BENEFITS FROM TREE GROWING IN THE DEGRADED UPLANDS: EMPIRICAL REALITIES FROM TABANGO, LEYTE, THE PHILIPPINES

Belita Amihan-Vega and Josiefer D. Mendoza

Understanding the poor upland farmers' rationality in managing their agroforestry systems necessarily includes analyses of the complex socio-economic and ecological niche in which their local knowledge is embedded. Cost-effectiveness in agroforestry research and extension is maximised by building on what farmers know and making such knowledge readily available as input for program interventions. This study illustrates one of the alternative methods being tested in systematising the documention on the local ecological knowledge by examining the benefits to farmers from tree growing in one of the pilot sites of the World Agroforestry Center (formerly the International Centre for Research on Agroforestry or ICRAF), Visayas, Philippines. The Local Ecological Knowledge – Knowledge-Based Systems (LEK-KBS) approach and computer software AKT5 has been used to identify and assess the importance of tree growing among upland farmers in Tabango, Leyte. Farmers were found to possess rich knowledge on their ecology and be utilising it for daily sustenance. Wood charcoal making provides the direct cash benefit from tree domestication. Other non-monetary benefits were manifested on the farmers' characterisation of the 34 indigenous species found in their locality. Poverty and infertile soil were the urgent socio-economic and ecological problems affecting farmers' activities and economic survival that came out from the LEK-generated database. While farmers generally preferred indigenous trees, for immediate cash returns they opted to plant fast-growing exotics on own farms, especially for charcoal. Short and long-term recommended intervention schemes include information and education campaign to induce farmers to adopt sustainable livelihood through charcoal and action cum research to rehabilitate and protect the Binaliw watershed.

INTRODUCTION

Filipino farmers face intense pressure to earn their living in the marginal uplands, which may give rise to a sense of hopelessness amid the burgeoning conditions of high population growth, lack of adequate social services and infrastructure, as well as limited economic opportunities. Unquestionably, poverty is the root of the problems in the country's uplands, and also the explanation for environmental destruction (Fujisaka *et al*. 1986, Pulhin 2000). There have been countless development interventions to solve the depressing state of most people in the uplands, some implemented with multilateral and bilateral support, and others undertaken with local initiatives (Kummer 1992, Harrison *et al*. 2000, Li 2002).

The Philippines has, for decades, been at the forefront in the promotion of smallholder forestry aimed at optimising the use of forest, crops, soil, trees and human capacities to enhance sustainable development and at the same time distribute the benefits to the resource-poor sector. Observably, several of these agroforestry development initiatives still follow the top-down strategy in program implementation. Local people's contribution in upland development endeavours, with the use of their knowledge, gained resurgence in research and development (R & D) circles from the socio-anthropological documentation in the post-Green Revolution emphasising 'participatory' and 'farmers first' approaches

(Chambers *et al*. 1989). Despite these efforts, tapping the upland farmers who act as repositories of knowledge especially on how they subsist by managing the scarce resources for survival has not observably been mainstreamed.

The value placed on local knowledge is still observably very low when it comes to upland development interventions. Perhaps the problem lies in implementers who are relying on the 'global' knowledge as the sole guide in development decisions that may tend to blind them to the larger social purposes and realities in the daily lives of people (Burch and Parker 1991). The penchant of prescribing mostly technical solutions to poverty problems in the uplands implies a view that disregards the significance of the other sources of knowledge. While scientific knowledge is the dominant form of knowing vis-à-vis local knowledge, the latter cannot be discounted when it comes to the accumulation of knowledge through day-to-day lived experiences in tending trees, crops and livestock. Resource-poor farmers cultivating in the marginal uplands hardly plant trees primarily for ecological purposes. Most of them plant trees and adopt agroforestry practices for subsistence and other economic reasons**.**

This paper supports the view that farmers are rational beings; no matter how economically deprived they are, they possess their own understanding of their environment which is woven into their ways of surviving the harsh realities in the uplands. Such knowledge has stood the test of time, and is embedded in a complex socioeconomic and ecological niche that requires a formal representation for comparative understanding and blending with scientific knowledge (Sinclair and Walker 1998). Building on what farmers know and practice is still the most advantageous means of ascertaining strategies that may involve adoption of agroforestry innovations. Studying the benefits of planting trees as an entry point will hopefully encourage farmers to plant more trees in order to combat poverty in the uplands. In contrast to the conventional paradigm that usually begins with a focus the production aspects of agroforestry (e.g. mobilising farmers for tree planting, and establishing and managing the nurseries), this study looks first on what farmers do with trees and analyses how to improve further their localised strategies.

The objective of this paper is to comprehend what benefits upland farmers gain from growing trees, and to establish a database of their local ecological knowledge for informed decisions on agroforestry-related interventions. Tabango, a town located in the northwest of the Leyte Island, is the project municipality of the World Agroforestry Center-ICRAF Visayas, which supported the study together with the International Fund for Agricultural Development (IFAD). The research was conducted to test a particular research tools in gathering qualitative information, namely the Local Ecological Knowledge-Knowledge Based Systems (LEK-KBS), with its accompanying WinAkt5 software designed by the University of Wales, Bangor (as described by Dixson *et al*. 2001).

In general, the study aimed to produce a LEK database that will be used as an input for any potential technical interventions in the Tabango uplands. Specifically, it sought to:

- identify the types of benefits farmers derived from tending trees;
- ascertain the relationship between tree growing and conserving the ecological landscape;
- identify constraints faced by farmers in increasing farm income and sustainable livelihood; and
- determine intervention schemes to promote sustainable livelihood in the Tabango uplands and address the ecological problems.

This paper first examines the importance of local ecological knowledge (LEK) in the cultivation, management and utilisation of trees, the conceptual underpinnings that serve as the springboard for the study and the methodology used. This is followed by a discussion of highlights of the study, the conclusion and relevant recommendations.

TREE GROWING AND LEK

Tree domestication by farmers is an age-old activity. Various studies have shown that farmers are motivated to grow trees for the environmental, economic, ecological and social considerations (Fujisaka *et al*. 1986, Kummer 1992, Arnold and Dewees 1997). These resources are vital for their survival, providing a wide array of products for food, shelter and implements. Local people's knowledge serves as a basis of their practices and interaction with the elements and processes in their agroecosystems. This knowledge may be indigenous or acquired from other sources. This is well illustrated by the Tausugs in Sulu who adopted indigenous tree domestication systems, and the Ikalahans of Nueva Vizcaya's localised fruit processing techniques, whose interdependence with the lands and environments became the very soul of their existence (Cabanilla and Kaing 1996, Rice 1996). People generate knowledge over time to allow them to cope with their particular agro-ecological and socioeconomic environment.

LEK is usually derived, yet continuously evolving, through experimentation and observation. It is distinct from the supernatural knowledge systems based on magical and unexplained circumstances. Unlike the scientific knowledge, local ecological knowledge is mostly undocumented and passed on orally and through practice from one generation to another. Such an articulation gives LEK a dynamic characteristic as it undergoes several testing and micro-applications. For instance, the use of plants from the forest and home gardens to cure common ailments is being observed by the younger generation of upland people from their older brothers and sisters thus becoming part of their current health management.

Full recognition of local knowledge systems is central to the issue of sustainable and equitable development. Until recently, farmers have been viewed as 'backward', 'static' and a 'hindrance' to modernisation. The perspective that modern science is capable of providing the solution to underdevelopment is also responsible for the depreciative view of indigenous and local knowledge systems (Appleton *et al*. 1995). As a valuable resource, local knowledge is unconditionally shared, its own practical concepts evolving sans royalties. Its non-commercial nature has benefited rural households in coping with the incidence of poverty.

Biodiversity conservation and preservation utilize the richness of local knowledge as shown by the culture of multipurpose trees, various cultivars of sweet potato and other root crops in highlands of Central America and Africa (De Boef *et al*. 1993). A pattern of regularity may exist with LEK across the same agroecosystems, yet gaps require scientific complementation. It should also be noted that there are aspects of local knowledge which have shortcomings, and romanticising them might not be wholly beneficial. Nevertheless, it has been observed that local ecological knowledge is in danger of disappearing due to global processes of rapid change and the capacity and facilities needed to document, evaluate, validate, protect and disseminate such knowledge are lacking in the South or developing countries (SciDev.Net 2002). As complementary with scientific knowledge, local knowledge should be accorded its importance for more holistic development.

Conceptual Basis for the LEK-KBS Study

The topical focus of this research sprang from the researcher's own sociological bias – that of placing prime consideration on people, in particular those in the rural areas, on how they cope with their situation in the face of scarcities in their respective agro-ecological zones. When a reconnaissance survey was conducted before this LEK study commenced, seeing the people between the few standing trees in the fragile uplands of Tabango and yet processing charcoal from wood, presented a puzzle worth unraveling. Interestingly, as a part of an interdisciplinary team, the choice of research problem was not initially appreciated. Apparently, it was misconstrued as endorsing charcoal making among the smallholders. On the contrary, by highlighting the utilitarian aspect of tree growing from the farmers' point of view, the study hoped to provide some understanding on how such a livelihood is made lasting under depressing socioeconomic and ecological circumstances. Agroforestry is all about eliminating poverty, especially among those who are tending its resources, and the people are at its core. If one recalls, this was the essence of the Brundtland Commission Report (WCED 1987), which argued that poverty and environmental degradation are joint issues that should be on the agenda for development.

A conventional reductionist approach to science may not be enough in comprehending the complex of issues in agroforestry. Rather, it may be necessary to exploit other ways of knowing to come up with more effective initiatives (Harris 1980). This study holds that local knowledge, albeit with limitations, can be harnessed in a complementary way with scientific knowledge to understand the poverty in the eroded uplands of Tabango.

RESEARCH METHOD

Research Site Selection and Brief Profile

The research location was chosen because Tabago is a pilot site of the World Agroforestry Centre-ICRAF Visayas. It should be noted that rural poverty incidence in Eastern Visayas is 49.8% as reported by the National Statistics Office Region VIII (undated). Tabango is characterised as one of the poorer areas (5th class town) in the north-west of Leyte Province, located on the western seaboard of the Camotes Sea. It is situated 63 km from Tacloban City (provincial capital) and 63 km north from Ormoc City. Its 13 *barangays*[1] including the town proper have a total land area of 12,920 ha with an estimated 2000 ha planted with trees (Salapa 2003). The town was created by virtue of Executive Order No. 184 of President Quirino on October 15, 1949 and inaugurated on January 16, 1950.

As of 2000 Census, Tabango has a population of 31,438 and 6,724 total households (National Statistics Office Region VIII (undated). The terrain is mostly mountainous, especially the interior portion, with 49.8% of the total land area slightly eroded and 10% moderately eroded, according to the data from the Department of Agriculture. Alienable lands comprise 83.5%, the balance being either inalienable or undeclared. Three soil types characterise Tabango, namely Lugo soil (71.3%, mostly in interior areas), Hydrosol (18%) and Faraon clay (10%). Rainfall is evenly distributed throughout the year. The major crops are corn, coconut and rice. The town is also one of the early sites of the Operation Land Transfer (Torres *et al*. 1986), an agrarian reform program of the Philippine government, popularly known as one of the places where the early adopters of contour hedgerows planted to *ipil-ipil* (*Leucaena leucocephala)* are found. Starting in the 1980s, the town has been identified as the main supplier of wood charcoal to Ormoc City, a major commercial centre in western Leyte.

The village study sites were Tabing and Manlawaan (Figure 1), with 458 and 542 households respectively. From the *poblacion*[2], Manlawaan is 9 km while Tabing is 8 km. Some of the fisherfolk are located in Tabing. Manlawaan is a larger *barangay* in terms of land area (803 ha). It has 11 *sitios*,[3] all located in the interior areas of Tabango, while Tabing is found along the coastal area. The predominantly shallow calcareous soil in both

[1] A *barangay* is the smallest political unit in the Philippines.
[2] This is a local term for town proper or centre of government and commerce in a Philippine municipality.
[3] Smaller districts or units within the *barangay.*

barangays has not deterred farmers from growing crops, mainly for subsistence; the uplands are devoted to coconuts; corn, fruit and forest trees while the lowlands are planted with rice. Wood charcoal-making and marketing the local produce also compose the local commerce. In terms of social services, both barangays have health centres and elementary schools. There is no communal water system, people sourcing water from their own wells and springs for home and farm uses. Manlawaan has a water spring called Binaliw.

From focus group discussions (FGDs), it was found that most of the lands in Manlawaan were owned by big landowners or *hacienderos* in the 1950s. In the 1970s, 66 ha were under land reform. Deforestation as well as charcoal-making commenced in these two localities in the 1980s. About 75% of the farmers in both *barangays* do not legally own the land they till.

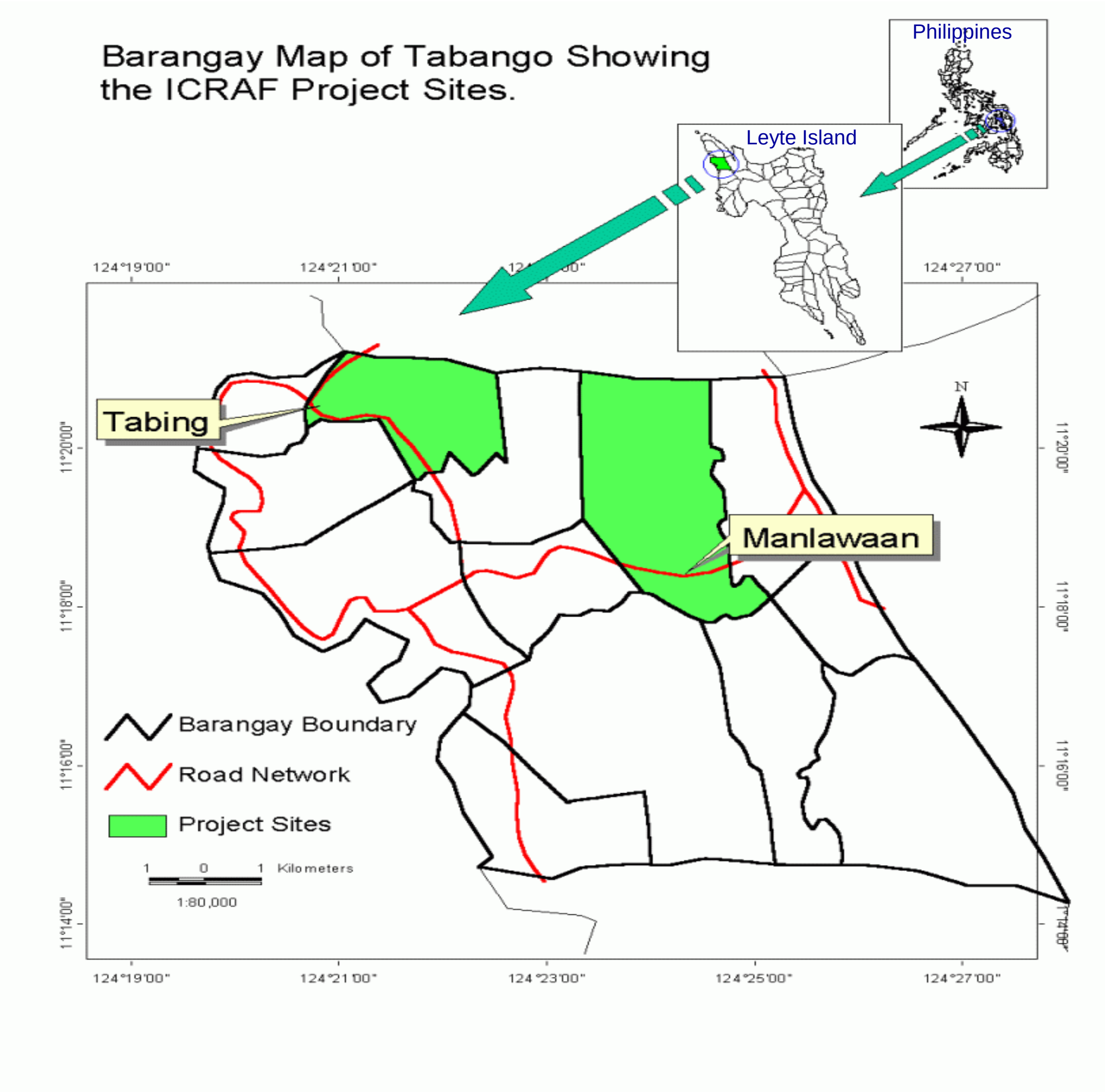

Figure 1. Map of Tabango

Source: WAC-ICRAF Visayas (undated).

Data Collection

A reconnaissance survey was conducted prior to formal commencement of the project in October 2001. Since there were no criteria as to the phenomenon or problem focus to which LEK-KBS might be applicable, the choice of the topic was based on the researchers' disciplinary orientation.

In terms of LEK-KBS Elicitation Strategy, the study followed the steps in the conduct of the research as specified by Dixson *et al*. (2001): scoping (secondary data gathering, identification of appropriate data sources and parameters); definition (identify key informants); compilation (conduct of participatory rural appraisal, field validation); and generalisation (determining representativeness of knowledge gathered). With the use of the WinAkt5 software, the knowledge base became the final output.

The KBS approach involved the systematic acquisition of local ecological knowledge. Explicit statements were recorded covering the source of knowledge, context, hierarchical classification, definitions and synonyms. These explicit statements were represented in a formal language using simple syntactic grammar that enabled the use of computers with some artificial intelligence (as described by Joshi 2001). A knowledge database serving as the output of the LEK-KBS included the sources of the knowledge, and in this case the names of the farmers who participated in the study and shared their knowledge with the researchers.

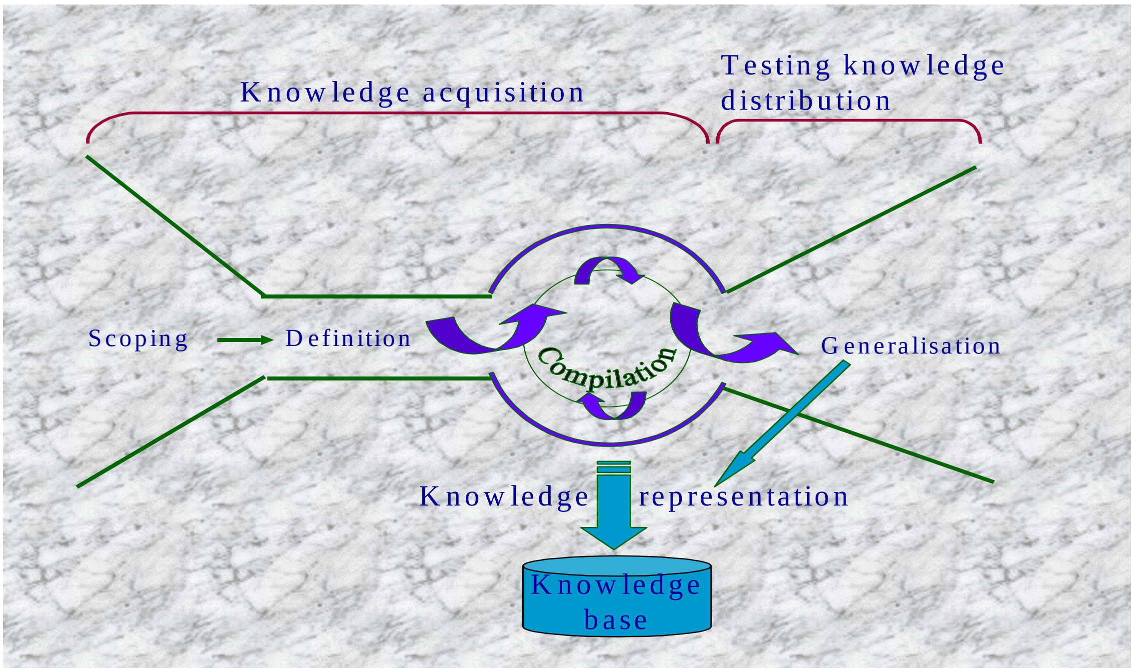

Figure 2. Schematic diagram of the LEK-KBS methodology

Source: Joshi (2001).

RESEARCH FINDINGS

Three sets of FGDs were conducted in each of the two *barangays* to gather farmers' knowledge on wood charcoal-making. Each FGD group was comprised of 10-16 farmers, with about a 60%:40% balance between males and females. Ages of participants ranged from 28 to 60 years. FGDS were undertaken on three consecutive Saturdays for each site. For the indigenous trees data, a similar process was conducted to the selection of farmers for wood charcoal-making, but FGDs were conducted for Manlawaan only. Side by side with this qualitative research, research for a graduate student thesis (Salapa 2003) [4] was

[4] Salapa, MJO (2003) *Economic Analysis on the Production of Wood Charcoal in Tabango, Leyte*. Master of Science (Agricultural Economics) thesis, Leyte State University.

conducted to complement the data and basically determine the economics of the production of wood charcoal.

A total of 104 statements on charcoal making and 115 on indigenous trees, which were compiled from farmers and eventually comprised the LEK-KBS for this particular study, were used as the basis for the following data.

Benefits from Tree Growing

From the data and field observations, farmers acknowledged the importance of trees for their survival. However, they were more emphatic about the direct cash benefits and other non-monetary gains they derived from tree growing. The cash benefits from trees were obtained by from processing wood into charcoal, selling fuelwood and selling dried *ipil-ipil* leaves.

Direct cash benefits

Oral accounts revealed that migrants from northern Cebu introduced wood charcoal-making in Tabango before World War II. As of 2003, there was a total of 274 farmers from four *barangays* of Tabango who utilised trees for charcoal, 30% of whom came from Manlawaan and 25% from Tabing. About 27 were actively marketing the charcoal as wholesalers, retailers and direct buyers for the whole town of Tabango.

Farmers engaged in charcoal-making for immediate cash income given the lack of other livelihood options to choose from especially during family emergency situations such as making payments for medical bills when a family member is ill, and for debt payments and children's school fees. They also process charcoal opportunistically when there are enough stands to prune, and when the market demand is high. The peak seasons are during the wet months of June-July and December-January. A sack of wood charcoal returns as much as P75-100 during the peak months as compared to P30-50 in other times of the year. Farmer informants reported that the high preference for wood charcoal is from commercial food establishments (mostly in Ormoc City) because of its slower heating capacity unlike the coconut charcoal. Also, gardeners observably use wood charcoal as a potting medium while others use it for household fuel needs. Farmers processed charcoal from trees in their own woodlots every second year. Some purchased twigs and branches for charcoal processing. The tenants who were also *mag-uuling* (charcoal-makers) usually adopt the 25:75 sharing arrangement with the lot owners receiving the lesser share.

A distinct gender division of labour was observed in charcoal-making. Men usually cut down the branches and carry them to the processing site. Women and children assist them in the piling of branches and twigs. Before setting the fire, the men collect weeds and soil to cover the piled branches while the women tend the processed charcoal until ready for sacking. The men also carry the sacks of charcoal along the roadside for transport or for pick-up by the buyers.

During the FGDs, the farmers admitted that wood burning is not environment friendly but then they asked, 'What is our means of earning a living in this part of the town; do we go stealing?' Besides, they rationalised that the practice is not wholly damaging because they only prune or cut down the twigs and branches not the whole tree. Furthermore, results from the LEK-KBS showed that contrary to expectations, farmers' perspective on wood charcoal-making was not just about sustenance *per se*, but rather they viewed it within a wider socioeconomic and ecological context (Figure 3).

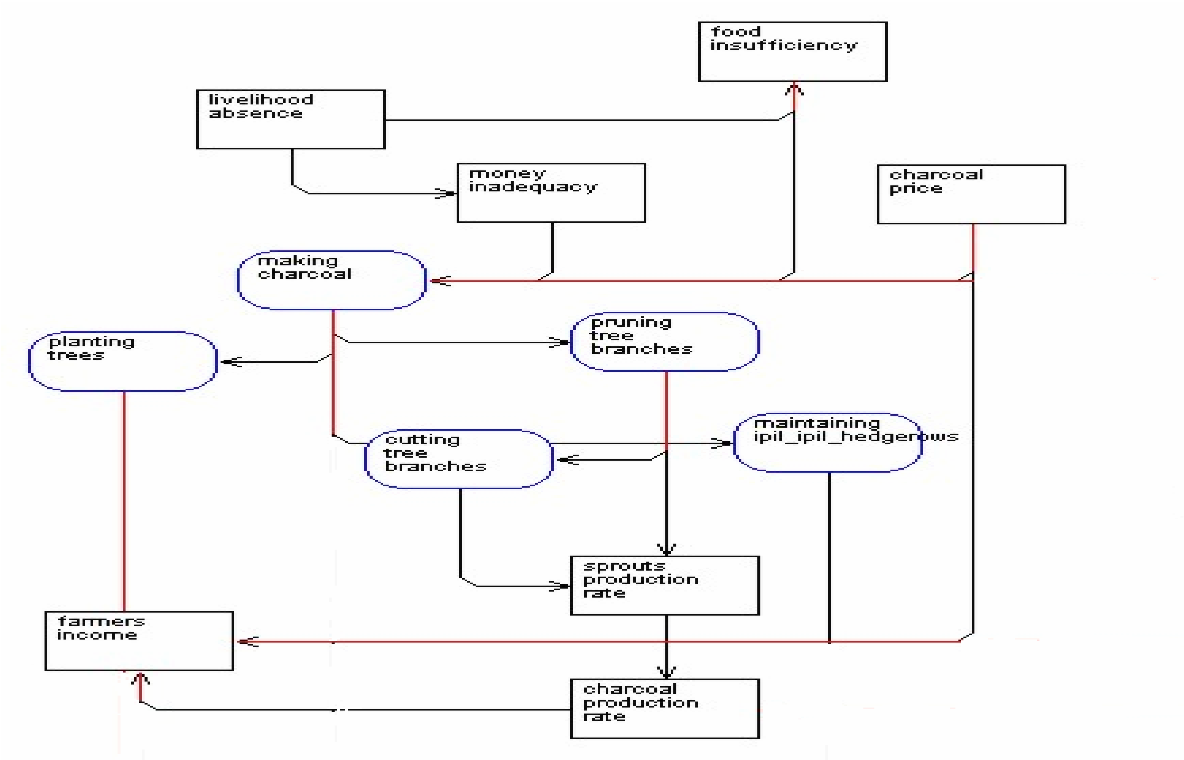

Figure 3. Farmers' understanding of the causes and consequences of charcoal making in their localities

Charcoal-makers revealed that what prompted them to engage in this activity as one alternative sources of income in the uplands was the absence of livelihood. This in turn caused inadequacy of cash and food insufficiency. Making wood charcoal requires them to prune and cut tree branches of species with a high rate of sprout production so they could process charcoal as often as possible. The farmers' sense of the market is also apparent. Farmers commonly use ipil-ipil (*Leucaena leucocephala*) hedgerows in the uplands. They contend that processing charcoal is also a way of maintaining ipil-ipil hedgerows. A higher rate of charcoal produced means more income. The amount of income is often associated with the increase and decrease of the charcoal market price. Figure 3 illustrates that the farmers' knowledge on tree growing is associated with their livelihood, tree management practices, and the market. Noteworthy was the farmers' observation that maintaining *ipil-ipil* hedgerows affects their farm income. Farmers with hedgerows have effectively adopted the corn-peanut-mungbean-charcoal cropping system.

As a common energy source in the uplands, *fuelwood* was also mentioned as a resource from which farmers can derive cash income. However, compared to charcoal, fuelwood is more difficult and expensive to transport. Farmers who did not opt for charcoal-making were sometimes contented to sell fuelwood. *Ipil-ipil* and *madre de cacao* are among the common species used for fuelwood. Another source of cash income from *ipil-ipil* that farmers gained was the selling of leaves to local buyers for processing into mosquito coils. Dried leaves were bought regularly from farmers for P8-10/kg.

Non-monetary Benefits

To ascertain the non-cash benefits that farmers profited from tree growing, the LEK-KBS diagram of Figure 4 was generated. From the farmers' point of view, tending trees has several ecological values. It provides the basic necessities for survival. As shown by the diagram, it has consequences on the atmospheric condition, soil status and watershed conservation. Some trees were also identified to have medicinal uses to cure human illnesses and diseases. Farmers also recognized that trees enhance availability of water, rejuvenate soil fertility and prevent soil erosion. This particular set of knowledge implies that farmers have their own understanding of the effects of tree domestication in relation to the other natural resources. They might not have adequate explanation for their observations; nonetheless, these data suggest that somehow development researchers and practitioners do not have to start from zero knowledge when dealing with farmers, especially concerning tree growing.

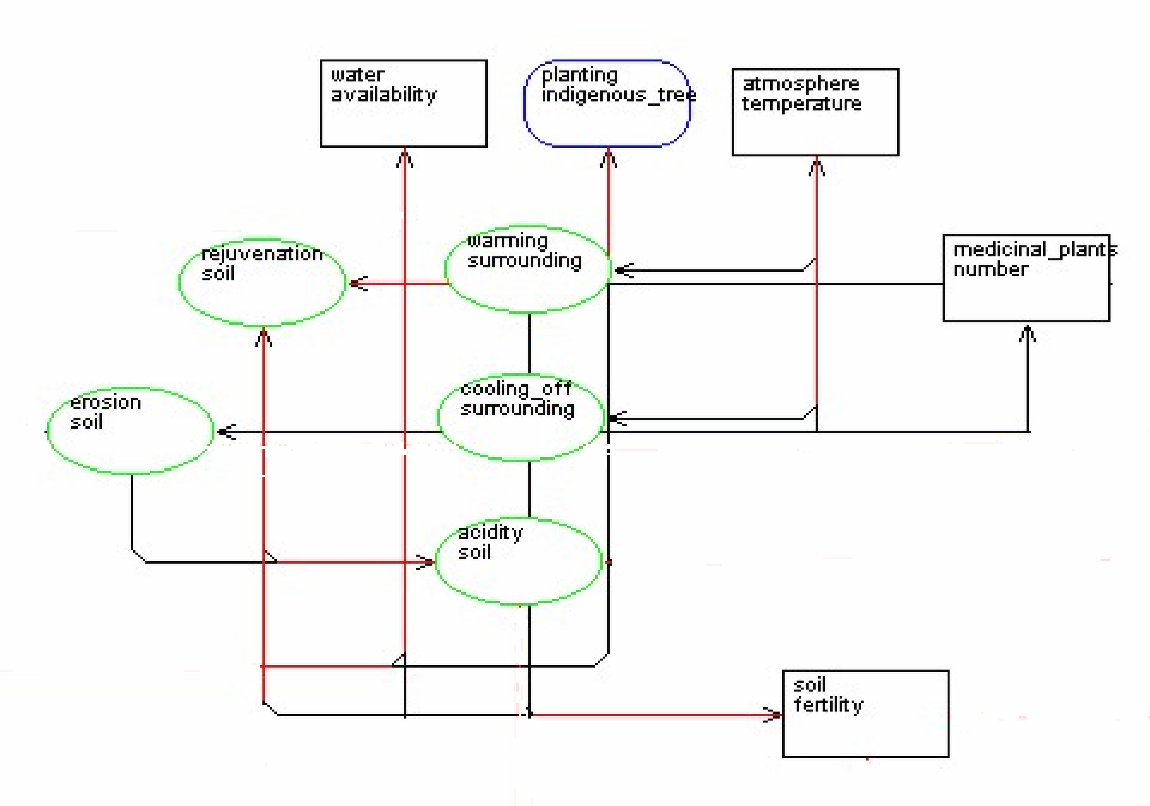

Figure 4. Farmers' knowledge of the non-monetary benefits of tending trees

From the LEK-KBS generated data and field validation, it was found that farmers were able to identify at least 34 indigenous tree species found in Manlawaan (as listed in Table 1). From the uses of each tree, it can be gleaned that the farmers enjoyed valuable benefits. The researchers noted that some of the tree species listed by farmers are not indigenous in the true sense of the word, but that farmers have tended these trees for many years and regard them as local species.

In terms of lumber durability and a variety of uses, indigenous trees were regarded as superior to exotics including gmelina or yemane (*Gmelina arborea*). As gmelina trees mature, they observed that water for the farm decreased as compared to areas without any gmelina trees. Farmers concluded that gmelina has high water uptake, reducing soil water and causing rivers to become dry. Some farmers also stated that gmelina trees might have toxic substances in its roots that can cause hazardous effects to other organisms (allelopathy) and even humans.

Table 1. Farmers' identified characteristics and uses of indigenous trees

Species common and scientific name	Common characteristics	Common uses
1.Narra/Naga *(Pterocarpus indicus)*	Slow growing, need sufficient nursery care, durable, deciduous species	Housing materials, furniture, rejuvenates soil fertility
2.Acasia *(Samanea saman)*	Fast growing, wide canopy cover, high coppicing ability	Charcoal, fodder, rejuvenates soil fertility, prevent soil erosion
3. Toog *(Combretodendron quadrialatum*)	Good tree, slow growing, straight bole, self pruning, durable	Housing materials, furniture, bark extract can be use as treatment for itching in making jellyfish salad
4. Tugas *(Vitex parviflora)*	Slow growing, good tree, durable	Furniture, housing materials, lumber production, farm tools accessories, prevents soil erosion
5. Bogo *(Garuga floribunda)*	Slow growing, good tree	Furniture, housing materials, medicinal
6. Lauan *(Shorea contorta)*	Self -pruning, durable	Furniture, lumber production, housing materials, prevent soil erosion
7. Bagalnga *(Melia dubia)*	Fast growing, less durable wood	Charcoal, firewood, housing materials, prevent soil erosion
8. Dao *(Dracontomelon dao)*	Termites infested, less durable wood	Housing materials, charcoal, firewood, rejuvenates soil fertility, prevent soil erosion
9. Bayong *(Afzelia rhomboidea)*	Slow growing, durable	Housing materials
10. Dita *(Alstonia scholaris)*	Easy to saw, lumber is less durable, crown shape is pagoda-like, high coppicing ability, light wood	Casket, charcoal, match stick, tooth pick, prevent soil erosion
11. Dakit *(Ficus balete)*	Wide canopy cover, water exudates, highly diverse, enchanted, parasite, killer of its host tree, highly diverse, frequently visited by birds, and fireflies during night, branchy, aerial roots are numerous	Medicinal, prevent soil erosion, firewood, charcoal, rejuvenates soil fertility
12. Antipo *(Artocarpus blancoi)*	Softwood, light lumber, leaves are big and rough to touch	Boat flooring, charcoal, housing materials, prevents soil erosion, rejuvenates soil fertility
13. Bangkal *(Nauclea orientalis)*	Grow anywhere, water exudates, slow growing, fruits are palatable to bats and other birds, tolerant species	Enhance water supply, bark can be used as supplementary for birth control
14. Talisay *(Terminalia catappa)*	Good shade, wide canopy cover, branchy at the top, high coppicing ability	Enhance water supply
15. Tagiloyloy	Breaks easily when blown by strong winds, branching pattern is drupe	Housing materials, prevent soil erosion
16. Lau-at *(Litsea glutinosa)*	Small size, fast growing	Medicinal, prevent soil erosion
17. Anislag *(Securinega flexousa)*	Moderately durable lumber	Firewood, housing materials, prevent soil erosion
18. Anagasi *(Leucosyke capitellata)*	Moderately durable lumber	Medicinal
19. Bayog *(Pterospermum diversifolium)*	Slow growing, wood colour is red	Firewood, housing materials
20. Ipil-ipil *(Leucaena leucocephala)*	Medium size, durable lumber if heart wood is big, leaves are small, high coppicing ability, nitrogen fixing tree, leguminous, roots have small nodes, peeled wood is cold	Housing post, charcoal, fodder, mosquito coil (leaf), firewood, rejuvenate soil fertility, seeds are utilised as dewormer and for some used as beverage, hedgerows
21. Tal-ot *(Ficus variegata)*	Wide canopy cover, water exudates, lumber is less durable	Casket, charcoal, matchstick, toothpick

Table 4. (Cont.)

Species common and scientific name	Common Characteristics	Common uses
22. Awom *(Mallotus multiglandulosus)*	Small size, medium leaf size	Charcoal, medicinal
23. Tan-ag *(Kleinhovia hospita)*	Sap exudates species, slow growing, high coppicing ability	Charcoal, firewood
24. Hanunum-o *(Mallotus ricinoides)*	Small size, fast growing	Charcoal, medicinal
25. Binunga *(Macaranga tanarius)*	Wide canopy cover, sap exudates species	Housing materials, firewood, provide good shade
26. Kaningag *(Cinnamomum mercadoi)*	Scented bark, big tree	Medicinal
27. Pili *(Canarium ovatum)*	Oval shape crown, palatable fruits	Medicinal (headache, colds), food
28. Tau-to *(Pteroscymbium tinctorium)*	Fast growing, less durable wood	Casket, tooth pick, match stick
29. Hanagdong *(Trema orientalis)*	Fast growing, tolerant species	Charcoal, firewood, housing post
30. Banitlong *(Cleistanthus pilosus)*	Good lumber	Housing material
31. Abgao *(Premna odorata)*	Small tree, scented leaves	Housing material, medicinal
32. Karot *(Elaeocarpus wenzelii)*	Fast growing, bark is fibrous	Used as clothes before, charcoal, housing materials
33. Tobog *(Ficus nota)*	Water exudates, wide canopy, small tree, pioneer species	Charcoal, firewood, medicinal
34. Hagimit *(Ficus minahassae)*	Water exudates, wide canopy, indicates water source	Charcoal, firewood

Many of the local species identified by farmers listed in Table 1 provide fuel, food, medicine, household tools and building materials. The most premium species that farmers considered was *Vitex parviflora*, locally known as tugas. It was singled out as highly valued for its lumber durability and high quality for furniture, construction materials, farm tools and fuelwood. The farmers also noted that lumber from tugas is highly water resistant. They estimated that it might take a century or more for its wood to decompose when submerged under water. This timber is traditionally used for marine purposes. Home furniture made from this tree is very expensive and has high marketing potential.

Most farmers also regarded timber as a valuable product of indigenous species, but also admitted its increasing scarcity. The market for timber from cultivated trees is growing, but farmers seemed reluctant to plant them in their woodlots because they are slow growing, they do not yield immediate cash returns, and long-term investment in trees is discouraged by uncertain tenure. Tenure insecurity also partly explains why farmers prefer fast-growing short-rotation species and plant only when seeds or seedling are distributed free (Salapa 2003).

What is striking from Table 1 are the indigenous species that farmers also utilised for charcoal-making. Among them are cassia, antipo, karot, hanagdong, binunga, camachile and dita. This suggests that unless farmers plant more ipil-ipil and other fast-growing species highly preferred for charcoal, the few remaining stands of endemic trees will be wiped out.

A field survey was undertaken to validate the tree species list made by farmers as a result of the FGDs and generated by LEK-KBS. It was found that most of the indigenous species are growing within or near the Binaliw watershed, which is the major source of water for Manlawaan. The researchers were inclined to believe that unless intervention takes place, the utilisation of these trees for charcoal-making will be become inevitable as the depressing economic realities worsen. Specifically, trees that exude water from their roots were usually found near springs. This is one of the significant uses of indigenous trees that were frequently mentioned by farmers. Due to the inadequacy of potable water to supply the whole village of Manlawaan for farm and home uses, farmers reported attempts to maintain these last few remaining species. Farmers believed that these species play a vital role in improving their farm and living situation in the uplands.

A further analysis from the LEK-KBS compiled statements on the listing of indigenous trees revealed that out of the 34 identified endemic species, 32.4% were considered exhibiting durability and 20% are classified as water exudates (including. tibig and hagimit) (Table 2). Farmers observed that these trees are producing water from their roots thereby enhancing vegetation in the surrounding areas. In terms of growth rate, 17.6% are known as fast growing species and 11.8% are classed as slow growing, relative to gmelina, eucalypts, acacia and mahogany.

Table 2. Characteristics of indigenous trees as identified by farmers

Characteristics of indigenous trees	Fraction reporting (%)
Durable	32.4
Water exudate	20.6
Fast growing	17.6
Sap exudate	17.6
Slow growing	11.8

Constraints in Sustaining Upland Livelihood

Most farmers recognised that earning and sustaining a living in the uplands is constrained by many factors (Figure 5). Generally, these are socio-economic and ecological in nature. Absence of livelihood opportunities causes poverty and often encourages upland dwellers to till forested lands causing forest destruction, extinction of wildlife and degradation of soil and water supply. The complex web of relationships between the issues of livelihood sustainability and tree growing has repercussion on other natural resource issues. These constraints can be perceived as challenges for development interventionists together with the farming communities.

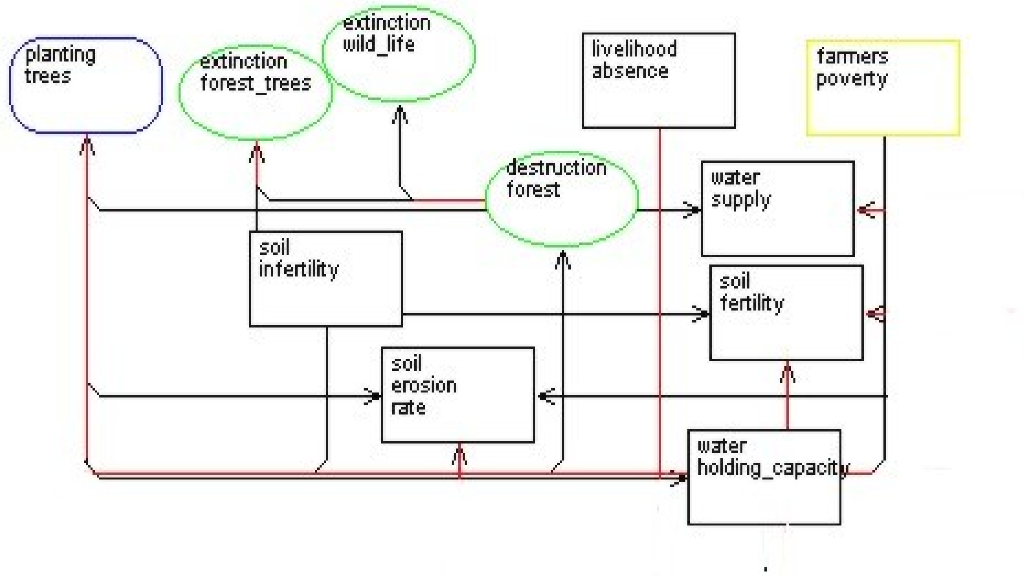

Figure 5. Farmers' understanding of the constraints in sustaining upland livelihood

Recommended Intervention Schemes

The application of LEK-KBS to ascertain upland farmers' benefits from tree growing suggests the following intervention initiatives:

a. It can be gleaned from the findings that wood charcoal-making is the leading livelihood among the farmers in the uplands of Tabango from which they can draw immediate cash income. It is important that an in-depth livelihood systems analysis be undertaken to explore other options that may suit in the area considering the available human and natural resources.

b. An information, education and communication (IEC) campaign would be desirable to promote sustainable livelihood from charcoal processing that minimises its negative environmental effects. A brochure on *Malungtaron nga Pagpanguling (Sustainable Wood Charcoal Making)* has been prepared by the team and validated with the farmers and representatives from the Department of Agriculture, Department of Environment and Natural Resources (Villaba-based) and the *barangays* and municipal LGUs.

c. Follow-up on the results of the validation meeting to undertake the *Rehabilitation and Protection of the Binaliw Watershed* with the key officials of Manlawaan and the municipality of Tabango.

d. The LEK analysis also pointed out that tree planting in the uplands should be the urgent focus among the communities because they blame the various threats (e.g. forest destruction, decreasing water supply, and soil acidity) on their depressing poverty incidence. Protection as well as the propagation of the last remaining indigenous trees should be part of the campaign. Domestication of indigenous tree species that are highly preferred by farmers in terms of uses should be encouraged.

e. The two project sites should be given priority by the local government units of Tabango, if there are agencies that freely distribute seeds and seedlings of ipil-ipil and other local species. The availability of planting materials is still a constraint in the area.

f. Conduct farmer-scientist trials to jointly validate claims of farmers about the trees they grow, e.g. whether gmelina is excessively water-extracting and makes the surrounding soil acidic.

g. Enhance the capability of development agents and extensionists by teaching popularised version of LEK-KBS as inputs to their own program planning and implementation

CONCLUSION

The research illustrated contrasting views on the state of tree growing and its utilisation by the people in the Tabango uplands. On the one hand, they may be seen as desperate for survival because of the utilisation of wood for charcoal-making but on the other hand they also depict that sense of rationality in using the richness of knowledge not only in tree cultivation but also in their way of living considering the meagre resources. Their local knowledge is one resource that needs to be exploited for their benefit. Ecological and livelihood security are critically interdependent on the conservation of biodiversity that is managed by the upland communities. This has been shown in the study and to a certain extent the LEK KBS methodology reflected this interrelatedness. It is the sustainability of these resources that farmers need to give the highest priority. While it is important to make a wider study on the similar phenomenon, the more urgent task is perhaps to share these findings with the farmers for potential intervention activities. The people in the Tabango uplands should be recognised as the keepers and stewards of their environment. Their 'ownership' of the resources is the underlying requisite as to how will they take care of it and conserve it for the next generation.

REFERENCES

Arnold, J.E.M. and Dewees, P.A. (eds) (1997), *Farms, Trees and Farmers: Responses to Agricultural Intensification*, Earthscan:London.

Appleton, H.E. and Hill, C.L.M. (1995), 'Claiming and using indigenous knowledge', in *Missing Links: Gender Equity in Science and Technology for Development,* http://gstgateway. wigsat.org/TA/lks/whylks.html, accessed 5 August 2004.

Burch, W.R. and Parker, J.K. (eds) (1991), *Social Science Applications in Asian Agroforestry*, Winrock International, South Asia Books, USA.

Cabanilla, D.B. and Kaing, S.A. (1996), 'Indigenous agroforestry systems of the Tausug: morality and sustainability', in *Indigenous Peoples of the Philippines: Knowledge, Power and Struggles*. Proceedings of the UGAT 18th National Conference, La Trinidad, Benguet, 17-19 October, pp. 31-44.

Chambers, R., Pcey, A. and Thrupp, L.A. (1989*), Farmers' First: Farmer Innovation and Agricultural Research*, Intermediate Technology Publications: London.

Davis, M. (1998), *Biological Diversity and Indigenous Knowledge*, Science, Technology, Environment and Resources Group, Research Paper 17 (1997-98), 29 June, http://www.aph.gov.au/ library/pubs/rp/1997-98/98rp17.html, accessed 1 August 2004.

De Boef, W., Amanor, J, Wellard, K. and A. Bebbington (1993), *Cultivating Knowledge: Genetic Diversity, Farmer Experimentation and Crop Research*, Intermediate Technology Publications, London.

Dixon, H.J., Doores W.J., Joshi L. and Sinclair F.L. (2001), *Agroecological Knowledge Toolkit for Windows: Methodological Guidelines, Computer Software and Manual for AKT5*, School of Agricultural and Forest Sciences, University of Wales, Bangor.

Fujisaka, S., Sajise, P. and Del Castillo, R.A. (eds) (1986), *Man, Agriculture and the Tropical Forest: Change and Development in the Philippine Uplands,* Winrock International Institute for Agricultural Development, Bangkok, pp. 244-268.

Harris, M. (1980), *Cultural Materialism: The Struggle for a Science of Culture*, Vintage Books, New York.

Harrison, S.R., Herbohn, J.L., Dart, P.J. and Brown, S.M. (2000), 'Sustainable small-scale forestry in the Philippines', in S.R. Harrison, J.L. Herbohn and K.F. Herbohn (eds), *Sustainable Small-scale Forestry: Socioeconomic Analysis and Policy*, Edward Elgar, Cheltenhamp, pp. 165-178.

Joshi, L. (2001), 'Knowledge-based systems approach for a systematic acquisition and use of local ecological knowledge', a lecture presented during the Training on Local Ecological Knowledge and Knowledge-based Systems, Chiang Mai, 8 – 12 June, Thailand.

Kaihura, F.B.S. (2004), 'Indigenous knowledge and rural livelihood improvement', *PLEC News and Views*, New Series No. 4, March, pp. 2-6.

Kummer, D.M. (1992), *Deforestation in the Postwar Philippines*, Quezon City, Ateneo de Manila University Press, the Philippines.

Li, T.M. (2002), 'Engaging simplifications: community-based resources management, market processes and state agendas in upland Southeast Asia', *World Development,* Vol. 30(2): pp. 265-283.

National Statistic Office Region VIII (undated), *Census 2000 Final Results*, Tacloban City, the Philippines.

Pulhin, J.M. (2000), 'Community forestry in the Philippines: Paradoxes and perspective in development practice', a paper presented during the 8th Biennial Conference of the International Association for the Study of Common Property (IASCP), Bloomington, Indiana, USA, 31 May - 4 June.

Rice, D.M.A. (1996), 'The forest ecology of the homo sapiens'. in *Indigenous Peoples of the Philippines: Knowledge, Power and Struggles*, Proceedings of the UGAT 18th National Conference, La Trinidad, Benguet, 17-19 October, pp. 31-44.

Salapa, M.J.O. (2003), Economic Analysis on the Production of Wood Charcoal in Tabango, Leyte, MSc (Agricultural Economics) thesis, Leyte State University, Baybay.

SciDev.Net (2002), *Indigenous knowledge*, August. http://www.scidev.net/ dossiers/index.cfm, accessed 20 July 2003.

Sinclair, F.L. and Walker, D. (1998), 'Acquiring qualitative knowledge about complex Agroecosystems', *Agricultural Systems*, 56(3): 341-363.

TABANGO, LEYTE (undated), *Profile of Municipality,* http://elgu.ncc.gov.ph/ecommunity/tabango-leyte/, accessed 20 July 2003.

Torres, F., Raintree, J.B., Dalmacio, M.V. and T. Dornhofer, T. (1986), 'Agroforestry systems for smallholder upland farmers in a land reform area of the Philippines: the Tabango case Study', in Fujisaka *et al.* (eds), *Man, Agriculture and the Tropical Forest: Change and Development in the Philippine Uplands,* Winrock International Institute for Agricultural Development, Bangkok. pp. 244-268.