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**Coping with Environmental Degradation in the Tropics:
Indigenous Strategies to Sustainable Development**

by

Nalan Yuksel

A thesis submitted to
the Faculty of Graduate Studies and Research
in partial fulfillment of
the requirements for the degree of
Master of Arts

The Norman Paterson School of International Affairs

Carleton University
Ottawa, Ontario
December 1, 1998
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Professor Iain Wallace, Supervisor

Abstract

Defining the predominant cause of tropical deforestation is a major issue of contention in international politics. The present debate revolves around the role of indigenous slash-and-burn agriculture in propagating this destruction. This ancient system of farming has had the misfortune of being one of the most maligned agricultural systems in the world. Misinformed and politically motivated government policies have not been successful in identifying sustainable alternatives for these resource poor slash-and-burn farmers. However, indigenous farmers on the island of West Timor, in eastern Indonesia, have drawn on their intimate knowledge of the local environment and have successfully used indigenous management practices to overcome environmental degradation. The indigenous farmers in Amarasi District have altered their local institutions to tackle their ecological problems. The resulting Amarasi System of agriculture and community development is a blend of politics, economics, religion and *adat* (customary) law. The success of Amarasi lies in the relationship between indigenous forms of land and resource management and the incentives provided for adopting and maintaining sustainable agriculture and practising conservation management techniques.

Acknowledgement

I would like to thank my family for their never ending support during my studies. I am very grateful to ICRAF-Indonesia, Dr. Garrity, Dr. Tomich, Paul Burgers, and Malcolm Cairns for allowing me the opportunity to visit their site in Bogor and for their support of my research in Amarasi, West Timor. Special thanks to my two research assistants, Ali, and Imo, for their help during my field work in the villages of Amarasi. I would also like to thank my supervisor, Professor Wallace for all his endless comments and suggestions, and my advisor, Professor Mehmet, for his support.

Table of Contents

Abstract	i
Acknowledgement	ii
Table of Contents	iii
List of Tables	vi
List of Figures	vii
List of Maps	viii
Chapter One ~ Introduction	1
Methodology	5
Chapter Two ~ Defining the Concept of Sustainable Development	8
Introduction	8
Historical Account of the Environment-Development Paradigms	9
Limits to Growth	11
Tragedy of the Commons	13
Scarcity Society	15
Sustainable Development Concept Examined	16
Alternative definitions for Sustainable Development	19
Disenchantment with the Concept of Sustainable Development	22
Political power relations	23
Over-consumption by the North versus population explosion of the South	25
People-centred development	26
Political Economy Perspective Revisited	29
Conclusion	32
Chapter Three ~ Deforestation in Indonesia	34
Introduction	34
Defining Deforestation and Agents of Deforestation in Indonesia	34
What Constitutes Deforestation in Indonesia	36
Remote sensory (satellite) imagery / GIS	37
Understanding the Roles of the Actors Involved	38
The Value of Nature	39
Defining the Process of Deforestation in Indonesia	40
Tropical Government Explanation	41
Developmental Explanation	41
Environmental Explanation	43
Public Policy Explanation	43
Political Explanation	44
Causes of Deforestation in Indonesia	45
The Role of Shifting Cultivators in Indonesia	48
The Effect of Logging in Indonesia	50
Effects of Transmigration on Deforestation	52
Role of Indonesian Politics on Deforestation	55

Conclusion	57
Chapter Four ~ The Facts and Fictions Behind Shifting Cultivation	58
Introduction	58
Understanding Swidden Agriculture	59
The Effect of Swidden Agriculture on the Soil and the Environment	62
Soil Conditions	63
The Effect of Fire	64
The Fallow Period	64
A Harvestable Forest	66
Swidden Agriculture's Role in Deforestation of the Tropics	67
Who are the Shifting Cultivators?	69
Traditional versus Pioneer Cultivators	70
Other Actors in the Rain Forests	73
When Swidden Agriculture goes wrong	74
Population pressures on Swidden cultivation	75
Economic and Political Factors Affecting Swidden Cultivation	78
Socio-Cultural Properties of Swidden that Affects Sustainability	81
Ecological Factors' Effect on Swidden	83
Indonesia's policies towards Swidden Cultivation	84
Conclusion	86
Chapter Five ~ The Amarasi Model	89
Introduction	89
Methodology	90
Research in Amarasi	93
Setting the Background	94
The history of Amarasi	98
Introduction of <i>Leucaena leucocephala</i> (Lamtoro)	101
Changing the socio-economic structure of Amarasi	103
Persuasion versus Punishment	105
The Role of Adat	106
Adat's loss in stature	108
The Influence of the Raja and Adat on the Amarasi Model	108
Elimination of land-lords	108
Re-settlement and land re-distribution	109
Land zoning	111
Paronisasi system	113
Land tenure	114
Control burning	116
Adat Retributions and Fines	117
Other Important Players in the Maintenance of the Amarasi Model	121
Impact of social leaders, the Church, and NGOs	122
Government institutions that support lamtoro and the Paron system	124
Conclusion	126

Chapter Six ~ Political Economic Analysis of Amarasi	128
Introduction	128
Constraints and Barriers for the Amarasi Model	128
Jumping lice and the monoculture of leucaena	128
Water supply	129
Carrying capacity of cattle	130
Labour supply/shortage	131
Disinterest of farmers to breed cattle and dependence on cattle from outside Amarasi	132
Dependence on middlemen to get cattle to market	132
Adat law forbidding sale of corn	133
Problem with credit	134
Possibilities for Change in Amarasi	134
Institutional evolution	134
Role of non-governmental organisations	136
Land ownership	138
Climax Amarasi	138
Market influences	140
Policy constraints	141
Conclusion	142
Chapter Seven ~ Conclusion: Policy Issues for Extrapolation	147
Appendix A	153
Bibliography	157

List of Tables

Table	Description	Page
1	Estimate of annual deforestation in Indonesia	35
2	Change over time in views of deforestation	47
3	Annual average of forestland released to transmigration program	54
4a	Boserup's theory of agricultural change (fallow systems)	61
4b	Boserup's theory of agricultural change (socio-economic)	76

List of Figures

Figure	Description	Page
1	Amarasi Model	91
2	Institutional Evolution	135

List of Maps

Map	Description	Page
1	Indonesia	95
2	Island of Timor and Amarasi District	96

Coping with Environmental Degradation in the Tropics: Indigenous Strategies to Sustainable Development

Chapter One ~ Introduction

Defining the predominant cause of tropical deforestation has emerged as a major issue of contention in the international political arena. Deforestation of tropical rainforests is a matter of grave environmental concern since it not only leads to soil erosion, watershed degradation, and reduction in bio-diversity but also affects climate change and hastens global warming. The tropical rainforests of Indonesia are threatened with deforestation caused by numerous factors such as economic development, government policies and population growth.

The growing trend of deforestation in Indonesia's rainforests is environmentally destructive and contrary to the aims and principles of sustainable development as postulated by the Brundtland report, *Our Common Future* (Brundtland, 1987). At the Earth Summit in 1992, the concept of sustainable development was adopted as the prominent principle of development policy for the 21st century (Basiago, 1995). The Earth Summit introduced international accords to integrate economic development and environmental protection, manage and conserve the world's forests, stabilise causes of global warming and conserve bio-diversity. *Agenda 21*, according to *The Rio Declaration on Environment and Development*, is "a blueprint on how to make development socially, economically and environmentally sustainable". Other important documents, such as *The Statement of Principles on Forests* promote 'the greening of the world' through 'the

management, conservation and sustainable development of all types of forests.” These documents point to the necessity to protect our limited resources for the continued survival of our delicate planet.

Indonesia, while committed to economic development, fairs less well on issues of sustainable development. Indonesian rainforests amount to 10% of the worlds remaining tropical rainforests, second only to Brazil in terms of forest cover (Whitmore, 1990). Thus, advocates of sustainable development see the Indonesian rainforests as vital for management and protection. The key issue is how to manage this protection. Contrary to past development policies in the region, conservation of Indonesia’s remaining rainforests may depend more on a rediscovery of its indigenous natural resource systems than by development polices that do not take into account the underlying causes of deforestation in Indonesia. These indigenous natural resource management systems , constitute a regime of environmental policy that may play a vital role in the country’s sustainable development (Basiago, 1995).

This thesis examines how indigenous farmers in Amarasi, a sub-district in the eastern islands of Indonesia, draw on their intimate knowledge of the local environment and successfully use indigenous management practices to overcome environmental degradation. It investigates how indigenous strategies of resource management in Amarasi address the concerns of environmental degradation and result in a model of sustainable development. The thesis examines whether the land-use practice of swidden cultivation (slash-and-burn agriculture) deserves the condemnation by state governments

that it has received throughout Indonesia and South East Asia. It explores whether the indigenous communities in Amarasi have successfully altered their local institutions to tackle their ecological problems despite international development efforts which generally have not been successful in identifying sustainable alternatives for these resource-poor swidden agriculturists. This thesis examines the role that Amarasi's traditional adat (customary) law has played in solving problems in their agroecology. Thus, the Amarasi model is investigated to determine how local policies are created and utilised to shape indigenous socio-economic and political institutions in order to cope with natural resource management issues.

The theoretical base will be grounded on an extended concept of sustainable development. Chapter two, *Concepts of Sustainable Development*, is an overview of the origins of sustainable development and the pursuit of including the environment in the development paradigm. Dissensions over the definition of sustainable development as defined by the North are also examined. Contrary views regarding attempts to incorporate environment and development are outlined from a Southern perspective. The concept of sustainable development is subsequently enlarged to incorporate the theoretical concepts of political ecology.

The third chapter, *Deforestation in Indonesia*, deals with the factors underlining deforestation in the tropics. It begins with the changing definition of deforestation and land degradation. It examines differing views on agents and factors of tropical forest depletion. It takes a political economic approach to the situation and examines certain

socio-political and economic factors guiding this environmental problem. It examines the governments' policies and perception on shifting cultivation and land tenure. Within this chapter, factors that affect deforestation such as agricultural intensification, rates of forest cover change, and population density increases for Indonesia are examined. The chapter concludes with an overview of the different causes of deforestation in Indonesia and the conflicting views on the main agents responsible for the land change.

The fourth chapter, *The Facts and Fictions Behind Shifting Cultivation*, is an examination of the practice of slash-and-burn agriculture. It outlines the characterisation of people involved in shifting cultivation in South East Asia. It also examines the factors under which slash-and-burn is sustainable and certain socio-political and economic reasons that can turn the practice into an unsustainable method of agricultural production.

The fifth chapter, *Amarasi Model – An Example of Indigenous Natural Resource Management*, is a case study based on research undertaken during field work in Amarasi, a sub-district located on the island of West Timor in eastern Indonesia from November 1997 until April 1998. The chapter investigates the indigenous strategies for dealing with declining soil fertility in a swidden agricultural system. Amarasi is an example of sustainable slash-and-burn agriculture that utilises indigenous agroforestry techniques. The case study is a policy analysis into the evolutionary process of the indigenous institutions that guide the agricultural system in Amarasi and the local peoples' way of life. In addition, the adat (customary) laws of Amarasi are examined from an environmental management perspective, with a view to understanding how they

constitute a standard for environmental policy and how they may function as a model for 'sustainable development' in Indonesia.

The sixth chapter, *Political Economic Analysis of Amarasi*, examines the constraints and barriers that affect the Amarasi model. Ecological constraints such as pests and lack of water supply are examined, along with constraints of labour and fodder supplies. Socio-economic constraints such as market forces, role of middlemen, adat laws, and problems with credit are also examined. The chapter concludes with a look into possibilities for change in Amarasi. Within this section, the institutional evolution of community institutions and leadership changes are examined along with the changing roles of non-governmental organisations. Economic shifts, such as market influences and policy implications, are examined in this chapter. Through a policy analysis of the Amarasi system, it is concluded that this indigenous resource management system is a successful model of sustainable development.

Methodology

The methodology for the thesis included two months of background research at the ICRAF-Indonesia headquarters in Bogor and two months of fieldwork on the island of West Timor, in Eastern Indonesia.¹ The research was part of the research agenda of ICRAF (International Centre for Research in Agroforestry), in collaboration with the *Politeknik Pertanian University* of West Timor. The focus of the research was a policy analysis of the agricultural system of Amarasi. It involved an examination into the evolution of the community based rules and regulations governing the system.

Prior to my departure to Amarasi, the research proposal and methodology was authorised by ICRAF-Indonesia, the University in Kupang, and the various government levels responsible for research in Indonesia. Letters authorising research in Timor and the villages I was to visit had to be approved at the national, provincial, regional and local government levels.

At the local village level, primary data collection consisted of informal interviews with farmers, religious leaders, local village-level government, elders, ex-government officials, social and informal leaders, and local non-governmental organisations (NGOs). Outlines of the semi-structured interviews were created in consultation with ICRAF. Final copies were given to ICRAF, the local University in Kupang, and Indonesian government offices for clearance and ethical considerations prior to departure for Timor (See Appendix A for an outline of the research questions asked).

The structure behind these interviews and the general direction of the research was initiated through discussions between myself, Malcolm Cairns, Paul Burgers and their Indigenous Fallow Management Program at ICRAF – Indonesia. In addition, Dr. Dennis Garrity, Dr. Tom Tomich and staff of ICRAF were very helpful in guiding and focusing my fieldwork prior to my departure for Amarasi. Dr. Tom Tomich, Director of the Policy Division, of ICRAF was designated as my supervisor for my field work. Through many meetings with the Directors at ICRAF it was decided that I would concentrate my research on the area of policy analysis. The addition of specific economic factors, such as

¹ A more detailed description of my research in West Timor is included in Chapter 4: The Amarasi System.

income analysis, were considered too broad in scope to be completed within the allotted time frame and limited manpower.

On-site support in West Timor was generously provided by Ir. Retno N. Umbu Saga MS and her staff at the *Politeknik Pertanian University* in Kupang. This collaboration with the University was instrumental in guiding me through the administrative necessities of doing fieldwork in Timor. In addition, the University graciously assigned two research assistants, Ali and Imo, who had the patience to be my translators throughout my visits to the villages in Amarasi. Finally, this research would not have been possible without the support of the Amarasi people who opened up their homes and their hearts to me, and whose open-hearted attitudes and warm smiles made my visit so unforgettable.

Chapter Two ~ Defining the Concept of Sustainable Development

“The concept of Sustainability has emerged as a powerful new paradigm, shaping the interpretations, goals, and behaviour of a broad range of actors on the global environmental stage.”¹

Introduction

The most dramatic development in environmental concerns in recent years has been the globalisation of ecological concerns. This recognition that environmental problems are global in scale has brought new concerns about poverty and underdevelopment. One powerful concept that emerges from these new concerns is the notion of sustainable development. However, the concept presented by the Brundtland report and their vision of sustainable development may be incomplete as a model for development. The conventional concept of sustainable development defined by the Brundtland report, with its narrow focus on poverty alleviation and economic growth, does not capture the diverse issues surrounding environmental degradation as it relates to Third World development. There is a need to expand the concept to include socio-political and historical factors along with issues such as social justice, equity and indigenous development.

This section begins with a historical look at some of the environment-development models that led to the creation of the sustainable development concept. The main tenets of sustainable development as postulated by the Brundtland Commission are outlined. Within this section, different definitions of sustainability are brought forward and

¹ Conca, Ken et al., *Green Plant Blues: Environmental Politics from Stockholm to Rio*. WestviewPress. 1995.

examined. In addition, the growing critiques to these definitions and Southern perspectives towards sustainable development are addressed. Finally, this section examines the political economy perspective on sustainable development and introduces the political ecology model as theorised by various authors such as Blaikie (1987) and Schmink (1987).

This chapter concludes that if a model of sustainable development allows for the influences of numerous socio-political, economic, and historical variables, then there can be no 'development paradigm' that can ignore the environmental dimension. The environment must become incorporated into every segment of development in much the same way that economic, social, and political development must be consolidated into every strand of environmental protection.

Historical Account of the Environment-Development Paradigms

Throughout recent history, there have been many different rationales guiding the notion of 'development'. Within each of these conceptions lie two common denominators - a disregard for the protection of the environment and a neglect for the functioning of the biosphere as a whole, with forests constituting a single component within this entirety. There are many explanations as to why development during the past century has been so environmentally destructive. Some natural scientists, for example, may contend that massive environmental degradation is inevitable with the increase of population. Biologists, such as Paul and Anne Ehrlich, may argue that global population must be controlled at once if there is to be any hope of preserving nature (Ehrlich and Ehrlich,

1990).² Certain economists may maintain that producers and consumers behave in environmentally unfriendly manners because the environment has not been included as a cost in market prices. Malthusians, on the other hand, may predict that population growth that exceeds the amount of available natural resources needed to sustain itself will result in famine, disease and war (Redclift, 1987). Moralists may assert that people are inherently short-sighted and tend towards mass consumption and greed. Finally, Marxists could argue that while capitalism can at times function rationally and appropriately, it nevertheless works within an exploitative paradigm. Thus, Marxists may see capitalists as too selfish and myopic to tend to the environment (Norgaard, 1994; 61).

Every discipline has its preferred explanation of the environmental-development crisis, consistent with its specific paradigms. In order to explore the relationship between development and the environment, and the formation of the sustainable development concept, it is useful to outline how the debate has changed over time.

The 1972 United Nations Conference on the Human Environment, (UNCHE), in Stockholm, was an inaugural event in the history of global environmental politics. Stockholm was the first international effort to evaluate and discuss the environment in a systematic and comprehensive manner. The conference signified the beginning of major changes in the way societies thought about managing the relationship between nature and development (Colby, 1991). In particular, the UNCHE symbolised the emergence of

² Anne and Paul Ehrlich state that the population problem is the largest environmental threat facing our planet. To deal with the environmental degradation in the tropical countries of the South, there is a need to address the problem of overpopulation (defined as "the condition in which a population cannot maintain itself without degrading the environment to a point that it can no longer sustain the population over the long

three powerful and controversial models. The first concept stated that there were inherent '*limits to growth*' facing the international economy, the world's population, and global consumption. The second concept to emerge was the '*tragedy of the commons*' approach of collective versus self-interested individual behaviours towards the environment. And the third concept claimed that environmental protection demanded a strong state to deal with the '*scarcity society*' problem.

Limits to Growth

During the early 1970s concerns for the environment began to coalesce with the notion that the world was rapidly approaching natural limits to growth. The much publicised book *The Limits to Growth* (Meadows et al., 1972) was instrumental in inciting public fears. The authors used an application of systems modelling to predict the consequences of unlimited growth in population and consumption. They concluded that accelerating industrialisation, rapid population growth, widespread malnutrition, depletion of non-renewable resources, and a deteriorating environment were rapidly leading the world towards an overall limit on attainable global growth and development. A continuation of this growth path could potentially lead to a catastrophic collapse of the world's economic and social systems. Thus, the Limits to Growth model stated the necessity to implement planned restraints on growth in population and resource consumption.

Critics of the Limits to Growth model were quick to argue that the model overstated the urgency of the problem, overlooked the possibility of substituting less-scarce inputs, and

term") and 'the plight of the underprivileged' (Ehrlich and Ehrlich, 1990).

underestimated the possibility for technological solutions (Conca et al., 1995).³ While environmentalists applauded the attention the Limits to Growth model drew to the finiteness of the earth's resources, economists strongly criticised the model's pessimism (Taylor, 1992). Economists argued that scarcity, signalled by price changes, would stimulate technological advance and therefore push back the limits of available resources. The South, on the other hand, viewed the Limits to Growth model with great concern. Many leaders of the Third World agreed that the North was responsible for the global environmental crisis; and now having reaped the benefits of industrialisation, was attempting to close the door on the South's attempts at development (Castro, 1972). The South made it clear that a global response to environmental problems would require linking the environment debate with Third World development concerns (Conca et al., 1995). Southern leaders were concerned that their national sovereignty and ability to develop would be hindered by international environmental regulations. They saw the North's concern for the environment as a distraction from the problems of development, neo-colonialism and racism (Gruen and Jamieson, 1994).

The Southern governments adamantly rejected all 'no-growth' positions at the Stockholm Conference, and reaffirmed their desire to increase GNP in efforts to achieve development. However, in the course of the 1970s, it became clear that continued growth depended not only upon capital formation and a skilled workforce but also on the long-term availability of natural resources (Sachs, 1992). In addition, under the influence of the appropriate technology movement of the mid 1970s, the old impressions of

³ These same arguments laid the groundwork for the evolution of the Sustainable Development concept in the 1980s, which argues that some forms of economic growth can be compatible with natural limits (Conca

destructive growth began to give way to more awareness of the availability of technological choices. Thus, towards the end of the 1970s, the Limits to Growth model was no longer seen as an insurmountable barrier to achieving development.

Tragedy of the Commons

While the Limits to Growth model focused on the debate over *consequences* of environmental problems, the Tragedy of the Commons model focused on its *causes*. This model was first introduced by Garrett Hardin in his essay *The Tragedy of the Commons* (Hardin, 1968). The model described the causes of environmental degradation as occurring when self-interested actors have unlimited use of natural resources or environmental systems. Self-interested actors would have an overwhelming tendency to exploit the resource, since the divided/shared costs of exploitation are minimised. Hardin suggested that self-interest and unlimited use were the root of problems like pollution and overpopulation. He argued that people are incapable of putting 'collective' interests before 'private' ones (Redclift, 1987). Therefore, the solution is either to replace open access with enforceable private property rights, so that people would internalise the full costs as well as benefits of their actions, or to impose governmental restrictions on access.

The Tragedy of the Commons model had a tremendous impact in shaping the paradigm dealing with global environmental problems and the global commons (oceans and atmosphere). However the model is still just a simplified representation of the complex social rules, customs, goals, and behaviours that influence how people interact with their

environment either individually or collectively (Conca et al., 1995). Critics of the model state that the tragedy may not be caused merely by population growth and self-interest but by changing *political* and *economic* factors (Buck, 1985). Management of communal property is at times discredited by using the 'tragedy of the commons' philosophy where by the concepts of 'common property' and 'open access' regimes are mistakenly interchanged. Most traditional resource management systems rely on system of common property with rules and regulations governing its' use, whereas 'open access' usually refers to oceans and atmospheric conditions. These factors may give certain power groups the incentive to privatise the commons or defeat community-based systems of property rights (Buck, 1985).

Likewise, though the model may sometimes be applicable in certain situations, it is by no means universal. Environmental degradation of the commons depends on the type of *social* rules governing these natural resources (Feeny et. al., 1990). There are numerous examples of societies that develop sets of rules to collectively manage local common-property resources. In many societies, the capacity for unified social action overcomes the divergence between individual and collective interest (Feeny et al., 1990). In line with this frame of thought, it is possible to have effective systems of collective management on the local or regional level, therefore, it may also be possible to have such a system at the international level.

Scarcity Society

One political consequence of the *Limits to Growth* and the *Tragedy of the Commons* models has been the elaboration of the Scarcity Society model postulated by William Ophuls in his 1977 book *Ecology and the Politics of Scarcity* (Ophuls, 1977). According to this model, the new era of scarcity would create a society which perceived the necessity for authoritarian political control in order to avoid 'ecological self-destruction' (Ophuls, 1977). The result would be a political system "much less libertarian and much more authoritarian, much less individualistic and much more communalistic than our present" (Ophuls, 1977). Due to its pessimistic outlook on the future and the call for an authoritarian rule, this model has remained controversial. Similar to the Tragedy of the Commons model, the Scarcity Society model may have an ideological agenda that attempts to discredit the indigenous communal management of natural resources. On the other hand, the *Scarcity Society* model does bring to the forefront political questions concerning the ability of governments to respond effectively to environmental problems at both the local and national level. It also attempts to draw a link between the control of people and the control of the environment with regard to the concept of development (Conca et al., 1995).

One of the central controversies at the Stockholm conference was the debate over whether economic growth and development are inherently environmentally destructive. Despite the critiques and changes in our understanding of environment and development since the Stockholm Conference, the themes of *Limits to Growth*, the *Tragedy of the Commons*, and the *Scarcity Society*, are integral parts to understanding the evolution of

the concept of sustainable development. These models reveal the explicit divisions between governments of the North and the developing South. They also unveil the conflict between the growth-oriented philosophies and those actors concerned about the negative consequences of continued economic expansion.

Sustainable Development Concept Examined

One powerful yet controversial new concept that emerged during the 1980s was the idea of sustainable development. It was instantly appealing to many because it appeared to reconcile those explicit divisions and conflicts raised by the divergent views at Stockholm. Despite its inherent weaknesses, the Stockholm Declaration did spark two decades of UN activity on environmental issues (Gruen and Jamieson, 1994). However, the path towards the 1987 report of the World Commission on Environment and Development (WCED), the Brundtland Report, which “announced the marriage between craving for development and concern for the environment” was arduous (Sachs, 1992). The Brundtland Commission’s final report, *Our Common Future*, set the terms of the debate concerning environment and development for the last decade. The report emphasised the ‘interlocking crises’ of population growth, economic development, and ecological destruction. The commission argued that the nations of the world must work together to switch from development at any cost to *sustainable development* (Gruen and Jamieson, 1994).

The goal of sustainable development put issues of poverty further into the limelight.⁴ Poverty alleviation, claimed by the Commission to be the most important purpose of the development ideology, had long been regarded as unrelated to environmental degradation. Environmental destruction was commonly linked to the impact of industrialisation and growth. The concept of sustainable development began with the premise that poverty and economic stagnation are inherently environmentally destructive (Conca et al., 1995). The Brundtland Report was the first international declaration to outline poverty as “a major cause and effect of global environmental problems” (WCED, 1987: 3). Subsequently, with the increase in deforestation and desertification, the poor quickly became viewed by some Northern theorists, Southern governments and international organisations such as the World Bank as the main ‘agents of destruction’ (Sachs, 1992).

As stated in the Brundtland Report: “Poverty reduces people’s capacity to use resources in a sustainable manner; it intensifies pressures on the environment” (WCED, 1987: 49). The insertion of poverty as a variable was seen as an attempt to merge “development” with “environment” and therefore was seen as an important break with past analysis (Broad, 1994). The World Development Report of 1992 reiterates the sentiment of the WCED by stating that the alleviation of poverty is essential for environmental sustainability. Furthermore, it states that economic growth is essential for sustained poverty reduction. In addition, adverse effects of growth can be reduced with effective

⁴ Issues of poverty were first brought to the forefront by the *Basic Needs* school of development theory, on which sustainable development bases its concerns for meeting the needs of the poor.

policies of improved environmental management, funded by the resources generated through income growth (World Bank, 1992).

The Brundtland Report advocated the need to work towards attaining environmentally friendly forms of production and growth that simultaneously facilitate economic development, alleviate pressures of poverty, and minimise environmental degradation. According to the report, “a necessary but not sufficient condition for the elimination of absolute poverty is a relatively rapid rise in per capita incomes in the Third World” (WCED, 1987: 49). Therefore, the central premise for sustainable development is the promotion of a path that reconciles the tensions between ecology and economy.

The new path of sustainable development would be one that implies limits - not absolute limits - but “limitations imposed by the present state of technology and social organisation on environmental resources and by the ability of the biosphere to absorb the effects of human activities” (WCED, 1987: 188). The term sustainable development suggests that the lessons of ecology can, and should, be applied to economic processes (Redclift, 1987). According to the Brundtland Commission, sustainable development is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987: 43). The report states that “it is not economic growth per se, but rather the environmentally destructive character of many current activities and incentives” that makes present development unsustainable (Conca et al., 1995). The Commission, thus, recommends ecologically

sound forms of economic production supplemented with renewed global growth to solve the problems of Third World poverty.

Alternative definitions for Sustainable Development

The WCED's definition does present the general idea of sustainable development, but critics state that it makes no attempt to indicate how it can be achieved. The report asks for renewed global growth, yet does not address how this would be possible without increasing the amount of resources used for that growth. The report does not define "needs" and leaves open the possibility that the present generation could live beyond this limit as long as future generations' needs are met (Norgaard, 1994). More importantly it does not address the issues of equity and distribution of resources, nor the issue that a disproportionately small number of advantaged people already live 'beyond their needs' while a large portion of the world's poor do not.

There have been many attempts to overcome this definitional generality. One such example from Goodland and Leduc attempts to include the idea of 'society benefits' to the concept of sustainable development:

Sustainable development is ... a pattern of social and structural economic transformations (i.e., development) which optimises the economic and other societal benefits available in the present, without jeopardising the likely potential for similar benefits in the future. (Goodland and Leduc, 1987: 36)

The definition states that the present generation should procure as much as they can, as long as future generations can attain the same amount. The problem remains that the

exact level of procurement will not be known. Therefore, how will we know whether we have exceeded it? In addition, the ability to calculate the degree to which economic development 'optimises' the benefits to future generations is again very difficult to determine and measure. The definition, as well, fails to address the issue of inequitable distribution of resources.

Economists attempt to overcome some of these constraints by stating that the procedure towards sustainable development must compare gains and losses of different types to different people in a cost-benefit analysis (Norgaard, 1994). The cost-benefit analysis takes the present income generation and distribution as implicit in its discussion of productivity. Ultimately, whether development is sustainable depends on the condition of the environment which the present generation passes onto the future. Therefore, some discussion of the environmental complexities must be incorporated into the definition.

For example:

The common use of the word "sustainability" suggests an ability to maintain some activity in the face of stress ... We thus define agricultural sustainability as the ability to maintain productivity, whether of a field or farm or nation, in the face of stress or shock. (Conway and Barbier, 1988: 653)

The above definition, while considering economic factors of income and productivity, wrongly assumes that the level of analysis, from a farmer's field to national levels, can be analysed in the same fashion. However, factors influencing productivity, such as political, social, international, and market forces, react much differently within each level of analysis and should be addressed accordingly.

The concept of sustainable development would be greatly enhanced if economic, social and biological systems could be united under the same definition. For example, the concept of sustainable development can be extended to include the following goals:

To maximise simultaneously the biological system goals (genetic diversity, resilience, and biological productivity), economic system goals (satisfaction of basic needs, enhancement of equity, and increasing useful goods and services), and social system goals (cultural diversity, institutional sustainability, social justice, and participation). (Barbier 1987: 103)

Taking a more environmental stance, O’Riordan states that sustainability is becoming accepted as the mediating term that bridges the gap between developers and environmentalists (O’Riordan, 1990). He proclaims that sustainability is a much broader phenomenon, which embraces ethical norms and takes into account the rights and claims of future generations of all living matter. Therefore, sustainability is a “reformist notion in the radical tradition of opening up institutions of economic investment and resource development to a far greater sense of Gaian accountability” (O’Riordan, 1990: 94).⁵

In sum, the challenge of defining sustainable development has remained elusive as there continues to be a lack of agreement about what it signifies. Some theorists have argued the need to emphasise the ‘sustainable’ dimension, while others have placed greater emphasis on the crux of ‘development’. Redclift states that “sustainable development seems assured of a place in the litany of development truisms” and asks to what extent

does it express convergent, rather than divergent, intellectual traditions (Redclift, 1987: 2). If sustainable development is a cliché, as stated by Redclift, then it may be difficult if not impossible to use the concept to build an operational model for analysing development and environmental degradation. In other words, the extent to which sustainable development provides an alternative paradigm and a focus for improving environmental policy and management remains in question.

Disenchantment with the Concept of Sustainable Development

Conceptions of what is economically and technologically practical, ecologically necessary, and politically feasible have been shifting rapidly (Colby, 1991). Societies have now begun to have serious discussions about 'sustainable development' spurred on by the continuing confusion over what it means and how to achieve it. Few environmentalists, like Wolfgang Sachs, see environment and development as fundamentally in conflict with each other. In Sachs' view, the concept of sustainable development paves the way for a new global 'ecocracy' that will manage the world's ecology in the same inefficient and self-interested way in which planners and experts have managed the global economy (Sachs, 1992). The continued commitment to a basically unreformed global economic system is, therefore, the biggest impediment to true sustainability (Conca et al., 1995). If sustainable development is to be an alternative to unsustainable development, then it should constitute a break with the traditional linear

⁵ Gaianism is an environmental terminology which is taken from the Greek name for the Goddess of the Earth, Gaia. The Greeks equated justice with the retribution of environmental systems when abused. Therefore obedience to natural laws and evenhandedness of retribution are central ideas in this interpretation of Gaia. (O'Riordan, 1990).

model of growth and accumulation that in the end serves to undermine the world's natural resources (Redclift, 1987).

Political power relations

Larry Lohmann echoes this view and questions whether the Brundtland Commission has provided an agenda for change or simply a justification for business as usual (Lohmann, 1990). He states that the concept of sustainable development put forward by the Brundtland Commission simply puts a green face on the current system, while perpetuating unequal relationships of power and wealth - both within countries and between the *overdeveloped* North and the *underdeveloped* South (Lohmann, 1990). Instead of analysing the causes of environmental degradation (e.g. destruction from economic growth, technology transfer and capital flows) the Brundtland report focuses on *poverty, population growth and underdevelopment* as the main causes of environmental degradation without exploring their origins. Environmental problems are, therefore, implied to be found in the South and not in the North. In this manner, sustainable development is less threatening to the powerful interests of those wanting to maintain the status quo.

The emphasis of sustainable development, as defined by the WCED, on growth and the economy implies that environmental issues are technological and financial and not matters of social equity and distribution of power and resources (Lohmann, 1990). Thus, Lohmann concludes, it does not address the environmental crisis in either the North or the South. Instead, it reinforces Southern dependence on environmentally destructive

models of development imposed by the North and will increase the power of Southern elites. It does not examine the effect of importing large amounts of capital into the South on either the environment or on the social heritage. In order to seek genuine solutions, states Lohmann, it is necessary to respect and explore differences, to face root causes, and to understand the composition of the power structure.

Sharachchandra Lélé offers an equally critical assessment of the concept of sustainable development. Lélé states that since the paradigm lacks a clear, widely accepted definition and conception, it is “in real danger of becoming a cliché ... - a fashionable phrase that everyone pays homage to but nobody cares to define” (Lélé, 1991). Both Lélé and Lohmann agree with the goal of meeting current needs without compromising the needs of future generations. Yet Lélé critiques some of the assumptions within the mainstream sustainable development philosophy. This includes: a narrow technical focus on the problem of poverty, without considering its fundamentally socio-political causes; the neo-classical emphasis (with its focus on the market) on how to meet people’s basic needs; and a lack of clarity about how it is to be sustained and for whom (Lélé, 1991). In addition, the notions of sustainable development place an undue burden of structural and value adjustment on the South, while ignoring the current consumption practices in the North. The problem of excessive Northern consumption poses fundamental challenges that are not addressed properly within the ‘managed-growth’ model of sustainable development (Conca et al., 1995).

However, to say that mainstream sustainable development has completely ignored these complexities would be unfair (Lélé, 1991). Where sustainable development does falter is in its emphasis on inadequate technology, managerial capabilities, pricing and subsidy policies with the solutions suggested being essentially techno-economic. Deeper socio-political changes, such as land reform, or changes in cultural values, such as over-consumption in the North, are either ignored or paid lip-service (Lélé, 1991).

Over-consumption by the North versus population explosion of the South

According to some Southern perspectives, the fundamental ecological problems facing the planet is over-consumption by the industrialised world and by urban elites in the Third World (Guha, 1989). The root causes of global ecological problems therefore lie in the disproportionate share of resources consumed. The solution, according to Guha, is a radical shift in consumption and production patterns which will require the creation of alternate economic and political structures - ones that are smaller in scale and more responsive to social participation - but one that rests equally on a shift in cultural values (Guha, 1989). The Commission on Developing Countries argues that although the environmental crisis has begun to force some changes in production and consumption, "the bearing of these changes on critical socio-economic and political conditions have been largely incidental" (Commission on Developing Countries and Global Change, 1992: 219).

Some environmentalists try to focus much of the attention of environmental degradation onto the problem of overpopulation.⁶ They state that global population must be brought under control at once if there is to be any hope of preserving the environment (Ehrlich and Ehrlich, 1990). Mahathir disputes this claim and states that 25 percent of the world population who are rich consume 85 percent of its wealth and produce 90 percent of its waste. Therefore, the issue of environmental protection is more of a change in the life-styles of the rich, than it is changing the life-styles of the poor. According to Mahathir, if the over-consuming North reduce their wasteful consumption by 25 percent, world-wide pollution will be reduced by 22.5 percent. However, if the poor 75 percent reduce consumption completely (and in this case were never born) then the total reduction in pollution is calculated to be only 10 percent (Mahathir, 1992). Thus, a change only in the life-styles of the poor is not only unjust but also unproductive and will not be enough in addressing global environmental problems. What is ultimately needed is a new concept for the global environment-development debate. This new concept must define the basic tenets of sustainability and the 'global' environment, and define and address such basic issues as over-consumption, population and burden sharing.

People-centred development

The Commission on Developing Countries and Global Change, consisting of scientists from the developing world, offers a similar perspective from the South.⁷ The commission argues that, to date, Northern concerns have dominated and directed the global

⁶ See Anne H. Ehrlich and Paul R. Ehrlich, *The Population Explosion*, 1990. Wattenberg, Ben, *Are World Population Trends a Problem?* Washington, D.C.: American Enterprise Institute for Public Policy Research, 1985. Simon, J., *The Ultimate Resource*, Princeton, N.J.: Princeton University Press, 1981.

environmental debate (e.g. Agenda 21 and Global Environment Facility Programs). However, issues that are not addressed, such as social concerns, economic issues, and intra-generational equity (the present disparities in wealth and opportunities) are instrumental to resolving the environment-development crisis. In the South, even the basic needs of the majority of the population are not being met, and economic and environmental priorities are largely ignored. According to the commission, it is critical for any meaningful approach to sustainable development to integrate environmental issues with issues of equity, social justice, human rights, and development for the South. Similar to the critique by Lélé, the commission states that:

Fundamentally, the main cause of the environment-development crisis is unsustainable forms and levels of production and consumption in the North and their export to the South. It follows that, to resolve the crisis, more than technological approaches are required. Unsustainable output and expenditure levels in the North must be reduced, and socially and environmentally inappropriate development systems in the South must be reformed. A more equitable international order must therefore accompany the shift to more ecological and equitable national development. (Commission on Developing Countries and Global Change, 1992)

Inherent in the Commission's notion of sustainable development lies the message of people-centred development. Other theorists, such as Sharp, have concepts comparable to this people-centred development idea. Sharp states that the concept of sustainable development embodies a belief that people should be able to improve their lives in accordance with criteria which take into account the needs of others, protect the

⁷ Commission on Developing Countries and Global Change, from *For Earth's Sake: A Report from the Commission on Developing Countries and Global Change*, pp 16-30. Ottawa: IDRC. 1992.

environment, and consider future generations. Sharp argues that people's rights and responsibilities form the crux of any discussion of sustainability. And thus, the precondition for any sustainable future lies in the mobilisation of human resources to plan and manage that change (Sharp, 1992).

Rajni Kothari in his essay *Environment, Technology, and Ethics*, discusses the moral dimensions of sustainable development (Kothari, 1990). He states that even though national governments and international agencies now include the environment dimension in their strategies of development ("through the universal slogan of sustainable development") not much has changed in mainstream development policy. There has been no genuine striving towards an alternative perspective on development, and no ethical shift that makes sustainable development a reality (Kothari, 1990). According to Kothari, sustainable development must be conceived of four ethical ideals: (i) a holistic view of development; (ii) equity based on the autonomy and self-reliance of diverse groups instead of development based on aid and technology transfer; (iii) an emphasis on participation; and (vi) a focus on the importance of local conditions and the value of diversity (Kothari, 1990).

For sustainable development to become a reality it is necessary to prioritise the welfare of the poor. However, the issue remains how to pursue this priority at the local level if the effects of international development systematically marginalize the poor. (Redclift, 1987) Thus, the political aspects of development can only be achieved through political restructuring at the local, national and international levels. Unless the concept of

sustainable development is realised at a level which recognises international structures and power relations, it is in danger of being yet another discarded development paradigm (Redclift, 1987). Therefore, the concept of sustainable development must be expanded to include many of the underlying social, economic, and political forces that act as contributing agents to the crisis of environmental degradation.

Political Economy Perspective Revisited

The sustainable development concept which draws a strong link between the poor and environmental degradation is, as Lélé argues, “an incomplete characterisation” of the problems of poverty, mal-development, and environmental destruction. The political economy perspective attempts to refocus the inquiry onto the ultimate causes of poverty rather than on poverty or the poor themselves (Broad, 1994). From the political economy analyst’s perspective, the key relationship to understanding environmental degradation, such as deforestation, revolves around the role of the rich in both the North and the South as environmental degraders - both directly through activities such as subsidies for commercial logging and indirectly through inequitable landholdings (Broad, 1994).

According to Thrupp, the political economy perspective “sets priorities within the social dimension of resource development issues, addresses inequities in resource distribution, and emphasises the political and economic roots of the problem” (Thrupp, 1990). Therefore, the success of sustainable development depends on whether it: (i) meets the needs of the poor; (ii) improves human welfare, social justice and equity in resource

distribution; and ultimately (iii) whether it counteracts the power structure that produces and propagates environmental degradation (Thrupp, 1990).

The political economy approach incorporates a more structural perspective, emphasising the causal relationships between societies' economic base and the institutions of the state (Schmink and Wood, 1987). For example, Susanna Hecht concludes that environmental degradation in tropical rainforests of developing countries can only be understood by examining the role of the state and of the land in inflationary economies (Hecht, 1985). Certain national activities, such as state subsidies for cattle ranching and inequitable land distribution, result in the *exchange* of land rather than its *productive value* to take precedence (Hecht, 1985). Thus, the productivity of tropical forests becomes less important as the land itself becomes the main commodity. In this manner, the political economy framework is extended to address the specific issues of land use patterns in the tropical rainforests of developing countries such as Indonesia. This approach, which Schmink and Wood have labelled "*political ecology*", illustrates how economic and political processes determine the manner in which natural resources can be exploited.

In addition to the political and economic causes used to explain environmental degradation, the political ecology model proposed by Blaikie and Brookfield focuses on the social dimension of environmental mismanagement. They state that environmental degradation should be considered a social problem since it has social causes as well as consequences (Blaikie and Brookfield, 1987). This sentiment is reiterated by Evernden, who states that the environmental crisis is as much a social phenomenon as a physical

one (Evernden, 1992). The definition of sustainable development defined by WCED (“satisfying the needs of the present without compromising the ability of future generations to satisfy their own needs”) is lacking since no one knows how to measure well-being in *social* terms (Arizpe et al., 1997). Therefore, Robert Ayres proposes a more complex definition of sustainable development:

“Sustainability is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are in harmony with and enhance current and future potential in order to satisfy man’s needs and aspirations” (Ayres, 1991).

This more precise explanation points to the need to involve social scientists, anthropologists, sociologists, and psychologists in exploring this concept of sustainable development (Arizpe, 1997). Sustainable development becomes not only a trait of individual behaviours (like the behaviours of the poor), but also of the “synergies created by the economic and political systems” in which they operate (Arizpe, 1997). In view of the wide variety of social and ecological circumstances, it becomes difficult to maintain a uni-causal model of explanation for environmental degradation. Blaikie and Brookfield use the term *regional political ecology* to combine the concerns of ecology with a broadly defined concept of political economy. The addition of the adjective *regional* is important to the theory because it takes into account the “environmental variability and the spatial variations” in sensitivity of land, as different demands are put on the land through time. The word *regional* also implies the “incorporation of environmental considerations into theories of regional growth and decline” (Blaikie and Brookfield, 1987). According to

the regional political ecology theory, environmental managers (or actors) react to the social, political and economic situations surrounding them.

Political ecology also derives from political economy a concern with the role of the state. The state commonly lends its power to dominant groups and thus may reinforce accumulation by these power groups at the expense of the marginalised poor, through such actions as taxation, food policy, land tenure policy and the allocation of resources (Blaikie and Brookfield, 1987). According to Blaikie, many areas of the Third World suffer from a set of related environmental symptoms which combine the results of land degradation, political and economic peripheralisation, stagnant production, out-migration and poverty.

Conclusion

The attempt to create a single theory to explain environmental degradation and tropical deforestation is very complex if not impossible. While the Brundtland Report does represent a step forward in the area of sustainable development, its narrow focus on poverty alleviation and economic growth does not capture the diverse issues surrounding environment and development. The power of the concept comes from its vision of integrating environmental quality and economic well-being, but the next and more difficult step will be to clarify whether and how that vision can be attained.

The concept must be made to fit the special circumstances of areas and degradation in Indonesia. In analysing the root causes of tropical deforestation, the model needs to be

expanded to include the specific socio-political, economic, and historical factors of this region. It must be broadened to encompass the issues of power and wealth that underlie current environmental problems in Indonesia. Likewise, the model must attempt to address the issues of social justice, equity, and indigenous development and examine the role of domestic and international pressures on the Indonesian government's policy making.

Incorporating the political ecology model into the concept of sustainable development is one method with which to refocus the inquiry onto the ultimate causes of poverty and tropical deforestation, rather than solely on the poor themselves. It creates an operational model (found lacking in the concept of sustainable development) necessary to investigate problems of deforestation and other environmental degradation. In doing so, a more complex framework for analysis is constructed to deal with the multitude of environmental problems now facing Indonesia and our delicate planet. Once the model for rainforest depletion is altered to adjust for the influence of numerous socio-political/economic variables, then it becomes apparent that there cannot be any development problem or solution that lacks an environmental dimension - whether or not we can conventionally conceptualise the linkages.

Chapter Three ~ Deforestation in Indonesia

Introduction

Defining the rate of deforestation in Indonesia is a daunting task. Estimates of the annual average rate vary widely, from as low as 263,000 ha (TAG, 1991) to as high as 2,400,000 ha (Hasanuddin, 1996). Table 1 lists differing estimates of annual deforestation rates in Indonesia and indicates how various sources assign differing amounts of blame to particular agents of forest conversion.

This chapter analyses the problems with imprecise and conflicting definitions of deforestation and how these affect the perceived rate of forest loss in Indonesia. It also examines the different agents of deforestation, and the political context in Indonesia to create a more dynamic picture of the socio-political condition. The addition of the political component demonstrates that the assessment of deforestation is dependent on a person's view on such things as the value of nature and the role of political and economic factors. Finally, the causes of forest loss in Indonesia are examined, including the impact of shifting cultivators, government transmigration policies, and the role of logging.

Defining Deforestation and Agents of Deforestation in Indonesia

Estimates of forest conversion in Indonesia can be contradictory due to unclear or diverging uses of the term "deforestation". Such varying definitions of key terms and concepts can lead to difficulties in forming international comparisons on estimates of tropical forest loss. Table 1 outlines such variations in estimates and the role of agents.

Table 1
Estimates of annual deforestation in Indonesia (thousands of ha)

Source of Estimate	AGENT							TOTAL
	Transmig. Dev't	Estate Crops	Swamp Dev't	Spontan. Transmig. ^a	Trad'l Agr. ^b	Forest Harvest	Fires	
World Bank 1990 ¹	250			500		80	70	900
FAO 1990 ²	300	274	85	461		80	113	1,315
TAG 1991 ³	65	11.4	30.4	156.5		NE	NE	262.9
MOF 1992 ⁴	300	160		300		77	478	1,315
Dick 1991 ⁵	78.4	11.4	30.4	178.5	135.5	120	70	623
Sukarjo 1996 ⁶	NE ^c	NE	NE	NE	NE	NE	NE	809
Hasanuddin 1996 ⁷	NE	NE	NE	NE	NE	NE	NE	2,400

The top four rows of this table (World Bank 1990 through MOF 1992) are adapted from the World Bank Country Study report (World Bank. *Indonesia: Environment and Development*, 1994: 52). The original was modified to reflect the fact that most sources did not separate the categories "spontaneous transmigration" and "traditional agriculture". The World Bank (1994) table falsely gives the impression that this distinction was made. Dick (1991) makes a significant contribution by recognising the distinction between these two groups.

^a Spontaneous Transmigration

^b Traditional Agriculture

^c NE signifies "no estimate"

¹ World Bank. *Indonesia: Sustainable Development of Forests, Land and Water*, 1990.

² Food and Agriculture Organisation (FAO). *Situation and Outlook of Forestry Sector in Indonesia*, 1990.

³ Transmigration Advisory Group (TAG). *Forest Clearance Study*. Ministry of Transmigration, 1991.

⁴ Ministry of Forestry (MOF), *Indonesia Tropical Forestry Action Program*, 1992.

⁵ Dick, J. *Forest Land Use, Forest Use Zonation, and Deforestation in Indonesia*, Background paper for UN Conference on Environment and Development, prepared for KLH and PAPEDAL, GOI, 1991.

⁶ Reported in the Jakarta Post, May 29, 1996.

⁷ Hasanuddin, L. *Mitos-mitos pengelolaan hutan di Indonesia*. Kertas Posisi No. 02. Friends of the Earth Indonesia. 1996.

Source: Sunderlin, William and Ida Aju Pradnja Resosudarmo. *Rates and Causes of Deforestation in Indonesia: Towards a Resolution of the Ambiguities*. CIFOR Occasional Paper No. 9. ISSN 0854-9818 1996

There are many different definitions of deforestation. The World Resources Institute (1992, pg. 118) defines it as “a complete change in land use from forest to agriculture – including shifting cultivation and pasture – or urban use. It does not include forest that has been logged and left to regrow, even if it was clearcut.” Other definitions of the term state that deforestation is “the removal or destruction of all or most of the trees of a forest such that reproduction is impossible except by artificial means” (Kartasubrata, 1993). In both definitions it is important to recognise whether the terminology of ‘deforestation’ refers to strictly a *permanent* removal of forest cover, or to both *permanent* and *temporary* removal (Sunderlin and Resosudarmo, 1996).

What Constitutes Deforestation in Indonesia

Some reports, like the World Bank and the FAO report (1990), implicitly assume that both *permanent* and *temporary* removal of forest cover constitute deforestation. Therefore, any area of forest land that is altered for a few years under shifting cultivation for cultivation, before it is left fallow to regenerate into forest land, is considered part of the definition of deforestation in Indonesia. The fact that shifting cultivation eventually (under optimal conditions) returns the forests into secondary forest status is not considered. Enlarged definitions such as these greatly aggregate both the area in Indonesia considered affected by deforestation and the role of the shifting cultivators in environmental degradation.

Another important consideration in defining deforestation is whether the term refers to the loss of forest cover for *all kinds* of uses, or to losses that will never naturally

regenerate for *timber production* (Sunderlin and Resosudarmo, 1996). The definition in this case will be greatly influenced by who is defining the term “forest” and “deforestation”, and by the values placed on the *uses* of a forest. Along the same lines, it is important to understand whether the term refers to the *removal of forest cover alone*, or additionally to the *loss of various kinds of forest attributes*, such as bio-diversity. If the definition relates only to the removal of forest cover, then the area deforested would be considerably smaller than if the concept of bio-diversity loss was included (Saharjo, 1994). For example, under shifting agriculture, the land cleared for cultivation is often considered to be ‘deforested’, even though the land may be left fallow and returned to its original forest cover. Moreover, under some definitions, selectively logged-over forests are not considered ‘deforested’ since there are still many trees left standing. Yet in many situations in Indonesia, these logged-over forests have resulted in a great deal of loss in bio-diversity and a considerable loss of various environmental functions of the forests (Sunderlin and Resosudarmo, 1996).

Remote sensory (satellite) imagery / GIS

Most estimates on forest cover change are based at some stage on remote sensory imagery. Therefore, the interpretation of the satellite data will depend on the type of algorithms used to process the information. The definition of deforestation is, thus, linked partly to questions of methodology. Satellite imagery and GIS mapping are also useful in determining the causation behind forest cover change. The high resolution imagery can reveal a shift from natural forest cover to a monoculture plantation, and indicate the cause of tropical forest loss. However, satellite imagery has limitations and drawbacks. In some

cases where the transformation in forest cover becomes fragmented, little visual information is available about the cause and effect. Thus, while satellite imagery can show some patterns of causation, social science research is necessary to achieve a full understanding of the reasons behind deforestation.

Understanding the Roles of the Actors Involved

Besides attempts to define deforestation, it is necessary to conceptualise the '*agents of deforestation*'. In order to determine who these actors are in Indonesia, it is important to clarify if the term refers to those who *remove* the forest cover, or those who subsequently *prevent its regrowth* (Sunderlin and Resosudarmo, 1996). If the definition is closer to the latter, then the small farmer who may settle on land that had previously been cleared by logging is given a larger role in deforestation than otherwise would be the case. However, if the definition of agents lies closer to those that actually remove the forest cover, then logging companies would be assigned a larger responsibility in the Indonesian context. However, causation could go in the opposite direction, where smallholders may open tracts of land, abandon them, and subsequently have the cleared land bought by large landholders and other companies for cattle ranching or plantations (Leonard, 1989).

Finally, agents of deforestation can be categorised in terms of the ultimate designated use of cleared forest area, instead of solely by the actions and intentions of those who actually opened the land (Sunderlin and Resosudarmo, 1996). In other words, Barbier et al. (1993) suggest that since most of the deforestation that occurs in Indonesia is the result of land

converted for agriculture, then a causal role must be assigned to the growth of agriculture in Indonesia.

The Value of Nature

There are also many different perceptions as to what constitutes the true value of a forest. The effect of substituting a natural forest with that of a forest plantation is relative to the observer's principal valuation of a forest. The Indonesian government or local and foreign industry may see the transformation of tropical forest land into a plantation for export crop as a favourable innovation. The yield for timber from these plantations for some observers is seen as greater per hectare than in natural forests. However, as might be expected, environmentalists and forest community supporters may view this transformation in a different light. They see this change as harming the bio-diversity found in Indonesia's tropical rainforests and destroying the livelihoods of communities living in the forests (Sunderlin and Resosudarmo, 1996). Therefore, if environmentalists were defining the concept of deforestation, the creation of such plantations would be considered to be 'deforestation'. Government and industry, on the other hand, might consider the transformation of tropical forests into plantations not as deforestation but as 'reforestation'. Local Indonesian NGOs have expressed the concern that many international observers are "mistaking plantations for Indonesia's tropical forests".¹

Depending on what the observer ascertains as the principal value of different types of forests, divergent interpretations of the same primary data will result. Different renditions

of the same information are factors of these varying interest-based positions. Therefore, a more precise use of key terminologies is a pre-condition for increasing the quality of research and accuracy of data collected on forest cover change in Indonesia. Clearly defining concepts such as what constitutes a forest, deforestation and specific agents of deforestation will help avoid confusion and avoid the selective interpretation of data regarding forest land.

Defining the *Process* of Deforestation in Indonesia

Deforestation continues unheeded in Indonesia because of deficiencies in the conventional explanations for causes of deforestation. As stated in the previous section, these explanations may outline different agents and underlying factors that contribute to the degradation, yet they do not provide an overlying context to understanding the *process* leading to deforestation. According to Peter Dauvergne (1993), these explanations create a static picture of deforestation in Indonesia rather than a dynamic one. In order to create a dynamic explanation of deforestation, political factors must be included in the formula.

To fully understand the process leading to deforestation in Indonesia, it is important to examine how Indonesian politics and attitudes of decision makers, shape and drive the factors behind deforestation. According to Dauvergne, it is possible to categorise the different explanations of deforestation into 5 groups according to which factors they deem to be the most important causes of deforestation: tropical government explanations,

¹ This quote is taken from the title of a local 'yayasan' or NGO's document entitled: "Mistaking Plantations for Indonesia's Tropical Forests." By Wahana Lingkungan Hidup; Yayasan Lembaga Bantuan Hukum

environmental explanations, development explanations, public policy explanations, and political explanations of deforestation.

Tropical Government Explanation

In the *tropical government explanation*, the main cause of deforestation is laid on the indigenous people and their traditional farming techniques. These tropical country governments, like Indonesia, acknowledge the role of logging, development projects and fires in deforestation, yet point to data (e.g. from the World Bank) to justify their condemnation of swidden agriculture as the primary cause. The Indonesian government's solution to deforestation has been to focus its attention on reducing traditional agriculture, especially in the outer islands.² Like in other tropical countries, tribal people are usually forcibly relocated to sedentary farming communities, have their traditional land rights taken away, or are prevented from using traditional farming techniques (Dauvergne, 1993). These actions are justified by the erroneous and misinformed claim that indigenous people and their traditional farming practices are destroying the rainforests of Indonesia.

Developmental Explanation

According to the *developmental explanation*, the main causes of deforestation are said to be the clearing of land for agriculture, commercial logging, fuel wood gathering, and cattle raising. Though developmentalists also see swidden agriculture as the largest immediate cause, they stress that more fundamental problems lie in the underlying causes

Indonesia. 1992.

² Outer islands refers to those islands outside the heavily populated islands of Java and Bali.

which lead to unsustainable traditional practises and mismanaged logging. For the developmentalists it is the factors of poverty, rapid population growth, ignorance, and certain public policies that need to be addressed in order to understand deforestation (Dauvergne, 1993). The key focus is on the actions of the poor, similar to the emphasis on poverty in the Brundtland report, "it is the rural poor themselves who are the primary agents of destruction as they clear forests for agricultural land, fuel wood and other necessities. Lacking other means to meet their daily survival needs, rural people are forced to erode the capacity of the natural environment to support them[selves]."³

However, according to Dauvergne, developmentalists differ from tropical country governments in that they do not advocate direct action against the swidden farmers, but instead believe it necessary to focus on the alleviation of poverty. By focusing on poverty reduction, developmentalists believe they are addressing the root causes of deforestation. The one method to alleviate poverty and environmental degradation is through economic development. Even though large development projects in Indonesia such as dams, plantations and roads may initially cause short-term damage to the environment, these damages are outweighed by the long-term economic benefits that will eventually lead to protection of the rainforests (Dauvergne, 1993). For developmentalists, it is economic incentives that will encourage people to reduce or stop tropical deforestation (Mahar, 1989).

³ World Resources Institute Report, *Tropical Forests: A Call For Action*, (Washington: World Resources Institute, 1985), part I. p.1.

Environmental Explanation

According to the *environmental explanation*, it is the impact of destructive logging and large development projects, along with the role of foreign companies and international organisations that encourage and finance these activities that contribute to deforestation in Indonesia (Dauvergne, 1993). Environmentalists would put the blame of deforestation on aid agencies, multinational corporations, international finance, and Third World elites who are motivated by profit maximisation and the international market. In their eyes, the most important economic force driving the destructive forest practices of tropical forest countries, like Indonesia, is foreign debt (Bramble, 1987).⁴

Environmentalists are also strong supporters of traditional farming practices and state that the negative perceptions of shifting cultivation “constitute ‘an article of faith, a dogma’... used to justify programmes of resettlement and agricultural intensification” (Cramb, 1988). For environmentalists, the focus on shifting cultivation as the prime culprit of deforestation has been overstated, while in fact the real culprits are the legal and illegal logging and commercial development projects such as plantations, ranching projects and dams.

Public Policy Explanation

According to Dauvergne, the *public policy explanation* of deforestation argues that the destructive impact of tropical government policies created by various bureaucratic

⁴ According to Barbara Bramble, “in order to service their debts, Third world countries have been forced to plunder their natural resources for all they are worth. The exploitation of forests and mineral resources has accelerated, whilst the area under cash crops increases daily.” Barbara J. Bramble, *The Debt Crisis: The Opportunities*. Ecologist, vol. 17, no. 4/5, p. 173. 1987

departments are the main forces behind deforestation in countries like Indonesia. Similarly, Robert Repetto states that ‘government policies that encourage exploitation – in particular excessive logging and clearing for ranches and farms – are largely to blame for the accelerating destruction of tropical forests’ (Repetto, 1988: 36). Like the environmentalists, the public policy explanation states that these government policies are due largely to the economic pressures caused by the overriding debt problem of many tropical forest countries.

Public policy advocates state that unfair government policies that take away the traditional land use rights of poor traditional farmers lead eventually to unsustainable farming practices. Without the security of land rights, these people have little incentive to conserve their environment. In addition, the Indonesian government’s resettlement programs, stumpage fees, log export taxes, agro-conversion policies and exchange rate policies encourage unsustainable logging practices and lead to destructive development programs and policies (Dauvergne, 1988). The political policies favour the powerful elites on the central regions of Java and Bali, to the exclusion of the politically weak indigenous people in the outer islands. Therefore, Dauvergne argues, these politically weak peoples in the outer islands are more vulnerable to uncontrolled resource extraction.

Political Explanation

Finally, the *political explanation* for deforestation looks beyond the previously discussed factors and agents of deforestation and states that “it is Indonesia’s political structure and process, and the attitudes of the decision-making elites... that shape and drive the

unsustainable swidden agriculture, destructive logging, harmful development projects and government policies that ultimately encourages exploitation of the forests” (Dauvergne, 1988). It is politics that shape the Indonesian government’s perception of deforestation and thus it is politics that will cloud its solutions for the problem. The government’s focus on traditional swidden agriculture as the primary cause of deforestation has resulted in the forcible relocation of many tribal people in the outer islands to government villages. This continues even though evidence may show that these tribal people practising sustainable swidden agriculture are not the main culprits in the deforestation problem in Indonesia.

According to Dauvergne, it is the Javanese elite that dominate decision making who believe swidden agriculture is inefficient and view the indigenous people in the remote outer islands as barriers to stability and integration. In this view, the politically weak tribal people are ‘convenient scapegoats to divert attention away from the much more important factors which contribute to deforestation: unsustainable swidden agriculture by recent settlers, unchecked logging, mismanaged development projects, and misguided government policies, all of which are supported and encouraged by the Indonesian political system and supported by international finance and markets” (Dauvergne, 1988).

Causes of Deforestation in Indonesia

As stated in the preceding sections, deforestation in Indonesia may be caused by many different agents and by many different processes. For example, large tracts of land (200 to 300 ha) of Indonesia’s tropical rainforests are converted into estate crops for tea,

rubber, coconut, oil palm, and cacao. Forestlands are also cleared for different forms of agriculture, such as settled agriculture, shifting cultivation and such things as human settlements. Deforestation also occurs due to fires, infrastructure building, mining, and indiscriminate and excessive logging (Kartasubrata, 1993). The total annual rate of deforestation in Indonesia is estimated to be around 300,000 ha in the early 1970s and increased to about 600,000 ha in the early 1980s (World Bank, 1990). By the end of that decade, the World Bank estimated a deforestation rate of between 700,000 and 1,200,000 ha, or an average of 1.2 percent per year. A 1990 FAO study found that the forest cover of Indonesia had been reduced from 74% to 56% in the space of 30-40 years.

There are two sides to the on-going debate over the causes of deforestation in Indonesia. Table 2 shows that there are several sources that see the growing number of smallholders (shifting cultivators, spontaneous transmigrants, and regular transmigrants) as the leading force of deforestation in Indonesia.⁵ However, there are those sources, while acknowledging the large role smallholders play in the rate of forest conversion, place a greater importance on the role of government, development projects and the timber sector. The next section examines two main agents, the smallholders and the timber industry, and their contribution to deforestation in Indonesia.

⁵ See FAO, 1990; World Bank, 1990; Barbier et al., 1993; and Fraser, 1996.

Table 2: Change over time in views on causes of deforestation in Indonesia

SOURCE	TYPE OF CAUSE						
	AGENT				UNDERLYING		
	Shifting cultivation	smallholder Spontaneous transmigrants	Regular transmigrants	Plantation & tree crops	Timber industry	Government / politics	Economic development
World Bank 1990							
FAO 1990							
Dick 1991							
WALHI 1992	Effects overstated						
Barbier et al. 1993	Growing population density most important						
Ascher 1993						Government - MIF alliance	Economic diversification
Porter 1994							
Dauvergne 1994					Effects understated		
Thiele 1994	Effects overstated				Effects understated		
World Bank 1994	Effects overstated				Effects understated		
Angelsen 1995	Effects overstated						
MOF 1995	Effects overstated					Government land claims	Exogenous price effects
Ross 1996							
Fraser 1996				Effects overstated			
Hasanuddin 1996	Small-holders blameless						
Dove 1996	Effects overstated					National political economy	

Shaded area indicates form of agency assumed to have the largest role in deforestation.

Source: Sunderlin, William and Ida Aju Pradnja Resosudarmo. *Rates and Causes of Deforestation in Indonesia: Towards a Resolution of the Ambiguities*. CIFOR Occasional Paper No. 9. ISSN 0854-9818 1996

The Role of Shifting Cultivators in Indonesia

Table 2 on the previous page denotes the overall shift over time in the conventional explanation of agents of deforestation in Indonesia. It reveals the shifting “centre of gravity” in recent years of the main focus of institutions like the World Bank (Sunderlin and Resosudarmo, 1996). In early 1990, the World Bank and FAO stated that shifting cultivation held a central position in the role as degraders of the tropical rainforests of Indonesia. As stated previously, in 1990 the World Bank estimated that the annual rate of deforestation in Indonesia was between 700,000 and 1,200,000 ha, within which smallholders accounted for 350,000 – 650,000 ha of the total forest conversion (World Bank, 1990).

However in 1994, the World Bank report on Indonesia stated that the effects of shifting cultivation on deforestation had been overstated and consequently the effects of the Indonesian timber industry had been understated. This new claim was based on the reasoning that the timber industry had an indirect role in deforestation by opening up lands that were subsequently used by smallholders. The World Bank concludes that the proper management of forest concessions granted to logging companies in the outer islands is one of the ‘highest priority’ environmental issues that Indonesia has to overcome (World Bank, 1994). The report states that “poor logging practices and the failure of replanting efforts have resulted in extensive degradation in many of these [timber] concessions and, together with the opening up of forest areas through logging roads, [has resulted in] an increase in deforestation.” (World Bank, 1994: 51)

Other sources, such as Dick (1991), take a more political economy view to the factors of deforestation in Indonesia and challenge the 'conventional wisdom' that labelled the traditional shifting cultivator as the main agent of deforestation. He states that government sponsored programs such as transmigration, estate crops and logging explained up to 67% of all deforestation in Indonesia. According to his study, the estimates on the rate of deforestation given by both the World Bank (1990) and FAO (1990) are too high for a number of reasons. First, the previous figures assume that changes in land tenure is equivalent to land conversion. Second, the research does not take into account the fact that smallholders usually occupy lands that have already been cleared by such activities such as logging and fire. And third, the data wrongly assumes that all areas under shifting cultivation had been cleared in the last 10-15 years, where in reality the shifting cultivators subsist on lands that have been cleared for generations or have never been forested. Therefore, Dick concludes that government policies need to be improved in order to impact on the process of deforestation and make it more optimal for the sustainable use of forest lands.

Though the World Bank report (1994) refers to the work of Dick (1991) and states that the effects of the timber industry and government programs have been understated, it still labels small-scale agriculture as the 'largest cause of deforestation' in Indonesia (World Bank, 1994: 53). However, the World Bank report states that a distinction is needed between spontaneous migrants, who 'constitute the single largest agent for land use change in the country', and traditional shifting cultivators (World Bank, 1994: 52). Thus, the impact of swidden agriculture on deforestation depends largely on whether the

definition includes only 'forest-dwelling communities of long-standing, following traditional practices' or whether it also includes 'spontaneous migrants' who turn to the natural forests for income due to lack of land tenure or alternative sources of income (World Bank, 1994).

The report goes on to say that since swidden agriculture is connected historically to the local ecology of the region that the continual re-use of clan-owned secondary forest should probably not be considered deforestation at all. In some sense, deforestation should only be considered in those cases where swidden agriculture, due to increasing population pressures, results in expansions into primary tropical forests or in serious soil degradation due to improper swidden activities, such as the shortening of the fallow period (World Bank, 1994). This distinction between proper and improper swidden activities, however, is difficult to make and is not available in the current research and data. As a result, swidden activities, whether sustainable or not, are grouped together under the same category.

The Effect of Logging in Indonesia

After small landholders such as shifting cultivators, the World Bank considers *commercial forest harvesting operations* as the next largest cause of deforestation in Indonesia. Estimates of tropical forest loss caused directly from logging range from 77,000 ha to 120,000 ha annually (Table 1) or 10-20% of the total area deforested (Sunderlin and Resosundarmo, 1996). Companies granted production forest concessions must guarantee the use of the Indonesian Selective Cutting System (*Tebang Pilih*

Tananman Indonesia – TPTI)⁶. However, reports by FAO express doubt as to whether logging is actually practised in an effective manner and concludes that ‘commercial deforestation’ may actually be widespread (FAO, 1990; World Bank, 1994).⁷

The rate of logging in Indonesia is roughly 40 million cubic meters per year (m cum/yr), whereas the “sustainable” rate recommended by the Indonesian Ministry of Forestry is 22 m cum/yr (World Bank, 1995). Within this amount, only a small portion of the land being logged by concessions are carrying out ‘enrichment planting’ (Sunderlin and Resosundarmo, 1996). In addition, factors such as *illegal logging*, increase the area of ‘commercial deforestation’ in excess of the limits for managed production in Indonesia. Some explanations point to certain government policies and practices that are inadequate and allow some concessionaires to mismanage their sites or exploit the forests at an unsustainable rate. For example, concessionaires may be allocated too large of an area, resulting in lower incentives or inability to prevent encroachment by shifting cultivators (Sunderlin and Resosundarmo, 1996).⁸ Low concession fees in Indonesia encourage logging companies to invest in tremendous amounts of forest land, “more for insurance purposes or speculation than for timber harvesting” (Thiele, 1998: 187).

⁶ This silivcultural management approach system is one in which the initially logging area is left with a residual strand, which within 35 years should result in an economically harvestable timber stock.

⁷ The FAO report found that required pre-logging inventories and post-logging residual stands were not conducted properly (only 2.2% of cutover lands had residual stand inventory); over-cutting and cutting outside approved boundaries was frequent (often encroaching into protected forests, nature reserves and even national parks); more frequent re-logging than the 35-year interval cycle was common, leading to significant residual stand damage; and control and supervision by the Indonesian Ministry of Forestry has not been effective (FAO, 1990).

Long-term management incentives for concessionaires are also stunted by low royalty payment rates that allow for high excess profits and encourage rent-seeking behaviours. Low royalty rates encourages concessionaires to prematurely re-enter the site, resulting in damages to immature timber stands. Low rent results in the under-valuing of the stock and discourages good management for future sustainability. Finally, Sunderlin and Resosudarmo (1996) suggest that there may be insufficient support for provincial-level protection of forests. The majority of forestry support and personnel are concentrated in Java, rather than the outer islands, where the larger amount of forest resources lie. Due to this policy problem and through lack of funds, “governments in provinces with extensive forest cover may be encouraged to replace forests with other forms of land use more able to generate revenue at the provincial level” (World Bank, 1995: 19).

Effects of Transmigration on Deforestation

Aside from traditional shifting cultivators and logging concessions, tropical rainforests have been affected by the transmigration policies of the Indonesian government. Roughly 60% of Indonesians live on Java and Madura islands, which together constitutes only 7% of land area. This makes Java one of the most densely populated areas in the world. There have been many attempts to relocate families from Java to the outer islands in order to relieve population pressures. There are two categories of transmigrants: ‘regular’

⁸ Though critics of shifting cultivators see them as encroaching on the concessions, in most cases these “forest people” have already been cultivating and living in these areas for generations. According to discussions with Dr. de Foresta from ICRAF, at times these large concessions are granted without consideration of indigenous peoples already living in the area. Dr. de Foresta states that there are many cases where logging companies have gone to survey their sites only to find them completely inhabited by people and communities within the forests. This often leads to conflicts between the forest inhabitants, the logging companies and government.

transmigrants who receive full government financial and institutional support, and 'spontaneous' transmigrants who migrate on their own accord without government assistance.

According to data from the Ministry of Transmigration (MOT), from 1974-1989, there were 664,000 regular transmigrant families and 455,000 spontaneous transmigrants. This differs from the estimate of the Transmigration Advisory Group (TAG) which claims that there were 323,000 regular transmigrants in the same period (Dick, 1991).⁹ Shifting cultivators are also integrated into the transmigration program through the Allocation Scheme for people living in transmigration areas. The Ministry of Transmigration and the Ministry of Forestry have joint programs to remove people from the forest and to resettle them in transmigration project sites (Kartasubrata, 1993). During the government's transmigration program for 1994-1999, REPELITA VI, it is estimated that an additional 350,000 regular and 250,000 spontaneous transmigrant families will be relocated (MOF, 1995). The following table shows the average amount of forestland released annually to the transmigration program during the government's REPELITA III and REPELITA IV programs (1979/80 to 1988/89)

By the year 2000, an estimated 10 million families are expected to have been transmigrated and resettled on the outer islands (Kartasubrata, 1993). Since each family receives 2 ha of land under the sponsorship of the Indonesia government it is estimated that 20 million ha of predominantly forest land will be transformed into agricultural land

⁹ TAG makes no reference to spontaneous transmigrants.

by the end of the century (Kartasubrata, 1993).¹⁰ However, there is much debate over the share of responsibility in deforestation attributed to transmigration. While in the mid-1980s many international NGOs put much of the deforestation blame on transmigration programs (Secrett, 1986; World Bank, 1988; McClellan, 1992), some critics, such as Dick (1991), challenged these 'exaggerated estimates of forest clearance' by transmigration. Dick states that past estimates of deforestation by transmigration is vastly overestimated because they assume that all land allocated for transmigration use has been converted from forest land, which in reality may not be the case.¹¹

Table 3: Annual Average of Forestland Released to Transmigration Program (in Hectares)¹²

Island or Province	Limited Production Forest	Permanent Production Forest	Conversion Forest	Unclassified Forest	Protection Forest	Total
Sumatra	24,223	42,712	116,354	101,143	8,655	293,087
Lesser Sunda						
Barat	273	173	2,940	-----	90	3,476
Timor	-----	87	1,578	250	15	1,930
Kalimantan	23,090	59,385	86,501	63,542	3,040	235,558
Sulawesi	8,485	10,710	17,350	34,485	3,285	74,315
Maluku	3,835	1,597	18,889	-----	-----	24,321
Irian Jaya	6,118	14,044	51,534	688	1,157	73,541
Total	66,024	128,708	295,146	200,108	16,242	706,228

Whether the amount of forest cleared as a result of regular transmigration is over-estimated or under-estimated, what is apparent is that transmigrants are more prone to resort to unsustainable forms of shifting cultivation. This unsustainable cultivation is due

¹⁰ Some data suggest that the 2 ha assigned to transmigration families are insufficient for subsistence survival and that most families further deforest the area once they have exhausted their allocated portions (Sunderlin and Resosudarmo, 1996).

¹¹ At times the new transmigration settlements may be on pre-cleared lands, or converted swamp lands, or in some situations the land designated for transmigration is never deforested.

¹² Source: Government of Indonesia/Ministry of Forestry, and FAO, "Situation and Outlook for the Forestry Sector in Indonesia." Jakarta. 1990. (Taken from Kartasubrata, 1990.)

to their unfamiliarity with the traditional forms of shifting cultivation for the specific ecosystem and due to their insecurity over land tenure (Sunderlin and Resosudarmo, 1996).¹³ There is little data available as to the exact number of transmigrants who turn to shifting cultivation or migrate further into the forests for survival due to inadequate infrastructure support.¹⁴

In addition, transmigration communities are often placed in the midst of, or adjacent to, existing indigenous communities practising shifting cultivation. Combined with increases in population, the addition of transmigration communities creates pressures on the amount of available land for traditional rotation of agricultural sites, resulting in shortening of fallows, overuse of poor soils, and intensification of agriculture. Whether through spontaneous or regular transmigration, or natural population growth, there is little doubt that the growing human presence in rural Indonesia has a major role in deforestation.

Role of Indonesian Politics on Deforestation

In addition to the negative environmental consequences of certain transmigration projects, there are specific forest policies of the Indonesian government that contribute to

¹³ In Indonesia local people joke that the transmigration policy might be intended to save the trees, but once transmigrant families, who are forced to leave their villages in Java for the outer islands, relocate they cut down the trees to build canoes and sail back to Java with the relocation money in their back pocket. Of course there is no data to support this claim.

¹⁴ A 1989 study by Fasbender and Erbe, regarding 5 transmigration sites in East Kalimantan showed that 23.6% of the households turned to shifting cultivation as means of survival. Quoted in Sunderlin and Resosudarmo, 1996.

deforestation.¹⁵ Furthermore, Indonesia's centralised decision-making process encourages environmentally destructive policies because the system does not allow for local participation or incorporation of concerns and knowledge of indigenous people in the outer islands who are directly connected to the forests. Many central departments make decisions without considering or understanding the special requirements, both ecologically and sociologically, of specific rainforest regions.

Moreover, within the bureaucracy of the Indonesian government, the concerns of the environment are often vetoed by other departments (Dauvergne, 1993). Economic and political interests often override the concerns of the Department of Environment. This neglect is exacerbated when, according to Hurst (1987), "ministry officials are paid to look the other way". Most of the government's five year plans focus on industrialisation and improving macro-economic indicators. Through 1960 to 1990, the *Repelita* plans (government five year programs) have focused on the promotion of timber exports and the financing of agricultural projects, such as rubber and tea plantations, without local input or consideration of the socio-economic needs of the outer islands. The Indonesian government claims to have introduced better forest management and conservation policies, such as attempts to stabilise the rate of commercial logging, increase reforestation taxes, demand timber companies to replant, and lower the rate of the transmigration program. However, these policies still fall short of proper enforcement

¹⁵ For example, the selective cutting policy, based on an overly ambitious thirty-five-year regeneration cycle, is left almost ineffective because the lease is given to logging company for only twenty years. Therefore there is no incentive for logging companies to allow the rain forests the proper time to recover (Dauvergne, 1993).

and regulation. Therefore, the final impact of these changes on lowering the deforestation rate has been minimal at best.

Conclusion

This chapter demonstrates the importance of defining key terms and applying them consistently across all aspects of the rate measurement. To understand the causes of deforestation in Indonesia it is important to consider not only the agents, but also the causes that affect the decision-making behaviours of agents. In the case of Indonesia it is important to analyse the role of many different agents, such as lumber companies, small holders, transmigrants and the many different processes which contribute to deforestation. However, it is politics that shape the way the Indonesian government views deforestation, therefore, the solutions it creates will mirror this judgement. The Indonesian government states that it is traditional swidden agriculture that is the primary cause of forest conversion in Indonesia. This revelation leads the Indonesian government to create many policies directed at attempts to stop this indigenous practice in Indonesia. The following chapter will take a closer look at the agricultural system, practised by so many for generations, which has received such condemnation by the Indonesian central government.

Chapter Four ~ The Facts and Fictions Behind Shifting Cultivation

Introduction

Shifting cultivation is one of the earliest systems of crop growing and a way of life for millions of people inhabiting tropical forests. In recent years this ancient and 'time-tested method' of shifting cultivation (or swidden agriculture) has received increasing attention from the global community. Agricultural encroachment by swidden agriculture has taken on a central position in the debate on tropical deforestation. In the last few decades this practice, considered the means of subsistence for so many people since the Neolithic era, has unfairly become perceived as a destructive practice in the world's remaining rainforests. The term slash-and-burn has become synonymous with inefficiency in land use and damages to the environment. However, this has not always been the case.

This chapter will examine the dichotomy and analyse the forces that affect the sustainability of shifting cultivation. The chapter begins with an examination of who are considered to be 'shifting cultivators' and their role in deforestation. The characteristics of swidden agriculture are outlined in an attempt to fully understand the system. Following this, the biological factors of swidden agriculture and the effects of slash-and-burn techniques on soil degradation are examined.

Next, an outline of the conditions under which swidden agriculture is sustainable are examined. Analyses of factors that can turn slash-and-burn agriculture into a practice with ecologically unfavourable implications are considered. This section draws attention

to external factors such as population increases, migration policies, government development and infrastructure policies, and maldistribution of resources and land that may be the force behind environmental degradation. Moreover, internal factors such as certain wasteful or inept agricultural methods that can arise from cultural, social or psychological variables in shifting cultivation are also outlined.

The chapter will highlight social, economic, political and biological dimensions of deforestation and soil degradation as it relates to shifting/swidden cultivation. However, the biological/biophysical dimensions of environmental change and degradation will not be the focus. Instead, more emphasis will be placed on the socio-political economic dimensions that are essential to ultimately understanding and addressing this issue. There will be an emphasis on certain policy changes that can affect the rate of environmental destruction caused by unsustainable swidden agriculture.¹ The chapter concludes with a look at the policies of the Indonesian government towards shifting cultivation in the outer islands.

Understanding Swidden Agriculture

Swidden Agriculture, or shifting cultivation, is a complex agricultural system that is well adapted, under certain conditions, to the limitations of the environmental conditions in the tropics. It is a practice that depends on rotation of impermanent fields between short

¹ Terminology definition: The term *shifting* is used to describe the nonpermanent field use in which the agriculturist rotates his fields. The term *swidden* comes from the Old English dialect word for a “burned clearing”. Anthropologists who have studied shifting cultivation from an ethnographic point of view prefer the term *swidden*. (Peters and Neuenschwander, 1988). The term *slash-and-burn* is the most well-known terminology and has been used extensively to describe the cropping process, yet it is not preferred in most recent agroforestry and scientific literatures due to the negative connotations. All three terms will be used interchangeably in this section.

periods of cropping and longer periods of fallowing. It consists of a sequence of cultivation that involves clearing, burning, and cropping. Fields are generally rotated between relatively short periods of cropping (usually one to two years) and longer fallow periods, sometimes up to twenty years or more (Peters and Neuenschwander 1988).

Typically there are three types of fallows: forest fallow (20 to 25 years), bush fallow (6 to 10 years) and grass fallow (less than 5 years) (Altieri, 1995). In order to be successful, swidden cultivation requires an in-depth knowledge of the tropical environment and a high degree of managerial skill (Warner, 1991). Practitioners usually live in permanent villages and rotate the use of a fixed number of fields. Other groups move the entire village once the plots have been depleted by soil nutrient loss or converted to grasslands (Peters and Neuenschwander, 1988).

In terms of natural resource management, shifting cultivation can be defined as “a strategy of resource management in which fields are shifted in order to exploit the energy and nutrient capital of the natural vegetation-soil complex of the future site” (McGrath, 1987). The emphasis on strategy and agroecosystem dynamics makes shifting cultivation “neither a static nor necessarily stable system of agriculture” but one that is flexible in response to change (McGrath, 1987). This flexibility in response to change places swidden cultivation on a continuum that shows a shift from one agricultural system to another in response to non-static conditions (Beckerman, 1987; Boserup, 1965; Raintree and Warner, 1986).

Table 4.a
Boserup's theory of agricultural change (modified after an unpublished paper by P.Porter).

	Agricultural Stage				
	Forest fallow	Bush fallow	Short fallow	Annual cropping	Multi-cropping
Fallow Systems					
Duration of cropping	1-2 years	From 1-2 to 6-8 years	1-2 years	Yearly	2-3 years
Fallow period	20-25 years	6-10 years	1-2 years	Several months	Negligible
Fallow landscape	Forest	Bush	Grass	None	None
Agricultural techniques					
Agricultural tools	Digging stick, axe, fire	Hoe, axe, fire	Hoe, plough, draught animals	Mechanized equipment including tractors	Mechanized equipment including tractors
Fertilization methods	Ash <i>in situ</i>	Ash, supplemented by burnt or unburnt vegetable materials from outside	Manure from droppings of drought animals	Chemical fertilizers, green manuring, marling, composts, silt, ect.	Chemical fertilizers, green manuring, marling, composts, silt, ect.
Land improvements	None	None	Rare	Irrigation (in dry regions), terracing	Irrigation, terracing
Labour inputs	Few hours of irregular work		Pronounced seasonal peak		Long hours of regular daily work
<div style="text-align: center;"> ————— increasing amount per crop hectare —————> </div>					

Source: adapted from Datoo, B.A. 1978. Toward a reformulation of Boserup's theory of agricultural change, *Economic Geography* 54; Figure 1.

Table 4.a shows how the intensification of swidden cultivation, through the reduction of the fallow time frame will alter the type of swidden cultivation from that of a forest fallow to bush and short (or grass) fallow. Within these changes, the agricultural techniques, such as tools and fertilisers will change as well. For example, as the fields are used more intensely, the soil will not have the time to rejuvenate, and the farmers will have to supplement the soil's natural minerals with fertilisers.

According to Geertz, the most distinctive positive characteristic of swidden agriculture in ecological terms, is that "it is integrated into and, when genuinely adaptive, maintains the general structure of the pre-existing natural ecosystem into which it is projected" (Geertz,

1963). Swidden agriculture operates in a supernatant, plant-to-plant, direct cycling manner (Geertz, 1963). The burning of the slashed land is a means of both accelerating the process of decay and of directing that process so the nutrients it releases are channelled as fully as possible into the planted crop.

In choosing a method of land clearing, clearing using manual swidden techniques is both more economical and more ecologically appropriate than other methods such as bulldozing, which can seriously damage soil chemical and physical properties (Moran, 1987). In comparison with other methods of agriculture in the tropics, a proper and stable system of shifting cultivation may actually minimise long-term environmental degradation (Seubert et al., 1977). Projects for alternative techniques in agriculture have in many instances failed, leaving behind grassland where forests had been previously utilised by shifting cultivators (Warner, 1991). In these regions the traditional cultivators, by using local technical knowledge and natural resource management, had successfully cleared and burnt the forest, planted and harvested their crops, and the forest had re-established itself. As long as the economic conditions make shifting cultivation possible, it can be the ideal solution for agriculture in tropical areas (Andreae, 1980). Therefore, attempts to eliminate swidden agriculture may “inadvertently lead to disastrous ecological and social consequences” (Peters and Neuenschwander, 1988).

The Effect of Swidden Agriculture on the Soil and the Environment

Tropical rain forests are found in areas of the world with high temperatures and humidity. The dry season usually lasts less than four consecutive months and there exists a dense

cover of tropical forest vegetation (Moran, 1987: 69). However, there are significant differences between the soils of Latin America, Africa and Asia. For example, the soils in tropical South and Central America tend to have more of an acid, low-nutrient condition as compared to African or Asian tropics. Therefore, it is imperative when making assessments as to the fragility or risk of degradation that these differences be taken into account, instead of grouping these areas as if they represented the same kind of environmental risk (Moran, 1987: 70).

Soil Conditions

The unique physical and chemical characteristics of tropical soils can constrain the agricultural potential of tropical areas in different ways. Some soils may pose such serious constraints to cultivation that clearing them will contribute to soil degradation. These delicate soils should be protected from conversion. The major soil constraints in the tropical rain forests appear to be low nutrient reserves, aluminum toxicity, high phosphorus (P) fixation, acidic soils, soils on slopes above 30 percent, and areas of low effective cation exchange capacity (Moran, 1987). Therefore, these tropical soils are more easily robbed of their nutrients and require a longer fallow time to regenerate and regain its nitrogen level. The condition of the soil will greatly affect the type of agriculture that can be sustained on the land. Any deviation from this (e.g. not allowing enough time for the soil to regenerate or farming on too steep slopes) will cause soil degradation.

The Effect of Fire

The impact of slash-and-burn cultivation on the soil can be evaluated by looking at how forest soil nutrients are cycled in the tropical ecosystem (Ramakrishnan, 1992; Peters and Neuenschwander, 1988). The cycling is a reaction to the unique properties of tropical soils and the very high precipitation associated with the ecosystem of the rain forests. Burning has a number of important purposes in this cycle. Fire loosens the soil so that planting with a digging stick may be easier. It slows the re-growth rate of plants that would affect the cultivation of the crop. As well, burning produces a layer of ash that provides accessible nutrient for growing crops. After clear-cutting and burning, the ecosystem loses its ability to hold nutrients. The depletion of nutrients in the soil continues during the cropping phase, arising partly from crop removal and from hydrology (Ramakrishnan, 1992).

The Fallow Period

During the fallow period after cultivation, nutrients are accumulated in the topsoil biomass of the fallow vegetation (Peters and Neuenschwander, 1988). Nutrients are returned to the soil through rainwater, litter fall, timber fall and root decomposition. These returned nutrients are released when the fallow vegetation is burned to clear the land for the next cropping cycle (Altieri, 1995). However, since nutrient cycling is dependent on the type of soil and vegetation, soil productivity varies greatly. For example, because of the specific conditions of the land, climate and vegetation in north-eastern India the recovery period for soil nutrients (i.e. length of fallow regrowth) is

estimated to take about 10 years, any shorter cycles would be considered unsound (Ramakrishnan, 1992).

The differences in soil fertility and burning practices in tropical countries make it difficult to generalise about the impact of shifting cultivation on soil (Peters and Neuenschwander, 1988). When the amount of land available is abundant and populations are scarce, this method of agriculture is considered efficient and stable. Recent population pressures, pressures of poverty, and factors such as weed growth and declining soil fertility has led to the reduction of the fallow cycle in many systems from a more favourable 20 to 30 years to a period as short as five years. Too frequent burning (caused in part by the shortening of the fallow cycle) can prolong soil exposure and increases the potential for both short and long term erosion and nutrient depletion.

The swiddener also has an important role to play in the regeneration of the forest. Until recently the dominant view on fallows was that the swiddener 'abandoned' or 'just let nature take its course' to restore the swidden area. However, careful examination of some swidden activities in Asia and elsewhere has revealed active management in swidden fallows. Fallow management is used by some swiddeners to shape the species growing in the fallow fields. In some situations fruit trees are planted and protected by the swiddeners in order to enable the woody species to become reestablished in the swidden area (Uhl, 1983). The swiddener may actually manipulate the species in the fallow in order to assure the dominance of certain species. This manipulation of the swidden fallow with a "combination of annual crops, perennial tree crops, and natural forest regrowth" is

now recognised as a form of traditional or indigenous agroforestry (Devevan and Padoch, 1988).

A Harvestable Forest

Due to the unique features of swidden agriculture it has been described as a system in which “a natural forest is transformed into a *harvestable forest*” (Kampto Utomo, 1957). In a harvestable forest, the proportion of total system resources stored in living forms in the cycle and the closed-cover protection from direct impact of rain and sun, protects the swidden plot (when handled properly) from being converted into a ‘field’ or grassland. Instead it can be characterised as a miniaturised tropical forest, composed of ‘food-producing and other useful cultivates’ (Geertz, 1963). However, the equilibrium of this domesticated form of a forest system is much more delicate and unstable than the natural ‘undomesticated’ forest.

Under less than ideal conditions, the *harvestable forest* of swidden agriculture is highly susceptible to breakdown into an irreversible process of environmental deterioration. This degradation will ultimately lead to a pattern of change that leads not to repeated forest recuperation but to the creation of grasslands and permanent replacement of tree coverage. Most of the tropical rain forests of Southeast Asia have been converted into this savannah grass or what Geertz calls a ‘green desert’ (Geertz, 1963).

Swidden Agriculture's Role in Deforestation of the Tropics

The agricultural situation and environmental condition in tropical countries are changing rapidly. Increased population pressures, mass migration, unequal distribution of resources, inappropriate technologies, government policies and exploitation of tropical forests have directly affected the practice of shifting cultivation. As increasingly more tropical inhabitants turn out of necessity to an intensified version of this ancient agricultural system, its inherent sustainability is collapsing under these new pressures.

According to a survey conducted by Norman Myers, it is estimated that tropical deforestation rates were 120,800 km² per year in 1990.² Of this total amount, the commercial logger contributes 45,000 km² of deforestation per year (with 30,000 km² concentrated in South-East Asia). The cattle rancher, almost entirely confined to Central America and Amazonia, eliminates roughly 15,000 km² of forest land per year. Subsidiary factors, such as road building, mining, dam construction, and plantations, account for roughly 10,000 km² of land clearing a year. The remaining 65,000 km², over 50%, is attributed to the slash-and-burn farmer. However, this number is not exact and has not been documented with the same accuracy as the other factors of deforestation. Yet according to critics of slash-and-burn, even with the number as low as 60,000 km², shifting cultivation still accounts for as much deforestation as all other factors combined, and this rate is rapidly expanding.

² This estimate is derived largely from remote-sensing assessment. Found in N. Myers, *Deforestation Rates in Tropical Forests and Their Climatic Implications* (London: Friends of the Earth, 1989).

According to statistics such as those above, the share of deforestation caused by shifting cultivators is seen as high as 45% (UNEP, 1992) to over 60% (Myers, 1992). Thus, deforestation is hastily linked to shifting cultivators and earns them the label as the primary agents of deforestation (Myers, 1991). Statistics such as these are enough to throw the poor subsistence farmers into the forefront as the main destroyers of the environment. However, before the assumption is made that a major cause of environmental degradation is due to the traditional practice of swidden we must endeavour to understand the changing contexts within which this traditional system of agriculture occurs.

Many authors have critiqued swidden agriculture without appreciating that the presumed destructive nature of the practice is very recent in origin. Most attempts to control swidden agriculture and to replace the practice with more intensive sedentary systems have not been very successful (Atal, 1984). Development policies implemented without regard for, or knowledge of, the practice may actually worsen rather than reverse the environmental degradation (Little and Horowitz, 1987). Failure in these development policies is a result of an inadequate understanding of the logic of shifting cultivation and factors influencing farmers' decision making (Angelsen, 1995). To lay the blame on the poor as 'destroyers of the environment' is unproductive and does not address the root causes of the problem. What is needed is not an overgeneralised account of such a complex practice as swidden agriculture, but "an appreciation for this traditional system and a condemnation of its misuse" (Geertz, 1963).

Who are the Shifting Cultivators?

Myers and others focus much of their attention on poor peasants who are squeezed out of their traditional farmlands outside the tropical rain forests (Myers, 1991). This group includes displaced peasants and small farmer migrants that are attracted to the forests by the prospect of owning their own land. Some of these factors include expulsion from earlier frontier areas, the breakdown of traditional tenant and sharecropping relationships, the increasing mechanisation of agriculture, and the concentration of landownership (Schmink and Wood, 45). Some statistics place the poor settlers who migrate into the rain forests and practice slash-and-burn techniques as contributing up to 80 percent of the land clearing (Leonard, 1989: 23). This number is only an estimate and may be a little high since it does not distinguish between swidden agriculture that is sustainable and those practices which lead to soil degradation.

However, the broad classification of certain people as “shifting cultivators” is not always accurate. The category may often include a wide variety of people living in the forests - including indigenous agroforesters, traditional forest product extractors, and communities that combine long-fallow swidden farming with natural management (Brower, 1989). All these actors derive a subsistence livelihood from the use of relatively small areas of tropical forests. Not all people who live in the tropical rain forests are shifting cultivators and neither are they all poor (Leonard, 1989: 23). Many traditional people of the forest have developed other agricultural methods that are ecologically stable under low population densities.

In Asia, the long fallow shifting cultivators have traditionally been ethnic minorities with their own language, religion, values and, at times, crops. The government perception of swidden agriculture as a land use system is intensely and historically tied to the view of it being practised by those people considered “outside” the mainstream culture of the country (Warner, 1991). These outsiders are viewed by the governments as being ‘primitive’ because of their simpler, or different, material culture and thus are viewed as practising a ‘primitive’ agriculture that is wasteful of resources and damaging to the environment. Attempts have been made to stop their activities by governments and international organisations that perceive the shifting cultivators as carelessly destroying the natural resources of nations. Thus, government programs are often implemented in attempts to change these systems and integrate them with national ‘mainstream’ practices (Warner, 1991).

Traditional versus Pioneer Cultivators

The perception of shifting cultivation in Asia is further complicated by the fact that slash-and-burn is currently being used not just by the traditional tribal minorities. Now landless peasants and new frontier migrants have also adopted these agricultural techniques.³ Though statistics may combine these groups, all of these cultivators are not the same. These new entrants, unlike most traditional swiddeners, do not practice the sustainable form of shifting cultivation.

³ Norman Myers (1992) makes a parallel distinction between “shifting” cultivators and “shifted” cultivators, with the latter referring to those poor farmers that are squeezed out of traditional farmlands into unfamiliar forest ecosystems.

In reference to the millions of shifting cultivators in Asia, it is possible to distinguish and categorise certain groups. Traditional slash-and-burn cultivators usually practice *integral* swidden, a land use system based on “a more traditional, year-round, community-wide, largely self-contained, and ritually sanctioned way of life” (Warner, 1991). When the communities of integral, or traditional, swiddeners are well established, they are considered to be practising *established* integral swidden (Conklin, 1957). Unless faced with population pressure or other constraints, land is used only one to three years before it is left fallow for a period of up to twenty or more years (Weinstock and Sunito, 1989).

The landless peasants, on the other hand, are practising *partial* swidden, which rather than based on a traditional way of life, is a reflection of “predominantly only the economic interests of its participants” (Conklin, 1957). These ‘forest pioneers’ are defined as people “who may utilise slashing and burning of the existing vegetation but with the primary intention of establishing permanent or semi-permanent agriculture” often with cash crops as the primary focus (Weinstock and Sunito, 1989).

The landless or pioneer peasants who practice partial swidden are considered to have strong sociocultural ties outside the swidden area. Since their ties are outside the area of cultivation, their productivity and ownership goals are different than the integral or traditional swiddener (Warner, 1991). Partial swiddeners do not have any historical or cultural ties to the area, and thus, they do not constitute a part in a stable community. Their only purpose is to obtain a crop for a year or two before moving on. The land is cultivated continuously until total or near total exhaustion of the soil fertility since there

is no long term plan to return to the same site (Weinstock and Sunito, 1989). More often the partial swidders have permanent fields (usually in the valleys) for cultivating and use swidden (usually on the hillsides or forests) to supplement their permanent fields. Since swidden is not a major part of their activities, they have little prior knowledge of swidden techniques and may degrade the environment because they do not know enough of the forest ecosystem to do otherwise. Thus, the partial swiddener makes an *incipient* swidden, but does not have the knowledge to develop a sustainable swidden system (Conklin, 1957).

The two swidden systems, *integral* and *partial*, have very different impacts on the environment, therefore it is very helpful to make a distinction between these two groups. Usually when degradation of the tropical forests occurs, it is the pioneers with their lack of indigenous knowledge for managing the delicate ecosystem that cause the destruction (Olafson, 1981, Moran, 1987, Watters, 1971). An established community living for more than one generation in an area will have a far more accurate knowledge of the local environment than the 'dislocated' migrant who uses agricultural methods and knowledge from his area of origin rather than techniques more fitting for the new settlement (Warner, 1991, Moran, 1987).

Unfortunately, many governments do not make this distinction in their policies towards shifting cultivation. For example, the Indonesian government condemns "forest pioneer" cultivation (*perambahan hutan*) as environmentally destructive, but it does not differentiate this practice from that of shifting cultivation (Sunderlin and Resosudarmo,

1996). In Indonesia, “an ideological polarisation” exists in which government and environmental NGOs do not recognise that shifting cultivation exists on a farming system continuum ranging from traditional shifting cultivation (long fallows and long-term forest conservation) at one extreme, to ‘forest pioneer’ cultivation (often associated with long-term degradation and deforestation) at the opposite extreme (Sunderlin and Resosudarmo, 1996).

Environmental NGOs in Indonesia are polarised in their ideologies to the extent that they focus the majority of their attention on traditional shifting cultivation to the exclusion of less sustainable farming systems on the outer islands. Sunderlin and Resosudarmo suggest that these local NGOs may fear that acknowledging unsustainable smallholder farming systems will undermine their claim that people of the forest margin possess wisdom (*kearifan*) in forest management. However, the acknowledgement of different farming practices would not hamper their cause, but would highlight the complexity of rural social change and demonstrate their concern for misplaced forest pioneers who are as much victims in the process of rapid social change as are the traditional shifting cultivators (Sunderlin and Resosudarmo, 1996).

Other Actors in the Rain Forests

It would not be accurate to put the blame for deforestation solely on those settlers practising shifting cultivation in the rain forests. It is important to remember that there are other agricultural actors in the rain forests who clear the land. For example, permanent farmers, tea/coffee plantations, as well as cattle ranchers and fuel-wood gatherers all

contribute to the deforestation problem (Garland, 1987). Attributing so much destruction to the slash-and-burn agriculturists is misleading, since the poor settlers may initially clear the forest, but in most situations the groups ultimately benefiting are the large landholders and companies who buy up small tracts of cleared or abandoned land and take advantage of state subsidies for cattle ranching (Leonard, 1989).

When Swidden Agriculture goes wrong

Traditional shifting cultivation is not necessarily destructive to the forests or contributive to soil degradation, but the situation may be changing. When a community puts sufficient strain on the carrying capacity of its resource base, the society can be reduced to a bare subsistence level, a process termed *agricultural involution*. (Geertz, 1963; Wallace, 1990). The trouble lies not with the practice of shifting cultivation so much as with certain social, economic and political conditions. For many tropical forest countries, addressing destructive agricultural practices is presently a serious concern. However, shifting cultivation is one practice that will not disappear in the near future, even *if* it was seen as desirable for it to do so. Either way, a thorough understanding of the complex socio-economic and political systems must precede any changes, if these changes are to safeguard against further environmental degradation.

Swidden cultivation can become unsuitable in a number of ways. First, an increase in population, through demographics, migration or colonisation, can increase the intensity of land use and cause old plots to be re-cultivated too soon. Second, reckless or inept agricultural practices can sacrifice future prospects for short term convenience. And

third, encroachment by migrants into eco-systems with insufficiently humid environments may be detrimental because these forests have a much slower recovery rate and burning may not be as easily controlled.

Population pressures on Swidden cultivation

Lands under shifting cultivation have traditionally supported populations of fewer than twenty persons per square mile (Nye and Greenland, 1960). At this level of population density, the traditional practice and the environment are in apparent equilibrium. However, the population explosion of the last century has affected this delicate balance (Peters and Neuenschwander, 1988). The population pressure causes land scarcity, through less arable land per capita, which brings about shortening of the very important fallow period (Ramakrishnan, 1992). Many areas that would previously have been left on a ten-to-twenty year fallow cycle now lie idle for only three or four years before re-cultivation. This shortening of the fallow cycle does not allow the soils and vegetation time to recover to pre-cultivation conditions (Myers, 1980).

According to Boserup's theory on agricultural change, it is the possibility of a 'Malthusian crisis' of overpopulation that will stimulate a change in agricultural technology and create a higher level of sustainable output from a constant resource base (Boserup, 1965; Wallace, 1990). An increase in population will result in an intensified land use, resulting in increased cropping frequency and a reduced fallow period. This increase in productivity will require a rising level of labour inputs to modify crop production (Wallace, 1990). According to Boserup's theory, this increased productivity

will affect the socio-economic structure of the community, influencing land tenure, transportation networks, division of labour and socio-political organisations. (Table 4.b)

Table 4.b
Boserup's theory of agricultural stages (modified from an unpublished paper by P. Porter)

	Agricultural Stage				
	Forest fallow	Bush fallow	Short fallow	Annual cropping	Multi-cropping
Socio-economic structures					
Land tenure	General right to cultivate land, no permanent occupation of plots	Specific right to cultivate a given plot subject to authority	Individual usufructory tenure, pledging to retain control	Peasant ownership, small farms (freehold)	Permanent ownership
	— redistribution of land becomes less frequent —————→				
Settlement form and transport network	Unstable, dispersed settlements; trails	Stable and larger settlements	Permanent settlements; roads	Urbanized to some extent	More intensive urbanization; more feeder roads
	— increasing efficiency of road network —————→				
Division of labour and exchange	rudimentary	Some division of labour; village markets with part-time artisans	Some professional artisans and traders	Long work hours, greater division of labour, landless/wage labourer group	Long work hours, greater division of labour, outmigration
Social and political organization	No central authority	A little more central authority	Differentiated forms of social organization; domain over people	Differentiated forms of social organization; domain over land	Shift of power to (remote) urban centre

Source: adapted from Datoo, B.A. 1978. Toward a reformulation of Boserup's theory of agricultural change, *Economic Geography* 54; Figure 1.

However, there are ecological limits to the amount any given tract of land can be used for more intensified production. In addition, there are many other land-use pressures that farmers must contend with besides an increase in the population/resource ratio. For example, most villagers must earn a cash income in order to buy non-local products. This need necessitates the commitment of some land for cash crops at the expense of staple products (Wallace, 1990). Wallace, thus, states that it is premature to argue that Malthus' pessimistic conclusions on population growth are totally invalidated en route to increased productivity as outlined by Boserup. In extremely stressed environments, larger

populations in combination with ecological and socio-economic factors may lead away from increased productivity and move the community towards *agricultural involution*.

Swidden cultivation is affected not only by an increase in the rate of population growth, but also through an increase in rural population by migration. The International Union for the Scientific Study of Population (IUSSP) states that “the already existing population pressure can be aggravated by the ... movement of urban migrants to the already crowded agricultural sector because of the sagging national and urban economy” (Mertens, 1994: 16). The study emphasises that even though population pressure can play an important role in turning traditional agricultural techniques into unsustainable practices, it is more important to look at the effect of government migration policies and the lack of opportunities for employment in the urban and other sectors of the economy. The IUSSP report states that population dynamics on the national or regional level along with other societal changes could contribute to institutional disruptions and rapid migration into the forests (Mertens, 1994: 15). This migration can cause the breakdown of community institutions for managing the forests.

The IUSSP concludes that the driving force behind extensive deforestation is the disruption of social, cultural, and productive institutions that provides the cohesion for rural societies that practice traditional slash-and-burn techniques (Mertens, 1994). For example, the report states that in Indonesia about half of deforestation is estimated to be due to the small-scale swidden cultivators. Another 25-30 percent is attributed to estate development and development projects which include transmigration settlement. In

addition, loggers will displace small landholders to more marginal areas, causing further encroachment on the forests. Indeed, even if strong population growth is present, the automatic conclusion should not be that population growth (alone) will cause deforestation (IUSSP, 1994: 17).

According to De Janvry and Garcia, the rural over-population dilemma is a 'formal and not real' problem. Land scarcity (less arable land per capita) is caused not by the overall size of the population, but by structural conditions of land tenure, resource distribution and socio-economic forces that restrict employment creation (De Janvry and Garcia, 1992). Highly unequal and rigid land tenure systems are environmentally detrimental because they force peasants into marginal ecological areas where sustainable farming is virtually infeasible (De Janvry and Garcia, 1992). According to Garland, socio-economic factors that lead settlers to engage in destructive agricultural practices include the composition of the household production unit over time, the decisions that households make regarding the hiring of wage labour, and the relationship between current agricultural prices and household production costs (Garland, 1987). In sum, to fully understand why settlers in the frontier lands frequently engage in unsustainable agriculture requires examination of issues concerning resource constraints imposed by the larger socio-economic context.

Economic and Political Factors Affecting Swidden Cultivation

Immense amounts of deforestation can also be attributed to economic policies that encourage the agricultural and demographic migration to the frontier lands. Frontier lands

refers to tropical rain forests areas that are relatively “uninhabited”. However, the term “uninhabited” is misleading since many indigenous peoples can often be found in these areas as well. Government planned migration policies and development policies have often led to clashes between migrants and the indigenous groups of that area. One such example is the transmigration policy of the Indonesian government into Kalimantan that has resulted in clashes with the indigenous peoples who occupy the rain forests. Other Indonesian government programs, such as timber concessions, have resulted in conflicts when the timber companies survey the land designated for the concessions and find the forests filled with inhabitants.

In addition, road construction policies implemented without changing the productive conditions of the poor migrants can create a pattern of migratory agriculture leading to deforestation and soil degradation. For example, an active road building policy towards and within the Peruvian Amazon led to mass migration of peasants who brought with them agricultural practices into regions not suitable for their type of traditional shifting agriculture. These inappropriate agricultural practices of migrants on unsuitable soils are considered to be directly responsible for the intensification and degradation of the rain forests (Garland, 1987; De Janvry and Garcia, 1992). The construction of major roads into the rain forests has been one of the principal causes of settlement in the so-called ‘protected forest lands’ (Mertens, 1994: 22).⁴

⁴ Protected forest lands are those delicate lands in which agricultural practices would be detrimental and unsustainable, and thus, should be under protection from settlement.

Road building is not the only condition that increases migration to frontier lands. Much of the migration is spontaneous and occurs as a symptom of the development failure in the country as a whole. The control of massive migration shifts to the frontier lands can only be addressed by attempts of re-distributive land reform, rural development, and employment creation in the rest of the economy (De Janvry and Garcia, 1992, 40). One of the main causes of both soil degradation and migration to frontier lands is the insufficient access to land and other 'productive assets (such as credit and agricultural equipment). Re-distributive land reform remains a key pre-condition to successful rural development and to ecological stabilisation (De Janvry and Garcia, 1992, 39). Granting squatters and landless peasants' land titling allows them the incentive and security needed to invest in soil conservation methods. The FAO study on local community development states that farmers' long-term interest and investment in the quality of their land may depend on the amount of direct influence they have on its management and use (FAO, 1978). However, even favourable land tenure will be unable to stop soil degradation if population pressure and scarcity of arable land impede sufficient fallow periods (Peters and Neuenschwander, 1988).

National governments have also played a major role in increasing the population of the tropics through their policies of planned colonisation schemes (Leonard, 1989; De Janvry and Garcia, 1992; Hecht, 1985; Arizpe et al., 1996). Tropical forests were seen as the 'safety valves' for countries facing a rising rate of landlessness because of overpopulation in arable areas (Indonesia); limited urban ability to absorb people displaced by agricultural modernisation (Brazil); or huge inequitable distribution of other agricultural

lands (Central America).⁵ By this method, the governments could release social and political pressures of land shortage and poverty in the rest of the economy. These poor new settlers, often without further government support programs, pose a far greater threat to the balance of the eco-system of the tropical forests than the traditional swidden agriculturalists of the forests.⁶ Since planned colonisation schemes create such serious ecological destruction and conflict with the original ethnic populations, one policy option is to severely curtail their use (De Janvry and Garcia, 1992). Areas where the ecological conditions are suitable for colonisation need to be clearly identified and zoned, and delicate areas designated forest reserves and protected from settlement.

Socio-Cultural Properties of Swidden that Affects Sustainability

Not all swidden agriculturalists are the same, nor do they all practice sustainable agriculture. Wasteful or inappropriate methods that are destructive to the long run equilibrium of swidden agriculture 'underscores the wide variation in proficiency that different groups of shifting cultivators operate in' (Geertz, 1963). However, overgeneralisation allows critics to group all swidden agriculturalists under the same banner as practitioners of 'destructive agricultural practices' without consideration of the real causes or acknowledgement of the differences within the grouping. In this manner, "gross generalisations can lead to intolerance" for the practice of slash-and-burn agriculture (Peters and Neuenschwander, 1988).

⁵ Leonard, Jeffrey. 1989. *Environment and the Poor: Development strategies for a Common Agenda*.

⁶ For example, the million poor migrants who moved into Rondonia Brazil through the Polonoreste Project simply did not receive the economic and physical infrastructure necessary to move beyond subsistence agriculture. They continued to practice destructive agricultural techniques that depleted the delicate soil fertility of the region which in turn forced them to encroach further into the rain forests and on to more fragile lands incapable to support both their system of swidden agriculture and their increasing numbers.

However, these differences in swidden activities demonstrates that cultural, social, and psychological factors are as important as environmental conditions in determining the stability and adaptability of this traditional practice (Geertz, 1963). For example, research done by Freeman (1955) showed how the *Iban* of Indonesia, while being below the maximum population density for their area, seriously over-cultivated the land due to certain sociological and cultural beliefs.⁷ For other groups, like the *Pwo Karen* of northern Thailand, land is regarded in their social culture as scarce and thus there are large attempts to preserve the lands' long-term productivity (Peters and Neuenschwander, 1988).

The sociology of modern swidden techniques varies greatly between different groups. These divergences result because swidden agricultural systems do not evolve at the same rate among different groups within distinct tropical environments. The differences in practices reflect the interrelationship between the physical and the cultural environments. These differing social perceptions towards deforestation can affect people's attitudes towards agriculture and conservation. Social perception can lead to the desire to restore the balance between the *ecosystem* and the *sociosystem* (Arizpe et al, 1996).

Religion is one such socio-cultural factor that influences the techniques used in swidden agriculture. Religious aspects of swidden burning usually appear in the rituals and

⁷ According to the study by Freedman, the reasons for their over-cultivation included a "historically rooted conviction that there were always other forests to conquer, a warrior's view of natural resources as plunder to be exploited, a large village settlement pattern which makes shifting between plots a more than usually onerous task, and a superior indifference toward agricultural proficiency" (Geertz, 1963).

ceremonies that accompany the burning process. The religious systems of many shifting cultivators include certain obligations and taboos towards their respective environments, which in turn affect the techniques used in swidden cultivation (Peters and Neuenschwander, 1988). Certain taboos may forbid a cultivator from burning his field before the others in his community or outline specific techniques he must use in the burning process. Supernatural aspects such as magic, rituals, rites and appeals to the gods express the villagers' concern about the commencement of the rainy season, when to begin the burning process, or answers to questions regarding a bountiful harvest.

Ecological Factors' Effect on Swidden

There are ecological factors that affect the development of swidden practices. One factor that affects the sustainability of swidden agriculture is the climatic conditions under which the shifting cultivator operates. Drier woodlands burn with greater ease and uncontrollability, especially when fanned by strong winds that are common in the rain forests. These factors increase the danger of deterioration of the forest into grasslands or scrub savannahs. If these factors are not compensated by the local practitioners, then in time what was once a pristine rain forest can be eroded to an almost desert-like state (Geertz, 1963). According to Geertz, "the delicacy of swidden equilibrium increases at equal pace with this transition toward a more subtropical environment because of the steadily diminishing power of the natural community rapidly to reconstitute itself after human interference" (Geertz, 1963). Thus, the climate can set critical limits within which swidden agriculture can be practised, adapted, and maintain its sustainability.

Indonesia's policies towards Swidden Cultivation

As stated previously, traditional swidden cultivation has the misfortune of being one of the most maligned systems of agriculture in the world. Slash-and-burn is afforded the antipathy of the Indonesian government, which affects its attitude and related policies regarding the system's continued survival. The reason for the mistrust in shifting cultivation may resonate from the inability of the government to control the activities of indigenous swiddeners living in the margins of its society.

Correspondingly, the forest policy and programming in Indonesia is marked by the absence of appreciation, or lack of understanding, for this traditional system. The Indonesian government's attitude towards swidden agriculture is clearly demonstrated in its various policies regarding the outer islands' forests. These policies are based on the official perception that all forested lands are *tanah negara* "federal lands" as stated in the 1960 *Undang-Undang Pokok Agraria*, "Basic Agrarian Laws" (Dove, 1985). The main goals for development of the forests in the outer islands consist of primarily export oriented lumber production, and secondarily, conservation of nature, and socio-economic development of the local people. However, the Indonesian government sees these goals as being threatened by the dominant system of swidden agriculture practised by indigenous people in Indonesian's outer islands (Dove, 1985).

The government's criticism of shifting cultivation revolves around, not only the effect swidden has on the environment, but also a criticism of the people who carry on this system. The government states that swidden cultivators are still living *secara berpindah-*

pindah dan terpencar-pencar “in a nomadic and scattered manner” (Republic Indonesia, 1983: 37, 55). It also questions whether this system of agriculture can be considered a system of agriculture at all, since it is “technologically poor and intellectually unprepossessing” (Ombo, 1981). The government’s criticism lies also in the fact that swidden cultivation does not offer the potential profits that would be available to the government under other types of forest activities, such as industrial timber production.

The government’s perception of swidden agriculture is used to justify a number of programs. For example, it instigated programs to promote more sedentary and intensive systems of agriculture. In situations where indigenous swidden cultivators are found to be close to hydroelectric projects or industrial logging concessions, there are many cases of the government removing and resettling the swiddeners. Projects and programs to address the perceived problems of shifting cultivation began in the early 1970s. For the Indonesian government, the goal was to minimise the adverse effects of shifting cultivation by introducing perennial crops (such as timber or fruit trees for sale in markets) to replace the fallow vegetation, and by introducing alternative soil conservation techniques (Kartasubrata, 1993).

There are six different ministries involved in attempts to change swidden cultivation in the outer islands. The Ministry of Forestry has three programs that impact on shifting cultivation: (1) a program to control shifting cultivation (through resettlement), (2) a village development program (introducing reforestation programs), and (3) a social forestry program (introducing forest plantations and sedentary subsistence dry farming).

The Ministry of Agriculture has projects to integrate people living in villages near agricultural estates (estate cropping) into those activities by offering technical assistance to establish estate crops for export markets. The Ministry of Transmigration has programs to remove the people from the forest and resettles them in transmigration project sites.

The Ministry of Social Affairs targets people who live in “isolated societies” and attempts to integrate these people into the regional and provincial market economies through the development of sedentary production crops. And finally, the Ministry of Home Affairs has its own resettlement program which resettles people from scattered and isolated villages (usually shifting cultivators) to more easily accessible locations that conform to the standard criteria set by the Indonesian government for village size, local administrative structure, education, and agricultural intensification programs (Kartasubrata, 1993). All of these programs have one thing in common, the determination of the Indonesian government to move shifting cultivators out of their traditional environments and force them to more intensified agricultural systems. Yet, most programs lack a consideration for the sociological and cultural diversities that exist in the outer islands, and a true understanding of traditional and sustainable swidden cultivation.

Conclusion

The ability of swidden agriculture to provide a livelihood for stable populations for thousands of years without excessive environmental degradation is indicative of its inherent sustainability. Natural processes such as nutrient accumulation in the fallow cycle and the accelerated nutrient release during the burning stage assures the balance of

the system. When the fallow period is sufficiently long and burning is contained within the swidden plot, its ecological impact is minor in comparison with other farming techniques. Thus, Andreae's statement that shifting cultivation is the ideal solution for agriculture under tropical conditions seems applicable. Increasingly, however, environmental organisations and governments, who may be uninformed and misunderstand this ancient system, label this traditional practice as the "greatest obstacle to agricultural production and environmental conservation in the tropics" (Peters and Neuenschwander, 1988). Examining certain economic, social, and political factors that have contributed to undermining this delicate balance in swidden agriculture reveals the dichotomy of this situation.

Increasing population pressure, land scarcity, and accelerated competition with other forms of land use have forced traditional swidden agriculturalists to alter their traditional techniques. In some instances, these forces have led the swiddeners down the continuum of agricultural change, towards an intensification of sustainable agriculture, while in other situations the swiddeners began practising unsustainable methods. These same population and economic pressures have forced many other non-traditional practitioners to take up the practice of intensive swidden cultivation in unsuitable areas.

The growing degradation has been greatly compounded by government migration policies and the construction of roads, opening up what were once inaccessible areas to settlement. The subsequent conversion and degradation of the environment is a result of

“the abuse of the traditional system, not the inevitable outcome of its rational implementation” (Peters and Neuenschwander, 1988: 79).

Attempting to eliminate shifting cultivation without regard for its complex nature is treating symptoms instead of causes. Slash-and-burn techniques are not only part of the physical and biological aspects of the land, but based on the integral part of the social, economic, and often religious life of the people. To be fully effective forest management programs in tropical countries must address each of these aspects. However, without addressing the problems of overpopulation and economic deprivation, malpractice in shifting cultivation is inevitable as the landless poor resort to unsustainable swidden out of a pure necessity of survival.

Chapter Five ~ The Amarasi Model

An Example of Indigenous Natural Resource Management

Introduction

As a result of certain external forces, like population growth and decrease in available farmland, the fallow period in many agricultural systems has decreased significantly. The decrease in the fallow time frame could eventually lead to an ever increasing land degradation problem leading to a decrease in productivity per unit land and per unit labour. This negative scenario is just one possibility in the downward spiral of land degradation and forest depletion. One possible alternative to this syndrome is the *Amarasi system* created in the Amarasi sub-district of eastern Indonesia.

The Amarasi model is an agricultural system that incorporates an intensified swidden system of managed fallows in combination with intensified animal husbandry. On an agroforestry front, it exemplifies a shift from subsistent shifting (slash and burn) cultivation towards an intensified agricultural system in which cattle fattening constitutes the basis of the local economy. In terms of institutional evolution, the Amarasi model illustrates how traditional problem-solving techniques in agro-ecology and socio-economy can be utilised to shape indigenous institutions in order to cope with agro-ecological problems (Djogo, 1995).

This case study examines indigenous strategies in dealing with declining soil fertility in swidden agricultural systems. It examines farmers' choices and why they adopt certain technologies. The chapter outlines the evolutionary process of the institutions and community based rules and regulations that guided the creation of the present agricultural

system in Amarasi. There are four issues that are addressed in this case study. The first issue examines how community based rules were formed, passed and enforced. Second, it looks at how the community accepts these new rules and changes to their livelihoods. The third issue examines how the communities modelled their institutions in order to assist them in solving certain resource management problems. And finally, it investigates the people's objectives and constraints in dealing with these changes in their social, economic and environmental conditions.

Figure 1 is a graphical portrayal of the agricultural evolution in Amarasi from a tropical forest ecosystem to an agroforestry model based on cattle fattening and *leucaena*. At each stage of evolution there are socio-economic and political factors that influenced farmers choices which affected the developmental path of the system. This chapter explores some of these external forces and the influences they have on the continuation of the system.

Methodology

The methodology for the research included two months of fieldwork on the island of West Timor, in Eastern Indonesia. At the local village level, primary data collection consisted of informal interviews with a wide gamut of local players. This spectrum included farmers, religious leaders, local village-level government, elders, ex-government officials, social and informal leaders, and local non-governmental organisations (NGOs). The types of questions asked for each individual group changed in accordance with the specific roles the people played in the socio-economic fabric of the village. (See Appendix A for an outline of questions asked).

Figure 1

Graph designed with the assistance of Tonny Djogo.

Interviews ranged from one on one conversations in the farmers' fields to organised group discussions in their homes. Each village was informed by the village local leader of the research being carried out by myself, ICRAF and the *Politeknik University*. Besides my two research assistants from the *Politeknik University*, the village leader, his secretariat, or the local village elder accompanied me during my interviews.

Visiting these sites provided opportunities for informal discussions concerning local farming practices, traditional adat regulations, changes in indigenous informal institutions, and problems and possibilities for improvement of their farming system. Living with local farmers gave many opportunities for more lengthy discussions with the families during their regular household activities.

Government officials at the district, regional and provincial levels were also interviewed through the informal interview process. The government departments most concentrated on for this research paper consisted of the animal husbandry departments, forestry departments, agricultural departments, and the departments of statistics. All interviews were conducted with the help of my local research assistants and translator.

Secondary data collection was used to obtain a more thorough picture of the historical context of the Amarasi model. As well, government documents were used for a more in-depth picture into the Indonesian government's stance on shifting cultivation. Due to the great interest afforded to the Amarasi system in the early and mid 1980's there exists a number of useful references that helped guide my way.

Research in Amarasi

Due to constraints of time and limited manpower, four villages out of a possible sixteen in Amarasi were chosen as sites to be more closely investigated. The four villages visited were Ponain, Oenoni, Toobaun, and Teunbaun. Each village was picked for its distinguishing characteristics and together they were used to obtain a comprehensive picture of the Amarasi model and the slight differentiations between villages practising shifting cultivation.

The village of Teunbaun is located in the western part of Amarasi and comprises of 5 hamlets, which include Baun, the ancient capital of the Amarasi Kingdom. It is in Baun where the Dutch administrators and the local ruler, Raja Koroh, set out to introduce the new agroforestry model. For the local people it is considered the 'birthplace' of the Amarasi System. To the east of Teunbaun lies the desa (village) Toobaun. Toobaun is much larger in area but less populated than its neighbour Teunbaun. The density of Teunbaun is one of the highest in Amarasi, with 124 people/sq. km, whereas Toobaun is one of the lowest, at 29 people/sq. km. The other two villages visited, Ponain and Oenoni, fall in between this density range at 87 people/sq. km and 46 people/sq. km respectively.

Ponain and Oenoni are situated in the north central part of Amarasi. Oenoni, with the lowest population density, has the highest number of cattle in Amarasi, at 1365 head of cattle, compared to that of Teunbaun the most populated village, which has the least

number of cattle at 300 head of cattle. The major difference between these sites is the type of secondary income generated alongside of cattle fattening. For residents of Teunbaun and Toobaun their major income is derived from the sale of cattle plus that of fruits such as coconuts and banana, while the locals of Ponain and Oenoni state that corn and cattle are their main income generating activities. This report will delve into the possible explanations of these differences.

Setting the Background

The Amarasi sub-district lies in the southwest tip of the island of West Timor located in the province of Nusa Tenggara Timur (NTT) in eastern Indonesia. Amarasi occupies a stretch of land 10-25 km in width and 65 km in length on the southern coast of Western Timor. It has an undulating terrain with an average elevation of 300 m, with a few hills ranging in height of 500 to 600 m. (See following page for maps of Indonesia and Amarasi.)

Nusa Tenggara Timur is one of the driest provinces of Indonesia and is extremely influenced by the climatic conditions of Australia. The area is characterised by a semi-arid climate with a short wet season and a long hot dry season. The monsoons from the Northeast frequently lose most of their moisture before reaching the island, resulting in low and erratic rainfall. During the dry season, Timor is affected by dry hot winds that blow over from the Australian desert.

Indonesia **Amarasi**

Timor Island – District Boundaries

Amarasi – Village Boundaries

The island is composed of uplifted coral reef, with rocky soils and thin topsoil. Due to heavy rains at the start of the short wet season (from November-December to March-April), natural erosion can be quite severe, resulting in a loss of much of the vegetation cover over the long dry season (usually from April-May to October-November). The vegetation of the island, prior to extensive agriculture, was predominantly dense monsoon forest. However, during the late 1800s and early 1900s factors such as increasing human population, intensification of swidden agriculture, increases in domestic livestock and expansion of grasslands led to an accelerated loss of the natural vegetation and extensive land degradation in the area (Piggin, 1997).

Most of the forest has been cut from the mountain areas by decades of slash and burn cropping. Presently, natural forests exist only at the highest elevations of Timor, most of which are considered protected state forests or too steep of slope to be used for cultivation. The vegetation on the island changed from natural forests to more weedy and shrubby savannahs. Floods and erosion have become more common and streams dry quickly after rainfall because of the lack of vegetation to catch and hold moisture (Piggin and Parera, 1993).

These ecological changes affected the agricultural structure on the island. While some perennial vegetation can establish directly on limestone, annual crops such as maize became increasingly limited to minimal soil. Most of the agricultural crops in NTT consist of slash and burn cultivation of corn, peanut, cassava, and pumpkin. However, because of the extensive grass savannahs that replaced the original dense monsoon

forests, the regeneration of soil productivity became much slower. By the early 1930s, crop yields began to decrease significantly, resulting in what the local population designated as a seasonal “starvation period”.

The devastation caused by the seasonal occurrence of famine led to the introduction of an approach to stabilise the agro-ecosystem. This approach has been labelled as the “Amarasi Model”. According to Metzner, the Amarasi System is a well illustrative case of a “successful autochthonous (indigenous) approach to stabilising an agro-ecosystem in the wet-and-dry tropics” (Metzner, 1983). There are two conditions that guaranteed the success of the Amarasi model. One condition was an ecological change in the region caused by the introduction of two non-endemic plants: *Lanatana camara* and *Leucaena leucocephala*. The second condition was the great influence and authority of the local traditional leader of adat (local customary law) who maintained a large amount of discipline among the peoples of Amarasi (Metzner, 1983). The people’s allegiance to their Raja (local ruler) in the ancient Kingdom of Amarasi was essential in the development of the agroforestry model.

The history of Amarasi

In 1912, under Dutch encouragement and the local Raja’s support, Bali cattle were introduced into the area. The aim of the policy was to motivate the local population towards a system of commercial cattle farming. This introduction, however, did little to provide adequate sustenance for the starving population, nor did it solve the plight of the poor farmers. One reason for the partial failure of the policy falls on the fact that the

livestock were not given to the masses but instead were distributed to the ruling elite. The Dutch distributed the cattle to the rulers and heads of villages in order to propagate the export of cattle to more populated islands like Java and Bali. However, this action increased the already heavily skewed social distribution of livestock in Timor. The small amount of livestock owned by the local people (horses, water buffaloes) was used mainly for ritual and social purposes. Therefore the local people did not initially benefit from the introduction of Bali cattle.

The number of cattle in the area increased tremendously, at the expense of other large livestock such as water buffaloes. By the early 1950's, Ormeling reported that "on Timor large [cattle] herds are the rule, individual possessions even amounting to thousands." Like many large cattle owners in Timor, the large cattle owners of Amarasi practised a system of free-grazing that required little labour and allowed Amarasi cattle-owners to carry herds of cattle ranging from 50 to 100. During that time, the majority of the cattle population was concentrated in the hands of 2-5% of the population in Amarasi.

The grazing practices of large cattle herds by the ruling Timorese elite increasingly forced the local population to fence in their lands to protect it against free-ranging cattle. Cattle owners were able to exploit the common land at the expense of the swidden agriculturists and push the farmers onto smaller portions of agricultural lands and degrade the common land through over grazing. This combination of over grazing and the extension of swidden agriculture due to increased population and reduced fallow periods

led to decreased soil fertility, erosion, forest depletion, and the continued spread of grasslands.

The introduction of Bali cattle into the region had an unforeseen ecological consequence on the ecosystem and resulted in the unintended introduction of the exotic species *lantana camara*. *Lantana camara* is a woody plant species that began spreading throughout the region in 1912 and was probably introduced as a pot plant or was transported with cattle to Kupang. The ecological structure of Timor changed drastically with the spread of this bushy shrub and by 1949 the weed covered roughly 80% of the Amarasi area (Omerling, 1955).

There is some debate as to the usefulness of the species. To the local animal grazers, this species was considered a weed because of its aggressive nature and domination of grasslands intended for cattle grazing. For the shifting cultivators, *lantana camara* was useful as a fallow species to provide rapid soil cover and reduced the fallow period from roughly 15 years to 5-6 years (Ormeling, 1955). The combined effects of intensified cattle grazing and the spread of the weed *lantana camara* resulted in reduced forest regeneration and placed increasing pressures on grasslands for grazing.

Since *lantana camara* is unsuitable for fodder, the spread of the plant greatly reduced the possibility for grazing and resulted in a dramatic reduction in the numbers of livestock. To overcome these problems, the Dutch colonial government, under pressure from influential cattle owners, began policies to introduce new agroforestry models into the

area. An agroforestry model was presented to hamper the spread of *lantana* which appeared to jeopardise the commercialisation of livestock raising in Timor (Metzner, 1983). The agroforestry system used in the province of Nusa Tenggara Timur was the introduction of *leucaena leucocephala* as a fallow species and fodder for cattle fattening.

The new system began in 1930 at the western tip of the Amarasi kingdom, at the old capital called Baun, and slowly moved eastward through Amarasi. The village of Baun was chosen as the site to introduce the new species *leucaena leucocephala* (locally called lamtoro), not only because of its proximity to the residence of the Raja, but because of its densely populated area and highly degraded landscape. The first seeds of *leucaena* were dispensed to the Raja and his advisors, the Temukungs, in order to grow seedlings and distribute these seedlings to the farmers in the district.

Introduction of Leucaena leucocephala (Lamtoro)

The introduction of the tree species *leucaena* drastically changed the economic and ecological base of Amarasi. *Leucaena leucocephala* is a tropical tree with a variety of uses. Under optimal growing conditions this tree species yields one of the highest annual amounts of wood ever recorded. Due to the large quantity and quality of forage, many livestock owners use *leucaena* as fodder to obtain the highest weight gains of cattle in the tropics. *Leucaena* is also used to revegetate hillsides, and as a provision for windbreaks, firebreaks, and shade.

Leucaena's ability to thrive on poor soils and in areas with long dry seasons made it a good candidate for restoring the forest cover in Timor. Due to its aggressive behaviour, it can compete vigorously with coarse grasses, such as *lantana camara*, which was rampant in Amarasi. Through natural leaf litter, *leucaena* enriches and fertilises the soil. Its foliage is extremely high in nitrogen content and comparable to that of manure or inorganic fertilisers. *Leucaena*'s ability to restore soil fertility can be very beneficial in swidden cultivation, since a crop of *leucaena* greatly reduces the fallow period needed between crops.

In Amarasi, *Leucaena* was used as a conservation method to rejuvenate the soil fertility and to combat the fast growing weed *lantana camara*. The new exotic species was initially planted as hedgerows and used as a fallow rotation for corn and as fodder for tethered cattle. The local authorities created *adat* (customary) laws to direct the farmers to plant the *leucaena* every 3 meters and alternate it with cassava. However, due to a number of factors, the lack of careful attention by farmers and the aggressiveness of the species, *leucaena* slowly grew out of the hedgerows and formed forests of *leucaena*.

In order to guarantee the planting of *leucaena* in the early stages of the system, the Raja, in accordance with his local council, instigated *adat* laws to control and ensure success of the new technology. One such *adat* stated that cultivators could not open new lands before lamtoro had been planted on the land they were leaving fallow. Another *adat* stated that before farmers could plant corn on a new plot they were obliged to seed the new area with *leucaena*. This ensured that every field farmers abandoned and every new

field farmers wished to open would have been seeded with *leucaena*. Hefty fines and punishment ranging from lashes to jail time were instigated in order to ensure compliance. This system of fines and punishments continued until the majority of the land was covered in *leucaena*. According the Metzner, without these series of supportive measures, such as adat and land use zoning (discussed below), this geo-ecological change would have been impossible (Metzner, 1983).

Changing the socio-economic structure of Amarasi

The introduction of lamtoro also had effects on the social structure in Amarasi. It affected the nomadic nature of shifting cultivation practices by increasing the farmers' dependency on the fallow species in order to support their main income generating activity, cattle fattening. This change in the nomadic nature of the people necessitated the change in the social structure and cultural institutions of the community. Socio-economic structures such as individual's usufructory tenure over land or the change to permanent settlements, road creation, and creation of markets for cattle sales all were affected by the shift to more intensified agriculture and managed fallows. Adat laws were generated to enforce this agricultural shift and the people accepted the new laws without much resistance. Social and political organisation were altered to fit these new customary laws.

The use of lamtoro led to the creation of adat laws to secure not only the planting of the species but also its protection from free-grazing cattle. Due to the cattle's voracity for the young leaves of the *leucaena* tree, the traditional method of free grazing became unsupportable with the planting of lamtoro. Adat laws were created in order to protect the

seedlings of *leucaena* from roaming cattle by way of new land use zoning laws and to enforce a new system of cut and carry method for cattle fattening.

The cut and carry method promoted by adat had a lasting effect not only on changing the agricultural system, but also greatly influenced the socio-economic condition in Amarasi. The labour intensity required for the cut and carry method, along with the regulating adat laws, led to the egalitarian distribution of cattle. It was no longer possible for one farmer to carry large herds of cattle under the cut and carry method. In addition, adat law requiring each family to fatten 3-7 heads of cattle greatly changed the previously skewed distribution of cattle. While in 1949, 1% of the population owned the majority of cattle; by the 1970s, it was estimated that 100% of the population owned cattle (Metzner 1980, 1983).

Today, cattle fattening has become the main basis of the income in Amarasi. It has led to the rising of real income to an estimated 20-30% higher than the average in West Timor (Piggin and Parera, 1983). This increase in living standards is attributed to the stable farming system developed around the management of fallows through use of *leucaena*. According to Jones, the prosperity of the Amarasi people is evident by the number of houses with concrete floors and walls, and by the tin roofs that replaced the traditional palm leaf houses found in the rest of West Timor (Jones, 1983).

Persuasion versus Punishment

It might appear that in some respects the villages were 'forced' or 'ordered' to plant *leucaena* and were coerced through use of fines and punishments. However, adat is such an integral part of the social fabric of the society, that social pressures were used more often to ensure that farmers continued to plant *leucaena*. Presently, there are no such enforcement policies, fines or punishments to plant *leucaena*. However, present day Amarasi farmers continue to plant the fallow species. According to local people, the reason behind the continuation of this system lies in the local farmers' beliefs in the beneficial properties of *leucaena*. More specifically they acknowledge the necessity or the benefits of *leucaena* as fodder for cattle and thus a necessity for their income and survival.

There are non-economic reasons why farmers continued to plant *leucaena*. Villagers state that they replant lamtoro not because of policy, but because it has become a part of their farming habit and tradition. According to the farmers and village government, there was a need for punishment in the beginning because not all farmers were aware of the beneficial properties of lamtoro. Punishment and fines were necessary until all the farmers became cognisant of the high yielding/fertility of the new fallow species.

However, local farmers were not given a choice in the type of species to plant, in which they could experiment and choose for themselves the best species. Instead they were regulated only to plant *leucaena*, which led to a decrease in attempts to incorporate other

fallow/fodder species. The negative effect of concentration on only one species led to a mono-culture of and dependence on *leucaena*.

This monoculture of *leucaena* was one of the factors leading to the 1986 infestation of the psyllid, a jumping lice (*Heteropsylla cubana*). In a matter of weeks the jumping lice completely consumed the lamtoro and left areas of once lush lamtoro forests completely barren. The dependence on *leucaena* and its vast destruction by the infestation led to a profound negative effect on the livelihood of Amarasi farmers. Prior to 1986 the farmers' dependence on *leucaena* to provide fodder to fatten their cattle was practically absolute and provided them with an income considered to be one of the highest in West Timor.

When the production of cattle feed decreased significantly in the mid-1980s, farmers in turn had to decrease their cattle holdings. On average, farmers' livestock decreased from 7-9 heads to 2-3 heads of cattle. In addition, the time necessary for cattle fattening increased significantly. Where prior to 1986 the fattening period for cattle ranged from as little as 4 to 6 months, after the infestation this time frame increased to over one year.

The Role of Adat

In order to fully understand the role adat played in creating and maintaining the system, it is important to understand the concept of adat. Adat or customary law is an indigenous decision-making and resource evaluation system that exemplifies the culture of the province of Nusa Tenggara. Adat governs how the people interact with the land and with each other in the community. Adat law covers all of the community's social life from that

of birth, marriage, and death to aspects of cultivation, infrastructure development, economics, politics and cultural aspects. Monk (1995) writes that adat law evolved in rural communities in response to 'the variability of their supporting environment' and is an overarching ethical code governing the wider life of a particular clan or village (Monk, 1995).

Adat is very different from legal law originating from the state's formal institutional structure. According to local inhabitants adat surrounds every aspect of their lives. Adat is not a written law; it is passed down through speech from generation to generation. It is told from the elders in the community to the young in the form of stories and rituals. Since the people were bound to obey the laws of the Raja, anything the Raja proclaimed would instantly be considered adat and be integrated into the social structure of the local inhabitants.

One major difference between formal law and adat is the method of punishment. If people break the adat, then the community punishes them in accordance with adat law. For breaking national laws, punishment is sought through the court system with the penalty consisting of a jail sentence. According to Basiago, adat, unlike the court system, is enforced through 'psychic punishment and fear of ostracism' (Basiago, 1995). People are persuaded by socially reinforced taboos that misfortune, death, or banishment from the community will fall upon them if they violate adat law. However, for the local people adat is seen as more adaptable because it is the community, in the form of informal leaders and elders, that decides the framework of punishment. Retribution is thus deeply

connected to the social structure of the society and responds to the changes in the social institutions.

Adat's loss in stature

Even though adat has been a very powerful force in the creation and subsequent continuation of the Amarasi model, it is now under threat by external influences. Opening up the villages to the outside world has undermined the closed society that reinforces taboos. In doing so, it has eroded faith in the sanctity of adat (Basiago, 1995). In the place of adat, national and religious laws have taken primacy. Economic incentives and market forces have now become the impetus for action. Ironically, the premise behind certain adat – joining villages to markets and support for cattle exporting - may be the precise reasons resulting in its slow demise.

The Influence of the Raja and Adat on the Amarasi Model

The successful adoption of *leucaena* was possible because of the introduction of regulations by the Raja. The Raja and his adat laws ensured continuation by enforcing the new regulations and creating social institutions to secure the new system. The following section examines several regulations of the local ruler, Raja Koroh, starting from the 1930's that altered the socio-political make up of Amarasi.

Elimination of land-lords

In the mid 1930's Raja Koroh amalgamated all the lands in his kingdom. In doing so he confiscated large portions of land which were previously considered clan or family land.

This act took the land away from the large land-owning classes and made the land more accessible to the majority of the population. The adat regulation proclaimed that all land belonged to the ruler. The land was, thus, considered “free land” for the use of all the people in Amarasi. Local farmers were given the right to cultivate the land without payment by the Raja’s local representatives. This right was extended to the farmers as long as they continued to work the land.

The amalgamation of land was possible without confrontation because the local ruler had the support of the majority of the people. The declaration by the Raja was positively received because the new adat was agreed upon through collaborations with the Raja’s advisors, the Temukungs and Amnasits, who held very influential and respected roles in the communities.

Re-settlement and land re-distribution

The Raja also began a policy of resettlement of villages and amalgamation of small communities. The creation of new villages began in the mid 1930s. The resettlement was done in conjunction with a regional infrastructure development program of building roads to connect villages and building schools and other facilities. Two of the villages in this research, Oenoni and Ponain, are new settlements. These two villages originate from a combination of various villages or hamlets that were transplanted together. This action brought together 4-6 Temukungs to create the new villages and new local government structures. The benefits of relocation for the local population included better access to road systems, markets, and public facilities such as hospitals and schools. According to

local elders, concentrating the population to a smaller area also increased cooperation among the farmers and increased their incentives towards community work.

This action also altered the fabric of the socio-economic condition of the villages. Bringing the villages closer to the newly expanding road systems and market places also brought the villages further away from a system of subsistence agriculture to one of more dependence on the market to buy and sell their products. Thus, for some villages the resettlement process ended their isolation from the open-market economy. The close proximity of farmers also made it easier for the local governments to regulate the agricultural activities and enforce new agricultural technologies and methods. The creation of new villages also required a new local government structure to incorporate the fusing of hamlets and Temukungs.

The Raja laid out the area for each new settlement and his advisors, the Temukungs, were commissioned to divide the land equally for each farmer. In most new villages every farmer was given 1,250 sq. meters to build their family house and cultivate a home-garden. This land was then considered to 'belong' to the farmer and became hereditary. In this sense the farmer could pass the family lot on to his children as long as he continued to work the land in accordance to adat law. However, there seems to be no indication that the farmers had the right to 'sell' the land. In most cases the land is passed on equally between the sons. This fact does not preclude the daughter from receiving land. There are occasions under which the land can be divided to the daughters.

According to local farmers, their daughters could acquire portions of land if they had no other access of obtain land.

Land zoning

In addition to amalgamating the hamlets, the Raja and his council instigated new land zoning in Amarasi. The land was divided between those plots used for agriculture and those designated for free grazing of livestock. This separation of agriculture and animal grazing areas meant that the land had to be divided by fences in order to keep roaming cattle away from the agricultural areas. Adat laws were soon developed to enforce communal fence building and maintenance. Fines were imposed on farmers for inadequate fences.

Initially the new settlements, called “Bender”, were considered agricultural lands and surrounded by fences built and maintained by each villager. Inside the settlement no livestock, such as cattle and horses, were allowed. Livestock were allowed strictly outside the Bender in the designated free grazing areas. The amount of time allocated per farmer for building and maintenance of these fences was quite extensive. According to research studies done by Metzner, one-third of the farmer’s labour was taken up by this chore of guarding his agricultural land against free-grazing cattle.

In order to help the farmer with the arduous task of fence building, an adat regulation was created to alleviate this constraint. The labour saving technique incorporated by adat required farmers to cultivate their fields in one condensed area called *ren buat*. This

compact agricultural area would contain groups of 20 to 60 farmers (Metzner, 1983). The advantage of these farmer complexes was that only one fence was needed around the whole *ren buat*. This greatly reduced the time and labour needed to build and maintain fences.

As the population of Amarasi increased, the area allocated for agriculture was expanded and the free-grazing area was decreased. This continued until almost all the land was classified as agricultural and therefore in no need for fencing. The elimination of fencing freed the farmer from diverting his precious time from that of fence building to more agricultural and cattle raising pursuits. Presently the only free-grazing area in Amarasi is the eastern tip of the sub-district.

During this time of agricultural land expansion, there was a change in the Adat law concerning free-roaming cattle. Adat law was adjusted to fit the changing land-use patterns. The new Adat law stated that farmers could begin to carry cattle in the agricultural zones as long as the cattle were tied and farmers practised the cut and carry method. Outside these farming zones, cattle were allowed to graze freely, but had to be corralled at least once a week. The tethering of cattle inside the agricultural zones insured that free-roaming livestock would not destroy the agricultural and fallow crops planted by the farmers. Inside these farming zones, the movement of cattle was the sole responsibility of the cattle owners, and therefore all precautions were taken to stop cattle from straying.

In 1960 and 1967 more intensive land use zoning was introduced in Amarasi in which the land designated for farming was increased. All land except for the eastern tip of Amarasi (and State Forest land) was declared farming zones. These new land use zones increased the integration of farming with tethered cattle raising. Yet with the large amount of discipline the farmer had developed in caring for their cattle, the new land use zoning system was a success. Fencing was soon omitted from the different zones in order to further heighten the farmers' discipline. The deterioration of fences in Amarasi also freed the farmer from the labour-intensive task of fence building to allow more time spent on fattening their cattle.

Paronisasi system

The move to the cut and carry method of cattle raising versus that of free grazing altered the outlook of the Amarasi System. As mentioned previously, the cut and carry method resulted in a more equal distribution of cattle. Labour constraints resulting from the need to tether livestock ensured that large cattle owners had to distribute their cattle to those farmers who had the labour and fodder supply in order to fatten the cattle. This partition of the large cattle herds resulted in the system known as '*paronisasi*'.

Paronisasi is the program in which cattle owners who have an inadequate labour and fodder supply, either give cattle or sell cattle to cattle-less farmers who have an adequate supply of *leucaena* fodder. The payment from cattle owners to cattle-less farmers for fattening the livestock is either a share in the eventual profits of the cattle's sale price in the export market, or a share in the offspring. The paronisasi system, through this

distribution of livestock, allowed the local population to have a share of the profit in cattle raising and increased the level of income for the local people. By 1970, Amarasi had achieved the most equitable distribution of cattle ownership in the whole of Timor (Fox, 1985).

The provincial government as well supported the cattle fattening scheme and created *paron* programs to increase the quantity of cattle exports from Amarasi. Under the *paron* programs the provincial government would buy two to three year old cattle from outside Amarasi and distribute it to those farmers interested in fattening the cattle. Prior to the psyllid infestation of 1986, the fattening period for cattle fed mostly on a diet of *leucaena* was 6 months. After the cattle reached the desired weight, the cattle were sold through intermediaries, mostly in the provincial capital of Kupang, and sent to other parts of Indonesia. The government's focus on Amarasi was heightened because of the regions abundant supply of fodder for this program. Therefore, the economic prosperity in Amarasi was unrivalled in the western islands of Indonesia (Metzner, 1983). The government *paron* programs were further assisted by the adat law requiring each family in Amarasi to fatten at least two, to a maximum of seven, heads of cattle.

Land tenure

One difference in the Amarasi model is the use of adat in distinguishing land tenure for the different types of farming plots. Amarasi adat law dating from 1940 stated that land ownership belonged to the ruler and the local population has 'usufruct' rights for cultivation. According to Angelsen, adat law gives "usufruct rights to forested land

planted with perennials after clearance". In other words, adat gives the people the right to utilise and enjoy the profits and advantages of the land belonging to the government so long as the property is not damaged or altered in any way. Indonesian law states that any plot cleared and overrun by secondary forest for more than two years through lack of proper tending becomes communal property and can be handed over to a third party with the agreement of the village head (Angelsen, 1995). It was the duty of the Temukungs, the king's representatives, to supervise the usufruct rights of the farmers.

In Amarasi, usufruct rights were extended to include the planting of *leucaena*. In other words, the Raja implemented regulations that stated farmers must manage the fallow period through use of *leucaena* on their plot of land every year in order to maintain stewardship. Therefore, *Rene (Ladang)* fields used for annual crops, such as corn, cassava, pumpkin and beans had to be fallowed with *leucaena* in order to have usufruct rights to cultivation extended to the plot. Since the Temukungs had to be informed of all new land openings, they had control over which new field was to be cultivated and guaranteed the exact location of the new field and the planting of *leucaena* on the abandoned fields. This strict observance of regulations for planting fallow vegetation overcame one of the drawbacks of shifting cultivation, which is the loose tie between the farmer and land resulting in insufficient concern for maintaining soil fertility.

In the late 1940s, the Raja in concert with the local council instructed the farmers on what perennial crops they should plant in order to secure the right to cultivate the land. Other than planting *leucaena*, farmers were instructed to plant 25-50 bananas and coconut trees

every year. The planting of these perennial crops occurred inside the settlement area and, along with *leucaena*, proved ownership (tenureship) of land. Because of this adat, farmers began to surround their fields with banana and coconut trees, while the interior of their plots were planted with *leucaena*. Fields that are planted with perennial crops, such as bananas, coconuts, mangos, lemon and jackfruit are called *Po'an* in Timorese, or *Kebun* in Indonesian.¹ By the 1960s, seasonal famine had been eliminated and food was being exported from Amarasi. Presently, Amarasi is considered to be the 'fruit basket' for the provincial capital, Kupang.

Control burning

One important feature of the Amarasi model is its focus on controlling the burning procedures inherent in swidden agriculture. Fire control is important for a number of reasons. First, the importance of fire control stems from the fact that each farmer's plot, roughly one hectare in size, is connected to neighbouring plots. This close proximity of the *ren buat* made it necessary to create adat laws to protect farmers' crops from the fires on the adjoining plots.

Second, farmers' fields contained perennial trees, like banana and coconuts trees, which farmers needed to protect from the fires. Adat laws and fines were created in order to guarantee the protection of these tree crops. For example, according to local adat, farmers must clear out a radius of 10 meters around the coconut trees to protect them from fire. This system was an extension of the one learned from protecting the colonial Dutch

¹ The method by which farmers decide which fields will become their *Po'an* (perennial fields) or *Rene* (*leucaena* and annual crops) depends on the condition of the soil. Plots with lower soil fertility are planted

government's Sandalwood tree plantations. Historically, the Dutch Government had commissioned the plantation of Sandalwood in the region for exclusive use in exporting. Sandalwood were considered State trees and not for local consumption. The local population was commissioned to look after this cash crop, but was not allowed any type of ownership over the trees. Hefty fines were imposed on any farmer who cut down or burned the Sandalwood trees.

Finally, fire management was controlled through adat because *leucaena* crops grown during the fallow period have an intrinsic value to the farmer as fodder. The typical Amarasi farmer usually works 2 ha of land, in which 1.0-1.3 ha is used to provide fodder and 0.6-1.0 ha is used for crop production (Piggin, 1997). Therefore, it was in the best interest of the farmers to ensure that nothing happened to *leucaena* while other plots were being cleared. This guaranteed the proper protection and management of the *leucaena*.

Adat Retributions and Fines

The creation of adat laws in order to propagate the continuation of the new system was essential in securing its survival and endurance. The creation of these new adat laws required a change in the social structure in order to accommodate the new system. With each adat carried a specific type of punishment for its transgression. The level of punishment and fines decreed by the adat are decided at the village level by the Temukungs. Even within villages, there is no consensus as to the exact measure of punishment for breaking the adat. The local people believe that the punishment must be

with *leucaena* and higher fertility soils are left for the perennial crops.

flexible enough to fit the crime and must come about through discussions with the elders and the informal leaders in the community.

In most villages it is the village level parliament, the LDMK (Lembaga Ketahanan Masyarakat Desa), that carried out the regulations and punishments. The exact punishment or fines are left to the discretion of the local governing body, usually starting with the elders in the hamlet. If disagreement arose between farmers, the disgruntled party has the option to take his/her complaint to a higher level in the village political body, usually ending at the village head who has the final say in dispute management. Very few complaints appear to reach this level, and most are decided with the local hamlet leader along with the elders in the communities. According to most farmers, the first person to hear the complaint is usually the elder in the community. If the elder can not diffuse the situation, then the matter is taken up with the locally appointed village government representative.

While punishment and fines were used extensively during the introductory stage of the system, certain fines ceased to be necessary over time. For example, punishment for farmers not planting leucaena soon became unnecessary as farmers began to equate leucaena as an economically viable product for fodder, soil enrichment and ultimately for economic prosperity. Therefore, economic incentives took over as the biggest factor for the continuation of the adat. Fines are still used, however, in situations like compensation for damages done by free roaming or escaped cattle. Following is a list of some of the

finer imposed on the people for breaking adat laws relating to the Amarasi agricultural system.

- *Fines for opening new lands without permission of Temukung/Amnasit*

According to local adat, farmers could not open new land without the permission of the Raja's advisors, the Temukungs and Amnasits. This adat was created in part so that the leaders could oversee the clearing and planting process and ensure that the farmers were adhering to the regulations to plant *leucaena*. In some villages, according to adat, it is the Temukung who decides when and in what fields farmers will begin cultivation. According to some ex-Temukungs, all farmers who wished to cultivate in a given year had to assemble together on a given date, designated by the Temukung, to divide the land for cultivation. If a farmer defied adat and opened land without the knowledge of the Temukungs then the system to ensure that *leucaena* is planted and that land is divided between the farmers breaks down.

- *Fines for not planting lamtoro*

Adat law created a punishment system for not planting *leucaena*. The punishment was carried out at the Temukung level. In some villages farmers recall punishments of 25-100 lashes for farmers who did not plant *leucaena*. However, more often it was social pressure that guaranteed the farmers would plant *leucaena*. After the majority of the region was covered in *leucaena*, there was no need to enforce this adat. However, the planting of *leucaena* is still considered 'adat' or customary. The planting of *leucaena*

become ingrained in the local population's beliefs and customs, so that it does not need the backing of fines or punishment to ensure that it is done.

- *Fines for practising free-grazing in agricultural lands*

Fines were established to dissuade farmers from continuing to allow their livestock to roam free. According to some village elders, government officials would go to the field every three months, accompanied by village farmers, to search for free-grazing livestock in the agricultural areas. They had the power to shoot any untethered cattle. The cattle's remains were then equally distributed among the farmers. The owner of the cattle was also ordered to compensate his neighbour for any damage done by the free-grazing cattle. Today, the owner of the cattle is only charged with a fine to compensate for damages.

- *Fines for cattle escaping and entering another farmers' fields*

According to adat law, if a farmer's cattle escapes and enters a neighbour's field and eats either the neighbour's lamtoro or perennial trees then the owner of the cattle must compensate the neighbour for the damage. According to the village leaders, the fines must be enough of a punishment to make the people afraid and therefore watch their cattle, but not high enough that the farmer could not pay the fine. This adat was enforced more so to ensure the discipline in the farmers as to control the whereabouts of their livestock. The balance of the system lay in the fact that farmers did not need fences to protect their fodder supply and this created the need to guarantee that farmers would tether their livestock.

- *Fines for stealing lamtoro from another person's field or in community fields*

Since an adequate level of lamtoro was vital in the cattle fattening process, fines were established to insure that farmers did not steal their neighbour's fodder supply. In some villages this fine was set at 25,000 Rp, to be paid by the thief to the owner. This amount is flexible and is set at the village (Desa) level every year. According to the local farmers, if a farmer suspected or discovered that another farmer was stealing from his supply of fodder, then the farmer could take the matter up with either the informal leaders or the local village level representative, usually starting at the head of the hamlet (the RT). However, this regulation did not seem to be enforced often since most farmers reported that neighbours usually respected each other's plots.

- *Fines for fire escaping to other farmer's plot*

As stated in the previous section, fire control was an essential part of the agricultural system. Farmers were conditioned to respect their neighbours' fields when the time for burning occurred. Fines were instigated in order to insure that farmers continued to practice safe fire habits, such as clearing all debris around their plots and fruit trees to insure that the fire would not escape nor damage any perennial crops.

Other Important Players in the Maintenance of the Amarasi Model

Adat and the Raja are not the only players that influenced the Amarasi model. Social leaders, church groups, local NGOs and the formal government structure helped shape the system we see today.

Impact of social leaders, the Church, and NGOs

The influence of social leaders, or informal leaders, in the Amarasi social structure is vast. Some farmers state that social leaders have an even larger power base than the formal government structure, including that of the Kapela Desa (village head). The importance of social leaders in the fabric of community life results from their direct link through working in conjunction with farmers. This close contact creates a high level of respect from the community towards the social leaders. Social leaders are usually chosen from the elders in the community or those who have held positions of authority, such as schoolmasters and patrons of large families. If farmers have problems or disputes, the normal course of action would be to approach the social leader to settle the squabble.

The church also had a large part to play in the development of the Amarasi system. The majority of the population in the region are Protestant, with Catholics being the second largest denomination. In the days of the Raja, the Protestant church was an intricate part of the kingdom and priests received their salary from the King. The church was funded by the Raja until the mid 1950s, after which it was funded privately by church members. The church's major role was in the dissemination of information from the Raja and his advisors to the local population. The King's advisor, the Temukungs, would invite the church leaders to a meeting to obtain their opinions on state policies.

If the Temukungs wished to discuss the policies with the farmers, the King's advisors would make an announcement in the church to all members concerning the proposed policies. Since the majority of the population belonged to the church, the formal

government structure could ensure that all farmers in the region would be aware of and understand the new policies. This role of disseminator of policies also led the church to be a leading player in the resolution of disputes among farmers regarding the adat laws. According to many local village people, disputing farmers usually meet first with church leaders for guidance before going through formal channels.

The church and other religious groups still hold a strategic position with the Amarasi people because of their role in the community and their close relationship with local people. As the church did in the past with programs from the Raja, it now has links to government programs. The formal government may create programs for all the villages, but church and social leaders adapt these programs to fit the particular needs of the community. In this fashion, the church works very similarly to that of local non-governmental organisations in connecting government programs with local farmers.

There are a number of non-governmental organisations (NGOs) working in Amarasi to improve the livelihood of the local inhabitants. Some NGOs, like the local *Delsos Yayasan* and World Vision Indonesia, help farmers either by giving small credit or by assisting them in forming credit groups. Other NGOs, like *Yasmara Yayasan* teach hedgerow and terracing techniques and attempt to bring in other fallow species besides *leucaena*. The NGO, *Yayasan Tana Nua*, is another local organisation that prior to 1986 strictly used *leucaena*, but since the infestation of the psyllid has diversified with other species and is attempting to teach local farmers the negative affects of monoculture and the benefits of diversification.

NGOs in Amarasi are known to encourage and facilitate community participation in rural development programs. At times they work alongside government to support government development programs with training and dissemination of technical information. At times the local NGOs are seen to have more flexibility and potential than the government to implement the programs. Local NGOs have a better capacity to motivate and facilitate the local people, making it easier for government to work with the Amarasi people (Djogo, 1996). This connection with the government appears to be a necessity in order for the NGOs to work in Amarasi. According to Djogo (1996) “whatever the results or strengths of NGOs, the relationship with the government is very important. Collaboration with government programs will result in a more pronounced impact, both socially and political.”

Government institutions that support lamtoro and the Paron system

The formal government has been involved since the early part of the program inception and has been instrumental in ensuring the continuation of the Amarasi system. Listed below are four recent examples of government programs in Amarasi.

IDT (Impres Desa Tertinggal): or Least Developed Village Program: The IDT program was launched in 1994 in order to help alleviate poverty at the village level. It is a national government credit program, in which the government gives farmers a base capital to be used for economic activity. Most farmers in Amarasi use the credit to buy cattle. Each IDT classified village receives a total of 20 Million Rupiahs. The farmers are divided into

Pokmas (farmers' groups) with each farmer receiving between 400,000-500,000 Rp. Repayment of the credit goes back to the Pokmas in order to circulate the interest free loan. According to government reports, the IDT program assists poor villagers to improve their social and economic well being in a number of methods: by increasing the quality of human resources, by increasing their capital, by developing new activities and by strengthening the group institutions of the poor.

***P2RT:* This government program started in 1995. Its purpose is to give cattle to poor farmers who are not in possession of cattle. The main objective is cattle breeding. Female cattle are given to those farmers with the lowest level of income. The farmers carry the cattle for 3 years. The female cattle are artificially inseminated and any calves born in this time are considered the property of the farmer. At the end of the three years, the farmer must give back to the program the same number of cattle that he received. The cattle are then in turn given to another farmer. The selection process to determine who receives the cattle is also tied to fodder supply. In order to qualify, farmers must have a minimum of 0.5 ha of land per cattle. The program also distributes seeds of lamtoro, king grass, and *Sesbania grandiflora*. P2RT is a new program and is available only in some villages in Amarasi.**

***BDB (Bantuan Daerah Bawahan):* Similar to the P2RT, the purpose of this program is to increase the number of cattle in Amarasi. It deals in the trade of female cattle and the use of artificial insemination techniques.**

Paronisasi: This is the Provincial government program that has been in operation since 1971. In this program the government buys male cattle from outside Amarasi, then distributes the cattle to those farmers interested in fattening the cattle for export to outside markets. The farmer usually carries the cattle for 6-12 months. Once the cattle reaches slaughter weight, it is sold through traders for export off Timor. If the farmer had bought the cattle from the government, then approximately 85% of the profit stays with the farmer, with 15% for the government. In other circumstances, the farmer does not pay for the cattle until the sale of the animal, in which case, 42.5% of the sale price goes to the farmer, and the government receives the remaining 67.5%.

Conclusion

The Amarasi system represents the evolution of an agricultural system towards an intensified system of swidden agriculture. It has become a widely practised agroforestry system based on managed fallows, maize cultivation and cattle fattening using *leucaena* fodder. The system had an ecological influence on the area. Streams and soils that previously had been affected by erosion and surface run off became protected by *leucaena* stands. Soil fertility rose and the ground became covered in *leucaena* trees. Not only did *leucaena* shorten the fallow period and allow for the intensification of maize and vegetables, but also the shade of *leucaena* allowed for the planting of tree crops, especially fruit trees.

The system has had a socio-economic influence on the Amarasi people. The proximity of the Provincial capital, Kupang, opened up access to a vast market for the farmers' fruit

crops and cattle trade. The local Amarasi farmers began to prosper as the land use system became more stable. All this contributed to environmental and socio-economic stability in the area (Stoney, 1992). Community institutions were also affected by the creation of the Amarasi system. These institutions evolved and were adapted to support the system. The creation of adat laws and punishments to propagate the system had a lasting affect on the people's habits and beliefs. As these new laws were implemented, the people changed their local governing systems to address the changing socio-political environment.

However, like most evolving systems, there are obstacles that must be overcome. As the agricultural methods of Amarasi shifts from a free shifting cultivating environment to a more sedentary one, community institutions must maintain pace with these changes to guarantee the sustainability of the new system. The following chapter will examine the constraints and barriers that the Amarasi system is facing and the possible alternatives for change in the future.

Chapter Six ~ Political Economic Analysis of Amarasi

Introduction

The preceding chapter outlined the Amarasi model of West Timor, Nusa Tenggara. In this chapter the constraints, such as jumping lice, the carrying capacity of cattle, the labour shortage, and market and environmental pressures, that affect the continued sustainability of the Amarasi system are examined. In addition some possible alternatives for the future are discussed.

Constraints and Barriers for the Amarasi Model

There are a few constraints to the Amarasi model that will affect the productivity of the system and its ability to adapt and grow in the future. The local inhabitants of Amarasi must face these obstacles and in some situations have attempted to overcome them through changes in their political and socio-economic institutions. The system is not a stagnant one and has been altered slightly throughout the years, yet there are many other hurdles that it still must overcome.

Jumping lice and the monoculture of leucaena

One biological constraint is the persistence of the infestation of jumping lice, the psyllid. Most farmers interviewed in the region state that jumping lice are still a problem. The psyllid experience exemplifies the dangers of over-dependence and a mono-culture in a single species. The level of *leucaena* stock has stabilised, but it has not yet reached the level it was before 1986. Provincial departments and local NGO groups have promoted

seed production of alternative species and new *leucaena* hybrids resistant to psyllid. The planting and dependence on *leucaena* has over the years become so ingrained in Amarasi socio-economic culture (through the system's integration with adat law) that some local NGOs find it difficult to alter farmers' habits away from *leucaena*.

According to one local NGO, the level of acceptance of new species and technologies seems to be tied to soil fertility. In areas, such as central Amarasi (Ponain and Oenoni) where soil fertility is high, they found that acceptability or adoptability for new species and new technologies was higher than in Western Amarasi (Teunbaun) where soil fertility was lower. Local NGOs report that even though farmers have begun gradually to introduce other species, such as *Sesbania* and king grass, most farmers still believe strongly in the qualities of *leucaena*. Speaking with local farmers, there seems to be a strong apprehension in replacing *leucaena*. However, the slow return of *leucaena* to its pre-1986 levels, has led to a gradual acceptance of these new species in some areas.

Water supply

Another environmental constraint is the lack of water in the region. Due to the extended dry season and the porous subsoil of the region, water supply for cattle is a particular problem. Most farmers interviewed stated a concern for water especially during the dry season when water levels are at the lowest. During the dry season some farmers stated that they must walk more than 1 kilometre to the nearest water supply. The task of fetching water is the responsibility of the women and children of the household. A couple of trips a day to the local water supply is usually the norm.

However, because of the historic adat regulations to plant bananas, this dilemma has been somewhat overcome. The daily water requirements of 30 to 40 litres per head of cattle have been provided by feeding banana stems that contain 80% water and provide essential minerals such as Na that is commonly deficient in *leucaena* (Metzner, 1983; Piggins & Parera, 1983). All farmers reported using banana leaves in combination with other species as a partial substitute for water. However, the problem of gathering enough banana leaves to meet the daily water requirements for cattle is extremely time consuming, and during the dry season the supply of leaves may be insufficient.

Carrying capacity of cattle

Another constraint to the Amarasi system is the number of cattle an individual farmer can adequately maintain in the cattle fattening program. The carrying capacity of cattle per farmer is tied to the supply of fodder and labour. Before the infestation of the psyllid when the level of *leucaena* was at its height, farmers could comfortably carry a maximum of 7 to 9 heads of cattle. The number of cattle could not be extended beyond the level of fodder the farmer could produce. According to local officials, a farmer needs approximately .5 ha of land planted with *leucaena* to produce enough fodder to feed one head of cattle. In addition, the number of cattle a farmer can carry, even with adequate supply of fodder, is tied to the amount of labour available to practice the cut and carry method of cattle feeding. The labour intensity required for constant feeding and gathering of fodder greatly limits the extent to which farmers can increase their cattle supply.

Farmers would have a difficult time extending the quantity of their cattle beyond this limit without some increase in labour and fodder supply.

Labour supply/shortage

As mentioned above, the cut and carry method is more labour intensive than free grazing. The community has adjusted to this problem in a number of ways. One such adjustment is the Paron system, in which farmers with excess cattle and not enough fodder, either sell their cattle or hire farmers without cattle to fatten their livestock. At the end of the fattening period, either a percentage of the selling price is given to the hired farmer or the cattle owner buys back the cattle and sells it in the market. Another method to overcome labour shortage in the fields is the Toit/hoka system. Local farmers would 'invite' family members and fellow villagers to help with farming activities. Compensation comes in the form of supplying food, not wages, during the process. This communal labour saving device is used whenever the farmer is in need and can be used at all three stages of the agricultural calendar from opening new areas, to weeding and harvesting.

In terms of soil enrichment techniques, the Amarasi system requires less labour to introduce than other soil conservation systems since farmers do not use techniques such as contours, contour ditches, or terracing. In addition *leucaena* is easy to manage since it does not have to be reseeded after the fallow period because it regenerates naturally. Thus, due to the ease of maintaining and regenerating the *leucaena* fallows, farmers are more likely to adopt the Amarasi system over that of other soil conservation methods.

Disinterest of farmers to breed cattle and dependence on cattle from outside Amarasi

The majority of cattle used in the cattle fattening program by farmers are brought in from outside of Amarasi. Local farmers say it is too risky to breed their own cattle. Farmers prefer not to breed cattle since the time frame needed is much longer than that of fattening cattle for 6-12 months. Farmers also state that since they must tether their cattle, it is too difficult to breed under those conditions. They state that cattle breeding is best done in free-roaming areas. This has led Amarasi to become strictly a fattening area dependent on the surrounding areas for its cattle supply. As these other areas develop fodder production systems, it might eventually threaten the supply of cattle. Therefore it is possible that some type of breeding system will have to be developed in Amarasi.

Dependence on middlemen to get cattle to market

Local cattle fatteners are tied to middlemen and cattle-traders to deliver their cattle to markets located outside of Amarasi. This dependency on outside merchants is due to the fact that farmers do not have transportation facilities to get cattle to markets such as in Kupang, the regional capital city. Farmers, therefore, rely on local markets created and regulated by local district government. The government at the *kecamatan* (district) level perpetuates this system by arranging for middlemen to go to the villages to buy and sell cattle. The majority of these middlemen come from outside Amarasi and appear to have disproportionately benefited financially from the cattle trade.

Adat law forbidding sale of corn

Due to the seasonal starvation period that historically categorised the region, the Raja implemented an adat law to stop the local people from selling corn. The corn that was grown was to be used only for personal consumption and for storage against the 'starvation period' during the long dry season. Even though the starvation period is not as predominant as it once was, many communities still practice the adat. In the more populated western part of Amarasi, the adat is still enforced and people are fined at the local level for selling corn. However, this punishment is not too rigorously enforced and social pressures are used more to persuade people to comply. Since Amarasi no longer suffers from seasonal famines, as it did in the 1930s-40s, the adat forbidding the sale of corn may eventually fade away as farmers turn increasingly to markets to sell their products.

For example, in other areas of Amarasi, such as the less populated central region of Ponain and Oenoni, the main income for farmers is generated from the selling of corn and cattle fattening. According to local farmers, the less populated areas of Ponain and Oenoni have changed their philosophy towards the adat law because of the proportion of land to individual farmer. The larger portion of land given to farmers in the less populated areas increases their ability to grow corn without it interfering with the production of *leucaena* for cattle fodder. Driving through these areas, the landscape is predominantly laden with either *leucaena* or cornfields. In the more populated western areas of Baun and Toobaun, the land ratio is smaller and thus available land must be used for the production of fodder for cattle and for growing fruit trees.

Problem with credit

Even though there are government programs to provide farmers with credit to buy cattle, there are concerns about the positive outcomes of the program. According to the program, the profits from the sale of the cattle are intended to be used to buy more cattle and propagate the system. However most farmers report that profits from the sale of cattle go towards building housing and personal consumption. Therefore, the credit programs, while allowing farmers access to funds, in some cases do not assist the farmers in creating long-term income generating activities. Instead these programs may create dependence on the credit.

Possibilities for Change in Amarasi

The Amarasi system is by no means stagnant. There have been changes to the system, some forced upon it by biological forces and others by market needs. The following section outlines the majority of these changes and the possibilities for future adaptation in the system.

Institutional evolution

The role of the leaders in the community and the institutions that govern the people has evolved with the changing system and will continue to transform as the system evolves increasingly towards a market-oriented agricultural system. (See *Figure 1* on the following page for an outline of the institutional evolution in Amarasi.) When Amarasi was a kingdom, the local Raja and his adat laws governed the people. This changed in

Figure 2

Graph designed with the assistance of Tonny Djogo.

1952 with the transformation of Amarasi into a district in the Province of Nusa Tenggara Timur. The local kingdom gave way to the formal, *Kecamatan* (district level) structure presently in place. The local Raja became the district level government leader, which aided the institutional transition.

Presently, it is the formal government structure that provides leadership and shapes the community institutions. However, non-formal leaders, such as elders, social and church leaders, still play an important role in the community. Increasingly some analysts, such as Tonny Djogo, state that the role of the markets has become more prominent as the community gears itself more towards market forces. The increasing power of the market is evident in the declining role and power of adat in governing people's lives.

Role of non-governmental organisations

While the role of the market may have increased in Amarasi, so has the role of non-governmental organisations (NGOs). Over the past decade, the number of NGOs working in the region has increased through the growth of civil society movements. Most local people have knowledge of many such organisations working with farmers in the region. NGO groups, like *Yasmara*, have been trying to introduce hedgerows and terracing. The majority of local organisations now attempt to persuade the farmers about the dangers of re-establishing the previous monoculture of *leucaena* that characterised Amarasi prior to 1986. While progress appears slow, there appears to be some acceptance of these new technologies and ideas. Farmers are now beginning to experiment with alternatives to lamtoro due to recurring fears of another psyllid infestation.

Recently local NGOs have attempted to introduce the technique of slash-and-mulch to replace the use of fire in swidden cultivation. Mulching is a technique in which farmers, after slashing the area, mix the forest litter with the topsoil and leave it to decompose naturally (which restores the nutrients to the soil that were lost during the cropping stage). Many environmental NGOs prefer mulching to burning, because of the negative affects of burning on the atmosphere and the risk of fire-escapes. However, there is much resistance to slash-and-mulch by swidden farmers in Amarasi.

Farmers in Amarasi consider burning not only a part of their cultural identity, but essential to their agricultural practice and the best method for restoring soil fertility. Farmers believe that they must burn the soil to clear it from persistent weeds. In Amarasi, fire is also used to control the large population of snails and other pests that infest their crops. According to the farmers, if they do not clear the land of weeds and snails, then the harvest will be lost. Most farmers who try the NGO and government suggested methods of slash-and-mulch return to burning due to the previously mentioned problems. However, many NGOs in the region continue to educate the people about this alternate technology.

There are many opportunities for NGOs to play a leadership role in collaboration with other development projects and agencies. NGOs working in Amarasi can help incorporate concepts of site specific, people-centred planning to these projects. The majority of these NGOs because of their connection to the local people and knowledge of the area have the

ability and the qualifications to train project personnel and the local population with new technologies. Incorporating NGOs, and local religious organisations, into policies for development can create a link between the government and the community.

Land ownership

As farmers move further away from shifting cultivation towards a more intensified fallow managed agricultural system, land ownership registered with the government might become a necessity. Very few farmers in Amarasi have had their land surveyed and registered. Such a low number signifies the fact that the majority of farmers choose to continue their right of usufruct because of the length and high costs involved in the registration and surveying process (Metzner, 1983). In Nusa Tenggara, adat law still regulates land and resource use within most communities. However, many government officials from outside the region often do not understand the local adat tenure and thus the potential for land conflicts in the region could substantially increase. Land issues appear to be more of an issue in densely populated areas of Western Amarasi, rather than in eastern areas. Population increases in the future may have an effect on land tenure as more and more farmers vie for limited parcels of land.

Climax Amarasi

The ecological outlook for Amarasi has also gone through some changes in the past few decades. One change that can be seen in the western part of Amarasi, the starting place for the new system, is the abundance of bananas, papayas, coconut palms and other tree crops. In western villages, like Soba, we see *leucaena* plots being converted into coconut

and banana orchards. There appears to be a movement away from lamtoro to more fruit trees/cash crops as soil regains fertility. Farmers in these villages state that income from fruit has overtaken in importance the income generated from cattle fattening. These fruit plantations have also gradually transformed the landscape. According to Jones this element of the Amarasi system can be considered the final stage and can be called the *climax Amarasi* model. It is characterised by high shade from tree crops, a lowering of lamtoro production and reduced cattle fattening activities (Jones, 1983).

The creation of the climax Amarasi is dependent on numerous factors, one factor being the biological condition of the soil. This system is attainable once the soil conditions are revitalised by the nitrogen fixing properties of fallow species such as *leucaena*. In addition, *leucaena* fields can offer the necessary shade needed to grow certain perennials, such as banana stocks. Climax Amarasi can be found in western Amarasi because the soil, which was once extremely degraded, has had ample time to rejuvenate through the introduction of *leucaena* 40 years ago.¹ The fact that the population in the Western part of Amarasi is greater than in the East might have an effect on the progression towards climax Amarasi. It is possible that with increased population in the Western area, the farmers have adapted the agricultural system in a way to obtain more benefits within an ever-decreasing quantity of available land.

The production of fruit crops from the climax Amarasi system has changed the socio-economic condition of Amarasi. Village people now depend on the markets in Kupang to

sell their fruit. This increase in dependence on markets outside Amarasi has increased the transportation to and from Amarasi. The roads leading to Kupang from various villages in Amarasi, especially the Western villages, are now occupied by '*bemos*' or minibuses transporting mostly women to the market to sell their fruit. In addition, it has led to the creation of alternate agricultural production efforts, such as smallholder production of coconut milk/oil for sale in Kupang and export to Java. The profit from the sale of fruit goes towards household consumption. If the family owns cattle, the men are in charge of the fattening process and of its sale. The profit from the sale of cattle is used towards more infrastructure building such as housing or sending their children to schools in Kupang.

Market influences

There are many questions as to how the Amarasi system can be maintained or adjusted to shift the local people to a market-oriented farming system. Many of the local people presently seek more opportunities to get their farm products to market. Improving the market access for cattle and crops could improve the socio-economic well being of the population. However, presently most of the benefits from cattle sales go to the middlemen who control the cattle trade. Buyers come from outside the region to local, government-sponsored, markets in Amarasi to buy cattle. The current system is one in which cattle are bought and sold by middlemen in the capital city of Kupang and are carried by ship to markets mainly in Java. This system does not allow for large benefits

¹ As mentioned in the previous chapter, the Amarasi system of *leucaena* fallow began in the West, due to the highly degraded soil conditions caused by factors such as a high population density. Over time, the system slowly expanded Eastward as the agricultural areas increased at the expense of free-grazing areas.

for the majority of Amarasi people compared to the profits made by middlemen in Kupang and on Java.

One major constraint for Amarasi farmers is transportation of cattle to markets in Kupang. Very few farmers own any mode of transportation, much less trucks large enough to transport cattle. Farmers are concerned about possible time constraints regarding taking the cattle to market outside Amarasi. In a farming system where labour constraints already exist, farmers are reluctant to take time out to travel to Kupang. However, in Amarasi where farmers are already accustomed to working in farmer-groups, co-ordination within these farmer-groups could be encouraged to co-ordinate efforts to facilitate transportation and reduce expenses. This may alleviate some of the marketing problems and allow farmers greater control over the sale of their cattle.

Policy constraints

There are many policy obstacles that prevent the farmers from fair competition in the market. The government's involvement in the cattle industry through certain government programs, such as *Paronisasi*, establishes the government as buyer and seller of fattened cattle to markets. Thus the government has a stake in the sale of cattle and protects its interest by regulating trade through the creation of markets within Amarasi and by offering avenues to middlemen to purchase cattle. As stated previously, a specified percentage of the profit is considered revenue for the regional government. Therefore, it is in the vested interest of the government to see the continuation of the cattle breeding program in Amarasi. The local regional government also benefits from taxes on cattle

trade by installing 'toll gates' at each road entrance into Amarasi, where a tax is charged for each cattle that leaves or enters the district.

Conclusion

As stated in Chapter One, the success of sustainable development depends on whether it: (i) meets the needs of the poor; (ii) improves human welfare, social justice and equity in resource distribution; and ultimately (iii) whether it counteracts the power structure that produces and propagates the environmental degradation. Under this definition the previous analysis of the Amarasi model has shown it to be a successful example of sustainable development for the following seven reasons. First, regulations and changes in land usage eliminated the huge free-grazing cattle herds by large land-owners that were the norm. Second, through *paronisasi* and policies to encourage farmers to fatten cattle, the system changed from one of unequal distribution of cattle to a more equitable one.

Third, an equitable increase in income for almost all farmers was generated through cattle fattening activities. Fourth, policies introducing and enforcing the planting of *leucaena* were ecologically successful for soil rejuvenation and reforestation. Fifth, increase in soil fertility allowed for an increase in export crops, such as fruit and corn to be sold in markets outside Amarasi. Sixth, increase in crop production resulted in the end of the seasonal famine period and allowed Amarasi to be considered the fruit basket of West Timor. Lastly, increased access to outside markets led to a more developed transportation system between Amarasi and the rest of the region.

The strategies used for improving the agricultural system in Amarasi were successful because the program was one that took into account a farmer-centred development perspective. An integral part in determining the sustainability of rural development programs rests on policies that obtain a significant amount of community involvement in the creation and implementation stages. To establish local participation, these programs must understand the indigenous approach to solving resource management problems. For example, community development in Amarasi is a mix of politics, economics, religion and adat. To fully understand the complexities and uniqueness of the Amarasi system, one must start with the history and a careful examination of adat law.

It is important to understand how to create a favourable policy environment in which cattle fattening and fallow management can work in unison. Furthermore, it is necessary to analyse the relationship between indigenous/customary forms of land and resource tenure, and the incentives provided for adopting/maintaining sustainable agricultural and conservation management practices.

The Amarasi model shows that farmers accept changes and make choices that will influence the output of their farms, both bio-physically and economically. However, farmers' priority rests on improving the output of their farms and their economic standings before considerations for improvements on the environment. For Amarasi farmers the increase in their economic standings was seen to be tied to *leucaena* and the

cattle fattening program. However, these changes would not have come to pass had it not been for certain socio-political factors.

Reasons why the system was not adopted or as successful in other areas could be the result of certain unique factors in Amarasi. The local Raja in Amarasi worked together with the social leaders and church organisations to decide upon the policies to be implemented in the region. Together they set off to regulate and enforce the new system. They brought the people together to learn how to work for the benefit of the community. Conflict was avoided between cattle raisers and farmers in Amarasi by dividing the land between that designated for agriculture and those lands designated for free-grazing cattle.

Contrary to the many articles written about the success of the Amarasi system as a model of fallow intensification, very little has been written about alternative systems, such as the indigenous swidden system in North Central Timor (Kieft, 1996). In North Central Timor, farmers have only in the last two decades (since the 1970s) adopted some form of cattle fattening. However, unlike their neighbours in Amarasi, these farmers have opted to use *Sesbania grandiflora* as fodder instead of *leucaena*. Understanding the reasons behind the choice of *Sesbania* over *leucaena* may answer some questions as to why certain technologies are accepted over others.

According to a study by Johan Keift, farmers outside Amarasi did not adopt *leucaena* for a number of reasons. Mainly, outside Amarasi there was no division between the free grazing cattle areas and fields with *leucaena*. Since cattle prefer the young burst of the

leucaena stems, fields left fallow with *leucaena* had to be continuously guarded against free grazing cattle and had to be maintained with fences.² Thus, while *leucaena* may be a faster growing tree species and offer greater weight gain in cattle, it is seen by farmers as too difficult and time consuming to maintain.

The farmers' rationales for choosing one plant species over the other, or the use of free-grazing versus cut-and-carry, depends much on policies created by local institutions, and changing agro-ecological and socio-economic conditions. However, not much income-related research has been done to determine which system presently offers a higher standard of living or greater benefits for the environment. Further research to compare economic variables, such as income distribution, between different indigenous fallow management systems may prove useful. Nonetheless, according to research on Amarasi and North Central Timor, both systems have been constructed by indigenous strategies to cope with declining soil fertility caused by decreasing forest resources, increasing population and a reduction of the fallow period.

The successful adoption of a managed fallow system using *leucaena* in Amarasi was possible because of the introduction of a series of supportive regulations that were introduced and enforced by the Raja, who was later appointed as administrative head (camat) of Amarasi. According to Metzner, examples from Timor show that the ecological balance can be restored only where the local authority figure, often solely on

² Other reasons included, farmers' fear of their crops being infected by the psyllid and while *Sesbania grandiflora* may not make bulls bigger than other fodder, it does put more fat on cattle which makes them heavier. Another major reason is farmers were told by NGO's and government officials that to introduce *leucaena* they had to stop burning (in favour of mulching), which farmers were not ready to adopt.

the basis of his traditional influence, has taken the initiative. Therefore, the role of local leaders in creating and enforcing community policies are key to the creation of these systems. Farmers are more willing to accept new technologies that fall in line with local institutions and community objectives.

Thus, the Amarasi case shows that innovations in agriculture stand a better chance of being accepted if the new technology incorporates indigenously developed institutions and is focused on improving the economic condition of the local farmers. Through a political economic analysis of the policy initiatives, and the social and economic conditions that led to the creation of the Amarasi system, insight is given into the sustainability and the opportunities to extrapolate policies and lessons learned from indigenous resource management methods to alternative areas within Indonesia.

Chapter Seven ~ Conclusion: Policy Issues for Extrapolation

Shifting cultivation has in the past, and continues to be for governments like Indonesia, the primary recipient of blame for large-scale tropical deforestation. This uninformed and politically motivated perception has led to the creation of policies and laws in attempts to stop shifting cultivation. However, the blame placed on shifting cultivators has been misguided. Agroforestry specialists state that swidden is a complex agricultural system that is well-adapted to the environmental limitations of the tropics. It requires an in-depth practical knowledge of the environment and a high degree of managerial skill.

Shifting cultivation systems, like those found in Amarasi, are examples of swiddeners' reliance on their intimate knowledge of the local environment, and the use of indigenous management practices to overcome environmental problems. The Amarasi model is a dynamic system created by socio-economic and political factors responding to the ecological environment. With the introduction of new technologies, the community institutions in Amarasi evolved to adopt these foreign technologies and guarantee their acceptance and continued application.

The ability of international and state-sponsored development policies to promote equitable and sustainable development have, in the past, been limited. Tropical deforestation continues to be widespread in Indonesia and many rainforest countries. The product of some development policies have not had the desired effect, at times resulting

in “growth with poverty” or “sustainable poverty”.¹ However, throughout all these interventions, the traditional system of swidden cultivation continues to exist and will remain a method of survival for many forest dwellers and people living in the margins of society.

To become more successful, development policies must acknowledge that agriculture is dynamic and responsive, rather than stagnant. Swidden agriculture, for example, is affected by many socio-economic and political factors. Social elements such as demographics, civil organisations, cultural variations and community institutions can effect the outcome of a practice in a given location. In combination with economic variables, such as markets and availability of capital and credit, social and economic components will affect the decision making processes of the farmers. However, these are not the only factors involved. Deviations in climate, soil conditions and crop types will also have a direct result on the many agricultural techniques used in tropical countries. Therefore, an integrated approach that accounts for these complex interactions is essential. A major challenge to the development community and governments alike is to create new policies that promote social, economic and ecological sustainability.

In order to be socially sustainable and fully integrated, these new policies must be derived from a people-centred development perspective. This community approach was vital to the establishment of the natural resource management program in Amarasi. Amarasi was able to move towards an intensified fallow management system because the

¹ Sustainable poverty is a term used by Malcolm Cairns of ICRAF to depict a condition in which poverty becomes institutionalised within a community.

new policies took into account the needs of the farmer and focussed on community participation. The farmer, through his decision-making ability, became an active participant in the creation of his agro-ecological environment, and with his culture co-evolved with the biological environment to create a viable and sustainable 'food procurement system' (Warner, 1991). Moreover, issues of social justice, equity and indigenous development are important ingredients to the success of Amarasi and the development of other sustainable indigenous agricultural systems. Challenging the issues of power and wealth of the large free-roaming cattle owners, the Amarasi model ensured that the distribution of resources (cattle and land) would be evenly disbursed to each farmer, securing all farmers the economic benefits derived from the system.

Policy research in Amarasi shows that community development is a mix of politics, economics, religion and adat. The local rulers of Amarasi ensured the adoption of the new techniques by creating a favourable policy environment in which cattle breeding and fallow management worked in unison with evolving community institutions, social leaders and local church groups. The local authorities created adat (customary) laws to give validity to the new technologies. Community leaders established local adat laws to ensure that the fallow period between crops would be managed by planting nitrogen-fixing *leucaena* trees. In addition, adat laws were created to guarantee that cattle fattening programs and agriculture could exist simultaneously through land zoning and supporting the cut-and-carry method.

In terms of the political environment, policy measures that guaranteed the success of the Amarasi included the extension of usufruct rights over land cultivation to incorporate the planting of *leucaena* as a fallow species. This secured land stewardship and gave the farmers incentives to plant *leucaena*. The local government aided the planting of *leucaena* by supplying seedlings and disseminating information regarding how to plant and care for *leucaena*. However, in the future there will be a need to avoid *leucaena* becoming a mono-culture crop, which may lead to similar problems with infestations of the psyllid. Land zoning – division of land between that used for farming and land used for cattle grazing - was another key ingredient for success. This division allowed farmers to plant their *leucaena* without fear of crop loss from free-roaming cattle. The introduction and enforcement of the cut and carry method also helped propagate the system. Programs of cattle share-rearing, or *Paronisasi*, allowed poor farmers to partake in the cattle fattening program. However, government programs to give cattle to farmers for fattening must ensure that farmers have an adequate supply of fodder. In Amarasi, local NGOs and government assisted farmers in obtaining seedlings of, not only *leucaena*, but also other fodder species such as *sesbania* and king grass. The addition of banana stocks to the fodder assisted the farmers with the requirements for water to overcome the lack of water supply during the dry season. And finally, the creation of local markets where cattle can be bought and sold were also important ingredients to the success of Amarasi.

A policy directive that incites strong local support for institutions creating regulations is essential to give credence to new technologies. Incorporating all aspects of the

community into the formulation of policy initiatives creates a bridge between historical methods and future possibilities. Agricultural systems, such as Amarasi, adapted to specific agro-ecosystems will result in a more sustainable system only if they are based on appropriate traditional techniques that combine to fit a particular ecological, social, political and economic niche.

The future sustainability of the Amarasi system will hinge on the ability of the communities to continue adapting to their changing environment. Pressures resulting from increasing population may alter the system away from the present Amarasi model towards one based more on the *climax* Amarasi model, or a combination of these two systems. A return of the psyllid infestation will require farmers to act quickly to replenish their fodder supply with alternate species. Indonesian government policies relating to timber concessions, land tenure, transmigration programs and regional cattle fattening policies will affect the future of Amarasi. In addition, the loss of stature of *adat* and the role of social leaders within the community, and the increasing reliance on market conditions will inevitably draw Amarasi closer to a market-oriented economy. If Amarasi can continue to use its indigenous strategies of resource management to address these concerns, then as in the past, environmental degradation can be overcome and lead to sustainable development for all its inhabitants.

In making policies to overcome environmental degradation in the tropics it is important to refocus our research onto the ultimate causes of poverty rather than on poverty or the poor shifting cultivators themselves. There is a need to take a closer look at activities

such as subsidies for commercial logging or inequitable landholdings which are issues of resource distribution and directly affect deforestation and sustainable development. It is apparent that issues of land use patterns in tropical rainforests countries like Indonesia must be addressed. New policies initiatives to combat environmental degradation must attempt to reconcile the causal relationship between societies' economic base and the institutions of the state. Many of the problems relating to tropical deforestation in Indonesia are interrelated to a set of environmental symptoms which result in land degradation, political and economic peripheralisation, stagnant production, out-migration and poverty. In changing our development policies for rainforest depletion to incorporate the influences of numerous socio-political and economic variables, only then do we create an operational model necessary to provide sustainable solutions to environmental problems facing ourselves and future generations.

APPENDIX A

Research Methodology Outline
Presented to ICRAF- Bogor and the *Politeknik Pertanian University* in Kupang

<i>Socio Economic Context</i>		<i>Methodology</i>	<i>General Questions</i>
Market Opportunities (Background information for policy analysis)	Distance - from village (km) - from farmers fields (km) - time it takes to get to market	Direct observation and interviews with local farmers	A1. What is the distance of the market from the village? (km) A2. What is the distance to the market from the farmers fields? A3. How much time does it take to get to market?
	Access - roads: condition - type of transportation	Direct observation and interviews with local farmers and policy makers.	B1. Number of Roads? B2. Condition of Roads? Paved? B3. Type of transportation
	Middlemen - number of middlemen - dependence on middlemen - percentage of profits to mm	Interview with local farmers and middlemen.	C1. Does the farmer use middlemen to get products to market? C2. How dependent is the farmer on middlemen to get projects to market? C3. Percentage of profits that go to middlemen? C4. If NO middlemen, than how does farmer get goods to market?
	Number of Markets - number in local area - furthest market	Interviews with local farmers and middlemen.	D1. How many markets are there in the local area? D2. What is the furthest market farmers are willing to go? D3. How many markets does the farmer rely on to sell his crops?
	Crops - percentage for consumption - percentage for market	Interviews with local farmers	E1. What percentage of crops are for personal consumption? E2. What percentage of crops are for market?
Access to Credit	Constraints - barriers to export - local regulations	Interviews with local farmers, middlemen and market people	F1. What does the farmer see as barriers to selling his crops in market? F2. What are the local regulations for selling in markets? F3. What regulations/barriers do middlemen see.
	Lender - type of credit available to farmers	Interview with local framers and lending institutions.	G1. What types of credit do farmers receive. Is it from a private or public institution? G2. What is a typical amount, type and interest rate.

Land tenure	Local ownership laws	Interviews with farmers, decision-makers, and local government officials.	H1. Ask farmers if they own their land. H2. Ask local government officials about land tenure rights. How much is owned by the state?
Policy Initiatives		Methodology	Questions
Infrastructure development	Infrastructure - roads, bridges ect.	Interview with local government officials, local people, direct observation, and secondary data	I1. Ask about number of access roads between villages and to markets.
Land Management Issues	Tenure - land zoning - equitable of land holding	Interviews with local officials, decision-makers, farmers, and secondary data	J1. Ask officials about land zoning. J2. Ask local officials about equitability of land holdings: i.e.: what is the average size of land holdings? What percentage of farmers own land?
	Promotion of <i>Leucaena</i>	Interviews with local officials, decision makers, farmers and secondary data.	K1. Ask local officials about the history of planting <i>leucaena</i> . K2. Ask farmers about history of <i>leucaena</i> in area. K3. What are the incentives to plant <i>leucaena</i> ?
	Promotion of cattle fattening - cattle distribution schemes - equability of cattle holdings - time spent protecting fields from cattle	Interviews with local officials, decision-makers, farmers, and secondary data.	L1. Ask local officials about the government cattle distribution programs L2. How has this contributed to equability of cattle holdings? L3. Ask farmers how much time is spent protecting fields from roaming cattle? L4. How important is cattle raising to the village? To the farmer? L5. How many cattle do the farmers own? How many cattle does he look after for another farmer? L6. What are the requirements for looking after another farmer's cattle? L7. Do farmers have any desire to extend their cattle stock?
ADAT: Local (village) regulations	Tether or confine livestock - fines for destroyed fields - time spent building fences	Interviews with farmers and local decision-makers.	M1. What fines are there for fields destroyed by cattle. M2. How much time is spent building fences to keep cattle enclosed. M3. How much time is spent protecting fields from straying cattle?

			<p>M4. Who is in charge of enforcing the fines?</p> <p>M5. Are there any other regulations/incentives?</p>
Village Structure	Identification of village hierarchy structure	Interview with Camat (district level government leader), village heads, and social leaders.	<p>N1. Who is in charge of creating the regulations for the villages?</p> <p>N2. Description of regulations dealing with cattle raising. Who creates and who enforces?</p> <p>N3. Description of regulations dealing with <i>leucaena</i>. Who creates them and who enforces them?</p> <p>N4. What have been the changes in Adat laws since the introduction of cattle and <i>leucaena</i>.</p>

List of Questions to Guide Informal Interviews of Farmers and Social Leaders

1. Lamtoro

- Historically how did the system get lamtoro? What were the Raja's policies?
- How/where did the farmers get lamtoro seedlings?
- Problem with jumping lice – is it still considered a problem?
- What are the possible substitutions for lamtoro?
- Do they still rotate their crops – with corn and lamtoro?
- Do they always use the same plots of land, or do they/can they open new areas?
- Do they own the land on which they plant lamtoro?

2. Cattle

- Historical – how did the system obtain the cattle? Who owned the cattle? Examine the Dutch policies and the Raja's policies.
- Past Government policies to distribute cattle – explain.
- Present policies to distribute cattle (i.e.: P2RT program).
- Where do they get their cattle from?
- Do they own cattle or when they sell it does a percentage of profit go to government?
- Ask about Adat laws of tethering cattle – ask for description.
- At what age do they buy/sell their cattle?
- What is the normal weight of cattle at sale time?
- How much money do they get on average?
- Who do they sell it to? Where do they sell the cattle?

3. Important Actors

- Social leaders – who are they? I.e.: elders, ex-village leaders

- Church leaders – role of church in creation/sustaining system
- NGOs – main roles?
- Social relations.

4. Land Use

- Historical – how was the land divided?
- Present Day – local ownership laws and land zoning.

5. Labour

- How many hours per day spent collecting fodder, fetching drinking water? Does this time change from dry to rainy season?
- How much time spent weeding? Is weeds a problem? Who does these tasks?
- Do they practice “hoka” or “toit” – communal labour system?
- Is there any problems with labour supply?
- Has this labour shortage/surplus affected the system?

6. Problem Solving Tools

- What happens if they have a very dry season? Or if a farmer needs help to feed his cattle or to buy cattle?
- What type of community help is there?

7. Farmer's decision making

- How do they know how many cattle they can adequately carry?
- How do they decide on fodder mix?
- What stops them from practicing free-grazing?
- Why is *leucaena* preferred over other species?
- Do they use fertilizers? Why don't they use natural fertilizer?
- How do they decide how many fruit trees to plant and where do they plant them?
- How much of the land is for lamtoro and how much is for cash crops?
- Why do they burn instead of mulch?

8. Adat Laws

- What is the impact of Adat laws on the Amarasi system?
- What is the impact of adat on decision making of farmers?
- Is adat still an important force in life of farmers?
- Is this unique to Amarasi?
- What has been the biggest influence in: creating the system; influencing the system; adapting/changing the system to meet changing needs of farmers?
- How has the communities adapted to overcome problems relating to agriculture?
- What are the limitations of the system? Possibilities of future growth?

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