solutions for a community of practitioners”. (Kuhn 1962:x)
marginalised. Professional values are altered to prioritise ‘low’ technology and apparatus. Efforts are made to make research approaches and methodology more holistic and experimental in the field. Even roles change so that poor communities become the teachers and experimenters. Evaluations are not conducted by peers but by the clients themselves”.

Chambers concludes that whilst this new paradigm refers to rural development it is also applicable to relationships between countries, trade and managing international aid organisations at a macro level. The thinking behind the development paradigm and new professionalism is based on the assumption that if development stakeholders at all levels should change their approach to work from the bottom-up by prioritising those who have previously been marginalised by the development process. Whilst this is the ideal according to Chambers, it is extremely difficult to achieve given the reality that each group of development stakeholders in the discourse arena operates at a different level with different interests and orientations. However, if we accept that epistemological strategies can be the key to increasing the effectiveness of development efforts, then this would encourage further exploration of how national and international development agencies could collaborate with local knowledge holders. Research specifically looking to relate and negotiate local norms with national and international intentions to increase the welfare (and implicitly the productivity) of communities could provide much needed epistemological bridges and bonds between the different levels of development actors.

The interests and orientation of development stakeholder groups can generally be categorised by first looking at the definition of community. Community as defined by Wilkinson and quoted by Prof. Ian Falk40 is as follows:

Sociological definitions emphasise interpersonal bonds such as shared territory, a common life, collective actions, and mutual identity. The essential ingredient is social interaction. Social interaction delineates a territory as the community locale; it provides the associations that comprise the local society; it gives structure and direction to processes of collective action; and it is the source of community identity. ...The substance of community is social interaction. (Wilkinson 1991:13)

Placing development stakeholders together into Chambers’ new paradigm is difficult as developers cannot really be defined as a community due to the limited social interaction between developers. Social interactions and other elements of community as defined by Wilkinson only begin to become apparent if we start to categorise development practitioners into general categories, for instance, local, national and international developers. Development practitioners within each of these three communities have similar ways of life, collective actions to strive for, manners in which they hinder change as well as relate to a common identity based on a similar level of access to knowledge, and perceptions of their needs and priorities.

Besides all being development stakeholders, each of these communities or groups can be seen to experience different development paradigms. Each has a system with limited coherence and a culture of mutually supportive concepts, values, methods and actions which can be widely applied. Despite this integration, the concepts, values, methods and actions may not necessarily apply cohesively across groups because of the basic differences of these communities. Research has found that western science in development projects largely disregards local wisdom and knowledge as well as the types and features of issues of underdevelopment and the way it is handled based on western references and knowledge (Grillo, 1997:3). This situation fuels the argument that the West dominates development practices. William Easterly strongly addresses the issue of aid from international organisations in an article presented at the third AFD/EUDN conference titled “How to Assess the Need for Aid? The Answer: Don’t Ask”. In this paper, Easterly addresses the use of the planning process in the aid community, plus strategies and frameworks which are developed to meet the needs of poor communities but only make sense if they are looked at with a ‘centralised planning mentality’. Easterly goes further by describing how various theories and economic models such as the “financing gap”, “poverty trap” and others continue to be used even though they have long been questioned as tools for estimating need and for analysis of policy and poverty. Easterly emphasises how international aid alone is not able to address the Millennium Development Goals. He concludes that planning processes should be put aside and funding given to those who are capable of producing results and funding reduced for ineffective programs. When the positive effects of aid become more obvious and increased numbers of people are lifted out of poverty, ‘rich’ countries will increasingly support such programs.

It is interesting here to once again look at the analysis given by Sen in chapter 10 of Development as Freedom emphasising capacity building to create development stakeholders who are ‘free’ to determine the direction of development and their role in it. The spotlight is put on the domination of Western practices, particularly from a cultural perspective. The force of economic exchange and labour division is difficult to avoid in a competitive world driven by technological advances which give dominance to economic competition. This issue is not always problematic in light of the benefits from global trade and the economic prosperity this may bring to a country. Sen proposes a form of globalisation which strives to decrease destructive impacts on work systems and traditional production, where changes occur gradually. This gradual change is done through a process of training and capacity building by development of new skills. This process can be supported by short-term social security network programs, particularly for those who directly experience the negative impacts of globalisation. What would perhaps make Sen’s approach more tenable is if there are also processes of training and capacity building to learn, accept and enhance local knowledge practices, many of which are relevant in an increasingly environmentally aware world.

Increasing “skills” or capacity as proposed by Sen can be seen from both an economic and cultural perspective. The second issue is very different from the first. In economic and technological development, many old systems are stripped away without regret in favour of new more efficient technologies and systems. However, as old systems and traditions are stripped away there may be a sense of anxiety and deep sadness. Every
community group must therefore be able (and have sufficient confidence) to determine which aspects of their traditions should be preserved, even though it may have direct economic costs. This brings us back to the issue of capacity. The decision to maintain or relinquish traditional systems should be discussed collectively, at least as far as is possible given the freedom and ability of sections of the community to discuss and make collective decisions about what traditional aspects should be relinquished and what should be maintained. Sen argues that capacity building is essential for understanding intercultural influences to gain benefit from the products of other cultures and nations. A capacity for mutual understanding and appreciation of cultural products is very important. Sen’s description of the criteria and meaning behind having the freedom to participate in real development is a result of decades of struggle and deliberation, working in global development organisations. Such a complete comprehension can be viewed with some scepticism, as it is not possible that all criteria can be fulfilled. However, Sen emphasises that the development process should not be considered the responsibility of only one or two stakeholder groups. Development is the responsibility of all stakeholders and can only be achieved if all individuals are actively involved. Those involved in development can only be guaranteed an active role if they are provided with the necessary basic capacities (Sen 1999).

If development is the responsibility of all stakeholders, are all stakeholders in agreement on what development itself is and what kind of development they want? In an earlier paper\(^4\), I told the story of a chance meeting between a community development specialist in Papua with a local fisherman napping on the beach to illustrate differences of perceptions. Too often we assume that since words such as “development” are used so commonly, that we forget to clarify if the notion of development is actually the same between the actors who are interacting. Although this can seem to be trivial, there are too many examples of investments in projects which are not sustained after the life of the project. It would be interesting to see the extent in which many of these cases are due to weak or inappropriate communication strategies often referred to in Indonesia as “socialization” and dissemination or inception processes or phases in a project. The question would be to what extent do such processes (and also planning process) focus on the need to “teach” local stakeholders rather than the need to bridge understanding based also on input and learning of local terminology and norms which relate to the objectives of a project.

At this point it is also worth mentioning Ricoeur’s thoughts on the dialectic between text and the reader. Ricoeur (Valdes, 1991:8) sees that the process of interpreting text is a dynamic dialectic. The process of interpretation and the level of appropriation (comprehension) that is achieved by the reader are extremely relevant in the development process for international workers who are highly dependent on development texts. Yet if community development facilitators, for instance, only read their manuals without processes of appropriation\(^4\) how will they be able to build a common understanding with

\(^4\) Published by the Knowledge Management for Development Journal (Vol.1, No.3)
http://www.km4dev.org/journal/index.php/km4dj/article/view/45/46

\(^4\) A common issue due to educational practices in Indonesia where teachers still use a lot of rote methodologies
local stakeholders? Time for processes of appropriation is thus required, yet in the case of community facilitators in Indonesia, training has been compressed to decrease costs\(^\text{43}\).

Where the dialect between a reader and text allows for appropriation, the reader will receive meaning and “something that was alien can be owned” (Valdes, 1991, 89). Where there is conflict of meaning an individual involved in development who reads a provided text will hopefully enter into dialogue with the text in order to get answers for questions that arise. Ideally, texts that are disseminated by international development agencies and articulated by the international development community should be negotiated collaboratively with national and local stakeholders. On the other hand, misinterpretation can and does occur when a text or discourse is presented as being non-negotiable (Lewis & Mosse, 2006:2). This again demonstrates the importance of the interaction process between development stakeholders in Indonesia and the importance of capacity building for all stakeholders to improve the effectiveness of these interactions.

Even though there are various papers highlighting the ethnography of actors involved in development from an instrumental, populist and deconstructive perspective (Lewis & Mosse, 2006:2), most of these are idealistic rather than methodical and there is still a need to “analyse the interaction of ideas and relationships in the development arenas” (Lewis & Mosse, 2006:5a). In the contemporary context, when different frames of reference are used to analyse the same moment or event there can be a war of interpretations. However, it is clear that an approach directed towards stakeholders such as that developed by Wageningen Agricultural University (Grillo & Stirrat, 1997:3) can be considered quite valuable in development studies. This focus on stakeholders becomes important because multiple realities emerge from one group of development practitioners to another. Methodologies should be clarified to create “compatible worlds” (Long 1992:5) so that these different realities can be understood by the different actors. In Indonesia, research has more commonly highlighted the discourse of communities and local development practitioners as found in the writing of “outsiders” such as the Geertz’s “Kinship in Bali” (1975) and Kuipers (1998).

Discourse analysis of practitioners has become important because the ‘language’ that is used in the development process already has its own vocabulary with different areas of discourse and meaning construct. One of Kuipers’ conclusions which emphasises that discourse analysis should be a collaborative process between levels is as follows: “...languages differentiate, change, grow, decline and expand not because of “natural life cycles but because of the way that linguistic ideologies, held by interested actors and speakers and those who hold power over them, mediate between features of linguistic structure and socioeconomic relations” (Kuipers, 1998:149).

\(^{43}\) An ongoing large national community empowerment program in Indonesia provides 14 days of basic training for its community facilitators as compared to 21 days in earlier (and effective) versions of the same program.
Development Paradigms and Bio-Security

In building a strategy to increase attention towards bio-security in Indonesia, it is helpful to map out the different development paradigms which exist, as well as the norms and preconditions shaping the policies and intentions of stakeholders in each of these paradigms. This can provide a broad outline in which we can frame and organize our thoughts and possibly develop delivery strategies which take into consideration the concerns of stakeholders at international, national and local levels, and specifically with regard to biosecurity. Consideration of the agendas of each level is critical if we are to build cohesion and ensure collaboration between stakeholders. This approach when applied to the handling of biosecurity issues in Indonesia is useful for analysing the communicative action occurring between stakeholders, whether this action is currently effective and whether or not approaches to make such action more effective for the sake of biosecurity are feasible.

To date, in Indonesia we have focused more on the tangible issues relating to biosecurity, using statistics to explain why we need to protect our environment, and using statistics also to show how no or little progress is being made. Perhaps, however, there is a need to increase our focus on the intangibles related to biosecurity, in particular on the underlying elements of “power, purpose and principles of the people involved” (Pattel 2006:62).

Diagram I
Diagram 1 outlines the interactions between the three general groupings of development stakeholders in Indonesia. Borrowing from models on social capital focusing on indigenous communities\(^{44}\), we can apply the aspects of identity and knowledge resources to each of the development community groups and a praxis of communicative action\(^{45}\) to find options for more effective interaction between the groupings. In this diagram, we identify three groups of development actors, being international, national and local. Each group has its own knowledge and identity resources which are components of “self” of the individuals in each group.

The international development actors’ group or community has incredible access to knowledge resources. They typically define themselves as donors or organizations conducting interactions between nations. They can be portrayed as a group in which collective rationality is not bound by location - i.e. they can be effective members of their own “community” without having to relate their efforts to local values or concerns. The paradigm of international development is very much oriented towards applying generalised principles of development to different countries. While most donors would no doubt claim to be modifying their approaches to suit local conditions, nevertheless their rationality is that of applying general principles towards specific situations.

The second group - the national development community - has knowledge and identity resources which lean more towards the interests of the country they represent, in this case Indonesia. The construction of self in this sense affects how individuals in this group rationalize their own role, which shifts between the national interests of Indonesia in its relationships with other countries, and the group’s own interests within the country. This results in a shifting/in-between or “antara” rationality that operates within a national paradigm, a paradigm that is more oriented towards aspects and elements of power. I refer to the national paradigm as being \textit{antara} because individuals within this community combine perspectives of both local and national actors which shift according to the political agenda of the country’s leadership and their own interests. Considering that leading actors within this community are increasingly well educated and are often graduates of foreign institutions (which influence their worldview), yet many were raised in local contexts and are aware and even must adhere to and combine local perspectives. Aside from this, self-interest in maintaining their status and the responsibility of actors at the national level to maintain Indonesia’s sovereignty is often reflected in a collective concern within the group regarding the agenda of other countries seeking to participate in Indonesia’s development. Due to these undercurrents, this paradigm reflects and emphasizes the orientation of national actors towards maintaining power and control. Studies on this community could also shed light on the different push-pull factors affecting actors at the national level resulting in this \textit{antara} rationality.

\(^{44}\) Refering to Ian Falk’s paper on: \textit{Human and Social Capital: A Case Study of Conceptual Colonisation}

\(^{45}\) Based on Jürgen Habermas, \textit{The Theory of Communicative Action}
The third group consists of actors at a local level, who have knowledge and identity resources appropriate and adequate in the local context, but which may not be readily apparent or applicable in broader contexts. This frequently limits the rationality of such actors to the local context. Local decisions are made and enforced that may seem irrational or inefficient to actors from outside the local context. This bounded rationality creates a development paradigm at a local level which is oriented more towards the direct applicability or purpose of each development process implemented.

This description provides three very broad development paradigms which run in parallel to each other but which may put boundaries around the effectiveness of each development process introduced if not sufficiently communicated and appropriately negotiated. For example, the international development community may seek to implement a particular development “principle”, i.e. conserving biodiversity. If this principle is not expressed in a manner that local development actors can directly relate to however, (i.e. why a local community should be charged with conserving its environment), then no significant, sustained change occurs. This may happen even when the national development community supports the international community because the application of such principles may not affect existing power structures, and may even help in legitimizing the position of national organizations, i.e. through international recognition.

On the other hand, when local development actors seek to increase local revenue by short term capitalization of biological resources, such as timber or fisheries, there is often support from the national level as this translates to an increase in national revenue. However, international principles regarding environmental conservation may seek to prevent such utilization of resources through the application of sanctions or by limiting the market, e.g. imposing restrictions on trade in protected species.

To give another example, the international community has encouraged decentralization in Indonesia to ensure a broader distribution of development, and this reform has met with enthusiastic support from local stakeholders. But national stakeholders are sometimes reluctant participants in the reforms because of the resulting shifts in power structures. This perhaps emphasizes the need for (and perhaps highlights the lack of) space to interact and learn together and could be further elaborated in future discussions and studies. During a meeting held between heads of provincial development planning boards from 12 eastern Indonesia provinces, a number of participants emphasized the importance of such smaller forums as nation-wide planning coordination meetings in Jakarta tended to be too large (in terms of participants) and so it was difficult to be heard, let alone negotiate on behalf of local needs.

These examples are all part of Indonesia’s progression as a nation. They emphasize the need for more effective communicative action between development stakeholders. Such

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46 This meeting was held on the 27-28 February, 2008 in Ambon City, Maluku, Indonesia with participants from both provincial and central government. This meeting was initiated by the Eastern Indonesia Forum and supported by the Decentralization Support Facility, Eastern Indonesia (DSF-SoFEI)
interaction between development actors is needed to build a common understanding of
how each group with their specific development paradigm, influences others. Improved
interaction between local, national and international development actors can lead to the
production of joint frames of reference for communication strategies relevant to each
development priority established and which increases the capacity of individuals in each
community to understand the issues and preconditions affecting others. Further studies
could hopefully increase awareness of the existence of different paradigms and could lead
to commonly adhered to practices of negotiation. As long as one group does not have
sufficient understanding of the rationality on which another’s paradigm is formulated,
then there cannot be an effective process of negotiation between actors of different
paradigms. Whenever international development actors insist on the need for the
application of certain principles which are considered “irrational” by either local or
national actors, the result is often a forced development process. This unfortunately
increases suspicions about external domination and often results in local resistance,
despite the well-meaning intentions of national and/or international actors.

Currently, the international development paradigm is largely shaped within the context of
human rights and environmental principles. Increasing the awareness on biosecurity in
Indonesia can be seen as a critical issue on a global perspective due to its impact in
affecting the global climate. From the national development paradigm, support for
biosecurity (especially as it impacts on food security) needs to be shaped in the context of
maintaining political stability.

Another aspect which could be formulated to increase awareness and support for
increased attention towards biosecurity at the national level is the trend of global
competition between nations moving towards knowledge based economies. Each country
seeking to compete in the global arena must optimize its skills, capacities and
technology as the nation's intellectual assets. But the tremendous wealth of knowledge
about biological resources contained within the cultures of Indonesia is not yet seen as a
significant national asset. Such knowledge needs to be seen as an integral part of
Indonesia's drive towards creating a knowledge-based economy. What has occurred
instead is the tendency to adopt knowledge from other nations, which in many cases is
incompatible with local capacities, and which ignores local context. This adoption
process also decreases the confidence in local capacities which rely on local technologies
and affects the social capital of communities. Such loss of confidence and social cohesion
ultimately relates back to political stability, and thus can be tied to national, power
oriented development paradigms.

From the perspective of the local development paradigm, biosecurity must be portrayed
clearly in the context of day to day survival and existing practices of food security. One
example currently being researched by Dharma Palekahelu focuses on the survival
strategies of the Wangu Village community who annually face relatively severe

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47 See Maholtra’s definition of knowledge assets (2003:6)
48 Pre-research paper presented on 3 April, 2008 in the Center for Eastern Indonesia Studies,
Satya Wacana Christian University
49 Village is located in East Sumba District, Nusa Tenggara Timur Province, Indonesia
conditions of drought and who have developed their belief systems referred to as Marapu, which emphasize the balance between man and nature, and the knowledge that overexploitation will cause nature to become “ill”. This is just one of many examples of work which profile local capacity and awareness of the environment.

Demands that Indonesia must conserve its environment need to be balanced with solutions for local communities that generate economic benefit from local resources without destroying these same resources. This emphasizes the change of lifestyles in communities who traditionally lived "with" their surrounding environment, which is shifting to communities who now live "from" their environment, bringing about a substantial depletion of local resources in a manner which often cannot be renewed or sustained. From a community empowerment perspective, indigenous peoples have utilized technology developed over generations based on and unique to their immediate environment. Such local technology is integrated within the local cultural identity which forms the social fabric of local communities. Such local knowledge can certainly be enhanced by outside approaches and techniques, e.g. to enhance productivity – but there are enormous social, economic and environmental risks if local knowledge is carelessly discarded.

**Facilitating awareness and knowledge on biosecurity between development paradigms**

The Food and Agricultural Organization of the United Nations (FAO) defines biosecurity as:

> "...a 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. Biosecurity covers the introduction of plant pests, animal pests and diseases, and zoonoses, the introduction and release of genetically modified organisms (GMOs) and their products, and the introduction and management of invasive alien species and genotypes. Biosecurity is a holistic concept of direct relevance to the sustainability of agriculture, food safety, and the protection of the environment, including biodiversity".

50 Such a definition which is perfectly adequate at an international level, has a decreased level of meaning at the national level, and has the risk of becoming meaningless to actors working in a local context if it is not communicated based on local practices of agricultural sustainability, food safety and environmental protection in which biosecurity is appropriated as a relevant and important issue affecting daily life.

If we accept that local communities need to be empowered with the awareness that the state cannot be continually relied upon to overcome issues of pests and disease, then a greater understanding of the environment and biodiversity is a key element in identifying local knowledge practices to overcome or avoid issues of pests and diseases and how these link and relate to global efforts. Again this understanding, instead of being

introduced as an external “need to know” should build on existing local identities and knowledge resources of local communities.

Facilitators and other community development actors face the challenge of enabling local communities to play an active role in modern development processes. This role must be able to increase the awareness and confidence of communities in terms of their identity and capacity. There is a need for facilitators to identify and recognize local knowledge and technologies as a focal point for interacting with communities on local potentialities which can be strengthened and relied upon as development priorities in their respective regions and environments. An initial focus on food security becomes especially relevant for national and local development paradigms. Nationally, improving and maintaining food security is related directly to power, as food security helps to create political and economic stability. Emphasis on this “connection” encourages support for food security and implicitly bio-security programs at the national level.

Locally, food forms the basis of a community’s identity and knowledge resources. One way to highlight the issue of food security at the local level is by focusing on the issue of consumption shifts from local staples to a more “national” staple diet. A recent study commissioned by the World Bank (yet to be published) on issues in Indonesian rice policy, highlighted the fact that there has not been a detailed national study which disaggregates the changes in consumer trends in Indonesia related to rice. Nor has there been sufficient analysis conducted on the various studies locally on food security,\(^{51}\) not only to measure the extent of these consumer shifts, but also to identify the loss of local knowledge resources related to regional specific staple crop varieties, \textit{i.e.} maize in the Nusa Tenggara islands, sweet potato in the Papuan highlands, and others. Such studies would be useful to see whether national rice policies have had a detrimental effect on the social capital of indigenous communities. Increasing awareness and confidence in local biodiversity oriented knowledge resources, and “feeding” such knowledge to national and international researchers is a daunting task, however policy shifts at both national and international levels could provide a realistic channel to build a more effective strategy to protect and utilize Indonesia’s megadiversity.

PNPM as a Platform for Biosecurity

The national community empowerment program, or PNPM (Program National Pemberdayaan Masyarakat), is a massive social development project which seeks to address issues related to the three development paradigms in Indonesia. In terms of principles, the program seeks to alleviate poverty, increase participation from otherwise marginalized groups, uphold the various principles of good governance, and provide a platform for harmonization between the many international development actors active in Indonesia. In this sense, PNPM can be seen as an ideal program meriting international support.

\(^{51}\) For instance the study conducted by CARE International (\texttt{http://bakti.org/files/resourcesmodule/@random448cfl20530b7/1175239087_Food_Security_Assessment_reportMarch_07_150307_ds.pdf})
From a national paradigm, the perceived transfer of resources from national government to local communities through this community driven program provides many advantages in strengthening support for the national government, as the design provides grants directly to the thousands of villages across Indonesia selected to participate in this program.

From a local development paradigm perspective, the program seeks to ensure direct fulfilment of priority needs identified by villages. Implementation of the program relies heavily on facilitators recruited nationally or appointed by village communities, depending on the scope of work (inter or intra village, sub-district, or district). Facilitators are tasked to support local communities in playing an active role in planning, proposing, implementing, supervising and/or evaluating development processes in their community. In this sense, the facilitator supports the community by strengthening the knowledge resources of the community and increasing capacity to interact with external development processes and actors.

A problem with this process is that many facilitators become “manual” based, and implement the process of facilitation almost by rote, rather than seeking or utilizing local practices and norms. This ensures “effective” implementation in terms of time-frame and funding disbursements, yet this same “effectiveness” can also have a negative impact on the social capital of a community. A common example for instance, is in the provision of clean water supply directly to households - which decreases the time and energy spent by households in accessing water. However communication and interaction between community members occurring at the communal washing site or well can also decrease as a result of this “development”. Facilitators need to be aware of such pitfalls, and methodologies have been developed to encourage facilitators to be more sensitive to local practices. This need for “sensitivity” provides an option for biosecurity and food security aspects to be introduced to PNPM.

The role of facilitators needs first to be seen or portrayed as portals of knowledge for development. In this role, a facilitator does not just channel knowledge “down” to a community. A facilitator should also support a community in strengthening its own knowledge and identity resources, and channel this knowledge “up” for analysis and processing with data and information from other communities. This practice has been implemented by the Locally Managed Marine Areas (LMMA) network52, where communities are supported in gathering data on natural resources within the area mapped as the community’s traditional land area. Species of marine and plant life are recorded and communities are made aware of the economic value of different species. Community members are informed on how to optimize revenue based on sustainable harvesting techniques, often linked to traditional rites which have been analysed and found to be conservation oriented53.

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52 Refer to website: [http://www.lmmanetwork.org/Site_Page.cfm?PageID=38](http://www.lmmanetwork.org/Site_Page.cfm?PageID=38)
53 i.e. the traditional practice of Sasi in Maluku and Papua which was found to be linked with mating and breeding periods of main marine species in the respective regions.
As a result, the communities participating in the LMMA approach have been able to increase their gross revenue while protecting their environment. They have developed a greater awareness of their available resources. Linked with this has been an increase in social capital based on increased confidence in the community’s traditional knowledge and practices. By utilizing data collection methods, the LMMA approach has also provided the means in which local development actors can interact at national and international levels, as the approach is evidence based thus enhancing the sustainability of farmers’ livelihoods. By building from such experiences and approaches, facilitators of PNPM as portals of knowledge can support both national and international stakeholders by optimizing local knowledge and identity resources.

From a national perspective, these approaches provide a huge opportunity to increase the nation’s intellectual assets and provide Indonesia with data, information and knowledge practices needed to negotiate with international players on ways to sustain programs that conserve and protect the country’s biodiversity. Issues of biosecurity can also be more speedily handled, if facilitators and their respective communities are informed about pest and disease issues, and where possible, effective traditional measures used to overcome such issues. Furthermore, the increased recognition of the role of local or indigenous communities in conservation also supports efforts to address the ongoing debate regarding traditional land-rites, by emphasizing the role of communities as agents of conservation within designated traditional land areas, mapped through facilitative processes. Diagram II adapts the previous diagram to shows how biosecurity dialogue on an international level would need to be linked to food security or resilience perspectives on a national level, and further linked to community development on a local level for effective interaction between the groups in order to develop a strategy of relevance to all parties.

Diagram II
Preliminary Conclusions

Conclusions presented here are preliminary as much more collaborative work and studies are required on the topic of effective communicative action in development. This could be done in support of a concerted effort to address Indonesia’s issues of environmental conservation through to bio- and food security as an issue which crosses the boundaries of local, national and international development paradigms. Most efforts implemented to address these issues have focussed on the tangible rather then the intangible elements of conservation and biosecurity. Future efforts should take into consideration the intangible elements of power, principles and purpose underlying the behaviour of development actors and ensure that initiatives are perceived as relevant solutions to the dominant perspective of each group.

The current international agenda regarding global warming and climate change must be portrayed nationally as an agenda towards food security and political stability. At the same time, this agenda needs to be configured to meet the priorities of local stakeholders in terms of recognition and revenue. PNPM provides a platform which could be utilized to link the three development paradigms. The role of community facilitators as knowledge portals is a key factor in linking and ensuring effective interaction between local, national and international development actors.

Events to bring together international, national and local stakeholders on issues such as community management of biosecurity are important in providing key input and suggestions for more coherent action between all relevant parties as well as the physical space for individuals to interact. This paper seeks to emphasize that it is not only important to talk about What to communicate to policy makers and others. Equally important is How issues and approaches are communicated, not only in terms of what media to use, but also in terms of the emphasis the message must apply in order to link with the rationalities and paradigms of development actors in Indonesia if stated intentions are to become reality.

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CONSIDERATIONS FOR THE PLANT BIOSECURITY POLICY INTERFACE: A CASE STUDY OF COMMUNITY KNOWLEDGE EXCHANGE AND POLICY IN INDONESIA

Scott Nathan Knight
Cooperative Research Centre for National Plant Biosecurity
Charles Darwin University

Abstract

According to Sriro (2006), Indonesia’s public policy authority in law, resides with the position of President assisted directly by Coordinating Ministries which are themselves assisted by State Ministries in the planning and formulation of policy across portfolios. It is the State Ministries that act as the bureaucratic conduit through which government departments and non-government agencies operationalise national public policy, including that of plant biosecurity. Whilst the various governance levels of national, regional, provincial, municipal and regency legislative bodies have a role in the policy process this is primarily as law makers of regulations or interpreters of existing national policy for application within their respective jurisdictions.

Notwithstanding this governance and policy construct, Indonesia as a fledgling democracy of ten years has demonstrated sensitivities which require community exchange with Executive government to mutually respond to localized public policy need and/or priority. This is demonstrable in special autonomy status being granted to Papua in 2004 and Aceh in 2006 and a partial regulatory amendment to Jakarta’s existing autonomy status to account for new development in the region.

But how do community information exchanges occur, and how do community views become recognised in the Indonesian public policy process? The overarching question for this paper is: What constitutes an effective policy? The assumption underlying this question is that for policy to be effective, community must have an input into policy development, implementation and evaluation. This assumption has been developed through preliminary research conducted in a Balinese community during 2007. It is the latter research that is reported on in this paper.

Introduction

‘Policy is the outcome of a series of decisions and actions by people with varying motivations and differing information’ (Friedman 2002).

Friedman commentary further asserts there is an inability of policy analysts to resolve basic conflicts between policy stakeholders such as elected officials, bureaucrats, interest groups and the public in general (Friedman 2002). Whilst being renowned as a neoclassical economist and free market orientated, Friedman acknowledges the role of ‘social’ exchanges within the policy process. That is he acknowledges it is the ‘people’
element which is fundamental to policy formation and that it is the motivation and information exchange of people which are the drivers of policy outcome, be this as policy success or failure.

It will be contended in this paper that it is through the understanding of existing community decision making processes and its membership’s associated individual and collective information exchanges which can provide the pathway to effective plant biosecurity policy initiation, formation, implementation and success. The paper will highlight the author’s preliminary investigation of a community’s exchange processes in a Banjar (hamlet) in a small rural community on the provincial island of Bali, Indonesia. Key concepts are explored of two way information exchange in the policy process (government to community) (community to government) and the requirement of government policy to penetrate community information exchanges if policy is to succeed.

The incentive for Indonesia’s policy authority (national government) to ensure effective Plant Biosecurity policy (and program) information exchange with communities is evident its 2007 ‘Country Report’ to the United Nations Food and Agriculture Organization (FOA) (UN Food & Agriculture Organization 2007). The report states that pest infestation remains a major problem in Indonesia with a resulting reduction in rice crop production estimated at 11 to 33 percent nationally. In other areas of horticulture, vegetables and fruit pest infestations and diseases have been estimated to have contributed to crop failure rates from 10 to as high as 100 percent (UN Food & Agriculture Organization 2007). These high rates of crop failure prevail despite the Indonesian government’s integrated pest management policy (IPM) which has since 1989 been designed to focussed on localised human resource development to bring about change in field practice by farmers to facilitate higher food crop yields. It would appear then that existing Indonesian plant biosecurity policy requires re-examination.

Given the above, it is the intent of this paper to provide preliminary insight as to how policy makers need to account for the base level networks of information exchanges for policy initiation, formation, implementation and outcome success, particularly as it is at this level where policy is required to be most effective if national plant biosecurity and national food security is to be managed optimally.

**Literature Review**

The Public Policy body of knowledge from western academic sources can be readily accessed. Some of these scholarly works are universal in definition and analysis such as Thomas Dye who describes public policy as what governments do, why they do it and the difference if makes (Dye 1976 p.1). Other scholarly works such as Stella Theodoulou are prescriptive and void of the ‘people’ element as evidenced in her theoretical six fluid stages of problem recognition, agenda setting, policy formation, adoption, analysis and evaluation (Theodoulou 1995). Falk and Knight note that public policy across sectors is developed by people for people and is the agency for people to engage in policy formation, implementation and evaluation (Falk & Knight 2005 p.225).
Fukuyama (2007) notes that public policy development for non-western state nations such as Indonesia it is not necessarily a matter of transferring dominant western policy constructs in a ‘one size fits all’ approach, but requires policy to be developed within the political and cultural constructs of a given nation. In his 2007 World Bank report on State building in the Western Pacific Fukuyama highlights the overemphasis of western developed economies such as Australia and the United States to favour public policy processes of a ‘Weberian’ rational-bureaucratic nature particularly towards developing countries when engaging in bilateral trade and development activity (Fukuyama 2007), to replicate policies which are of a western cultural persuasion. Indonesia’s public policy development has its distinct and emerging challenges of balancing democratization, decentralization and tradition of community governance (adat law) across a culturally diverse archipelago of over 200 ethnic groups, 18,000 islands with a population exceeding 230 million and therefore its policy development will differ greatly to that of other nations.

Rodrik (2003) forewarns that the social and complex realities of rural Indonesia are rapidly changing with democratization and that these changes are occurring in the power dynamics at the local level. That is, communities will not necessarily just be a receiver of information, programs and policy, but are beginning to exercise democratic demand that local needs be met. A 2006 United States Agency for International Development report on local governance highlighted that elected officials with popular mandates now have greater public expectations which must be managed through the tangible delivery of their respective election policy platforms (Edstrom 2006).

Indonesia as a fledgling democracy of ten years has demonstrated sensitivities which has required community exchange with Executive government to mutually respond to localized public policy need and/or priority. Unique to the policy process in Indonesia is the dual role of Dinas (government leadership) and Adat (customary law). While it is the legislative process of government policy intent through law which facilitates ‘the what, why, how, where, to whom and what with’ in order that policy can become operational, in the context of Indonesia, the ‘triple deck’ State laws of Dutch54, Modern and Adat55 (Sriro 2006 p.406-09) add unique and distinct dynamics to the Indonesian policy process which must be accounted for in any public policy construct.

Fundamentally, public policy is what governments choose to do and not do (Falk & Knight 2005 p.226) and as a legislative undertaking undergoes extensive political, community, bureaucratic or academic processes (Falk & Knight 2005 p.226). The challenge for Indonesian contemporary policy makers is how to utilise the cultural and community information exchanges of the very base level of Indonesian society in the policy process of the supreme level of governance (national) given the numerous legislative levels of policy governance (diagram 1) through which policy must be negotiated and/or translated.

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54 Noting that Dutch law is applied where modern legislation has not superseded the transitional provisions of Indonesia’s Constitution of 1945 (Sriro 2006, p.407-09)
55 Noting Adat law may have effects on commercial transactions involving property rights and upon interpreting national laws (Sriro 2006, p.407)
I now turn my attention to policy development for the community management of plant biosecurity by presenting commentary of three scholarly works of Falk, Flora and Karetji.

According to Falk, social values (norms), networks and trust need to be harnessed in order to facilitate purposeful action in the social policy process (Falk 2007, p.9). Falk contends that if governments are inclusive and consultative then the ‘social capital’ (networks of people) to which policy is targeted has the potential to inform and be informed. ‘Inclusive and consultative processes are slow but they pay off in the short and long term’ (Falk, 2007, p.18). Optimal social capital, Falk asserts, can be achieved through identification of situational needs, transfer of leadership (from informal stakeholders to formal stakeholders), development of formal networks, and the management of ongoing processes for the policy’s sustainability (Falk, 2007 p.16).

Flora extends the concept of capital beyond a single subset to include many components/types of ‘capitals. Flora defines the multiple capitals as natural capital, cultural capital, human capital, social capital, political capital and financial capital (Flora 2007, p.4-6) and contends that each of these capitals are investing their respective resources to increase these resources over a long term horizon (Flora 2007 p.3). In other words, this could be viewed as building wealth or value within/in terms of natural, cultural, human, social, political or financial capital. Karetji in his research on linking biosecurity to community development in the Indonesian eastern archipelago notes that ‘it is not only important to talk about what to communicate to policy makers, but it is equally important how the issues and approaches to policy are communicated’ (Karetji 2007, p.8). Falk, Flora and Karetji, whilst differing in their emphasis on community
engagement, all share a collective view that local need requires a pathway to be heard in the policy process if policy is to maximise its effectiveness.

In this review I have outlined three key elements of public policy as they apply to the Indonesian and Australian bilateral context. Firstly, the importance of Indonesian policy constructs to be sovereign and organic in its development and the requirement of Australian stakeholder to be sensitised to this fact to minimise policy pressure points in a bilateral relationship. Secondly, the importance, beyond legislation, of the dynamics of Dinas (government leadership) with Adat (customary law) in Indonesian policy development, particularly with regards targeted policy areas including plant biosecurity. Thirdly, the importance of the information networks forming a basis for/underlying the Indonesian governance to inform government and be informed by government on public policy, particularly in the critical area of plant biosecurity where agribusiness and food security are at their most vulnerable. The importance of ‘top down’ meeting ‘bottom up’ in the policy process cannot be overstated. The social and economic consequences of vital plant biosecurity information not being identified from the very base level of society at the earliest possible point are self evident for food security and trade.

Following the next section on methodology, this paper will present results and discussion to outline emerging findings of a base level community in which “Community Exchange” was examined.

Methods

This section presents research of a case study of community exchange processes and networks, both formal and informal, which acted as the conduits of base level transmission of policy need and knowledge. Mixed method qualitative research was undertaken to build a ‘complex holistic picture’ (Creswell 1998) of existing community information exchange processes. The emerging data provides information about how policy makers may or may not account for the base level networks (information exchanges) and how this may be of particular interest to plant biosecurity policy formation.

The research was case study and used ethnographic and grounded theory techniques to build theory, since there was little theory in this area. In addition, semi-structured interviews (Fontana 2002) were used to gather the data for the theory development (Chamaz & Mitchell 2001).

The case study (Stake 1995) was bounded by place (Banjar) and a time period of 3 months, September 2007 to December 2007. Ethnographic techniques of interview were used to collect data (Creswell 1998) and the semi-structured interviews were conducted with 30 Banjar (Hamlet) adult members as a sample of 361 persons or 8.3% of the voting age population. The sample cohort of 30 interviews was representative in age, gender, occupation and marital status of the larger population cohort of 361 persons.
The guiding principles of the interview questions: How does community information exchanges occur from the very base level where plant biosecurity is at its most vulnerable to need and/or input to the Indonesian public policy framework?

All interviews were conducted in Balinese language with interpreting services being provided by an ‘insider’ member of the Banjar. Initial permission for interviews was provided by Kelian Dinas (Banjar government leadership) with agreement with Kelian Adat (Banjar customary law leadership). Final agreement of community participation in the project was obtained at a community meeting (Banjar Community hall) where all members agreed.

Whilst assistance was provided through interpreter services, the interview design, site selection, observations, participation and discourse analysis (Silverman 2005) of transcripts remained with me as the Chief Researcher. Problems encountered include the potential for first language translation to distort meaning (Bahasa Bali to English). However each interview was digitally recorded and re-examined in collaboration with the interpreter to verify data accuracy. One of the 30 interviews was conducted in English because the interviewee possessed advanced English language skills.

As per triangulation analysis principles (Creswell 1998 p.221), the use of multiple and different sources of methods has been used to describe a Balinese Banjar’s community information exchanges. Three research methodologies of case study, ethnography, and grounded theory were triangulated in order to corroborate evidence (Creswell 1998 p.202) from observation, interview and transcript analysis to describe/analyse a theme or perspective of the Banjar’s community information exchange processes internally and externally with government. The latter being the critical governance juncture of base level public policy interface with the other tiers of Indonesian governance.

Discussion

Ethnographically, Banjar Tengah is a hamlet (Kepala Dusun56) within the Bendesa Adat57 area of four Banjars; Banjar Abyemsemal, Banjar Wangsa and Banjar Kelingkung and Banjar Tengah. The Banjar in this study is a Balinese Hindu rural community north west of Sukawati and south of Ubud in the Regency of Gianyar on the island Province of Bali Indonesia.

Banjar Tengah’s population is a mix of original inhabitants (Bali Mula58) and those with acknowledged descent (Wayan & Ketut 200759) from the Majapahit Empire that came to Bali from Java in the 14th century (Pringle 2004, p.59). Banjar Tengah’s descendants of

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56 In the context of this study the lowest administrative level of Indonesian governance hierarchy
57 Bendesa Adat area defines the Balinese customary law jurisdiction of the three religious temples (Pura Delam, Pura Desa and Pura Puseh), in this case of the stated four Banjars Tengah, Abyemsemal, Wangsa & Kelingkung (Source: Kelian Adat Banjar Tengah Sept 07).
58 Balinese Mula referring to the first Balinese, a derivative from the Indonesian national language of Bahasa Indonesia used by Hobart, Ramseyer & Leeman 1996 p.16
Majapahit make up three quarters of its population of 520 persons (Table 1), with these
groups having continued links to the original clan temples in the Balinese Regencies of
Klung Kung and Karangasem, the original entry points of Majapahit from Java to Bali.

The Balinese Mula population of Banjar Tengah whilst not identifying as Indigenous are
acknowledged locally as having ancestral lineage prior to Majapahit and to the Banjar
Tengah’s locality and therefore warrants them the title of original inhabitants.

### Table 1

<table>
<thead>
<tr>
<th>Age</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
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<tbody>
<tr>
<td>0-6yrs</td>
<td>32</td>
<td>29</td>
<td>61</td>
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<tr>
<td>7-12yrs</td>
<td>33</td>
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<td>13-16yrs</td>
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<td>20-30yrs</td>
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<tr>
<td>31-44yrs</td>
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<td>44yrs-59yrs</td>
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<tr>
<td>60yrs+</td>
<td>19</td>
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<tr>
<td>Unknown birthdates</td>
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</tr>
<tr>
<td>Total Population</td>
<td>281</td>
<td>259</td>
<td>520</td>
</tr>
</tbody>
</table>

| Voting Age 17yrs< | 176 | 185 | 361 |
| Age 17yrs > | 85 | 77 | **159** |
| Total Number of Family Compounds | 56 |
| Average number of persons per Compound | 9.3 |

Dinas (government) census indicates there were no ‘outsider’ Indonesian nationals
residing within the boundaries of the Banjar and as a foreign researcher registered with
Indonesia’s Ministry of Research and Technology, I was the only identified ‘outsider’
living within the community.

Whilst it is not the intent of this paper to detail the attributes of Bali’s Hindu caste
system, it is important the study acknowledges its existence. Banjar Tengah is
predominately Sudra (90%) and Wesya (10%) and whilst the Indonesian Government has
banned discrimination based on caste, observations during the study period indicated that
caste is still an important ‘community information exchange’ feature. This was
demonstrable in the separation of Pura Dalem for Sudra and Pura Ksatriya Dalem for
Wesya as well as the use of ‘Lumrah’ (everyday Balinese language) and ‘Halus’ (refined
Balinese language) (Suari 2005 p.5) between Sudra and Wesya caste members.
Notwithstanding this, it was observed contemporary economic status was not confined to
one caste or another.

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60 Census data sourced Kelian Dinas, Banjar Tengah July 2007
61 The four Balinese social codification’ in order of ascending privilege, Sudra, Wesya, Ksatriya and Brahmana (Eiseman, F.B. 2005, p.25-26)
Religion was central to the daily life in Banjar Tengah with its four Priests and Pura (temple) Kelian performing distinct leadership roles each at the Pura Dalems (cemetery temples), Pura Subak (Subak temple) and Clan Puras (Clan temples). Preparation and participation in numerous and frequent religious ceremonies is accommodated through predominately Banjar based occupations where flexibility of working days is possible.

Table 2

<table>
<thead>
<tr>
<th>Industry</th>
<th>Associated Occupations</th>
<th>% of Workforce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture Sawah</td>
<td>Planting, management of irrigation, harvesting, equipment hire (of machinery and/or Balinese cattle), as duck farming for post harvest activity, wholesale services, agri-general labour</td>
<td>41%</td>
</tr>
<tr>
<td>Agriculture Non-Sawah</td>
<td>Poultry and Piggery</td>
<td>4%</td>
</tr>
<tr>
<td>Woodcarving &amp; Crafts</td>
<td>Barong making, made to order wood carvings, handmade picture frames, handmade notebooks</td>
<td>18%</td>
</tr>
<tr>
<td>Other Internal</td>
<td>Warung, tailoring services, ceremonial offering preparations, brick making, carpentry, builder, general labour (non-agri) etc</td>
<td>32%</td>
</tr>
<tr>
<td>Other External</td>
<td>Overseas employment, government, retail, tourism</td>
<td>5%</td>
</tr>
</tbody>
</table>

Overall, the varieties of occupations (Table 2) are gender balanced and there is little evidence of women being restricted in labour market participation despite the prominence of their additional responsibilities for child rearing and household management, including finance.

There are fifteen formal organisations identified in Banjar Tengah with the following characteristics:

- 12 of the 15 organisations have male leadership only
- 12 organisations have Priest or Priest’s wives participation
- 11 organisations have married male leadership only
- 10 organisations have both male and female participation
- 4 organisations are exclusive to Clan ancestral lineage
- 4 organisations are exclusive to married males
- 2 organisation are exclusive for married females
- 2 organisations (Dinas & Adat) share meeting times & share sinoman (messenger)

62 Priests of Tengah were responsible for leading regular ceremonial activity at Puras (temples). The High Priest of the Banjar is located outside the Bendesa Adat area but leads all important ceremonies when required.

63 Balinese ducks are used in the post rice harvest process where they assist by eating over rice seeds left over from the ‘threshing process’ of extracting rice seeds from the rice plant. (Interview with Pak Ketut 16th Sept 07)

64 Banjar Tengah had one wholesale purchaser of surplus rice only in residence. This did not preclude Banjar members selling rice to external rice buyers.

65 Predominately for Sukawati tourism market

66 Occupations undertaken external to Banjar Tengah.

67 Overseas employment specific to seasonal cruise ship tourism industry (6mths on/3mths off) with families remaining residents of Banjar Tengah.

68 Sinoman is a messenger delegated the duty of relaying detailed information to each Adat and Dinas member at their family compound. If nobody is at the family compound when the Sinoman
• 1 organisation is exclusive to Priests and Priests wives
• 1 organisation is exclusive to unmarried male and females

Each of the fifteen organisations has interconnecting networks and multiple memberships with other Banjar organisations both formal and informal that enable internal Banjar ‘community exchange’ of information. Table 3 provides a summary of each group’s profile.

Table 3

<table>
<thead>
<tr>
<th>Banjar Tengah Organisations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name of Formal Entity</strong></td>
</tr>
</tbody>
</table>
| 1. (Banjar) Adat | o Customary law group; all married men of Banjar  
o Kelian (leader) elected from group for five year term.; Sinoman (messenger) nominated monthly  
o Membership includes Priests of Banjar (as ordinary members)  
o Responsibilities: Adat law pertaining to property ownership, cremation & family compounds |
| 2. (Banjar) Dinas | o Government leadership group, all married men of Banjar  
o Kelian (leader) elected from group for five year term  
o Secretary, Treasurer elected and shared monthly nominated Sinoman (messenger) from Adat  
o Membership includes Priests of Banjar (as ordinary members)  
o Responsibilities: base-level general govt admin duties (births, deaths, marriages, I.D. etc) |
| 3. Pendidikan Kesejahteraan Keluarga (PKK) | o Family and Health leadership group; all married women from Banjar  
o Leader is automatically appointed as wife of Kelian Dinas  
o Secretary, Treasurer elected and nominated monthly Sinoman (messenger)  
o Membership includes Priests Wives (as ordinary members) |
| 4. Pura Dalem (Cemetery Temple) Sudra Caste members only | o Pura Dalem group (Cemetery Temple); All Sudra married men and women & youth group members of Banjar Tengah  
o Kelian (leader), Vice, Secretary, Treasurer all married male elected for indefinite period  
o Each family compound required to contribute labour (daily) and finance to Dalem activities  
o Pura Dalem group separate to Adat role and not directed by Priests but religiously supported  
o Note: Temple larger than Ksatrya; Sudra make up approx 90% of Banjar and Desa population |
| 5. Pura Ksatrya Dalem (Cemetery Temple) Wesya and Ksatrya Caste members only | o Pura Ksatrya Dalem group (Cemetery Temple); All Wesya married men & women & youth group members of Banjar Tengah (note: Also all Wesya, Ksatrya, Brahmana of Bendesa Adat members, and includes Raja of Lod Tunduh)  
o Kelian (leader), Vice, Secretary, Treasurer all married male elected for indefinite period  
o Each family compound required to contribute labour (monthly) and finance to Dalem activities  
o Pura Dalem group separate to Bendesa Adat role and not directed by Priests but supported |
| 6. Mangku Association | o Priest Association  
o Male Priests and Wives only  
o No formal leadership position but Priests wives role secondary to male  
o functions as cooperative |
| 7. Sekaha Taruna | o Youth organisation (also referred to a ‘Muda Mudi’ literally meaning male / female)  
o Unmarried male and female of Banjar 16yrs+  
o Leader (male) elected from group for one year.  
o Unofficial female leader elected from group to support male leadership role  
o Secretary, Treasurer and monthly nominated Sinomans (male & female) |
| 8. Subak Gunung (Association) | o Sawah Irrigation Association. one of eight in Bendesa Adat area  
o ‘Pekaseh’ leader elected from group  
o ‘Petajuh’, deputy leader role elected from group;  
Nominate monthly Sinoman (messenger)  
Membership defined as married male landowner and/or sawah worker from Banjar only  
Membership includes Banjar Priests & Subak Priest who are also sawah owners and/or workers |

comes, a small branch is left near the entrance so the owner will know a Sinoman has come with a message and will then ask a neighbour what the message is. A Sinoman is nominated every month (Balinese calendar month of 35 days) at the combined Adat and Dinas meeting. (As described by Pak Wayan Sumardi Nov 07)

69 Wesya members of Banjar Tengah are members of the Bendesa Adat Pura Ksatrya Dalem with Ksatrya and Brahmana caste members from the Banjar Wangsa. This temple has exclusive membership to higher caste members of Bendesa Adat area only. Wesya membership is approximately 25% of total Ksatrya Dalem Pura membership.
### 9. Women of Subak Gunung
- Part of larger Subak Pura (temple) association of the Bendesa Adat area
- **Women of Subak**: Wives of Subak Gunung members
- Support group to Subak Gunung activity including planting, harvesting
- Organises and executes numerous ceremonial preparations throughout rice growing process
- Wives of Pekasem and Petajuh mirror leader and deputy leadership roles

### 10. Gusti Clan Organisation
- **Clan organisation** of Wesya Caste in Banjar Tengah
- Membership is Male married; Adult female if no male in immediate family
- Leader male elected from male members of group
- Deputy leader elected from group; Nominated Sinoman (messenger) from group
Table 3 Banjar Tengah Organisations Continued

<table>
<thead>
<tr>
<th>Name of Formal Entity</th>
<th>Description</th>
</tr>
</thead>
</table>
| 11. Kalah Clan Organisation | o Clan organisation of Kalah in Banjar Tengah
| | o Membership is Male married; Adult female if no male in immediate family
| | o Leader male elected from male members of group
| | o Deputy leader elected from group; Nominated Sinoman (messenger) from group
| 12. Arya Penatila Clan Organisation | o Clan organisation of Arya Penatila in Banjar Tengah
| | o Membership is Male married; Adult female if no male in immediate family
| | o Leader male elected from male members of group
| | o Deputy leader elected from group; Nominated Sinoman (messenger) from group
| 13. Bendesa Mas Clan Organisation | o Clan organisation of Bendesa Mas in Banjar Tengah
| | o Membership is Male married; Adult female if no male in immediate family
| | o Leader male elected from male members of group
| | o Deputy leader elected from group; Nominated Sinoman (messenger) from group
| 14. Gamelan Group (Male) | o Banjar Tengah Male Gamelan Group; Married male only
| | o Orchestral Gamelan Leader with two vice who also assist with teaching & musical arrangement
| | o Banjar Tengah Balinese Instrument group (Orchestral) for Bendesa Adat area Pura (temple) ceremonies. Main Pura (temple) performances at Pura Dalem of Banjar
| 15. Gamelan Group (Female) | o Banjar Tengah Female Gamelan Group; Married female membership; Female Leader
| | o Membership is supported by Male Gamelan Orchestral leader and Male Gamelan instructors who also participate with teaching & musical arrangement for the female Gamelan.
| | o Banjar Tengah Balinese Instrument group (Orchestral) for Bendesa Adat area Pura (temple) ceremonies. Main Pura (temple) performances at Pura Dalem of Banjar

The study undertook 30 interviews with a representative sample of the Banjar Tengah population over the period from early September to early December 2007. Thirty persons were interviewed of a possible 361 adult members or 8.3% of the total research site population. Semi-structured interview questioning was undertaken with respondents about their organization membership, organization profile, organization decision making processes, personal government contact, their organisation’s government contact, organisation interactions with other Banjar organisations, knowledge about the management of plant pests and diseases and the origins of such knowledge.

Of the 30 persons interviewed 55% were members of the Banjar Adat and Dinas group *(noting that this represents dual membership)*; 27% were members of Subak Gunung Association; 27% of Pendidikan Kesejahteraan Keluarga (PKK) or married women’s group; 27% of Sekaha Taruna (Youth Organisation)*70* (11% male & 16% female); 11% of Wesya casta group (5.5% male & 5.5% female); and 88% of Sudra Casta (56% male & 44% female).

Interviews transcripts and observations indicated the rich flow of information exchanges within Banjar Tengah. A diagrammatic representation of these exchanges indicated a complex communication web (diagram 2) which had the capacity of permeating information throughout the whole Banjar membership. These information exchanges included formal organisations consulting each other as well as individual exchanges of information.

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*70 Youth an Organisation membership criterion is based on marital status (unmarried) and does not refer to the common definition of youth being 17-25yrs. Some members of Sekaha Taruna were identified to be mid to late thirty years of age.*
Banjar Tengah Organisations (Refer Table 3)

Banjar Tengah Gatekeeper Organisation (Refer Table 3)
1. Adat Group
2. Banjar Dinas Group
3. Subak Gunung Association

A: Kecamatan / Kabupaten Adat Office
B: Desa Office
C: Kecamatan Department of Agriculture

Results

Results are presented as follows: (1) information exchange between individual, community organization and government; (2) land title and land management; and (3) management of pests and diseases.

Individual, Community Organization and Government Information Exchange:

The dialogue within a family compound provides an individual adult access to rich flows of Banjar information. Such information exchange was predominately dominated by ‘Banjar business’ or internal Banjar information. There appeared to be incidents of greater degrees of external knowledge (within the family) where an individual member has outside work experience and/or that individual would be recognized as a resource for external information if needed. All individuals acknowledged a role in the Banjar Office of Kelian Dinas for their respective individual ‘external’ government enquiries.
Community organization information exchanges were based on three main criteria: Firstly the organization’s charter and if this charter requires interaction with other organizations to fulfill its intended purpose (e.g. Banjar Dinas Group and Pendidikan Kesejahteraan Keluarga refer table 3);

Secondly, membership itself as family clan, casta, gender also provided additional rich flows of cross-organization information; and

Thirdly if the organization through its constitution was obliged to provide information to other groups (e.g. Adat to Priest group).

There was no evidence of a coordinating entity in which one organization held more prestige over another; however the dual roles of Adat and Dinas permeated every aspect of Banjar daily life including that of other Banjar organisations.

Government information exchanges to the Banjar were restricted to the three Banjar organizations of Adat, Dinas and Subak Gunung Association. Membership of all three organizations was restricted by gender and marital status (married male) and all three could be perceived as ‘gatekeepers’ of formal government information exchanges with individuals and/or formal organizations.

Throughout the period of research there was no evidence of restricted information practice emanating from the three gatekeeper organizations. However there was evidence of ‘guided viewpoints’ from the gatekeeper leadership in the collective decision making process.

All organizations were democratic in structure with individual members being able to exercise freedom of viewpoint in the decision making process of collective agreement.

There was no evidence of block voting within one organization to another based on a member’s affiliation or other organization membership. It appeared that each decision making process was specific to the agenda being presented at the time.

Finding 1: It was found that government exchanges with the Banjar were exclusively through the three married male organizations of Adat, Dinas and Subak Gunung with the Office of Dinas being the conduit for women and youth contact. These three organizations appeared to be the community ‘gatekeepers’ of initial government information to the community (refer Diagram 2).

Land Title and Land Management:

Land title varied according to the purpose to which the land was being used and that this title had implications for the type and degree of internal and external management of such land. The three land titles identified are that of Banjar residency, dry crop cultivation and sawah lands. All three are legally binding under Indonesian law as Adat customary land title. These titles whilst fluid were subsequently registered through the Dinas or Subak
process for government tax purposes, but remained within the legal authority and customary rule of Adat.

Banjar residency land title refers to the collective ownership by Adat of all family compounds within the Banjar. No individual or family was identified to have legal title of their compound despite their compound being ancestral. There were noted historical movements of families to compounds within the Banjar which required no sale or exchange of equal value. Such movements were described as being specific to Banjar cohesiveness. One example was the movement of a young family of two adults and two children to a childless elderly couple’s compound where the young family inherited the right of residency.

Dry crop cultivation was central to the Banjar’s daily food security and religious offerings process. The crops of the dry area were primarily tropical fruits and vegetables with an abundance of coconut palms and bamboo. These areas were also used for pigs and Balinese cattle husbandry. Land title in these areas were identified as family collectives and ancestral title. The dry crop land titles were specific to dry crop cultivation and any changes to the use of the land subsequently changed its title. That is if dry land was converted to a family compound its title changed to the Banjar Adat land title process.

Sawah (rice field) lands were also identified as being family collective land titles and were specific to rice cultivation and subject to change should the land purpose change also.

Finding 2: It is found that land title of the Banjar and surrounding agricultural lands is fluid and determined by land use. Land management was identified as a mutual responsibility between Banjar customary Adat law and the government processes of agricultural land registration for tax purposes. The community itself placed emphasis on local Adat’s determination of land title over that of government.

Management of Plant Pest and Diseases:

There were identified regular visits to the Subak group by the Kecamatan (District) based Department of Agriculture field officers with such visitations reported as being a source of pesticide product information or new rice planting techniques aimed to increase growers yields.

The cost of contemporary practice of pest control with pesticide was often quoted as being cost prohibitive and resource limited (not all rice farmers had the required equipment) and the ‘new’ knowledge for increased rice yields was quoted as being secondary to traditional practice which was perceived as more reliable. A consistent comment by respondents was the trust in traditional practices over that of government (Dept of Agriculture) to produce the desired outcome, be this for crop yield or pest management.

Religion was integral to the traditional management of plant pests and diseases.
Religious ritual was viewed as effective, if not more effective as pesticide practice and an activity which could be undertaken within the context of the broader religious obligations of the Banjar. The initial identification of critical plant pest incidents such as rice moss required an immediate religious response through ceremony.

One incident identified during the interview period was responded to with a religious major ceremony for the Subak members of the affected area within a matter of days.

Subak Gunung as an organization has its own dedicated Pura (temple), its own lontars (religious scripts), its own religious calendar and its own Priests. Whilst contemporary agricultural practice is known through the Department of Agriculture visits, the foundation of Banjar practice was well embedded in the ritual obligations of ‘pleasing the Gods’ through religion in the first instance and government in the second.

Dry area crop cultivation was family specific and was not represented by any one organization. The management of plant pest and diseases in this sector of agricultural activity varied. Some respondents with pesticide information (through their organization membership such as Subak), indicated commercial pesticide products were sometimes utilised. Other respondents indicated that the cropping or pruning of the diseased area would be undertaken. Overall, the dry area food cultivation of the Banjar did not appear to be collectively managed however respondents indicated that the information exchanges between growers occurred in a variety of ways. Be this through individual exchanges, family exchanges, exchanges of information whilst attending an organization’s meeting and so on. Religious daily offerings were also a feature of dry area crop cultivation activity.

Finding 3: It is found that traditional knowledge sources and ongoing religious activity are dominant features of Banjar Tengah’s plant pest and disease management processes. Government Department of Agriculture field visit input was regular but considered secondary (and costly) compared with the ceremonial obligations for ongoing food cultivation and pest management.

Conclusions

Government exchanges with the Banjar were exclusively through the three married male organizations of Adat, Dinas and Subak Gunung with the Office of Dinas being the initial conduit for women and youth contact by government.

These three organizations (Adat, Dinas and Subak) acted as the community ‘gatekeepers’ of initial government information to the Banjar that must be negotiated through if such information to permeate successfully to the other sectors of the community.

The implications of this conclusion are that the legitimacy of gatekeepers is not for government to decide as the legitimacy of such processes is well established and accepted within the given community. Such ‘Gatekeepers’ can therefore be springboards for the rapid dissemination of information within a community as they can have well established
and comprehensive links with community activities. In the context of a rapid response to a critical plant biosecurity issue, the alliance with community gatekeepers and government is evident, particularly with regard to critical instances where a rapid response is required.

Land title of the Banjar and surrounding agricultural lands is fluid and determined by land use. Land management was identified as a mutual responsibility between Banjar customary Adat law and government processes of land registration for tax purposes. The community itself placed emphasis on the Banjar’s Adat determination of land title over that of government.

From Finding 2 it can be concluded that Adat (traditional law) and its associated land title and land management practices are central to an Indonesian community’s cohesiveness and should be integrated with government plant biosecurity activity. The implications of this conclusion are that Adat (traditional law) and Dinas (modern law) need to be acknowledged as complementary in the policy process. Whilst two legal entities of Adat and Dinas may appear to be possible tension points between tradition and government, the author believes the research presented demonstrates this not to be the case as such synergy between Adat and Dinas has its foundations in the formation of the Republic and has been demonstrably managed both by government and community for mutual benefit over many decades inclusive of land title, land management and food cultivation.

Traditional knowledge sources and ongoing religious activity were dominant features of Banjar Tengah’s plant pest and disease management processes. Government Department of Agriculture field visit input was regular but considered secondary (and costly) compared with the ceremonial obligations for ongoing food cultivation and pest management.

It can be concluded that traditional knowledge sources and religious beliefs of a community must be considered within the context of the introduction of any new knowledge by government. The implications of this conclusion are that the introduction of legitimate government and/or industry new knowledge can be fraught with pitfalls (of not being acknowledged) if not related to existing practice. As a change management process it requires the unlocking of old knowledge for the introduction of new knowledge. This is more likely to succeed if such new knowledge is incorporated into existing ‘traditional’ knowledge practice. This would vary from location to location and from one cultural group to another.

Religion plays a central role in a society’s belief system. The rituals associated with such beliefs are legitimate to those who practice them. In this study, it was clear that while religion may or may not be the initial driver of government policy formation for the management of food security and plant biosecurity, it is a demonstrable Indonesian societal fundamental which requires consideration and incorporation where possible in the policy formation and implementation process as a basis of trust and genuine cooperation between community and government.
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IDENTIFICATION OF SOCIAL CAPITAL FOR UNDERSTANDING AND RAISING PLANT BIOSECURITY AWARENESS, KNOWLEDGE, AND ACTIONS

I.W. Mudita
Senior lecturer, Faculty of Agriculture, and researcher, Research Institute, Nusa Cendana University

R.L. Natonis
East Nusa Tenggara Provincial Food and Horticultural Crop Service, Seed Production Technical Implementation Unit, Noelbaki Village, Kupang District

Abstract

Social capital is increasingly used as a comprehensive approach for overcoming complex problems. In this study, a social capital approach was used to increase understanding and improve interest, knowledge and implementation of biosecurity measures. This study was conducted from May to July 2007. Data was gathered through household surveys and field observations in Noelbaki village, Kupang District, Nusa Tenggara Timur. Results of the analysis indicate that some variables of social capital relate closely to knowledge and implementation of biosecurity measures. However, variables that relate to a single aspect of biosecurity may not necessarily have any relationship with other aspects. The level of ‘interest’ has a positive correlation with the number of collective activities occurring and the level of participation in these collective activities. Interest also increases with frequency of communication and total information sources accessible by members of the community. ‘Knowledge’ improves with involvement in an increased number of community groups, increased collaborative activities and greater cooperation. Knowledge levels also improve where information is sought from a greater number of stakeholders and the time needed for transfer of information is decreased. Finally, community members will be more willing to participate in ‘implementation’ of control measures if they are involved in a greater number of groups, have increased communication with other stakeholders, the time needed to access information is decreased and more information sources are accessible.

Introduction

Crops are subject to pests and diseases that reduce production both in quantity and quality. This yield loss is much higher in developing countries where crop protection has not yet been appropriately implemented than in developing countries where crop protection policy is well established. As an illustration, global crop loss estimates provided by Oerke et al. (1994) showed that crop loss in Asian countries was higher than that in North American and European countries. Crop loss for wheat in North America was valued at US $ 6 million (NRC 2002; Wheelis et al. 2002). The value of crop loss for food crops in Southeast Asia is lower due to the lower production quantity, but it has tremendous impacts in terms of food security. Brown planthopper explosion in 1985 resulted in
Indonesia becoming an importer of rice after being an exporter during the previous year (Untung 1993).

Efforts to reduce the crop loss caused by pests and diseases have been evolving from trial and error through the use of pesticide as the main weapon to finally using an ecological approach called integrated pest management (IPM) (Kogan 1998, Levins & Wilson 1980). IPM focuses on existing pests and diseases rather than on those invading from outside. Within the last decade, especially after bioterrorism using biological agents has become a serious threat worldwide, a more comprehensive approach in dealing with pests and disease problems has been developing. This approach is called biological security, or biosecurity for short, within which crop protection is an important component of a much broader context (Delane 2001, Meyerson & Reaser 2002 a, b). As with crop protection policy and practices, much initial work was on technological aspects and little attention was given to social aspects of this approach.

Previous experiences have shown that social aspects play important roles in determining the success and sustainability of a particular crop protection program. Research has indicated that farmers do not implement a particular pest management measure as it was prescribed but according to their interpretation based on their traditional way of thinking (Vayda 1996, Vayda & Setyawati 1998). Farmers also make their own simple economic calculation on which they determine pests and diseases to be given priority. As the result, pest and disease management programs developed by the government are not necessary followed by farmers (Londingkene et al. 2004, Mudita et al. 2004). Social aspects of crop protection are in fact very complex, dynamic, and consist of various interlocking components. To deal with aspects of such complexity in nature, a new approach called social capital has been now becoming widely used. Social capital has been proven by Grootaert (1999) as a useful approach in elucidating factors related to the widespread poverty in Indonesia after the 1998 economic crisis.

Social capital can be viewed as a unifying concept embodying multidisciplinary contexts along three dimensions: its scope (or unit of observation), its forms (or manifestations), and the channels through which it affects development (Grootaert & van Bastelaer 2001). Referring to work of Putnam et al. (1993), Colleman (1990), and North (1990), the scope of social capital can be divided into micro, messo, and macro levels. At its micro level, social capital is understood as those features of social organization, such as networks of individuals or households, and the associated norms and values that create externalities for the community as a whole. Meanwhile, social capital as a variety of different entities which all consist of some aspect of social structure, and which facilitate certain actions of actors –whether personal or corporate actors– within the structure implicitly considers relations among groups, rather than individuals, and thus provides a messo scope. The third and most encompassing (or macro) view of social capital includes the social and political environment that shapes social structure and enables norms to develop. Whether at the micro, messo, or macro level, social capital exerts its influence on development as a result of the interactions between two distinct types of social capital, i.e. structural and cognitive. Structural social capital facilitates information sharing, and collective action and decision-making through established roles, social networks and other social structures supplemented by rules, procedures, and precedents. On the other hand,
cognitive social capital refers to shared norms, values, trust, attitudes, and beliefs. The later is therefore a more subjective and intangible concept then the former (Uphoff 2000). Any form of capital, material or non-material, represents an asset or a class of assets that produces a stream of benefits. The stream of benefits from social capital, or the channels through which it affects development, includes several related elements, such as information sharing and mutually beneficial collective action and decision-making (Collier 1998).

The stream of benefits from social capital is capable of generating material/market and non-material/non-market returns to the individual. For example, Kamrul-Islam et al. (2006) found a positive association between social capital and better individual health. With respect to plant biosecurity, it can be expected that social capital will also be associated with awareness, knowledge, and actions among members of the community. The challenge is to determine which components of social capital have significant roles in raising awareness and understanding of biosecurity and can lead to taking necessary action. To find out, social capital was used as an approach in the East Nusa Tenggara site of a long term Australia-Indonesia cross-boundary research on raising community-based awareness of biosecurity. It was expected that from the phase I of this multi-years research, baseline information on determining social capital components could be identified. This information will be useful as an entry point to understanding and raising biosecurity awareness among members of the community in the next phase.

Research Methods

Time and Location

This phase I research was carried out in April-July 2007 in a village selected from three proposed villages for the site in East Nusa Tenggara Province. Selection was based on criteria of existence of various land uses, existence of unharvested crops in the field, and heterogeneity of ethnic composition of the population. The selected village, Noelbaki, is located in Kupang District, 16 km to the east from the town of Kupang on the main road linking Kupang with Atambua, the easternmost Indonesian town in the island of Timor. This village is easily accessible from the town of Kupang using rural transportation vehicle (angdes) or using inter-town busses. The village area is 17.7 km² and the population in 2006 was 6,389 people in 1,321 households, resulting in a population density of 361 people/km² or 75 households/km² (BPS Kabupaten Kupang 2006).

Most of the village area consists of flat land. This flat land is part of a larger Oesao-Pariti Lowland, the second most important lowland in the island of Timor after the Besikama lowland located in the southern coast of Belu District. A slightly undulating topography is found only in the southern part of the village along the village border with its neighboring Oelmasi Village. The lowland receives an average of 1,481 mm annual rainfall within 120 days during the period of November-March. Irrigated rice field is the dominant land use, particularly in northern part of the village, compared to permanently cultivated dryland, shifting cultivation, secondary woodland, and settlement concentrated in the southern and southeastern part of the village area (Kantor Desa Noelbaki 2006). Irrigation water for the rice field is provided by the Dendeng Dam, a small dam located
within the village area, and more recently also by the Tilong, a large dam located in Oelmasi Village.

Data Collection

The collected data consisted of primary and secondary data. The primary data were collected through interviews and field observation, whereas the secondary data were obtained from village offices and other institutions. In the process, secondary data were collected ahead of primary data so that the resulting information could be used as the baseline for designing the survey and field observation.

The sampling unit for the survey was the household, whereas for policy makers it was government institution. Household samples were determined according to the stratified random sampling procedure, for which the strata and the sample size within each stratum followed the recommendation of the Denpasar workshop held in May 2007 as follows: (1) farmers (24 respondents), (2) non-farmers (8 respondents), and (3) local organization leaders (9 respondents). Samples for policy makers was intended to be from three institutions (Village Office, Sub-District Office, and Kupang District Food Crop Service Office), but only one institution was available. Randomization was done within strata after consulting the village staff concerning the household population within each stratum being used as a sampling frame.

A questionnaire was designed to collect social capital as well as biosecurity data. The part of the questionnaire for collecting social capital data was designed according to the social capital questionnaire structure developed by Grootaert et al. (2004). Questions on social capital were designed to capture the multi-dimensional aspects of social capital, both its structural and cognitive aspects (Krishna & Uphoff 1999). The structural aspect covered group and network type in which members of the community were involved and contribution provided to, and benefit obtained from, such groups and networks. On the other hand, the cognitive aspects covered subjective perception on thrustworthiness of one member to another that in turn would influence the livelihood of the member and norms concerning joint actions taken and reciprocity to attain a particular common goal. In addition to these aspects, questions were also asked to cover a third aspect called linking social capital, concerning the relationship of someone to those having certain political and private authorities (World Bank 2000). Following Grootaert et al. (2004), questions on social capital were grouped into the following sections:

1) Groups and Networks. The questions here considered the nature and extent of a household member’s participation in various types of social organizations and informal networks, and the range of contributions that one gave and received from them. It also considered the diversity of a given group’s membership, how its leadership was selected, and how one’s involvement had changed over time.

2) Trust and Solidarity. This category sought to procure data on trust towards neighbors, key service providers, and strangers, and how these perceptions have changed over time.

3) Collective Action and Cooperation. This category explored whether, and how, household members had worked with others in their community on joint projects...
and/or in response to a crisis. It also considered the consequences of violating community expectations regarding participation.

4) Information and Communication. This category of questions explored the ways and means by which households received information regarding market conditions and public services, and the extent of their access to communication infrastructure.

5) Social Cohesion and Inclusion. Questions in this category sought to identify the nature and extent of these differences, the mechanisms by which they were managed, and which groups were excluded from key public services. Questions pertaining to everyday forms of social interaction were also considered.

6) Empowerment and Political Action. The questions in this section explored household members’ sense of happiness, personal efficacy, and capacity to influence both local events and broader political outcomes.

The above sections thus reflects the group membership (“structural”) and subjective perceptions of trust and norms (“cognitive”) dimensions of social capital (sections 1 and 2), the main ways in which social capital operates (sections 3 and 4), and major areas of application or outcomes (sections 5 and 6).

In addition to the part concerning social capital, the questionnaire also consisted of parts covering awareness of, knowledge of, and actions taken to, manage pests and diseases damaging crops in the village. Questions concerning these aspects of biosecurity were coupled with direct field observations to enable any pests and diseases mentioned during the interview be verified. The field observation was carried out using IRRI (1983), Kalshoven (1981), and Semangun (1988, 1989, 1990) as references and field guides. Pests and disease control actions taken by farmers were verified using government recommendations as available in Komisi Pestisida Departemen Pertanian (1999).

Data Analyses
Answers to social capital questions are tabulated to yield data of nominal, ordinal, or rational variables. The list of social capital variables covered in this survey is presented in Table 1.

<table>
<thead>
<tr>
<th>Section</th>
<th>Variable</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups and Networks</td>
<td>Involvement in groups</td>
<td>GRPS</td>
</tr>
<tr>
<td></td>
<td>Involvement in networks</td>
<td>NETS</td>
</tr>
<tr>
<td>Trust and solidarity</td>
<td>Trust to community</td>
<td>CTRUST</td>
</tr>
<tr>
<td></td>
<td>Trust to government</td>
<td>GTRUST</td>
</tr>
<tr>
<td></td>
<td>Solidarity</td>
<td>SOLID</td>
</tr>
<tr>
<td>Joint action and cooperation</td>
<td>Number of joint action participated</td>
<td>ACTS</td>
</tr>
<tr>
<td></td>
<td>Community leader participation</td>
<td>LEAD</td>
</tr>
<tr>
<td>Communication and information</td>
<td>Number of communication carried out</td>
<td>COMS</td>
</tr>
<tr>
<td></td>
<td>Time required to access information</td>
<td>TINFO</td>
</tr>
<tr>
<td></td>
<td>Frequency accessing information</td>
<td>INFO</td>
</tr>
<tr>
<td></td>
<td>Number of information sources</td>
<td>SINFO</td>
</tr>
<tr>
<td>Social cohesion and inclusion</td>
<td>Perception of safety</td>
<td>SAFE</td>
</tr>
<tr>
<td></td>
<td>Number of excluded households</td>
<td>EXHSE</td>
</tr>
</tbody>
</table>
At the same time, tabulation was also carried out on biosecurity variables. The resulting values of biosecurity variables were then used to calculate the indices as follows:

1) **Awareness index (AWARE):** the proportion to the maximum ratio of the number of pests and diseases mentioned in the interview (s) to the total number of pests and diseases found from field observation (q). If the ratio of s/q was denoted as \( r_a \) then AWARE was calculated by dividing the \( r_a \) of each respondent with the maximum \( r_a \) of all respondents.

2) **Knowledge index (KNOW):** the proportion to the maximum ratio of the number of pest and diseases correctly mentioned during the interview (p) to the total number of pests and diseases found from field observation (q). If the ratio p/q was denoted as \( r_k \) then KNOW was calculated by dividing the \( r_k \) of each respondent with the maximum \( r_k \) of all respondents.

3) **Control action index (ACTIONS):** the proportion to the maximum ratio of the number of appropriate control measures taken according to the government recommendation (m) to the total control measures taken by farmers obtained from the interview (n). If the ratio m/n was denoted as \( r_c \) then ACTIONS was calculated by dividing the \( r_c \) of each respondent with the maximum \( r_c \) of all respondents.

Separate regression analysis was carried out for AWARE, KNOW, and ACTIONS using social capital as independent variables. Before regression analysis was carried out, a diagnostic test was carried out to determine which social capital variables were autocorrelated. This diagnostic test was performed simultaneously with a preliminary test aimed at reducing the number of independent variables to be involved in the regression using principal component and factor analyses (SAS Institute Inc. 1990a, b). Regression analysis was then carried out by retaining only social capital variables that were appropriately represented by the first factor after the data were rotated using factor procedure. Multiple regression analysis was performed using the score of social variables resulting from the factor procedure by employing the stepwise variable selection procedure (SAS Institute Inc. 1990a).

**Results**

Principal component analysis on social capital variables revealed that there were four large eigenvalues (9.9878, 1.8822, 1.6526, and 1.1420), which together accounted for 81.47% of the standardized variance. Thus, the first two principal components did not provide an adequate summary of the data. Rotating the data monotonically using factor analysis yielded three large eigenvalues (10.4549, 2.3222, and 1.5190), which together accounted for 79.42% of the standardized variance. The first two common factors then provided a better summary for the data compared to the first two principal components.
before rotation. Rotation provided a slight improvement in data summary (Figure 1) and also better position of variables with respect to Factor 1 and Factor 2 (Figure 2).

Figure 1. Graphs of Eigenvalues Before and After Monotonic Rotation of Social Capital Data: (a) Total Eigenvalues and (b) Cumulative Proportion of Eigenvalues. Data from Noelbaki Village, Central Kupang Sub-district, Kupang District

Figure 2. Position of Social Capital Variables to Factor 1 and Factor 2: (a) Before and (b) After Monotonic Rotation of Social Capital Data. Data from Noelbaki Village, Central Kupang Sub-district, Kupang District

After rotation, Factor 1 accounted for 58.08% of the standardized variance and therefore was adequate for selection of variables to be retained in regression analysis. Among social capital variables, SAFE (perception of being secure), CTRUST (trust to village community), GCTR (control over government policy), and CCTR (control over community decision making) were accounted for less than 50% by Factor 1 and therefore were not involved in the regression analysis. Other variables that were accounted for
more than 50% by Factor 1 were further subject to regression analysis with biosecurity variables AWARE, KNOW, and ACTIONS separately as dependent variables.

Regression analysis with biosecurity variable AWARE revealed a significant relationship (Pr>F <0.0001) with the following equation:

\[
\text{AWARE} = 0.37520 + 0.04506*\text{ACTS} + 0.06027*\text{COMS} + 0.03946*\text{SINFO}, \quad \text{R-Square} = 0.97 \quad \text{and} \quad C(p) = 6.67, \quad [1]
\]

where AWARE=awareness index to the presence of crop pests and diseases, ACTS=number of joint actions and cooperation participated, COMS=number of communication performed, and SINFO=number of information sources accessed. The coefficient of determination of 0.97 and the C(p) of 6.67 indicated that data variations were adequately accounted for by the resulting equation. This equation suggests that community awareness to the presence of crop pests and diseases increases in line with the increasing number of joint actions and cooperation participated, the increasing frequencies of communication performed, and the increasing number of information sources accessed by members of the community.

A significant relationship (Pr>F <0.0001) was also produced from regression analysis with biosecurity variable KNOW. The resulting equation is:

\[
\text{KNOW} = 0.25517 + 0.02843*\text{GRPS} + 0.05790*\text{NETS} + 0.04377*\text{ACTS} - 0.01118*\text{TINFO}, \quad \text{R-Square} = 0.97 \quad \text{and} \quad C(p) = 1.86 \quad [2]
\]

where KNOW=knowledge index of the presence of crop pests and diseases, GRPS=number of group joined as active member, NETS=number of parties ever contacted to obtain information, ACTS=number of joint actions and cooperation participated, and TINFO=time required to arrive at information sources. The coefficient of determination of 0.97 and the C(p) of 1.86 indicated that variations were adequately accounted for by the resulting equation. The equation indicates that farmer knowledge of the presence of crop pests and diseases increases and the time to arrive at information sources decreases, if farmers joined more groups, made more contacts to obtain information, and participated in more joint actions and more cooperation.

The biosecurity variables ACTIONS was also significantly related with some social capital variables (Pr>F <0.0001). The resulting equation is:

\[
\text{ACTIONS} = 0.38007 + 0.05547*\text{GRPS} + 0.05210*\text{COMS} - 0.0412*\text{TINFO} + 0.12043*\text{SINFO}, \quad \text{R-Square} = 0.92 \quad \text{and} \quad C(p) = 1.66 \quad [3]
\]

where ACTIONS=index of pest and disease control actions, GRPS=number of groups joined as member, COMS=number of communication performed, TINFO=time required to arrive at information sources, and SINFO=number of information sources accessed. Coefficient of determination of 0.92 and C(p) of 1.66 indicated that most of data variations were well accounted by the equation. This equation shows that community members are more likely to take action to control pests and diseases of their crops if they are members of more groups, communicate more with other parties, have faster access information, and have access to more information sources.

**Discussion**
The results of this study show that analysis of social capital makes significant contributions to our understanding of community awareness, knowledge, and actions relating to biosecurity. Regression analysis shows that not all social capital variables are equally important in terms of close association with community awareness, knowledge, and actions. By identifying those social capital variables that show close association, efforts can be focused on a particular social capital aspect in enhancing community awareness, knowledge, and actions on biosecurity. A similar approach had been taken by Krishna & Uphoff (1999) in using social capital in their study on watershed development in Rajasthan, India, and by Isham & Kähkönen (1999) in their study on community-based water projects in Central Java, Indonesia.

Participation in joint actions and cooperation provide opportunities for community members to meet other people from whom information on pests and diseases in the village can be obtained. When this initial information is considered relevant to the problem they have in their own field, they can seek further information through engagement in communication with the colleagues they think are more knowledgeable on the subject or through deliberate efforts to access other information sources such as through reading brochures, listening to radio, watching television, or attending extension meetings. Because all of these information sources are cognitive in nature, it is not surprising that they do not necessarily have an ability to correctly identify pests and diseases they know by name. It is common among farmers when the invading pests and diseases are new that they fail to identify the correct identity of the pest or disease without help from outside experts. In Central Timor, Londingkene et al. (2004) found that even an officer responsible for monitoring pests and diseases of estate crops failed to correctly identify coconut hispid although he pronounced the Latin name fluently. Being able to correctly identify pests and disease in the field is mainly important as the first step for farmers to realize that there is a biosecurity problem hampering their crops and that there is a risk of crop loss associated with it.

To be able to both correctly identify and report crop pests and diseases, community members seem to need a more intense interactions with either their more knowledgeable colleagues or with other more trustworthy sources of information. In terms of social capital, such interactions require an involvement in a structural organization such as membership in farmer groups or regular contact with governmental and non-governmental organizations (Isham & Kähkönen 1999). Through these more intense interactions, community members have opportunities to obtain a more hands-on experience through regular field work provided by field extension specialists. It is during this field work that they have an opportunity to identify directly any pests or diseases they previously knew only by name. Field work was used as the primary way of learning to identify pests and diseases and their natural enemies at the so-called field school program of the Integrated Pest Management (IPM) implementation in Indonesia (Untung 1993). Such field work would also involve other people from whom each participant has an opportunity to learn in a joint-action way. Of course, in addition to field work activities, other ways are required to further cross check what they have already learned. In this case, available sources of information and time to arrive at those sources would be critical for them to achieve the required ability in pest or disease identification.
Knowledge of crop pests and disease is the prerequisite for effective management actions. Pest and disease management in Indonesia is based on an integrated approach (IPM) that preferred natural control mechanisms of pest and disease population dynamics over use of chemical pesticides. Within the IPM framework, pesticides are recommended as the last resort only when other measures are inadequate in providing pest or disease control (Royer et al. 2006). In this study, control actions were measured in terms of whether they are implemented by following or ignoring IPM principles. The ability of community members to adhere to this IPM approach in coping with pests and diseases of their crops is associated with their involvement in various groups as an active member, communications with other colleagues or institutions, and frequent use of available information sources. Again, as with knowledge of existing pests and diseases, time required to arrive at the various sources of information limits this ability. The role of information here is important since, as already discussed by Vayda & Setyawati (1998), IPM promotes not only new control measures but also a paradigm shift in viewing pests and diseases as a normal component of agro-ecosystems. Farmers in Noelbaki Village have been accustomed to the excessive use of pesticides for so long that organized efforts involving farmer groups and contacts with extension officers are necessary to counteract the lure of instant control being possible only with the use of chemical pesticides.

Social capital analysis provides a useful approach to enhance our understanding of biosecurity problems at the community level. However, as with other approaches, it is also prone to weaknesses. Apart from criticisms of the concept itself as already reviewed by United Kingdom Office of National Statistics (2001) and others (e.g. Navaro 2003), there are some methodological shortcomings that need to be carefully addressed. The lengthy questionnaire tends to take so much time that the respondents may refuse to cooperate unless compensation is provided. Such a complaint was widespread when the original draft of the model social capital questionnaire was tested in different developing countries worldwide (Onu et al. 2002). In addition, respondents were suspicious of the true motive of some questions, especially those questions they consider embarrassing or threatening their security (Adelabu 2002). Efforts have been made to make the questionnaire as simple as possible, for example by using words local people are most likely to understand and paraphrasing questions that are likely to be embarrassing. Data analysis was also carefully designed to overcome the intrinsic nature of the resulting data of variables that tend to correlate one to another.

At this very early stage of a long-term planned biosecurity study, the information gathered regarding the association of community awareness, knowledge, and actions is important for planning the next project activities. Referring back to the results, the following aspects need to be given attention in planning activities for the next stage of the study:

1) Awareness raising of pests and diseases threatening crop biosecurity should be promoted though capacity building of farmer groups, woman groups, irrigation user groups, and youth groups enhanced with improving supports from extension workers and pest monitoring officers.

2) Transfer of knowledge of pests of diseases of biosecurity importance should be carried out through field work activities involving informal leaders who should be
encouraged to promote the process with help from informal networks they have with both farmers as well as outside governmental and non-governmental organizations.

3) Efforts should be made to promote any indigenous pest and disease control actions and to convince farmers that resorting to excessive use of pesticides is not only costly but also risky in terms of health and the environment.

Conclusions and Recommendations

Referring back to the results and discussion already presented earlier, the following conclusions can be drawn:

1) Social capital offers a new way of understanding pest and disease problems threatening crop biosecurity at the community level by its ability to provide a straightforward yet comprehensive approach in gaining an overview of factors associated with community awareness, knowledge, and actions.

2) A number of social capital variables have been identified as being closely related to community-level biosecurity issues, but variables that are related to one variable are not necessarily related to other biosecurity issues.

3) Social capital variables found to be closely related with community-level biosecurity issues are useful as entry points in gaining an overview of biosecurity problems faced by the local community and as the basis for planning the necessary activities to be carried out at the next stage of the study.

Based on the results obtained during the phase I of the study, it is recommended that the following points be considered in the next phase:

1) Activities in the phase II should include facilitation for informal leaders to raise awareness and enhance their knowledge regarding pests and diseases threatening the biosecurity of crops in the region.

2) Activities with informal leaders should also include capacity building in organization management and development of networks.

3) Awareness raising and knowledge improvement should also be accompanied by facilitation for better compliance with the IPM approach with an emphasis on enhancement of indigenous control measures.

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NATIONAL POLICY ON BIOLOGICAL DIVERSITY  
(BIOSECURITY)  
Prof. Kasumbogo Untung  
Professor of Plant Protection,  
Department of Agriculture, Gadgah Mada University  

Abstract  
FAO provides a definition of biosecurity and international regulations are designed to enforce biosecurity measures for the protection of the health of humans, plants, animals and the environment from dangerous introduced organisms. Indonesia is not yet able to fully comply with international stipulations for biosecurity and so export of some Indonesian products are limited. The roles of local communities and universities in increasing awareness and knowledge of biosecurity measures in Indonesia are discussed.  

Introduction  
In this era of globalisation, the prefix ’bio’ is widely used in words such as biotechnology, biodiversity, biosafety, biosecurity, bioimperialism, biopiracy, biodemocracy, biocide and bioterrorism as described in Shiva (1994). 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 globalisation. These terms appear in response to emerging issues facing people and nations who seek to maximise their control, use and management of natural resources.  
The definitions of these ‘bio’ terms overlap and are interrelated. Before we can discuss the issue of ‘biosecurity’ in this workshop, we must first agree on what this term encompasses so that our discussion can be based on a common understanding.  
The majority of the Indonesian population lives in rural areas, deriving its livelihood from agricultural activities. These communities are not ready to enter the era of global free trade and are not yet ready to face issues of biosecurity. Many developed countries use the issue of biosecurity to prevent the introduction of agricultural products from outside and to improve their own exports. In the era of globalisation, biosecurity which is actually a part of applied biology, has been politicised as it relates to industrialised 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).  
This paper will discuss the scope and objectives of the term ‘biosecurity’, government policy and issues faced in the development and introduction of the concept of biosecurity.
in Indonesia. The impacts of biosecurity issues on the lives and knowledge of traditional Indonesian farmers will also be discussed.

**Scope and Limitations of Biosecurity**

According to the Food and Agriculture Organisation of the United Nations (FAO), “Biosecurity is a 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. Biosecurity covers the introduction of plant pests, animal pests and diseases, and zoonoses, the introduction and release of genetically modified organisms (GMOs) and their products, and the introduction and management of invasive alien species and genotypes. Biosecurity is a holistic concept of direct relevance to the sustainability of agriculture, food safety, and the protection of the environment, including biodiversity” (FAO 2003).

According to the FAO, the following development sectors are most closely linked to biosecurity:

1. Agriculture and forestry sectors in regard to the life and health of plants, including forests
2. Agriculture sector, fisheries and marine species in regard to the life and health of animals, including marine species
3. Health sector, in relation to human life and health, including food security
4. Environmental sector, in relation to protection of the environment and biodiversity.

**Factors Affecting the Development of Biosecurity**

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 have been 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. 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.

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 analysed and developed by the Codex Alimentarius Commission (CAC) which was formed by FAO and the World Health Organisation (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 Organisation (WTO) adopted standards, guidelines, recommendations and procedures that were established by the IPPC, CAC, IOE and other international organisations 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.

The attention paid to issues of biosecurity has been increasing in recent times due to the following factors:

1. Continuously increasing impacts of globalisation
2. Increased international trade of food and agricultural products
3. Increasing human movement across international borders
4. Limited technical and operational resources
5. Increased diversity of agricultural production and food processing technology
6. Increased community awareness of biodiversity and the environment and the ways agricultural activities impact on these
7. Improved communication and global access to information about biosecurity
8. Nations that are highly dependent on food imports
9. Legal obligations on nations and relevant bodies resulting from international agreements
10. Previously nations determined their own regulations but now they are increasingly bound by international agreements for effective biosecurity

**Biosecurity Policy**

*a. International*

There are several conventions, agreements and treaties that have been established by various international organisations. The FAO (Food and Agricultural Organisation) has conventions in the areas of food and agriculture, the WHO (World Health Organisation) in the health sector and the UNEP (United Nations for Environmental Protection) in the environmental sector. Many international non-government organisations (industry associations, NGOs, and professional associations) have contributed to the establishment of global agreements. These standards, guidelines, recommendations and procedures have been created based on careful consideration, analysis and scientific data from the most recent and relevant research. Not surprisingly, developed countries have the greatest access to – and control of – up-to-date science and technology that determines international regulations including those that relate to biosecurity.

Some of the international trade agreements and stipulations created by international organisations, and subsequently adopted by the WTO, have become compulsory criteria for international trade of food and agricultural products between member nations of the WTO. The ‘Sanitary and Phytosanitary’ (SPS)–WTO agreement contains regulations about implementation of sanitation policies (human and animal health) and
phytosanitation or plant health. Biosecurity issues in relation to international trade of food and agricultural products are also addressed in the TBT (Technical Barrier to Trade)-WTO agreement.

b. National
Currently Indonesia 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. However, upon inspection, we can see that the government already has various policies which address biosecurity. These include the following:

1) Quarantine
Policy for phytosanitation, or the protection of plant health from the threat of invasive plant species and animals that come from outside of Indonesia, is included in legislation under Act No. 16 (1992) regarding Quarantine for Animals, Fish and Plants. Policy for implementation of this Act has been established through Regulation No. 14 (2002) regarding Plant Quarantine. Guidelines and procedures for the implementation of quarantine for plants is defined in detail through a decree from the Minster of Agriculture. All regulations within the Animal, Fish and Plant Quarantine Act which applies in Indonesia have been developed in accordance with international quarantine standards established by the IPPC and have been adopted by the SPS-WHO Agreement. According to this legislation all food and agricultural products to be exported must be accompanied by an internationally recognised Health Certificate from the Agricultural Quarantine Agency. There are already many cases where agricultural products have been rejected from entering other countries when they did not have this Plant Health Certificate.

In general, regulations protecting plant health from Invasive Alien Species are covered by the Animal, Fish and Plant Quarantine Act, but no specific legislation has been created. Deliberate and accidental importation of IAS pose a risk to plant health, and a risk to the broader environment. National policy for preventing the introduction of IAS should be established by the Department of Agriculture and the Environmental Ministry.

2) Food Safety
National policy regarding Food Safety as part of Biosecurity is addressed in general terms in Act No. 7 (1996) for Food. This Act states that it is prohibited to circulate food that contains poisons, is dangerous or poses a health risk. It is also prohibited to circulate food that has higher than the set threshold levels of contamination (biological, physical or chemical contamination). Maximum Contamination Limits for Food in Indonesia is set to comply with standards outlined in the Codex Alimentarius Commission (CAC)/WHO. Indonesia has been actively involved in many technical meetings organised by CAC, though actual implementation of the standards continues to be a challenge.

More detailed guidelines for quality control as well as food and agricultural product safety of fresh agricultural products have been released in a decree by the Minister for Agriculture. Processed food products are covered by decrees from the Ministers of Health and Head of the Medicines Control Agency. The government is currently developing a
system of certification and labelling to indicate product quality and food safety, including certification of organic foods. In 2003, the government formed a certifying authority to coordinate the issuing of food certificates defining 3 levels, PRIMA 1, PRIMA 2 and PRIMA 3. Products with a PRIMA 1 classification are easily imported to markets in Europe and the USA.

3) GMO Products
National policy regarding international movement of genetically modified agricultural products is contained in Act No.5 (1994) for Ratification of the UNEP Convention on Biological Diversity and Act No.21 (2004) regarding authorisation of the Cartagena Protocol on Biodiversity to the Convention on Biological Diversity. The Indonesian government have also enacted Regulation No.21 (2005) regarding Biological Safety of Genetically Modified Products which was initiated by the Minister for the Environment (Untung, 2007).

So in fact the Indonesian government already has a range of legislation relating to biosecurity in accordance with international agreements. The greatest challenge remains how to find ways to ensure that the legislation is enacted in the field.

Impacts of Biosecurity on the National Economy
The Biosecurity issue that continues to cause problems for Indonesia and other developing countries is the increasing difficulty in exporting agricultural, livestock, forestry and fisheries products to the United States, European Union and Japan. These countries have good infrastructure with strict regulations and enforcement of Biosecurity measures in accordance with the applicable international regulations. 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 EurepGAP (Europe Good Agriculture Practices) which have been in place in the European Union since 2005.

Unfortunately we are not able to apply the same criteria set by these developed countries to the import of agricultural products to Indonesia. Our regulations and infrastructure are not sufficient or accredited and the quality of professional human resources for monitoring and enforcement of regulations is extremely lax. Until now, Indonesia 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.
Issues Faced

There are many factors hindering the adoption of international biosecurity measures. These obstacles include the following:

1. A lack of political support for biosecurity programs
2. The approach of the government bureaucracy is still extremely ‘egosectoral’ and the approach of agricultural research bodies is very ‘egodisciplinary’, including amongst university academics
3. The government does not have a national coordinating body or authority to handle biosecurity issues.
4. Regulations lack detail and are not integrated
5. Infrastructure such as roads, transport, laboratories are insufficient
6. Staff responsible for inspection, monitoring, and field work do not have access to the required technology or the necessary knowledge of biosecurity
7. Stakeholders such as farmers and agricultural industries are not sufficiently aware of the importance of biosecurity and are therefore not supportive

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 neighbours 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.

Role and Contribution of the General Community

The role and contribution of communities living a traditional lifestyle are not particularly relevant to discussions of global and national policies regarding biosecurity. In general, traditional communities in isolated areas of Indonesia are 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. Discussions regarding biosecurity tend to focus on issues of international trade of food and agricultural products.

Discussions regarding local conservation technology, knowledge and culture are more relevant if discussed in relation to the implementation of global and international biodiversity policies, even though previously it was explained that biosecurity also addresses environmental protection. However, the intention here is to look at activities and enterprises required to protect national assets, (i.e. biodiversity), from the introduction of new organisms through rapidly increasing international trade.

Global policy on biodiversity has already been established and agreed on by heads of state (including the president of Indonesia) at the Earth Summit in Rio de Janeiro 1992. The United Nations Convention on Biological Diversity (UN-CBD), which was signed at the end of the 1992 Summit, entered into national law as part of Act No.5 (1994) regarding Legal Recognition of UN-CBD.

The first Article of the CBD states that the aims of the Convention are: “the conservation of biological diversity, the sustainable use of its components and the fair and equitable
sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.” Discussion on the role of traditional communities in the conservation and use of genetic and biological resources should be linked to the CBD which already has strong legal standing.

The role and contribution of ‘modern’ or agribusiness farmers in implementation of biosecurity measures is more significant because these are the largest primary producers for export products. They are therefore also the farmers who will be most impacted on by the introduction of damaging organisms through imported goods from other countries. Primary producers must improve their knowledge and technology use, as well as their management skills to allow them to produce food and agricultural products which meet the strict quality and safety criteria required by countries targeted for export.

**Conclusion and Recommendations**

1. The limitations and scope of the term ‘biosecurity’ should be in accordance with the international understanding as defined by the FAO.
2. Biosecurity is an integrated policy and activity framework that aims to protect the health and life of plants, animals, humans and the environment from the introduction of dangerous organisms through the movement of international trade.
3. Global and international policy regarding various aspects of biosecurity are already being implemented, particularly activities around quarantine. The role of biosecurity is increasingly strategic and will determine Indonesia’s ability to compete in global markets since the WTO has adopted various international agreements relating to mechanisms for international trade of food and agricultural products.
4. Indonesia is not yet able to fully comply with international stipulations for biosecurity, which is detrimental to Indonesia in an era of global trade. There are an increasing number of agricultural products entering domestic markets from outside, but the amount of Indonesian product that is able to penetrate markets of developed countries is decreasing.
5. Discussions of the role, use and protection of local knowledge from traditional communities is more appropriate if it is linked to the UN Convention on Biological Diversity
6. Universities are institutions for education, research and community service and therefore have a duty to bring the issue of biosecurity into the mainstream for all managers in order for Indonesia to be more competitive

**References**


REVITALIZING SOCIAL CAPITAL, EMPOWERING LOCAL POTENTIALS: REDUCING POVERTY IN FOREST AREA AT BALI PROVINCE

Nyoman Utari Vipriyanti
Departement of Social Economics Agriculture,
University of Mahasaraswati Denpasar, Bali, Indonesia
Ernan Rustiadi
Departement of Soil, Faculty of Agriculture,
Bogor Agricultural Institute, Bogor, Indonesia

Abstract

The economic crisis in Indonesia since 1997 increased the number of poor people from around 27 million before the crisis to almost 40 million recently. The majority of these poor people are living in the village, either in forest areas or coastal areas. Indonesia has witnessed some fundamental changes in politics and economy, as well as social affairs. Unfortunately, with such limited resources, these changes are sometimes painful, making it more difficult for villagers to cope. As a consequence, tensions are mounting and social capital is loosening. When this type of capital is lacking, it is difficult for rural people to develop their own resources and lift themselves from poverty.

Social integrity variables such as trust, network and social norms play an important role in reducing poverty because in poor regions where natural and human resources are lacking, social capital often represents the only asset owned by households and society. Until recently, little attention has been paid to the true meaning of social capital due to poor availability of data, and problems associated with measurement. This research attempts to bridge such a gap by conducting a study of social empowerment of households through social capital reinforcement for impoverished poor communities such as forest communities.

Based on these arguments, it is imperative to understand the link between social capital and other type of capitals to alleviate poverty in rural areas in Bali Province, especially in forest areas. This study, therefore, attempts to model such a link by means of quantitative and qualitative analysis.

The results show that in Bali Province, social capital can increase household income in three ways: by (1) improving individual participation in a social network thus reducing transaction costs, which is important for improving people’s earnings, (2) improving people’s participation in local networks and reducing rent seeking behavior to facilitate collective action, and (3) extending networks and enhancing the level of social trust so that villagers have access to education, capital and health services.
Introduction

During the last five years (2000–2005), productivity of dominant sectors in Bali province (agriculture; trade, hotel and restaurant; industries and services) have decreased due to security instability (boom blast and conflict). This not only has significant impact on tourism sector, but also on other sectors. Decreasing the number of visitors who visit Bali has weakened tourism sector productivity, and increased unemployment and the number of poor households. Until 2005, there is an increasing number of poor households (describe at Figure 1). Most of the poor households in Bali are concentrated in regions that are dominated by agriculture sectors, such as Residency of Karangasem, Buleleng, Jembrana, Tabanan and Bangli.

![Number of Poverty Incidence at Bali Province 2000, 2001, 2005](image)

So far, poverty examinations in Bali have only focused on unavailability of traditional capital such as quality and quantity of physical, financial, human or natural resources (tangible resources). However, some research suggests that poverty is also caused by lack of intangible resource such as social capital that including trust, norms and networks. Social capital will have significant effects on economic development by facilitating transaction between existing individual, household and group in a region. Social capital also facilitates improvement of access of poor communities to education and health facilities, and also capital supply.

Development differs from growth, where development tends to focus on processes, quantitative growth and also qualitative aspects such as institution, organization and culture where the economy prevails. Therefore, regional development should including integrated planning between physical, economic and social aspects. So far, social aspects are continously neglected, in contrast with physical development such as road, telecommunication facilities, etc. This neglect will result in negative impacts on local public socio-economic living that in turn will increase the amount of structural and relative poverty.
Limited job opportunities in the tourism sector in Bali has resulted in decreasing employment in working aged residents, especially after the boom-blast incident in 2002. In fact, decreasing percentage employed in Bali has been followed by increasing numbers of poor households. Social conflict frequently occurs in Bali, particularly related to the public being unconvinced of government performance and good will.

The conflicts are not only vertical in nature but also horizontal, among members of desa adat (desa pakraman)71 or between certain ethnic groups. The conflicts are detrimental to the image of Bali in the international market. Poor images will result in decreased tourist visits and reduced length of stay in Bali. Bali society has long been known for high tolerance according to universal norms such as Tri Hita Karana72, but is changing. Setia (2002) suggested that the changing trend is towards a worst condition. Dwiyanto (2002), stated that social, economic and political conflict could be expected to be resolved by the existing traditional institution. However for the case of Bali, desa pakraman, the traditional institution that for a long time has strongly bound society in Bali, is unable to manage differences among the members, so that there is often internal and external conflict.

Poverty caused by the development gap between sectors and region is more dangerous because it triggers social jealousy that in turn weakens social capital. Grootaert (2001) believed that poverty has a close relationship with capital; it means that poverty elimination efforts can be conducted by social capital revitalization. Therefore, efforts to revitalize community social capital, particularly in poor regions in Bali is one alternative that should be given attention and consideration as a base capital in achieving better living as stated in the poverty alleviation strategy by the poverty alleviation committee. Social characteristics to alleviate poverty were expected to be able to revitalize common culture by strengthening institutions, mutual trust, expanding network and strengthening norms that contain local wisdom.

Methods and Results

This paper presents an analysis of social capital to solve poverty problems, particularly the relationship between social capital determinants and household income. The primary data were collected from 50 peasants around forest areas and consisted of qualitative and quantitative data that were statistically analysed. Tests of the significance of relationships between social capital determinants and household income were carried out by t-tests.

Poverty

A large body of literature shows that poverty is caused by factors including:

1. Limited food supply and fulfilling nutrient requirement
2. Limited access to qualified basic health services and low health status

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71 desa adat (desa pakraman) is traditional organization in Hindu Community
72 Tri Hita Karana is universal value that is taking care of relationship between human being with its creator, God, between human being and human being with its environment
(3) Low access to qualified and cheap (both formal and informal) education
(4) Limited job opportunities and options for developing a business, limited protection of business assets, and limited work protection for child and women labor such as women migrants and household servants.

Groups are that susceptible to being poor or experiencing poverty processes are describe here:

1. **Rural community**
   The most valid simple assumption concerning poor people is that generally they living in rural areas with their main livelihoods in the agriculture sector and other traditional economic sectors.

For developing countries, the important aspect that should be considered for poverty problems is that most of the third world governments devote their attention to urban areas with modern and commercial sectors.

2. **Ethnic minorities and indigenous people**
   Poor conditions experienced by minority ethnic groups and indigenous people in the developing world can be due to forms of socio-economic and socio-political discrimination. Tension among ethnic groups may develop because of existing gaps in ownership of valuable resources, for example job opportunities (the dominant ethnic groups usually dominate job opportunities). As a consequence, indigenous people and minority ethnic groups live in absolute poverty.

Generally, indigenous people live in forest areas with limited access to more developed regions. These communities have their own norms to conserve the environment according to their local wisdom. In Bali, indigenous people in forest areas stepped aside long ago to hide from attacks by other groups. Centralised development policy and forest management has neglecting the value of local wisdom.

**Religion and socio-cultural living of around forest community in Bali**

Until 2003, the forest area in Bali has not experienced significant change and is 130,686 hectare or 23 % of Bali Island. About 73 % from the area is conservation forest. Just only 27629 hectare is production forest, divided into permanent production (1,907 ha), limited production forest (6,719 ha), and convertible production (19,002 ha). The main forest product is log wood. By 2003, log wood production had sharply increased to 951 m³ from 54 m³ in 1999. Increasing of log wood production is not a happy fact because increasing wood production needs a long time period. The increase in log extraction indicated that government policy is non sensitive on environmental problems. Forest mismanagement will cause suffering in forest communities because of increased risks of ecological destruction such as land slides and flood.

So far, it was expected that 25 % or 31,818 hectare of inland forest in Bali has been converted. The forest conversion is due to illegal use of forest area by community groups
living around the forest, illegal use for other forest sector development and illegal logging. According to Bali Forestry Office, in 2005, inland forest area is 127721 hectare or only 22.5 % of total Bali area (*i.e.* 563,286 hectare). This indicates that Bali forest is dominated by mangrove.

Bali forest is classified into three categories: namely preservation forest, conservation forest, and production forest. Preservation forest area is 73.3 % or 95,766 hectare, functioning as preservation for water and soil, supporting flora and fauna habitat, and supporting tourism (eco-tourism), cultural, health, education and research activities. Conservation forest is a forest to protect, conserve, and habitat for various kinds of flora and fauna. These forests are located in the national park of West Bali (TNBB), center of natural conservation area Batukaru Tabanan, around of Batur Bangli Mount, natural tourism park of Bedugul and Sangeh, and national park Ngurah Rai Denpasar. Conservation forests occupy 26,293 hectare or 20 %. Production forest is concentrated in Buleleng Regency (4,732 hectare), Jembrana Regency (2,993 hectare) and the small areas in other residencies. Various tree species are planted in this production forest including teak, pines, snorkeling, and others economic trees.

The condition of forest vegetation in Bali is classified into three kinds. Forest destruction may have significant impact on increasing drought and landslide disasters. It was estimated that 3100 hectare (10 %) of existing preservation forest has been destroyed as a result of illegal use by communities. At present, it was estimated that 2 million hectare of forest has been destroyed in Indonesia. Most of this area is located outside Bali. The relative low level of forest destruction in Bali is due to the close relationship with the religion-socio-cultural systems of the community.

Community traditional organizations and traditional norms that are widely known as *awig-awig* are obeyed by Bali communities, particularly in rural areas. The *awig-awig* focus on togetherness, congruence and harmonization in economic, ecological and social aspects. Eventually, *awig-awig* binds Bali communities in two ways, like the sides of a coin; on one side hampering certain group progress, and on other side muffling any existing conflict caused by socio-economic gap. Traditional and norms organization that are still maintained are describe here:

**Banjar and Banjar Adat**

In Bali, there are local community organizations that are relevant to reducing forest destruction, *i.e.* *banjar*, *banjar pakraman* and *subak abian*. *Banjar* is a social unity on region unity basis. This social unity was strengthened by custom unity and holy religious ceremony. In the mountain regions, *banjar* membership is limited to persons born in this *banjar* region. This limitation makes strong binding among *banjar* members particularly for the specific one and will establish social capital bonding.

At certain times, decisions are made together in *Bale Banjar*, the *banjar* residents meet regularly and a *banjar* building is used for member activities. *Banjar* are headed by a *kelian banjar* that are chosen by *banjar* residents for a certain period. *Kelitian banjar* was responsible for managing government administrative affairs whereas *kelian adat* (*kelian banjar pakraman*) was responsible for managing general affairs that related to social and
religious living of banjar pakraman members as a community. On the other hand, he or she are also capable of solving custom problems. Banjar membership is on administrative region basis while banjar pakraman membership is based on Pura Kahyangan Tiga coverage, praying place for the banjar adat members.

Subak and Subak Abian
Subak abian usually more developed in forest communities than subak organization. Subak seem loose from Banjar and have the own leader. Members of subak abian are not necessarily banjar members because subak members are based on location of farm field. Particularly for subak, the membership is based on location of paddy fields on the same irrigation channel. Therefore, not all of subak members live in a banjar.

In awig-awig subak, there is no special treatment for larger land owner. Each land holder receives the same treatment on agriculture sector requirement. Breaking of awig-awig subak will impact on moral sanction enforcement such as exclusion by other subak residents. The sanction is avoided by consideration that land that is owned is an immobile asset and so is not removable by the owner, although the owner may be relocated.

Sekaha
Other than community organizations, Bali also has specific organizations that focus on specific living namely sekaha. The organization has hereditary characteristics, however some of them are temporary. There is sekaha with the function of making ceremony related to rural/village communities, for example sekaha baris dance (group of tari baris), sekaha teruna-teruni. The sekaha is generally permanent, however some may be temporary when established on special need basis, for example sekaha memula (planting group), sekaha manyi (harvesting group), sekaha gong (gamelan groups), etc. The above sekaha are usually groups that are separate from the banjar or village organization.

Gotong-Royong
In Bali community living, there is help through another system (nguopin) that relates to wet field and farm activities (planting, grubbing, harvesting, pest mitigation), household activities (home roof repair, wall, digging well, etc), family ceremonies, or accident and death. Nguopin among individuals is usually based on the understanding that assistance given should be repaid in the same way. Besides nguopin, community members help each other through activities in sekaha. Another similar cooperation is known as ngedeng for example for a gamelan group involved in dancing during odalan ceremony. People also help each other in kerja bhakti (ngayah) for religious, public and government activities. Bali’s community recognize the existence of desa, kala, patra. This awareness creates variation and local difference. Religion of Hindu which has long been integrated into Bali society is an element that has strengthening the existence of awareness of unity. The influence of the difference of Java-Hindu culture in various area in Bali since the Majapahit era, created two Bali society forms, that is Bali-Aga society and Bali-Majapahit society. Generally, Bali-Aga society inhabits mountain rural area while Bali society of Majapahit has generally developed in plains areas and is the largest part of Bali’s population. Most of the mountains represent vast forest, lengthwise from west to east, dividing Bali into two parts: relatively narrow plain in the north and the larger one in the south. Until this time, vast forest in Bali are still maintained and conserved because
most of the large Balinese temples, as place for praying of Hindu society, are built in forest areas, for example Pura Pulaki (Pulaki Temple), Pura Batukaru (Batukaru Temple), and the biggest temple in Bali, Pura Besakih (Besakih Temple), which is located on the glorious hillside of Gunung Agung (Agung Mountain).

_Social capital and around forest community welfare in Bali_

Preservation of forest environments in Bali has a close relationship with society norms. The norms, together with network and trust, establish social capital in Bali. Utari _et al._ (2007) suggested that social capital in underdeveloped regions in Bali are determined significantly by the norms, not by trust. The reason is that reducing trust does not weaken social capital in underdeveloped regions.

The model developed to analyze the relationship between social capital and household income is based on Grootaert model (1999) and adapted for socio-cultural conditions of the Balinese. Social capital will be estimated by means adherence to group norm that imply the social expenditure level of each household (sexp). Household welfare level will be estimated by amount of family income.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Regression coefficient with TSLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Income (inc)</td>
</tr>
<tr>
<td>Constant</td>
<td>-223092.9</td>
</tr>
<tr>
<td></td>
<td>(33847)</td>
</tr>
<tr>
<td>number of employed family member</td>
<td>117195.2**</td>
</tr>
<tr>
<td>family member (emp)</td>
<td>(64066)</td>
</tr>
<tr>
<td>network density (nw)</td>
<td>13092.18</td>
</tr>
<tr>
<td></td>
<td>(37242)</td>
</tr>
<tr>
<td>Participation in group decision</td>
<td>419808.9***</td>
</tr>
<tr>
<td>making (part)</td>
<td>(76696)</td>
</tr>
<tr>
<td>Social capital (sexp)</td>
<td></td>
</tr>
<tr>
<td>Dummy region (wil)</td>
<td>70173.84***</td>
</tr>
<tr>
<td></td>
<td>(22439)</td>
</tr>
<tr>
<td>Income (inc)</td>
<td>0.040402***</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
</tr>
</tbody>
</table>

source: analysis of primary data, 2005  
number in ( ) shows standard deviation  
***significant at 5 percent  ** significant at 10 percent  * significant at 20 percent

The analysis shows that household welfare level (inc) is significantly affected by adherence to norm (sexp), number of employed family member that (emp), participation in the most important organization (part) and network density (nw). However, from the
four variables, only three variables show significant effects, i.e. number of employed family member (emp), participation in the most important organization (part) and adherence to norm (sexp). The more family members employed the greater the welfare of the household. Variable of adherence to norm (sexp) has positive effect in household welfare level. The addition of one thousand rupiah for social capital expenditure will increasing household income Rp. 2.388, ceteris paribus. These results support previous research that was conducted partially, in particular Grootaert (2001) and Brata (2004) stated that participation increases community access to financial sources and therefore improves welfare.

**Conclusion**

Poverty, including that of communities near forests, is still an issue that should be treated specifically. Negligence in managing the poverty is not only causing a gap but also tending to push the society undertake illegal logging and use of forest. Adherence to norms and broadness of network in fact will give positive influences to household income level in communities near forests in Bali.

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SOCIAL PARTNERSHIPS IN LEARNING: SUCCESSFUL TRAINING THROUGH ENTERPRISE DEVELOPMENT IN REGIONAL AUSTRALIAN INDIGENOUS COMMUNITIES.

Ruth Wallace
Charles Darwin University, NT Australia

Abstract

Developing partnerships that support biosecurity and sustainable livelihoods in regional and remote communities have at their core, sound processes and structures to share, create and recognize emergent and local knowledge. Through their analysis of the key elements of integrated rural development in East Nusa Tenggara, Indonesia, Blyth et al. (2007) note a sustainable livelihood approach requires the integration of physical, economic, political and sociocultural environments. Blyth et al. (2007) also outline 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 and build local capacity and build connections with national policy approaches. This paper reports on a macro-analysis of enterprise development and training models in Indigenous communities across Australia and considers the potential role of enterprise training in embedding plant biosecurity management at a local level to achieve environmental, economic, cultural and social sustainability.

Introduction

The efficacy of practices to ensure plant biosecurity, *i.e.* 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.* (2007:11) 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 learning models need to recognise 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.

Engagement in learning is informed by people’s cultural and social experiences, relationships and identities. Developing successful approaches to training in remote and
The Australian Cooperative Research Centre for National Plant Biosecurity’s pilot study in Australia and Indonesia identified the need for a training framework that endorsed local knowledge for the community management of biosecurity in both countries. This paper reports on a macro-analysis of the findings of a series of Australian recent studies related to enterprise development and training that support local workforce outcomes through learning partnerships. These studies predominately focused on remote Northern Australian communities and explored the potential to improve economic and community outcomes through training and investment based around enterprise development. The enterprises included a wide range of income generating businesses managed by and for Indigenous people in tourism, construction, aquaculture, land management, music, catering, art, transport, horticulture, education and hospitality.

The analysis showed that developing a training framework to effectively engage local and broader knowledge in learning partnerships has the potential to support embedding plant biosecurity management in regional communities. This paper discusses these findings and the implications for developing a training framework that focuses on partnerships and relationships, rather than systems. These partnerships are essential to building cultural, economic and socially sustainable livelihoods. The paper identifies key elements of a successful training framework for regional Indigenous communities with the aim of outlining 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.

**Significance**

The successful identification, management and eradication of plant biosecurity incursions across the extensive and sparsely populated Northern Australian coastline is a challenge that is being addressed by effective partnerships between Indigenous land managers and relevant government agencies. This biosecurity surveillance, reporting and management work has the potential to be developed to support economic, cultural and social sustainability through connection to existing enterprises and areas of knowledge strength. The *Northern Territory Indigenous Economic Development Strategy* recognises the strength, resilience, diversity and cultural integrity of Indigenous people, and the high levels of disadvantage which impact 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 there is a need for a hybrid approach that includes scientific, biological, social, commercial viability and Indigenous expert assessment of cultural
practice (p8). 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 system. Training programmes with remote Indigenous communities need to relate to a new paradigm, one that has an economic development dimension and targets *previously unrecognised productive activity spin-off benefits to industries and regions beyond the Indigenous estate* (Altman 2001:8).

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 coordinate decision making across and between communities and stakeholders
- approaches to projects that are flexible, source local knowledge and informed by location-tailored research
- analysis and support of social capital relationships and management and
- sustainability through community participation at every stage, training local staff to continue project and ensuring projects are integrated into existing institutions.

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 exotic plant pests (EPPs), works through social partnerships in learning 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 in remote and regional communities. This is responsive to recent national policy changes about Indigenous community and workforce development and Indigenous people’s desire for economic independence.

**Literature review**

Bourdieu (1990) described *habitus* as the socially constructed systems that organise practice and representations and essentially socially negotiated nature of meaning. The notion of *habitus* recognises the social construction of knowledge and its mediation through individual and shared action. Innovative and successful approaches to learning partnership and regional development in remote and regional contexts with Indigenous people necessitates effective partnership and the recognition of diverse knowledge systems as they relate to the worlds of work, community engagement and learning. Social partnerships catalyse and enable change in human or social policy (EU Guideline Principles 2004) 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 2008:7). These frameworks operate at and across all levels i.e. involving individuals, organizations and learning systems.

Understanding multi scalar and multi dimensional relationships is central to understanding the ways learning works in context and the key agents in the relevant relationships. Seddon et al. (2004) have described social partnerships as the localised networks that engage stakeholders in a local area in a network that works on issues and activities of local importance. Effective partnership work embraces and harnesses the contributions of local partners and external agencies, their interactions and the changes they make in the collective work of realising shared goals. Social capital theory (Woolcock 2000, Putnam 1998, Grootaert et al. 2004) provides an analytic framework to understand relationships between social units, agents, and institutions across different levels and disciplines, and recognises issues of value (Schuller et al. 2000). Social capital is defined as the groups, trust, networks and norms people access for a range of purposes. Networks (Putnam 1996) comprise bonding ties which link people of similar level and demographic characteristics, bridging ties which link people with different demographic characteristics (Gittell and Vidal 1998, Narayan 2002, Putnam 2000), and linking ties which connect people to those in authority and institutions (Woolcock 1999). These forms of social capital are informed by social practice and the related social constructs and relationships. In a broad sense, social capital refers to resources accessed through relationships (Portes 1998, Falk et al. 2003, Burt 2000) and the kinds of involvement in networks and relationships in a collective (Putnam 1998). Flora has identified entrepreneurial social capital, a particular arrangement of social capital that relates to community economic development (Flora and Flora, 1989; Flora, 2004). Social capital provides a metalanguage and framework to understand social networks that occur in learning partnerships.

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). Mitchell et al. (2006:32) noted networks are complex, constituting multiple parties with diverse and challenging goals. Networks are also used to assist practitioners and varied stakeholder groups to build relationships and be responsive to students and community needs. They recognise and are able to work with a range of knowledges and associated practices. Educational systems need to recognise and integrate the plurality of the society in which it operates.

Enterprise development and training is defined in this context as training constructed that focuses on supporting enterprise development that draws on local knowledge and is connected to local governance structures. Customised training is tailored to the enterprise owners’ development and mapped to nationally accredited training. In Australian Indigenous contexts, customised training is sensitive to local situations and explicitly makes links to the relevant national agendas. As Indigenous enterprises are operated by the community, rather than individuals, owner-operated, enterprises emphasise 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 business than non-Indigenous business owners (Flamsteed and Golding 2005). This includes access to business services, commercial labour markets, business models and sites and learning through involvement in other Indigenous businesses.

Flamsteed and Golding (2005) emphasised 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.

Methods

A macroanalysis (Chambers 2004) of a series of enterprise development projects undertaken by a partnership of Indigenous enterprise owners, Registered Training Organisations and industry representatives explored the role of accredited training and social partnerships in learning effective pedagogies in enterprise development and training. The sites for the research were all regional, remote contexts that are institutionally based resource contexts, where community based development and training has always been the greatest challenge. Enterprise development offers a sound and sustainable vehicle for developing and implementing a locally relevant training framework.

Key partners in the projects analysed were Indigenous enterprise owners across northern and central Australia, Kimberley College of TAFE, CHARTTES Training Advisory Council, and Charles Darwin University. The enterprise development and training project analysed were conducted between 2004 and 2008 examined;

- The development and trialing of a range of e-learning, e-business tools and information that support the establishment of a range of enterprises.
- Mapping enterprise development to nationally accredited training competencies
- Developing e-tools for assessment using visual, written, digital and cultural literacies and competencies. These include ways to formally recognise and assess local knowledge using digital photographs, videos and stories and e-portfolios.
- Representing Indigenous enterprise owners’ expertise, workplace learning, competence and contexts in a teaching and assessment tool mapped to the relevant nationally accredited qualifications.
• Pedagogies that enhance practitioners’ ability to work in flexible ways with diverse client groups and develop innovative and flexible approaches to assessment and skills recognition.

• Ensuring relevant, quality training and qualifications are implemented that support economic independence and knowledge management at a local and national level.

• Policy and practices that support sustainable enterprise training models with Indigenous people and achieve high level employment outcomes for Indigenous people and communities.

The thematic macro analysis of the project’s outcomes, considered the approaches to sharing knowledge and ownership and work-based learning. These include addressing infrastructure issues such as funding, technology and skills sets; approaches to sustainable enterprise learning and production, professional development of local and external expertise for training focusing on partnerships and relationships rather than systems to effect change.

Results

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 capitalising and building on their strongest skills such as performance, cultural work and Indigenous traditional and contemporary knowledge (Mark Grose, Skinny Fish Music, interview 19/04/2005).

Workbased Learning: Workplace based learning and assessment was 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 become part of the learning culture and resources in the community. In this environment, student support was characterised by initially integrating the principles described Langton et al (1998), not an additional activity.

Learning Partnerships: All case studies highlighted the importance of community ownership of learning partnerships. This 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 was 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 do was a great way to stimulate the imagination, as projects develop through
sharing. Some of the learning was 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. This 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 had 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 development officers 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.

Professional practice and delivery: Quality training programmes facilitated by expert trainers/learning facilitators over a long term partnership made a significant difference to enterprise success. Effective training programmes developed through shared knowledge and trust, assumed Indigenous people had considerable knowledge and competence to bring to the training relationship and 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 was 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 based on trust and commitment. Partnerships with Elders and local experts were significant in recognising 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 programmes 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 programme to other enterprise partners.

Training frameworks: Qualifications were not the final aim of training; employment and personal outcomes needed to were the 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 combinations 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.

**Diverse knowledge systems:** Enterprise training recognises 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. Digitally based resources supported people to learn and demonstrate competence across language and knowledge systems. 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.

**Discussion**

Any training enterprise development training is framed by social learning partnerships that work across diverse knowledge systems and unequal power structures. Effective training is first and foremost about good partnerships, investing in the development of strong partnerships before, during and after training periods will improve the training and its outcomes, in the long term. Being able to accurately understand, describe and support frameworks for social partnerships in learning will make a significant difference in moving from a check list for effective training to being able to actualise the concepts described. Indigenous enterprise development training is part of core business and can be effectively developed with mainstream and Indigenous specific programmes that focus on building successful enterprise. Training is discussed, negotiated in the context and with the people who will participate in the training. Training is linked to diverse knowledge sets and experiences, this requires partnership with the people who recognise, understand and own this knowledge. These partnerships need to be developed so that the professional decisions are valued and recognised, this may be through investigating the developments in the Training and Assessment qualifications and associated payments.

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 analysing 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 competence? in 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.

By understanding learning as a social activity framed through relationships or partnership, organisational barriers can be addressed. By incorporating learning partnerships into the workplace through active involvement in learning communities, the possibility of improving organisational learning is increased. This could be by providing catalysts, support for action and effective feedback about outcomes. Effective processes need to group complementary professional interest, ensuring sufficient access to resources, change management, evidence based practice and celebration of success. Learning partnerships concentrate on providing valuable and transformative learning opportunities to create new knowledge, understandings and solutions to problems in the group, rather than the transmission of knowledge and skills (Smith and Blake 2005). Whiteford (2005:45) notes the importance of linking professional development to identified competencies that are valued in the workplace.

Learning opportunities that relate to the students’ social practices and group memberships may build bridges between students, educators and communities’ understanding of each other’s knowledge and use of literacies. Developing identity affirming learning experiences can support regional students and communities’ identities. If the educational system operates from a view that assesses what people coming to learning do not have – a cultural deficit view – their knowledge is not being recognised. The deficit view of students’ knowledge actively disempowers teachers and students, reducing their opportunities for learning. If a student does not identify themselves as a part of the classroom; its literate practices, knowledge and identities it is understandable they would reject participation in a learning experience that negates their identity as an individual and in relation to other groups.

Educational systems that engage with regional community, 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.

Social partnerships in learning 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, capacity building processes and the underlying relationships that facilitate connections, engagement and decision making between government, non-government, enterprise, community, stakeholders and individuals. These frameworks operate at and across all levels i.e. involving individuals, organizations and learning systems and are constructed to understand the connections between systems and the learning that underpins those connections. While important these connections are generally poorly understood and
managed. The development of a sound basis for understanding and working with social partnerships in learning can impact on the planning, negotiation, implementation and recognition of research outcomes in the long term.

Social partnerships in learning frameworks help build flexible and porous boundaries that increase inclusion, recognise the diverse knowledge systems that operate and more importantly understand their interaction to make powerful connections and alliances between groups and knowledge. This does not mean everyone agrees but that stakeholders understand and are able to work in complex environments. An important element is that while educational institutions are good at acquiring and developing new knowledge, we need to do better at connecting this to lifelong approaches to learning and local contexts. This would be seen through understanding and negotiating ways to work through difficulty and take advantage of opportunities, manage change in capacity poor environments and build sustainability and formalise flexible partnerships.

Implicit is the development of powerful connections that are based on joint need and sharing capacity. Social partnerships in learning can be developed through pedagogy, policy and research. These include understanding social partnerships in learning as the underpinning knowledge across all disciplines. By explicitly understanding how to work across systems, students are better able to negotiate and rationalise their learning experience. Educators support the connections by accessing approaches to learning that use problem based learning, that are linked to local enterprise issues and customise learning to the individual investment in building good networks around knowledge and capacity. This moves the focus of teachers’ professional development to pedagogical approaches to capitalise on individuals and their strengths rather than focusing on normalising systems. The use of ICT supports multimedia and multiliterate approaches to knowledge sharing and assessment that value diverse knowledge systems.

In this paradigm, students’ journeys are planned and identified resources are part of a lifelong journey, one that supports development of in-depth knowledge and avoids compliance driven approaches to completing a qualification. The empowerment of students and educators would be supported by moving from top down approaches to education to learning partnerships and knowledge sharing that includes academic, professional and community knowledge and imperatives as a resource and basis for co-creation of knowledge. Social partnerships in learning can only be developed in partnership with people from a range of disciplines, as each discipline describes partnerships and knowledge management in different ways. These approaches inform the metalanguage and cooperative approaches to understanding social partnerships in learning.

Working in partnership across knowledge systems involve recognising that the work is complex and, at times, uncomfortable. A major 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 and sharing knowledge as it relates to various contexts. In many ways this is not new but having a framework to operationalise it, is new. Relationships of trust take time but are fruitful in achieving positive outcomes for all stakeholders, by working from across three different knowledge systems (community, government and...
education) and taking time to develop that trust the team could see new opportunities and be flexible.

Summary and conclusions

Analysis of regional learners’ experiences of learning engagement challenges formal educational institutions to consider the appropriateness of current approaches to supporting students’ learning. Social partnerships in learning offers a framework for shifting the focus of educational practice and policy. The continued input and ownership from stakeholders is essential in this process, in combination with the ability to analyse, 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 better processes and modeling that focuses on improving outcomes for individuals and communities and provide a framework for improving educational and workforce outcomes in regional areas.

Developing an approach to community management of plant biosecurity that recognises the expertise and commitment people have to biosecurity can be supported by collaboratively develop a training and skill recognition framework. This framework can explicitly endorse community knowledge and skill sets that focus on identification, intervention, management and eradication of plant biosecurity. The content would be developed through a sustainable ‘patchwork of enterprise’ development and training development opportunities in regional and difficult contexts 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.

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SOCIAL CAPITAL AS THE BASIS OF BIOSECURITY MANAGEMENT SYSTEMS

Tonny D. Pariela
Faculty of Social and Political Science
Pattimura University - Ambon

Abstract

Plural Social Capital can be defined as the social relationships between groups with different identities within a single community, which act to strengthen the social ties as a community. The process of developing a community identity is described through preserved social capital using the case study of the village of Wayame. The role of plural social capital in community biosecurity management systems is discussed.

Introduction: About Plural Social Capital

Social capital is considered to be an important issue contributing to community development of nations or individual communities based on a concept of ‘investment in social relations with expected returns’ (Lin, Cook, and Burt (eds), 2001:6).

To understand the concept of social capital within this context various definitions have been given but these definitions do not differ substantially73. Putnam for example, defines social capital as ‘features of social organisation such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions’ (Productivity Commission74, 2003:8). A similar view is given by Woolcock and Narayan, who state that ‘social capital refers to the norms and networks that enable people to act collectively’ (in Callois and Angeon, 2004:3). Lang and Hornburg (1998:4) state that social capital ‘commonly refers to the stocks of social trust, norms, and networks that people can draw upon in order to solve common problems’.

The basic idea of social capital as it is described above, implies that social interactions have an important function in forming social capital indicators such as trust, social norms and networks. Social interactions lead to the development of social relationships between individuals, between individuals and groups, and relationships between groups. In turn this leads to the formation of networks where trust is able to develop with social norms providing stability within a community. In other words, networks connect people in a community through a framework where collective actions, social norms and values act as the glue in the network, while trust is a source as well as a product of social capital which supports cooperation (Kearns, 2004:6). As an integral part of social norms, social

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74 The Productivity Commission is an independent institution in Australia which functions as an official advisory body to the Government of Australia on issues of microeconomic policy and regulation.
sanctions form another aspect of the manifestation of social capital, and can assist in the controlling behaviours that deviate from these norms and have the potential to threaten the stability of social structures.

In essence, social capital is a resource within social structures (Pantoja, March 2000:17; Coleman in Dasgupta and Serageldin, 1999:16), and can therefore be deliberately accessed and mobilised (Callois and Angeon, 2004:3; Lin, Cook, and Burt (eds), 2001:12). The reality is that within any social structure, social capital is a reflection of social relationships that have developed within a group based on common characteristics such as ethnicity, religion and race, which strengthen the bonds within the group – this is known as bonding social capital. Social relationships between groups with different identities based on these characteristics are known as bridging social capital, while relationships between individuals and groups arranged hierarchically within the social strata are referred to as linking social capital (Kearns, 2004:7; Commission Research Paper, 2003:16). Analysis of these three types of social capital suggests that communities will inevitably inhabit a social space that extends beyond territorial boundaries, making it difficult to use these terms to understand social realities within complex communities. In reality within a community those with different backgrounds live together and interact in an inclusive manner at all levels from community through to national level.

Results from my research conducted in the village of Wayame during 2007 revealed that within the reality of the pluralism of the local community, people have developed an identity as a single community with territorial ties that separate them from other communities. In other words, the people of Wayame have developed an identity apart from other individuals or communities. This has been a deliberate response to a crisis situation (i.e. conflict in Maluku), aimed at maintaining an existence as a single community. In this context, social capital which is created as a result of situational pressure in the face of a community crisis, is maintained (preserved social capital) so that it can be used any time there is a change in the social environment (which may occur suddenly), resulting from crisis.

The process of coming to identify themselves as a community was not something that just happened suddenly, but instead was the result of deliberate intervention from a creative minority (to borrow a term from Arnold Toynbee) known locally as the Wayame 20 Team. By using the exclusivity of the social relationships that existed before the conflict in Maluku, this team played a role in rebuilding and maintaining the strong networks within the village as well as those between neighbouring villages. They strived to strengthen trust within the networks based on social norms that had been developed cooperatively within the community. Through the associated social process undertaken in a participatory manner with the community, there has been a gradual ethnic and religious de-territorialisation moving towards community territorialisation. This has led to the formation of a new area of social capital which may be referred to as plural social capital (PSC), which in no way erodes the basic characteristics of the different identities in the community of Wayame.

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75 Wayame village is located 29 kilometer north of the city of Ambon
Based on the above context, PSC can be defined as the social relationships between groups with different identities within a single community, which act to strengthen the social ties as a community (Pariela, 2008:236).

**PSC and Collective Actions**

Berger and Luckman (1967) explain that the degree of anonymity depends on the levels of interest and intimacy. They state that ‘the degree of interest and the degree of intimacy may combine to increase or decrease anonymity of experience’ (Berger and Luckmann, 1967:33). Results of the research conducted in Wayame show that with the concept of social capital as the driving force behind collective action (participation and cooperation in the community), the concept of anonymity as raised by Berger and Luckman can become an indicator for measuring how collective action can be used to provide momentum for action.
This demonstrates that a society’s sense of self identity, which is bound by a territorial connection, is part of the perceived reality through social interactions, which in turn drives collective action in the form of cooperation within the community to achieve common objectives. This is the ‘reality of everyday life’ referred to by Berger and Luckmann (1967:23) as an ‘intersubjective world; a world that I share with others’. It is within this context that the degrees of interest and intimacy increase, as does the motivation for collective activities. If the degree of interest is greater than the degree of intimacy, a large social distance or broad radius of trust may be created which can potentially lead to community tension and conflict. Alternatively if the degree of intimacy is greater than the degree of interest, the community will have a small social distance but will tend to be apathetic as the community does not have a common interest to drive cooperation. In this case, if a crisis situation is faced, there needs to be a balance between the degrees of interest and intimacy (Pariela, 2008:238). Through this balance, the community will have enough social energy to stimulate and drive them to cooperate in facing the crisis. In my opinion, communal engagement founded on social capital within a community is the basis of survival strategies for facing the pressures of a crisis.

**PSC as the Basis of Biosecurity Management Systems (BMS)**

Can PSC form a basis for the development of a biosecurity management system? There tends to be a correlation between the two, but is the contribution of PSC to development of biosecurity management systems intentional? These are crucial questions within the framework of understanding the importance of PSC as an integral part of biosecurity management systems.

Marginal communities (particularly traditional rural communities) usually have specific mechanisms for maintaining environmental balance, within the contexts of both social and natural environments. From an anthropological perspective, such mechanisms are seen as a reflection of hidden rationality as part of local wisdom or more broadly, traditional knowledge. This is recognised by sociologists and anthropologists as an adaptive strength of traditional communities that contributes towards environmental conservation, including contributing to biosecurity strategies. A community’s conduct toward the environment reflects the subjective rationalisation which generally emerges from (a) a history of interaction with the environment (socio-ecological experience), and (b) a spiritual history as inherited from ancestors (cultural ecological history).

Within the dynamics of a community currently undergoing socio-cultural change, traditional knowledge that has formed as a result of accumulated socio-ecological and socio-cultural experiences, is eroded and begins to be replaced by a set of new knowledge. Often this knowledge is not welcomed by the community. Additionally, there is the influence of development processes which introduce an economic ideology (penetration of capitalism) into rural communities changing the cognitive structure of traditional communities. As a result, communities experience a process of alienation and degradation of the social norms relating to the environment. Local institutions which

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76 Perceived reality can be defined as the process of individuals or groups within a community finding purpose in the current common situation
previously acted as a social safety valve also become ineffective. This situation has the potential to cause tension and conflict within and between communities; as well as between communities, local governments and the private sector. Such tension and conflict can have fundamentally negative impacts on biosecurity management systems.

In light of these issues, it is clear that different communities within society hold important positions and play a strategic role in collective activities for overcoming crises, including addressing threats posed by pests and diseases. Collective activities should not only result from mobilisation processes such as that experienced in Indonesia during the era of the New Order. They should also be based on the growing cooperation and participation that develops out of collective awareness in a community, particularly towards a present or pending threatening situation. In this way, collective awareness will reflect perceived reality, placing the threat of pests and disease as a common enemy.

Falk et. al (2008) quote Plant Health Australia (2005), describing plant biosecurity as measures designed to protect harvest products from attack by agricultural pests and diseases at national, regional and individual levels. This view reflects the deliberate manipulation of systems as a means of addressing attacks by pests and diseases. Such manipulation requires an appropriate approach so that the community can adopt and adapt the substance of the proposed instrument without feeling alienated by new knowledge which is introduced. The question is, how can modern ideas be combined with the traditional knowledge already held by communities?

The socio-ecological and cultural ecological experiences which make up a community’s traditional knowledge should become the foundation for development of modern knowledge or science within the framework of biosecurity management systems. In other words, any new knowledge that is introduced should be combined with traditional knowledge. It is assumed that no community operates within a knowledge vacuum, and this will better equip the community to adapt to the new knowledge. With this approach the community should not be alienated from, or feel apathetic toward, the environment. In fact, existing social energy can be manipulated and used in addressing the threat of pests and diseases. This concept can be represented as follows:

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77 In Crisis – Journal of Interdisciplinary Development Studies, Special Biosecurity Edition
Articles by Cornelia B. Flora, Michael Christie, Sang Putu Kaler Surata, Paul Royce, Eka Martiningsih, Bronwyn Myers, Wayan Mudita and Remi Natonis\textsuperscript{78}, implicitly and explicitly discuss the profiles of communities which possess the strength of traditional knowledge to consolidate themselves against any situation, including potential threats posed by pests and diseases. The issue is, how do you assist communities to organise these traditional knowledge sets to allow them to effectively respond to crises without distorting the balance of their social environment? In this regard, all community capital present within and between communities as described by Cornelia B. Flora\textsuperscript{79}, should be seen as synergetic strengths, making up a community’s capacity in regard to development of PSC and technical skills for facing pressures of crises such as the threat of pests and diseases.

\textsuperscript{78} In Kritis – Journal of Interdisciplinary Development Studies, Special Biosecurity Edition.
\textsuperscript{79} Ibid.

\textbf{Traditional Knowledge}
According to various sociological theories about social stratification within society, PSC does not always reflect differences only in identity based on origin, but can also be elaborated to included differences in various strata (e.g. traditions, socio-economic background). It is important to consider how differences resulting from cultural and socio-economic aspects of a community can be managed through social mechanisms built into the social structure to allow a common perception, participation and cooperation within a community and between neighbouring communities. In this way all community capital within individuals and within a social structure can be integrated in the interests of social stability and security within a community, as well as the social relationships between neighbouring communities. This represents an essential prerequisite for community-based BSM. The difficulty is in identifying how associated social processes can address the cognitive, effective and psycho-motor dimensions of a community in light of eagerness to participate and cooperate in the development of adaptive BSM that addresses actual objective needs. Community knowledge (cognitive dimension) which includes moral considerations (effective dimension) within a common perception of their environment will encourage the community to participate and work cooperatively (psycho-motor dimension) within a BSM framework.
Conclusion

Community capital, specifically social capital, is a strength within society that is essential for communities to face the pressure of a crisis. Social capital, particularly plural social capital, in turn becomes a prerequisite for strengthening social cohesion founded on common perceptions about current or future situations thereby allowing collective action. In order to access social capital as a resource or energy held within social structures there need to be interventions to strengthen community capacity through the introduction of appropriate knowledge (based on traditional knowledge). In this way, local communities will possess the ability to address challenges in a way that is responsive and predictive.

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