

Farm-level timber production: orienting farmers towards the market

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Recommendations for helping small-scale farmers manage timber trees for specific markets, based on experiences in East Africa and Southeast Asia.

Timber from natural forests is increasingly less available because of conservation, environmental and social concerns. Industrial plantations make up only about 5 percent of the total forest area but provide 35 percent of the world's wood supply (FAO, 2001). Expansion of industrial plantations, however, is limited because of competition from alternative land uses. Yet the demand for timber and other forest and tree products is increasing at the local, regional and international levels. In response, many small-scale agroforestry systems have evolved market orientations.

Trees on farms have long been recognized as protecting and often enhancing soil fertility, assisting in soil and water conservation and providing fodder, fuelwood and construction materials for rural households. They also help maintain biodiversity (by diversifying plant cover and providing habitat for other plants and animals) and enhance the landscape. In addition, commercial production of timber on farms in the tropics, either as scattered trees or as small-scale woodlands is a potentially

important element of farm livelihoods (Deweese and Saxena, 1997).

The potential of small-scale timber producers in providing raw materials in both contractual (corporate-smallholder partnerships) and open-market situations looks promising. However, considerable obstacles are to be overcome if farms are to produce timber of the quality and quantity sought by markets, and if timber production is to enhance incomes for farm families.

This article explores the potential of farm-level timber production, specifically in non-contracted or open-market situations where farmers produce timber as one component (segregated or integrated) of their farm enterprise and search for markets in an ad hoc manner. The article does not address contractual arrangements between corporate and smallholder partners (e.g. outgrower schemes). (Such arrangements are discussed at length in FAO & CIFOR, 2003.) The article focuses primarily on timber production for local and regional construction and furniture manufacture. It draws on experience in East Africa and Southeast Asia—regions where these local industries are increasingly supplied in this way.

The article addresses key issues at the landscape and household scale:

- the potential of farm-level timber production to enhance farm livelihoods;



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Indonesian farmers receive higher profit margins by converting standing trees to sawn timber for sale to consumers

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- medium-scale wood enterprise perceptions of timber from farms;
- market and marketing chain analysis to support farm-level timber production;
- transparency in legislation, farmers' rights, advocacy and extension.

Issues associated with the global and national scales – e.g. biodiversity conservation and carbon sequestration (see Tomich *et al.*, 2001) and the contribution of farm-produced timber products to national economies – are not discussed here.

AGROFORESTRY, TIMBER PRODUCTION AND RURAL LIVELIHOODS

“Agroforestry” refers to a dynamic, ecologically based natural resources management system that, through integration of trees in farms and in the landscape, diversifies and sustains production for increased social, economic and environmental benefits for land use at all levels (Leakey, 1998). Farmers plant or conserve trees on their farms for a variety of products and services – not only timber, but also fuelwood, fruits, vegetables, fodder, medicines, resins, shade (for livestock or understory crops), and soil and water conservation. Timber may be a secondary product, harvested only after the tree has served its primary production or service role. In small-scale systems in developing countries timber production is generally not intensive; once trees are planted there is little proactive management – fertilizer application, thinning, pruning or weeding. If these activities are undertaken they are usually intended to benefit agricultural crops.

Tree species used are diverse and can be either indigenous or exotic. In North Lampung, Sumatra, home gardens, averaging 0.75 ha, contain as many as 21 tree species excluding the understory component (Roshetko, Mulawarman and

Incorporating timber trees in croplands diversifies farm productivity and enhances farm livelihoods (northern Mindanao, the Philippines)



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Purnomosidhi, 2003). In farms around Mount Kenya, it is not uncommon to find up to 19 different tree species on one farm. In a survey conducted around eastern Mount Kenya, approximately 200 different tree species were identified on farms (Oginosako *et al.*, 2003).

Smallholder tree-growing systems are conventionally considered less productive than nearby commercial plantations. However, results from the global Alternatives to Slash and Burn (ASB) project (Tomich *et al.*, 2001) demonstrate that the potential overall economic profitability of some small-scale agroforestry systems appears to be comparable to that of large-scale plantations. The analysis suggests that small-scale systems provide greater employment and equity as well as social stability without significant reduction in economic growth.

But can small-scale systems contribute significantly to the quantity and quality of timber required by the market? The multiple-species, multiple-product nature of small-scale agroforestry systems results in tradeoffs with productivity and quality of wood. A 1-ha agroforestry system will generally produce less timber than a 1-ha forest plantation. But if timber production is intensified in the agroforestry system,

there will be a tradeoff with the diversity of the system and its agricultural productivity.

Species selection and germplasm access

Traditionally, farmers have grown trees using local seed sources to provide products and services that support their livelihood needs and are known to be compatible with the annual crop and livestock components of their farming systems. The tree species used are not necessarily those sought by the timber market.

When farmers seek to plant non-local species, they have little control over the species made available to them. Scientists and extension agents may make this decision through reviews of literature and screening trials to meet the requirements of local biophysical conditions (Franzel *et al.*, 1998), often without considering markets or local uses.

Research indicates that the use of improved-quality germplasm and improved varieties, provenances and clones could raise the profitability of smallholder production of tree products, including timber. Yet farmers have little access to quality germplasm of either indigenous or exotic tree species. In most

cases quality seed sources of indigenous species have not been identified and farmers have limited experience with proper seed collection and management techniques. The supplies of quality exotic germplasm are usually limited and restricted to government and industrial use (Holding and Omondi, 1998; Roshetko, 2001).

These limitations frequently contribute to mismatch between on-farm tree resources and market demand. This shortcoming can be improved through farmer participation in species evaluation and selection activities (Franzel *et al.*, 1998).

Factors influencing tree harvesting

The decision of when to harvest trees may be determined by the prices of the principle agricultural commodities and vigour of other farm enterprises. For example, many on-farm timber trees are grown as shade in predominantly coffee or tea production systems. As long as coffee prices provide a profitable return, and farm incomes are stable throughout the year, farmers are not inclined to harvest their trees. Trees under this situation become a form of living bank account.

Trees may be harvested when the prices of basic farm commodities (coffee, tea, cotton, tobacco) fall. During the past two years in Central and Latin America and East Africa, many overstorey shade trees have been felled for timber, fuelwood and charcoal sales as a result of the fall in coffee prices and the need for cash. Any tree (including fruit, shade or timber trees) may be felled prematurely for timber or charcoal sales to provide households with quick income during lean periods when commodity prices are low, in emergencies or for celebrations, or to meet regular financial commitments (school fees, taxes). Such felling not only affects the sustainable yield of timber production,

but can also be detrimental to the long-term agricultural productivity of the farm, impairing soil fertility and soil and water conservation.

TIMBER FARMERS, MARKET AGENTS AND FOREST ENTERPRISES – IMPROVING LINKAGES

Most farmers have little access to market information concerning timber demand and price; little knowledge of market specifications; and weak linkages with market agents (Roshetko and Yuliyanti, 2002). As a result, they have little knowledge of how to assess the value of their trees and how and where to market them.

Because farmers often plant and manage trees without a specific market or product in mind, farm-grown timber is often of substandard quality, and volumes and lengths are often inadequate. Other problems cited by medium- to small-scale construction, furniture, and sawmill enterprises in sourcing farm-grown timber (Holding, Njuguna and Gatundu, 2001) include:

- difficulty in identifying farmers selling trees;
- difficulty in collecting a sufficient quantity of logs to achieve economies of scale for transportation;
- low recovery rates (as low as 20 percent) because of poor form and small size;
- the many stages of handling and conversion between the farm and the sawmill, with an associated reduction in conversion efficiency.

Because of the lack of knowledge and often substandard quality of their products, farmers are at a disadvantage in negotiating with brokers and mobile sawmillers who come to villages in search of trees to fell. Farmers often feel exploited by market agents (Holding, Njuguna and Gatundu, 2001). Market agents counter that the unreliable qual-

ity and quantity of smallholder timber, plus the time and expense required to interact with numerous smallholders, are the reasons for farmers' low earnings from timber (Roshetko and Yuliyanti, 2002).

To improve these conditions, farmers, market agents and forest industries can work together to educate farmers to produce better-quality timber (see Box opposite). Researchers, extension agents and NGOs have an important role to play as facilitators to ensure that relationships are transparent and mutually beneficial to all parties.

MARKET ANALYSIS FOR SMALL-SCALE FARM-GROWN TIMBER

Most efforts to enhance small-scale timber production have focused on planting or growing trees. In developing countries the marketing of farm-grown timber has received little attention and is not well understood. Farmers and projects often start planting trees without knowing the market. Before planting it is recommended that a market analysis be conducted to identify the products and species for which market opportunities exist. This is the best way to ensure that the trees grown will have a positive impact on farmers' livelihoods.

Subsequently, an analysis of the marketing chain can be conducted with the producers to understand the various stages of processing and conversion of the product, and parts of the chain where efficiency and profitability could be improved. A marketing chain is a sequence of operations for a particular product from its production to its final point of sale (see Box on p. 52). A marketing chain analysis is divided into functions, participants, linkages and channels; it is essentially multidisciplinary. The chain is analysed in technical, institutional and economic terms. However, issues of landscape diversity and resource sustainability also need to be taken into account.

Farmer and industry collaboration to expand tree farming and meet commercial needs in northern Mindanao, Philippines

When natural forests were abundant, the Philippines was one of the major producers of tropical timber and the forestry sector was a top foreign exchange earner. As timber supplies from natural forests have declined, wood producers have increasingly depended on imported timber to meet domestic demand. In 2001, about US\$86 million was spent on imported sawnwood (FAO, 2003).

In the past two decades, as a result of favourable market conditions, trees grown on farms have become a reliable alternative wood supply. During the early years of tree farming, planted trees were mostly used for paper pulp and low-value wood products (e.g. pallets and boxes). As timber supplies have become scarcer and tree farming has developed and spread, many of the common fast-growing plantation hardwoods have been increasingly used for construction materials, furniture, panels, flooring and crafts.

Northern Mindanao has 135 mini-sawmills exclusively supplied by tree farmers (DENR, 1998). These mills supply larger wood-processing plants with sawn timber for the fabrication of blockboard, furniture and other wood products.

An increased market share of farm-grown timber has been made possible by recent advances in technology and product transformation which allow the use of smaller diameters and lesser-known and lesser-used timber species (Sosef, Hong and Prawirohatmodjo, 1998).

To lessen its current dependency on expensive imported timber, the plywood industry of VICMAR Development Corporation in Tagoloan has been testing the veneering properties of over 30 lesser-known and lesser-used tree species commonly grown on farms, including some fast-growing exotic species. Last year, VICMAR, together with a group of upland farmers from three municipalities, identified ten

species with properties and quality similar to those of commercial species. Further research on these and other species is needed to explore:

- decentralized germplasm production and delivery systems;
- tree production (propagation and management) methods appropriate for small-holder farmers;
- local knowledge about species uses and management;
- technological properties and market acceptance.

The use of a greater number of lesser-known and lesser-used indigenous and exotic tree species is expected to help farm-grown timber gain more than a modest share of the national and international timber market and help the forestry sector again become a net contributor to the Philippine national income.

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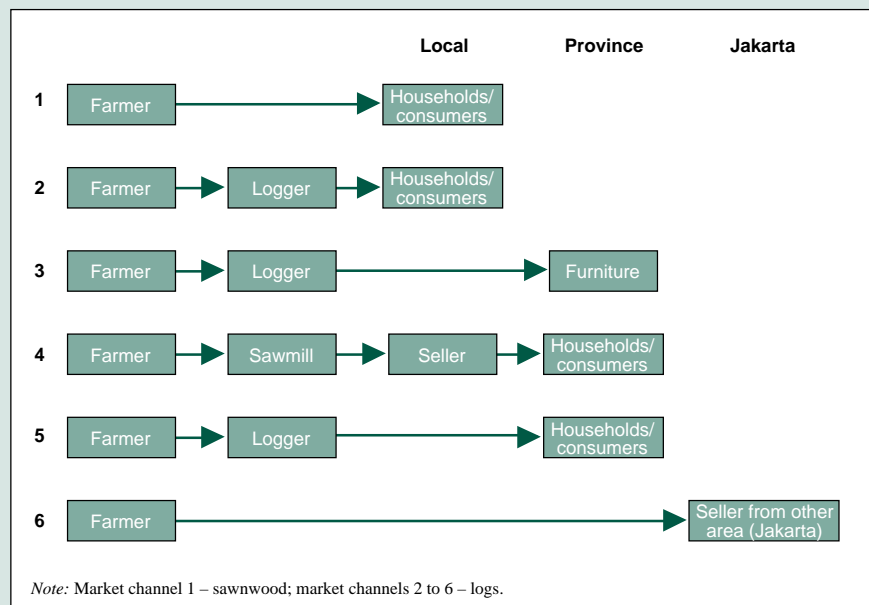
Smallholder timber production and marketing in Lampung, Indonesia

Lampung Province, Indonesia, like many areas across Southeast Asia, was once heavily forested but has witnessed conversion of most of its land to other land uses. The province is now a timber deficit area, importing 94 percent of its 400 000 m³ annual wood demand from other provinces (Provincial Forestry Office Lampung, 1999). This local defi-

cit creates an opportunity for smallholder farmers to develop or expand farming systems that provide timber for construction, packing crates and furniture markets.

A study of timber production by smallholders was conducted in five communities in Lampung where farmers grow timber to intensify their farming systems, provide for their

Marketing channels for smallholder timber in Lampung, Indonesia



The following are some of the questions the producer can be encouraged to consider in ascertaining which timber or multipurpose species to plant.

- Do the tree species on-farm match market demand? What are the characteristics of the market?
- Does the range of tree species currently on-farm provide a sustainable source of those products sought by the market?
- How can farmers achieve a more advantageous position in evolving markets?
- Does the tree species mix on-farm balance market demand, household requirements, compatibility with the

cropping system and sustainability of the on-farm tree resource?

- Does tree species diversity on-farm support a range of livelihood options at different stages in the life cycle of the household, from ready cash to intergenerational investments?
- What is the quality and diversity of germplasm supply for the species used?

Marketing chain analysis can assist in comparisons between regions and countries and between time periods; it can assist in evaluations of the competitiveness of subsectors and subchains and of the potential of different products for enterprise development. Marketing

chain analysis is readily adaptable to participatory approaches, enabling farmers and farmer associations to assess their own markets and make more informed choices.

The institutional dimension of marketing chain analysis looks at the role of direct actors (owners of the product for at least one stage of the marketing chain) and indirect actors (those providing some type of service to one or more marketing chains or products). Indirect actors include, for example, financial offices, public services, professional associations, police, legislators and village or tribal heads. Key questions that arise with regard to the relationships

timber and income needs, and make better use of their limited labour and capital (Yuliyanti, 2000; Roshetko *et al.*, 2002). The study indicated that smallholders use variants of three basic systems to produce timber: home gardens (the traditional system), in which timber species are grown with fruit trees and estate crops (coffee, rubber, etc); single-purpose timber block plantings (primarily of single species); and intercropping with annual crops (cassava, corn, upland rice and peanuts). The latter two systems have been developed more recently in response to the favourable market conditions for small-sized timber. Of the two, block plantings are currently preferred as household labour limitations make it difficult for smallholder families to cultivate annual crops on all their landholdings. Intercropping systems may become more popular as the area of underutilized land decreases with increasing area planted.

In most communities, average landholdings are between 1.5 and 2.0 ha with a few families owning 5 to 10 ha. Smallholder timber production systems are not intensively managed.

Paraserianthes falcataria (a short-rotation low-value timber) and *Tectona grandis* (a

medium- to long-rotation premium-value timber) are the two major species grown by smallholders. Market demand for both species is reliable. Other commonly used species include *Alstonia scholaris*, *Acacia ariculiformis*, *Acacia mangium*, *Gmelina arborea*, *Maesopsis eminii*, *Peronema canescens*, *Pterosperum javanica*, *Swietenia mahagoni* and *Dalbergia latifolia*. Farmer preferences for tree species depend on household needs and markets, but are also influenced by socio-economic factors. Farmers with more land, higher incomes and off-farm jobs prefer to invest in long-rotation premium-value timber species and estate crops; farmers with limited income and land plant short-rotation timber species.

Smallholders utilize six channels when marketing their timber (see Figure). For short-rotation species (*P. falcataria*), smallholders receive the highest profit margin (51 percent of final product value) for sawn timber sold directly to consumers (market channel 1). For long-rotation species (*T. grandis*), smallholders receive the highest profit margin (35 percent of final product value) for logs sold directly outside the province (market channel 6).

between actors include the following (Freud and Dabat, 2000).

- How do different actors influence the transactions and therefore the price?
- How important is trust among the various actors to the smooth functioning of the marketing chain?
- What are the principle opportunities and constraints observed by each direct and indirect participant in the marketing chain?

Timber conversion on-farm

One specific area where training and advice can directly help farmers meet the market requirements more effectively is in the processing and conversion of

timber on-farm. On-farm conversion is desirable because it usually enables farmers to capture higher profit margins, may provide additional local employment opportunities and generates residues that can be used locally. Farmers may convert standing trees into sawnwood themselves, but more commonly they hire local skilled or semi-skilled chainsaw operators. Short-rotation low-value timber species are those most commonly converted on-farm. The resulting products are primarily sold in village- or local-level markets (households or local wood industries).

A study on sawn-timber yields of farm-grown *Grevillea robusta* in Meru

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Compiled in collaboration with: Yuliyanti, Winrock International and ICRAF, Bogor, Indonesia.

district of Kenya compared the efficiency of unskilled and skilled power-saw and tractor-mounted sawbench operators (Onchieku, 2001). Results indicated that recovery rates ranged from 27 percent for unskilled power-saw operators to nearly 60 percent for skilled sawbench operators. Currently, anyone with a tractor can hire five to six labourers and set up a tractor-mounted sawbench business. Many entrepreneurs in this business are locally based. Both industry and contractors would benefit from:

- on-site training (on a paid basis) for tractor-mounted sawbench operators and chainsaw operators;

Farm-level timber production linkages: research, development and advocacy

In Meru district of Kenya, since 1999, timber for local construction and furniture manufacturing has increasingly been sourced from farms because of logging bans and a diminished supply from neighbouring indigenous forest blocks and State-owned forest plantations. Accordingly the Meru timber marketing programme, implemented jointly by ICRAF, FAO, the Kenyan Ministry of Agriculture and Rural Development and the Forest Action Network, was initiated in 1999 to address research, extension and advocacy issues of farm timber supply.

In the first stakeholders' meeting, farmers and sawmillers identified a series of problems and solutions regarding farmers' entrance into the market for timber.

Farmers listed the following problems: a lack of mensuration skills and a consequent inability to value their product; poor knowledge of tree management; poor knowledge of the market; low prices for timber; difficulty in harvesting trees in coffee plantations; conflicts with family or neighbours about felling trees; permit requirements for felling and transporting timber; and transportation.

Sawmillers cited: inaccessibility of trees on farms; bureaucracy in obtaining felling and transport permits; poor quality of logs; lack of information on quantity or location of timber; distance of farms from processing facilities; and presence of nails and other objects in the logs leading to damage of machinery.

As solutions, the farmers requested that the Forest Department provide information on pricing, mensuration techniques and tree management, and they proposed to form a farmers' organization to facilitate marketing. The sawmillers suggested that farmers should clear access paths; that farmers be provided with advice on improved farm planning and management for improved wood

quality; and that farmers select one central point close to their farms for log delivery by farmers and collection by brokers and millers. The pilot programme therefore embarked on a series on interlinking research, extension and advocacy activities.

The research component focuses on documenting and analysing the structure of the timber marketing chains and identifying actual and potential market niches for farmers. Over 200 timber businesses have been censused along eastern Mount Kenya, and 40 separate marketing chains characterized and documented. Household surveys and discussions with farmers on their multi-product tree management strategies will enable the development of market-oriented timber management protocols with farmers.

The extension component has trained extension staff and farmers in tree mensuration and valuation techniques, tree management and silvicultural practices. It is piloting the formation of farmers' marketing groups, farmer-led market analysis and improved market-focused tree management.

The advocacy component focuses on policies pertaining to pricing, market information, harvesting and transporting of timber from farms, and farmers' rights in the marketplace. The experiences of farmers, extensionists and researchers from Meru are feeding into a nationwide advocacy effort. Activities have included local workshops on tree felling, policing of timber transportation and radio programmes.

The next step, emerging from requests from both farmers and the industry, will be pilot contractual and joint venture arrangements between tree product farmers and local industries.

Compiled in collaboration with: S. Carsan, ICRAF, Nairobi, Kenya.

- a system of professional certification and regulation of mobile power-saw operators and contractors.

Training, certification and regulation would not only increase the returns to industry, contractors and farmers; but would also improve conversion rates, increase the amount of timber reaching local and national markets and enhance the sustainability of on-farm and natural timber resources.

TRANSPARENCY IN LEGISLATION, FARMERS' RIGHTS, ADVOCACY AND EXTENSION

Standardizing legislation

Trees on farms fall under a myriad of rules and laws, from water licences, watershed and environmental protection legislation and forest and agricultural regulations to taxation acts. These are sometimes contradictory and call for mutually exclusive actions. In this situation farmers are subject to exploitation by unscrupulous administration officials citing various rules and laws. In many countries farmers must have permits – or are told that they must – to harvest trees that they planted on their own land. Officials in one or more agencies may require “fees” to issue or process the permits. Often there is no legal basis for these permits, or officials fraudulently apply natural forest management regulations to farmlands. In addition, there may be export taxes or quotas intended to promote domestic wood processing; these may drive down the domestic price of timber and hence, in the case of agroforestry species, reduce the incomes of smallholders. Related rules may also be selectively enforced or misused by officials (Tomich and Lewis, 2001).

Any programme in timber marketing requires farmer empowerment not only in terms of markets and market knowledge, but also in terms of government

legislation, rules, and farmers' rights (see Box opposite). In this way, farmers can avoid unwarranted charges. Officials themselves may be confused over which rules to apply in which situation. Streamlining of legislation and rules in relation to on-farm tree planting and harvesting is required, as well as greater transparency in that legislation. Ideally, small-scale timber farmers should be represented in national industry associations and local government bodies and should have strong linkages with forest industry companies, local and national forestry agencies and government legislature.

Conflicting extension and administrative advice

Advice from agriculture and forest extension staff can be conflicting. Agriculture staff may advise lopping trees for fuelwood at shoulder height, while forest staff advise managing trees for longer stems and greater diameter to yield more logs. The result is confused farmers and ineffective tree management.

On the other hand, innovative farmers are developing silvicultural methods that fit their biophysical and socio-economic conditions. For example, Kenyan farmers in one locality close to Mount Kenya have successfully grown straight *Cordia abyssinnica*, a high-value indigenous hardwood species that naturally grows twisted, by training and supporting it with less valuable but straight-stemmed tree species.

There is a strong need for farmer-to-farmer extension and capacity building for farmers and extension staff in timber tree selection, management and marketing.

CONCLUSION

Many farmers in developing countries show an interest in managing trees to produce quality timber for specific markets. Experience indicates that farmer

Timber broker drawing a marketing chain, Kenya



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A tractor-mounted sawbench, Kenya

interest depends on demonstration of the financial benefit of good management and on reliable access to profitable markets. The challenge to research, extension and development specialists is to help facilitate the development of such conditions.

Activities that will assist small-scale farm-level timber production to achieve its multiple potentials include those at the farm-level to improve farmers' access to:

- markets and market information;
- germplasm of suitable and well-adapted species, provenances, varieties, clones and seed sources of high quality;
- knowledge regarding species selection, tree management, product processing and required product quality.

Key community-level activities include:

- market analysis to assess current and future demands and identify the tree products for which farmers may have comparative advantages;
- the development of farmer groups to facilitate tree production and product marketing and to enhance economies of scale;
- collaboration with government agencies and advocacy groups to clarify and strengthen land and tree tenure rights and legislation and to address other policy issues that may hamper farm-level timber production.

The benefits of farm-level timber production are not limited to farmers. Associated benefits also accrue to the wood industry and to the public. These include

enhanced timber supplies to meet social needs, strengthened local and national economies, diversified landscapes and the protection of environmental services (watershed functions and biodiversity conservation).

However, the true magnitude of farm-level timber production and its impact on local and national timber markets, present and potential, are not known. Research is needed to assess:

- the number of farmers involved in different tree product markets by region;
- the household income provided by farm-level timber production (as both total and proportion of household income);
- the volume and value of wood products sourced from farms, as a proportion of industry supply, by product type. ♦

Confused tree management: a result of conflicting advice from extension staff in forestry and agriculture



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