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8 Local knowledge on indigenous trees: towards expanding options for smallholder timber tree planting and improved farm forestry in the Philippine uplands

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ABSTRACT

Tree domestication initiatives, aimed at conserving natural resources as well as providing small-scale farmers with more options for income generation, need to be based on a thorough study of existing knowledge of the range of available tree species. Since previous public and private research has almost entirely focused on improving production of a small number of exotic species, local peoples' needs, priorities, knowledge and practices on indigenous trees need to be further evaluated. These new initiatives are seeking to integrate indigenous trees, which have been traditionally harvested from natural forest, into tropical agricultural systems. The study conducted in eight municipalities in the islands of Leyte and Bohol, Central Philippines, aimed to identify the topmost promising indigenous species for smallholder tree domestication based on the knowledge of farmers as well as suppliers of tree products. The eight study sites were purposively selected to include areas with both existing and non-existing natural forest. Knowledgeable farmers, wood processors and market dealers of tree products were interviewed using a semi-structured questionnaire, followed by focused group discussions. In addition, we collected information on the veneering potential and marketability of farm-grown indigenous tree species among timber industries of

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northern Mindanao. One important component of this approach was the utilization of the Local Ecological Knowledge–Knowledge Base Systems (LEK–KBS), using a computer software application called WinAkt to store and retrieve the information gathered from the local people. This paper emphasises the importance of considering the socio-economic conditions of farmers and the local ecological knowledge in the identification of tree species options with potential for farm forestry and in the development of a farmer-driven tree domestication process.

INTRODUCTION

During the past two decades, the rapid decline of timber supply from natural forests and an increasing domestic demand for wood products have caused a steady increase of timber prices in the Philippines (PCARRD 1994). At the same time, with the widespread adoption of people's oriented forestry programmes, reforestation and tree planting have been promoted as a way to alleviate poverty, increase domestic supply of wood and rehabilitate degraded upland environments. As a result, smallholder farmers have become major timber producers in many parts of the country (Garrity & Mercado 1993).

The farm forestry industry in the Philippines is mostly based on the well-known *Gmelina arborea, Paraseriantes falcataria,* and to a lesser extent, *Acacia* sp. and *Eucalyptus deglupta.* Because of their excellent growth rates and the favourable market conditions, these species were promoted as "the million-Peso trees" and farmers were promised high economic returns in short periods. However, in recent years as more trees become mature, prices for farm-grown timber have decreased due to market saturation. Consequently, many farmers, not able to realize the expected economic benefits, have discontinued tree production after the first rotation. Similar experiences have been also reported in other parts of the Philippines (Caluza 2002) and elsewhere (Saxena 1991).

Market instability and other risks faced by timber tree farming (e.g. poor growth rates) can be ultimately attributed to the promotion of "undifferentiated tree planting" (Raintree 1991). As in traditional plantation forestry, species selection for smallholder farm forestry has been determined only by the tree's attributes (e.g. fast growth), without due consideration to other biophysical, socio-economic and cultural factors that condition tree planting in the smallholder context. Therefore, to avoid further disappointments and realize the full economic and environmental benefits derived from tree farming, there is a need to develop a range of tree options that considers the needs, priorities and knowledge of planters, manufacturers and consumers.

Recently, research and development institutions in the Philippines recognized the ecological and economical value of indigenous tree species (Roshetko & Evans 1999), and have emphasized the importance of their future production on private smallholder farms rather than in large plantations. Smallholder tree planting systems are generally more successful than large-scale reforestation schemes, because these small-scale tree growing activities benefit from intensive management over a limited area and suit farmers' desire to profit from the investment of time and resources. Field evidence also suggests that there is a great potential to expand and promote a wider range of alternative tree species that are more appropriate to the smallholder context. On degraded landscapes indigenous trees are deliberately protected and nurtured on farms. Farmers manage their number and value the tree products for household consumption, the market and environmental benefits (e.g. soil fertility, shade). Farmers are also showing an increasing interest on indigenous tree planting, if provided with the right incentives and some support.

In several upland municipalities of northern and central Mindanao, a farmer-led movement, known as Landcare, that initially focused on the dissemination of soil and water conservation practices, is becoming increasingly active in the collection, propagation and planting of high-value indigenous tree species. Farmer's motivation and initiative to test tree resources and diversify their farming systems are supported by the local government through financial and policy initiatives (Laotoco *et al.* 2002).

In the Philippines, there is a lot of information on recommended indigenous tree species for reforestation, their propagation and management (PCARR 1982, Margraf & Milan 1996a, DENR–ERDB 1998). However, very few tree planting programmes have promoted native trees. Many of these initiatives have failed because they have been based on technical aspects rather than local people's knowledge and necessities. Even in those few encouraging initiatives like the GTZ–VISCA "Rainforestation Farming" (Margraf & Milan 1996b) that have succeeded, there has been a long process in the promotion, propagation, planting and utilization of indigenous tree species on farms.

As suggested by Simons *et al.* (2000) the integration and improvement of trees on farms could be done through a participatory farmer-driven domestication process. The first step of this process should be to determine farmers' and users' priorities, preferences and needs (Franzel *et al*. 1996). As forestry science has traditionally overlooked existing trees of importance to farmers in deforested landscapes, local knowledge on these indigenous trees can be a very useful resource in the development of options that complement the current scientific knowledge focused on a few plantation species (Walker *et al*. 1995). By starting with what farmers already know and practise, it is highly probable that the consequent action or any intervention to be implemented will be acceptable by the users (Joshi *et al*. 2001). Walker *et al*. (1995), as cited by Joshi (2002), indicated that a rigorous analysis of the detailed articulation of farmers' understanding of the ecosystem functioning is one of the ways by which local knowledge is integrated into the scientific knowledge systems. Local ecological knowledge as a method in qualitative research requires depth in the understanding and at the same time the knowledge produced can be systematically stored, formally represented and generalized.

This paper reports the results of research activities aimed at identifying and expanding tree options for smallholder farm forestry by creating a knowledge database on indigenous tree species with high potential for tree farming. We firstly conducted a study on the islands of Bohol and Leyte to determine farmers' perceptions on constraints to indigenous tree planting and to elicit local knowledge on native tree species. Secondly, we collected information from technicians at a plywood company in northern Mindanao on the veneering properties and potential uses of several indigenous tree species commonly grown on farms. Consideration of local knowledge on indigenous tree species may enhance involvement of individuals and farmers' groups in a participatory tree domestication strategy that can realistically provide more appropriate tree options to upland farmers for farm forestry and the re-vegetation of degraded lands.

MATERIALS AND METHODS

The study focused on selected upland villages in eight municipalities of Leyte and Bohol. These islands in the central Philippines are characterized by generally shallow degraded soils and little remaining forest cover (i.e. below the national average of about 20%). The site selection was based on two variables: the existence of remaining natural forest

(presence of natural forest as opposed to without natural forest), and the type of soil as characterized by the soil pH (acidic vs. calcareous) (Table 1).

Table 1. Final sites selected for the study

Selection Criteria	Leyte		Bohol	
	Municipality	Village selected	Municipality	Village selected
Calcareous soil—with forest	Hinunangan	Calag-itan	Valencia	Omjon
Calcareous soil—without forest	Tabango	Manlawaan	San Isidro	Baryong Daan
Acidic soil—with forest	Inopacan	Cabulisan & Caminto	Guindulman	Biabas
Acidic soil—without forest	Tomas Oppus	Mapgap	Inabanga	Ilaya

The Darwin Database on Local Knowledge and Biodiversity Conservation (DOF 1998) was used as an initial source of information about identified indigenous trees with economic and ecological importance. The ALICE computer software was used previously as a database tool and will be used to store collected information from the present study, i.e. the existing database will be complemented and amended.

Collection of primary data for the study was done mainly through individual interviews using a semi-structured interview schedule and by conducting focus group discussions (FGD) in selected sites. Actual field observations and collection of herbarium specimens were also done to supplement the interview and FGD data. All of the processors and market dealers within or nearby each focus village or municipality were included in the interview. Processors included chainsaw owners/operators, furniture-makers, lumber-makers, firewood gatherers, charcoal-makers and others. Market dealers were those selling tree-based products in small or commercial quantities (Mangaoang & Lawrence 1998).

In addition, two workshops were held with two experienced technicians from a plywood manufacturing company of northern Mindanao to discuss and collate information on potential uses and marketability of farm-grown indigenous tree species. In an effort to reduce their dependence on imported veneer, the company has tested over the years the veneering properties of some 30 exotic and indigenous lesser-known [1] and lesser-used[2] timber species commonly found on farms. Results from these tests are only observational as there has not been neither proper sampling nor experimental design. However, the results presented are validated by the many years of experience of the key informants in timber processing and marketing.

The LEK study on indigenous trees in Manlawaan and Tabango, Leyte, was a validation of the earlier study by ICRAF. As sketched out by the authors of the LEK—KBS method (Thapa *et al*. 1995), there are four stages in the knowledge acquisition

[1]According to (Sosef *et al*. 1998):

The term lesser-known indicates that the producers and consumers are unfamiliar with these timbers as sources of veneer.

[2]The term lesser-used denote those species which generally lack market acceptance and utilization though occasionally are used and even traded.

strategy, namely scooping, definition, compilation and generalization. In scooping, the aims of the study were set out, the parameters to be studied were clarified and identification made of who would be interviewed. The definition of the terms to be used was the second stage. Actual knowledge acquisition strategy was carried out in the compilation stage. This was mainly done through the use of participatory rural appraisal tools, such as the focus group discussion (FGD), timeline, species ranking, and key informant interviews. AKT 5 computer software was used to store the knowledge base. The last stage of LEK–KBS was the generalization phase to find out how representative the knowledge base was.

A sample of the population was surveyed to determine the representativeness of the generated knowledge base. In addition, the study utilized field validation to pinpoint where the existing indigenous trees are found and characterized them. It should be noted, however, that the study was focused on those people in the selected sites who were most knowledgeable about indigenous trees and thus, they were not a representative sample of the community they belonged to. On the other hand, according to Joshi (2002), the representation of local people's knowledge as concise, unitary statements:

- reduces ambiguity and misinterpretation
- allows easy access to information
- allows explicit analysis and synthesis of information on related topics
- facilitates rigorous analysis of these unitary statements using techniques of automated reasoning and artificial intelligence
- enables quick updating of knowledge bases in an electronic form by modifying existing statements and by adding relevant new statements

RESULTS

Knowledge, uses and preferences

Around 100 to 200 indigenous timber and fruit tree species were identified in each of the study areas. However, an estimated 10–15% of the species listed by farmers are not truly indigenous. For instance, mango (*Mangifera indica*) and raintree (*Samanea saman*) are considered indigenous because they have been known and used by local people for decades and even centuries (Margraf & Milan 1996a).

Most of the identified indigenous timber species are currently confined to forested areas. Only very few are found in the farms and as such, oftentimes limited to peripheral or roadside planting. The confinement of the premium timber species in natural forested lands could be indicative of their non-domestication for a good number of years.

Economic benefit is the foremost value ascribed to trees/forests. But interestingly, people also duly recognize their ecological values, such as for the hydrologic cycle, microclimatic conditions, soil conservation, as food and habitat for wildlife.

In addition to house construction, post, furniture, boat keel, charcoal and firewood as the main uses of timber trees, farmers have indicated a multitude of other uses such as medicine, beverage, spice, vegetable, forage, organic fertilizer and insect repellent. Specific utility values were associated with particular tree species, notably the medicinal values of trees.

Knowledge on indigenous trees, particularly on tree identification, is affected by the state of the forest resource in the area. It is therefore observed that there is a direct

relation between the knowledge base and the stage of degradation of the remaining forest. Farmers' knowledge about indigenous trees is considered as a motivating factor for them to conserve biodiversity.

Molave (*Vitex parviflora*) stood out as the topmost preferred indigenous timber species for cultivation on farm. It is also the most preferred species for furniture-makers, processors and buyers. Its durability and magnificent wood finish were cited as the main reasons for preference. Farmers also favor it because seed is readily available from existing mature trees, and it has medicinal value.

Other top indigenous species selected by farmers include santol (*Sandoricum koetjape*), snislag (*Securinega flexusa),* samod (*Shorea contorta*), sagimsiman (*Syzygium brevistylum*), bayong (*Afzelia rhomboidea*), dalingdingan (*Hopea manquilingensis),* narra (*Pterocarpus indicus)*, tagibokbok (*Stemonurus luzonienses),* mayapis (*Shorea palosapis)*, hagakhak (*Dipterocarpus warbugii*), toog (*Combretodendrom quadrialatum*) and almon (*Shorea almon)*.

The respondents in all sites readily recognized the superior wood quality and durability of indigenous species. The choice for indigenous instead of exotic species had been based on the indigenous trees' durability, wood finishing quality, their medicinal and high economic values. On the other hand, short rotation and availability of planting material were cited as the advantages of exotics.

Constraints to growing indigenous trees

Farmers in all study sites have encountered the following constraints in growing indigenous trees:

- Lack of financial resources to start and maintain tree farming. In the early growing years trees need periodic brushing and weeding around them, which the respondents perceived to be very laborious.
- Lack of technical skills and knowledge about collection and seed germination of indigenous trees. The respondents find it difficult to identify fallen seeds and/ or wildings.
- Long period before trees provide harvestable products. This is also coupled with tenure insecurity since people have no confidence that they are allowed to harvest. In most cases the landlords do not encourage planting of trees on their lands.
- Lack of area that could be devoted to tree cultivation alone due to farmers' concern about tree-crop competition.
- Long or complicated bureaucratic procedures to obtain harvest permits. This may have contributed to the negative impression of farmers about tree farming and plantation establishment programmes of the government.

Processing and marketing aspects

A decreasing trend in the supply of raw materials, especially for premium timber (e.g. molave and marra), is acknowledged in all sites, while the demand for quality furniture products is very high. The strict implementation of the Department of Environment and Natural Resources (DENR) policies against those who illegally cut timber has made it difficult for wood processors to procure raw materials. Hassles in the processing of papers and legalities involved in timber cutting, processing and transport (e.g. high payment for the issuance of a cutting permit involving indigenous trees) had significantly decreased

woodcraft production while the demand for its finished products had apparently increased over time (PAWB 1998).

Special arrangements between furniture processors and buyers are often made due to scarcity of available preferred raw materials for a particular product. The buyer himself brings his own raw material for the product that he wants to have manufactured. In this manner the processor avoids the legalities of buying and transporting raw materials from the timber sources. Chainsaw owners are usually paid cash in terms of wood volume by tree owners.

Indigenous trees commonly grown on farms identified as suitable for veneer and sawn timber by technicians at a plywood industry in northern Mindanao are presented in Table 2. Recommendations are based on observations on the wood's peeling, drying and gluing properties, surface finishing and colour qualities.

Table 2. Tree species commonly found on farms that can be used for veneer and sawn timber

Veneer		Sawn timber
Face & back	**Core**	
Hinagdong (*Trema orientalis*)	Marrang (*Artocarpus odoratissima*)	Mangolinaw (*Melia dubia*)
Gubas (*Endospermum peltatum*)	Durian (*Durio zibethinus*)	
Antipolo (*Artocarpus blancoi*)	Santol (*Sandoricum koetjape*)	
Binuang (*Octomeles sumatrana*)	Kamansi (*Artocarpus camansi*)	
Loktob (*Duabanga moluccana*)	Balete (*Ficus* sp.)	
Dita (*Alstonia scholaris*)		
Bakan (*Litsea philippinensis*)		
Baono (*Mangifera caesia*)		

DISCUSSION

The findings of the study showed that farmers in rural upland communities in the Philippines have a remarkable knowledge about indigenous trees. This wide range of knowledge is usually associated with the utility value of the tree species, which are more often than not economic in nature. The results also indicated that resource knowledge goes with resource state of degradation, and therefore, without good documentation this knowledge will be lost together with the resource base. Biodiversity loss and ultimately the extinction of germplasm is a serious threat given the continued confinement of the main timber resources in natural forests, their non-domestication and rising population pressure.

Although most of the identified indigenous timber species are currently confined to forested land in the study areas of Bohol and Leyte, an inventory of farm-grown trees conducted on 217 farm plots in Claveria, northern Mindanao, found that 21% of the on-farm timber trees are established as natural regeneration of indigenous species (Bertomeu, forthcoming paper). This could be due to either earlier deforestation in the Visayas than in Mindanao, or to spontaneous tree domestication initiatives in the latter for some reasons that would be worth exploring.

The respondents indicated preferences especially for indigenous timber tree species for on-farm domestication. People consider wood quality as their foremost basis for preference and, accordingly, value the "premium" indigenous species for their domestic

use, as well as for their high market value. Despite the introduced bias in the respondent selection, the results of the study still provide a solid springboard for future research and development efforts. Local people undoubtedly acknowledge the ecological and economic superiority of indigenous over exotic species. The fact that farmers commonly associate fast growth and early harvest of products with exotic trees points to the important intermediate role that exotics play in the provision of valuable products and environmental benefits, especially as long as skills and knowledge on indigenous trees are lacking (i.e. in the short term).

To support farmers' tree domestication initiatives, a small-sized local Trust Fund has been recently established with support from the Spanish Agency for International Co-operation (AECI). The Fund is providing incentives in the form of small grants for community-based projects like the collection and distribution of seed and germplasm, nursery establishment and tree planting initiatives. It also provides support to local governments for proper land use and community capacity for forest management planning and incentives for conservation of native vegetation on private lands. The minimal financial support provided by incentive schemes like these could prove appropriate in involving farmers' groups and local communities in the integration of indigenous trees on farms, land restoration and forest conservation. Through such mechanisms the cost of restoration and forest biodiversity conservation can be justly shared among the individual farmers, local communities and society as a whole.

Existing policies and regulations on planting, transportation and harvesting of indigenous trees play a crucial role in tree planting and the development of farm forestry. As farmers' responses show this proves to be a strong disincentive for native tree planting. Therefore, it would prove unrealistic to expect spontaneous planting and use of indigenous trees on farms. However, if policies change and farmers are provided with appropriate incentives and support, faster and wider integration of trees on farms and degraded uplands can be expected as it has occurred with exotic and unregulated tree species.

CONCLUSION

Based on the above discussion, the following conclusions can be made:

- There is a need to thoroughly assess the potential of promising and traditionally preferred indigenous tree species for on-farm domestication. Important aspects include the production of planting materials through seed and wildings collection, suitability and/or growth performance (including resistance to pests and diseases) in varying site conditions (mostly in cultivated and degraded lands which are not suitable for the more delicate dipterocarp species). Observations suggest that some pioneer species grow at least as fast as exotics, and are better adapted to degraded soil conditions.
- Research also needs to support the identification of established schemes/patterns and silvicultural practices as well as wood processing techniques for smallholders. The above will provide the necessary basis for small-scale farmers to effectively incorporate indigenous trees into their farming systems and maintain them to produce desirable timber and other products.
- There is a great potential for farm forestry in the Philippines to supply markets with farm-grown indigenous timber trees. But to increase the number and diversity of indigenous trees under cultivation there is a need to:

- ➢ Review and/or evaluate existing government policies and arrangements related to the cultivation, processing and marketing of indigenous tree products as these were perceived to be creating disincentives to farmers' engagement to on-farm domestication of promising indigenous trees.
- ➢ Intensify information, education and communication needed for the production of quality planting material, silvicultural practices, and processing and marketing aspects of promising indigenous trees. Information also needs to raise awareness on the environmental benefits of indigenous trees (including biodiversity conservation) and effectively articulate their value for the community. It should also include the relevant policies and arrangements related to tree farming.
- ➢ Provide good documentation and data storage of the rich local knowledge on indigenous trees, tree farming, wood processing, and marketing. This will serve as a major reference for future research and development activities related to indigenous trees, particularly in their promotion for on-farm domestication.
- ➢ Provide institutional arrangements that can effectively support farm forestry development. Local government support, small incentive schemes and establishment of mechanisms for farmers to make informed choices (e.g. tailored training, tree growing manuals, exchange visits with other farmers) can prove to be an effective approach to farm forestry development and rehabilitation of degraded lands.

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