



The Amarasi model

An Example of indigenous natural resource management in Timor, Indonesia

INDIGENOUS FALLOW MANAGEMENT NETWORK



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**The Amarasi model:
An example of indigenous natural resource management
in Timor, Indonesia**

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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 swidden agriculture in propagating this destruction. Misinformed government policies have not been successful in identifying sustainable alternatives for these resource poor swidden 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 practicing conservation management techniques.

INTRODUCTION

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

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. It 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.

BACKGROUND AND METHODOLOGY OF THE RESEARCH

The research is part of the research agenda of ICRAF. It contributes to a better understanding of the importance of how an indigenous policy system can improve indigenous resource management to improve the livelihoods of farming communities. In collaboration with one of the partners of *ICRAF's Indigenous Fallow Management Network (IFM)* on West Timor, the *Politeknik Pertanian University*, and *ICRAF's Programme "Natural Resource Strategies and Policy"*. The research centred on 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.

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Methodology

The methodology for the research 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. 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.

Interviews ranged from one on one conversations in the farmers' fields to organised group discussions in their homes. 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.

Choice of the research villages

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.

This report will delve into the possible explanations of these differences.

THE ISLAND OF TIMOR AND THE AMARASI SUBDISTRICT

Bio-physical aspects

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. Nusa Tenggara Timur is composed of uplifted coral reef, with rocky soils and thin topsoil. The island 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.

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). 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).

Most of the forest has been cut from the mountain areas by decades of swidden 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). Extensive grass savannahs which developed, replaced the original dense monsoon forests, the regeneration of soil productivity became much slower.

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 swidden cultivation of corn, peanut, cassava, and pumpkin. However, By the early 1930s, crop yields began to decrease significantly, resulting in what the local population designated as a seasonal "starvation period".

General features of Amarasi subdistrict and the research villages

The Amarasi sub-district 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.

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.

TOWARDS MORE SUSTAINABLE INDIGENOUS RESOURCE MANAGEMENT

The devastation caused by the seasonal occurrence of famine led to the introduction of an approach to stabilise the agro-ecosystem in Amarasi. This approach has been labelled as the "Amarasi Model".

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.

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.

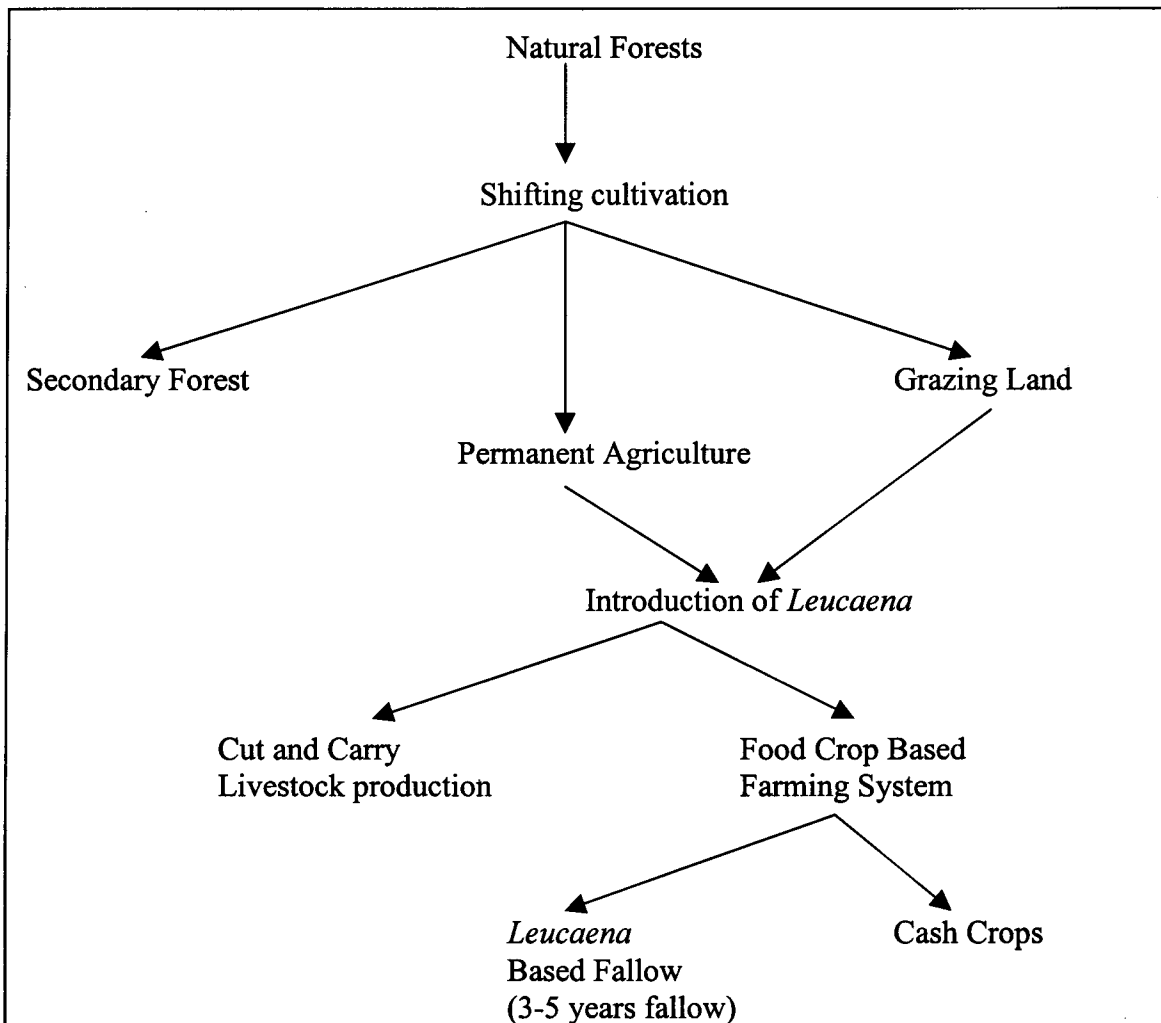
- One condition was an ecological change in the region caused by the introduction of two non-endemic plants: *Lanata camara* and *Leucaena leucocephala*.
- The second condition was the great influence and authority of the local traditional leader of adat (local customary law) who maintained a large amount 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 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. Community institutions evolved and were adapted to support the system.

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 to cope with agro-ecological problems (Djogo, 1995).

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 case study explores some of these external forces and the influences they have on the continuation of the system. The graph below was developed in co-operation with Tony Djogo, and shows the evolution of the forests into the agroforestry model of Amarasi.

Graph 1: The evolution from natural forest towards agroforests in Amarasi



The development of the agricultural system according to the Amarasi Model

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.

However, the commercial cattle farming led to a tremendous increase of the number of cattle in the area, 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 the 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 (Ormerling, 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 enabled to reduce 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 the regeneration of the natural vegetation and placed increasing pressures on the grazing areas.

Introduction of *Leucaena leucocephala* (Lamtoro)

The spread of the plant greatly reduced the possibility for grazing and resulted in a dramatic reduction in the numbers of livestock, since *lantana camara* is unsuitable for fodder. To overcome these problems, the Dutch colonial government, under pressure from influential cattle owners, began policies to introduce agroforestry practices 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). An agroforestry system developed in the province of Nusa Tenggara Timur, which can be summarised as enriched fallows based on *leucaena leucocephala*.

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, *leucaena* is used 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 and shrubs, such as *lantana camara*, which was rampant in Amarasi. Its foliage is extremely high in nitrogen content and comparable to that of manure or inorganic fertilisers. Initially, the new exotic species was planted as hedgerows every 3 meters and alternating with corn. 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*, developing into a rotational improved fallow system alternating with corn.

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.

The introduction of *leucaena leucocephala* (locally called lamtoro), 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, 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.

The introduction of lamtoro influenced the nature of shifting cultivation practices. It increased 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 a change in the social structure, while cultural and indigenous political institutions were altered to fit these new customary laws. 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.

BUILDING ON THE INDIGENOUS LAW SYSTEM "ADAT" AND THE ROLE OF THE RAYA

In order to fully understand why the adoption of the new system was without problems, it is important to understand the concept of adat and the role adat plays in creating and maintaining the system. This indigenous law system is very different from legal law originating from the state's formal institutional structure. 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). 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.

The Influence of the Raja on the implementation of the Amarasi Model

The successful adoption of *leucaena* was ensured through the introduction of regulations by the Raja. The Raja and the 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.

Village resettlement and land zoning

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 co-operation among the farmers and increased their incentives towards community work.

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. Adat laws were soon developed to enforce communal fence building and maintenance. Fines were imposed on farmers for inadequate fences (see next section).

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. 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 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 to obtain land. However, there seems to be no indication that the farmers had the right to 'sell' the land. 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.

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 (usufruct rights) 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.

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 a few drawbacks of shifting cultivation, which is the loose tie between the farmer and land resulting in insufficient concern for maintaining soil fertility, and the need to control burning.

Control burning

One important feature of the Amarasi model is its focus on controlling the burning procedures inherent in swidden agriculture. 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. 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.

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*.

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. Farmers' fields contained perennial trees, like coconuts and banana 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 government's Sandalwood tree plantations.

Retributions and Fines

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.

In order to guarantee the planting of *leucaena* seedlings 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. 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 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 LKMD (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.

Following is a list of some of the fines 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 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, 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 also 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*.

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* has 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*

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. 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 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 persons 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 neighbours 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*

The close proximity of the neighbour's plot made it necessary to create adat laws to control fire. Fire control is essential within the swidden 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.

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. 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*. Fines are still used, however, in situations like compensation for damages done by free roaming or escaped cattle

There are also 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. 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.

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. In short, the farmers acknowledge the necessity or the benefits of *leucaena* as fodder for cattle and thus a necessity for their income and survival. Economic incentives took over as the biggest factor for the continuation of the adat.

According to Metzner (1983), without these series of supportive measures, such as adat and land use zoning (discussed below), this geo-ecological change would have been impossible.

SOCIO-ECONOMIC CHANGE IN AMARASI

The introduction of the tree species *leucaena* drastically changed the economic and ecological base of Amarasi, while contributing to changing and more stable socio-economic conditions of the Amarasi people and the area (Stoney, 1992). 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. 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. The creation of new villages also required a new local government structure to incorporate the fusing of hamlets and Temukungs.

As the population of Amarasi increased, the Adat law was consecutively adjusted to fit the changing land-use patterns. The area allocated for agriculture was expanded and the free-grazing area was decreased. 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. 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 farmers, and therefore all precautions were taken to stop cattle from straying.

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 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.

"Share-rearing" or the 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. 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). This partition of the large cattle herds resulted in the system known as '*paronisasi*'.

Paronisasi is the Provincial government program that has been in operation since 1971. In this program the government buys male cattle from cattle owners who have an inadequate labour and fodder supply, outside Amarasi. Then give cattle or sell cattle to cattle-less farmers who have an adequate supply of *leucaena* fodder. 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%.

The *paronisasi* system 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).

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. 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 Bawah): 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.

As stated before, 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 coconuts and banana 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 coconut and banana 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.⁴ 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. 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).

OTHER IMPORTANT PLAYERS IN THE PRESENT-DAY 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.

Other NGO's playing an important role

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,

⁴ 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 with *leucaena* and higher fertility soils are left for the perennial crops.

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."

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 section examines the constraints and barriers that the Amarasi system is facing and the possible alternatives for change in the future. In addition, some possible alternatives for the future are discussed.

CONSTRAINTS AND BARRIERS FOR THE AMARASI MODEL

There are however constraints to the Amarasi model that might 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, a negative effect of concentration on only one species (*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. Most farmers interviewed in the region state that jumping lice are still a problem. 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 psyllid experience exemplifies the dangers of over-dependence and a mono-culture in a single species. 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 systems 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 grandiflora* 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 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 problem 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 0.5 ha of land planted with *leucaena* to produce enough fodder to feed one 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.

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

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.

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.

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 FURTHER ADJUSTMENTS 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.

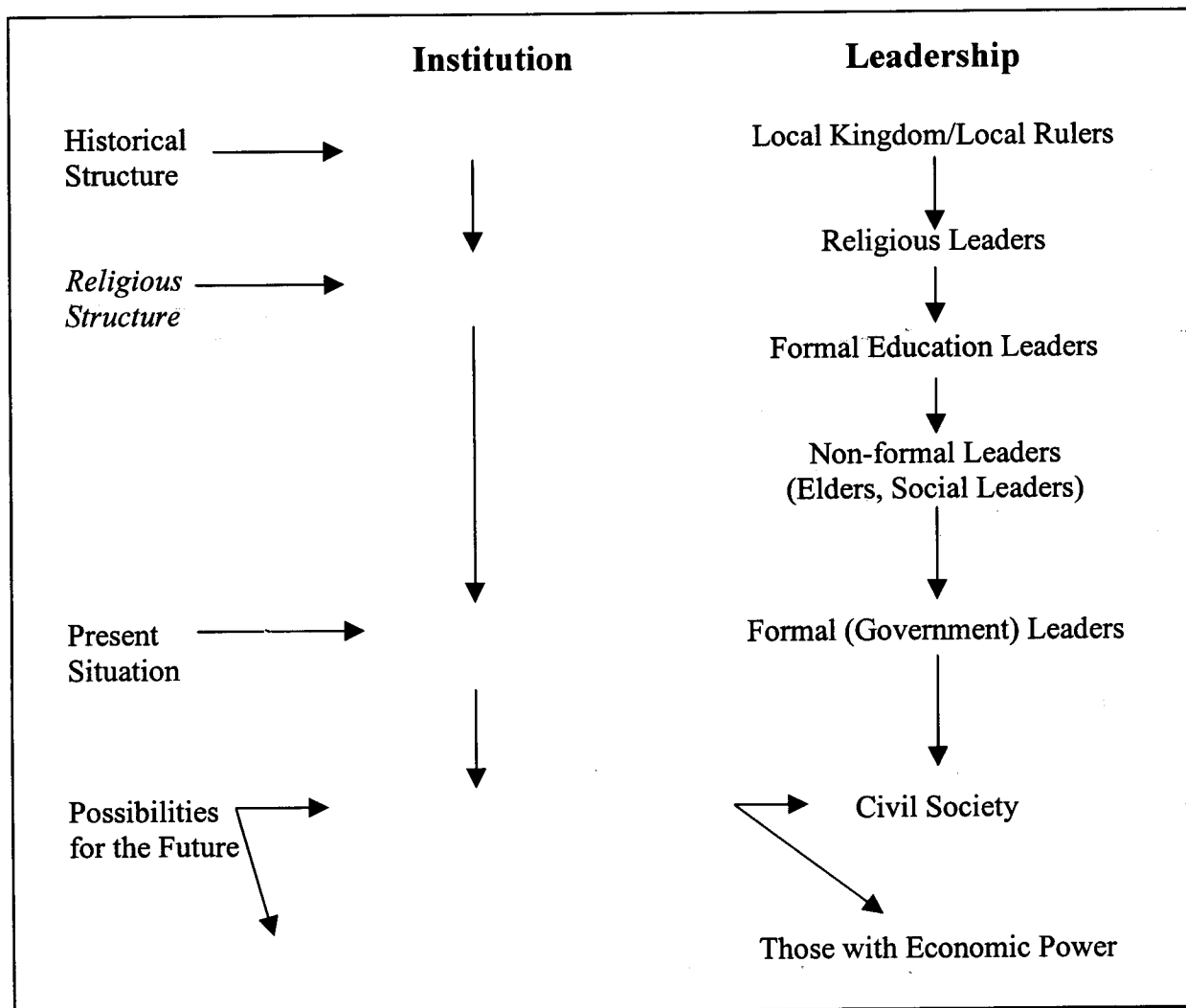
Institutional evolution

When Amarasi was a kingdom, the local Raja and his adat laws governed the people. This changed in 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.

Graph Two gives a graphical outline of the institutional evolution in Amarasi. The graph is developed in close co-operation with Tony Djogo.

Graph 2: Institutional Evolution in Amarasi



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 effects 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.

Besides being a strategy for land-opening, fire in Amarasi is 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 numbers signify 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 highly dense areas of Western Amarasi, versus that of Eastern areas. Population increases in the future may have an affect 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. 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

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.⁴ 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.

One change that can be seen in the western part of Amarasi, the starting place for the new system, is the abundance of coconut palms, banana, papaya, and other tree crops. In western villages, like Soba, we see *leucaena* plots being converted into coconut and banana-tree 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 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 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.

The increasing power of the market is evident in the declining role and power of adat in governing people's lives.

⁴ As mentioned in the previously, 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.

CONCLUSIONS AND LESSONS FOR EXTRAPOLATION

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 (Djogo, 1995). For Amarasi farmers, the increase in their economic standings was seen to be tied to *leucaena* and the cattle fattening program.

Reasons why the system was not adopted or as successful in other areas could be the result of certain unique factors in Amarasi. Policy research in Amarasi shows that community development is a mix of politics, economics, religion and adat. 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.

Sustainable Development in Amarasi

According to Thrupp (1990) the success of sustainable development depends on whether the system: (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 Amarasi can be a successful model 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.

An integral part in determining the sustainability of rural development programs also rests on policies that obtain a significant amount of community involvement in the creation and implementation stages. The strategies used for improving the agricultural system in Amarasi were successful because the program was one that took into account a farmer or people-centred development perspective. To establish local participation, such programs must understand the indigenous approach to solving resource management problems. Incorporating all aspects of the community into the formulation of policy initiatives creates a bridge between historical methods and future possibilities. 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.

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 (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 grandiflora* over *leucaena* may answer some questions as to why certain technologies are accepted over others. The farmers' rationales for choosing one plant species over the other, or the use of free-grazing versus cut-and-carry, depends much on changing agro-ecological and socio-economic conditions and policies created by local institutions.

According to a study by Johan Kieft, 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. Other reasons included, farmers' fear of their crops being infected by the psyllid and while *Sesbania grandiflora* may not make bulls bigger than those cattle fed on fodder such as *leucaena*, 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. Thus, while *leucaena* may be a faster growing tree species and may offer greater weight gain in cattle, it is seen by farmers as too difficult and time consuming to maintain.

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.

Development policies must acknowledge that agriculture is dynamic and responsive, rather than stagnant. A system like swidden agriculture 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. 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 build on indigenous systems of resource use and promote social, economic and ecological sustainability.

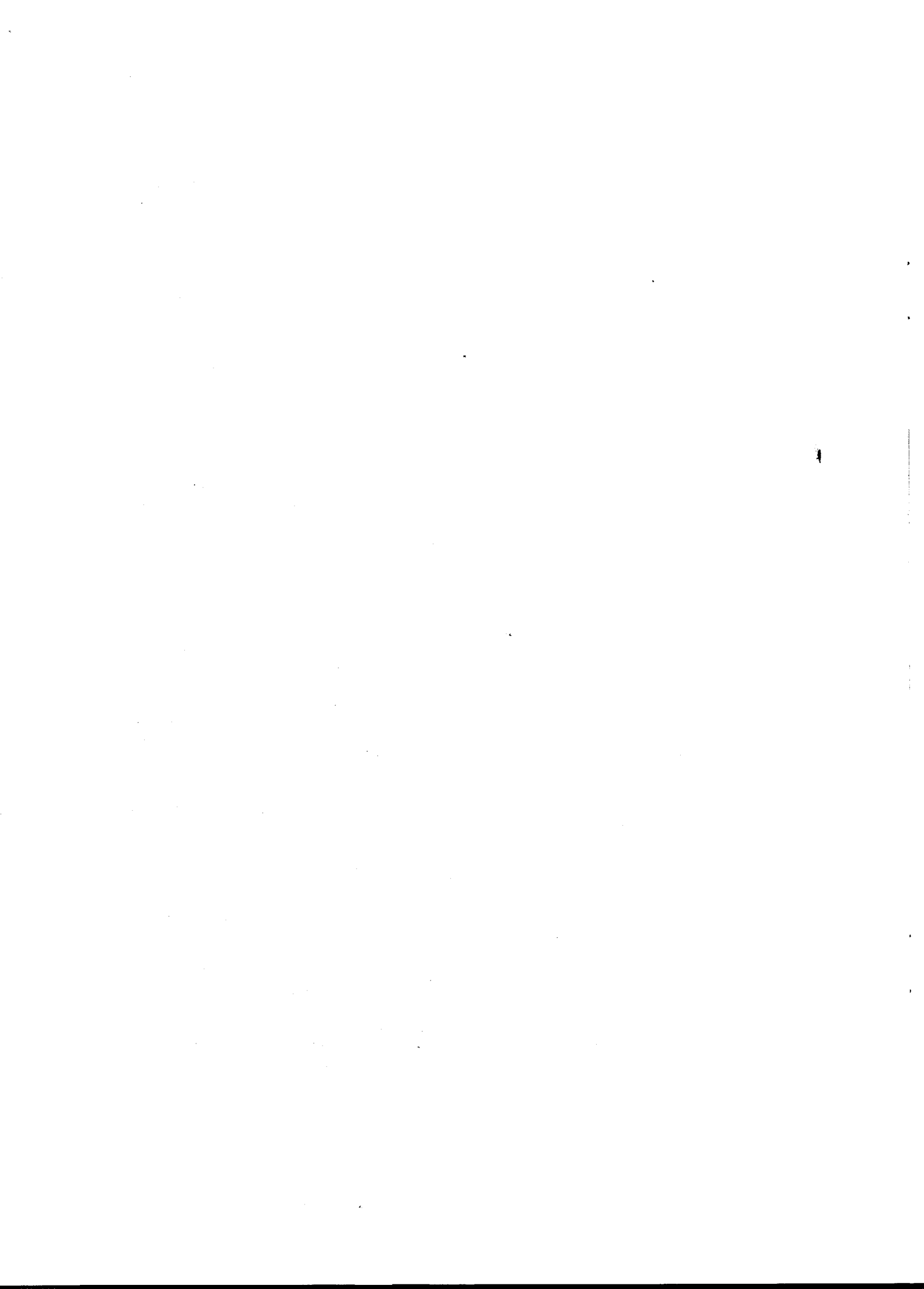
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Misinformed and politically motivated government policies have not been successful in identifying sustainable alternatives for these resource poor slash-and-burn farmers., indigenous farmers on the island of West Timor, in eastern Indonesia, have drawn 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 practicing conservation management techniques.

The indigenous Fallow Management Network is part of ICRAF's South East Asia activities. The Network focusses on assisting a range of collaborating partners to validate and extrapolate promising (components) of indigenous fallow management systems in order to benefit a wider upland farming community. Technologies to improve/intensify degrading upland fallow systems should emphasise participatory research approaches resonating with farmers needs and objectives.

The Network is evolving in keeping with the nature of the network as a voluntary association of scientists and practioners. Its activities evolve naturally as its members identify new needs and ways to work together. Outside scientists or students (Masters and Ph.D.) with strong overlapping interests in these issues, field experience, a proven ability to work independently and access to funding resources may wish to explore the possibilities of an attachment to ICRAF S.E. Asia to work directly within the IFM Network.



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