REPORT

Timber ownership certification and opportunities for smallholder credit: Case study on teaksmallholdings in Bokeo, Lao PDR

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Summary

Teak plantations play an essential role in rural communities in Northern Lao PDR. Such plantations were established over the last 25 years, in most cases with the aim of both obtaining permanent land titles and creating assets that can be mobilized in times of financial need by selling at least part of the standing trees. The report describes the process of developing a certificate that is issued by the government to recognize user rights over one rotation period and to facilitate the legal harvesting and transport of timber from teak plantations. Financial valuation was added to the certificates to test the possibility of using standing timber value as loan collateral in local microfinance schemes. The report presents background research, a global review of similar approaches, opportunities and shortcomings of the certificates and an evaluation system.

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Introduction

Forest-based small-scale enterprises face formidable barriers in accessing microfinance services (FAO 2005). Capital needs for smallholders range from short-term loans for inputs such as fertilizer, labor, storage and processing of products. Medium- and long-term loans are needed for financing equity, leasing equipment, purchasing seedlings, building assets, ensuring loan repayment, as well as for savings to stabilize uneven cash flows and crop protection insurance (FAO 2005). Despite the global urgency to provide for the credit needs of households engaged in forest-based livelihoods, there has been little sustained effort to produce adequate solutions involving the use of trees as collateral for forest-based smallholders in developing countries.

Given the multiple difficulties faced by smallholders in obtaining loans, it is urgent to develop innovative and responsive loan and collateralization mechanisms that can meet the criteria of both borrowers and lenders without placing borrowers at great risk, while also keeping in mind that credit opportunities come with substantial risks for both borrowers and banks. Borrowers must demonstrate creditworthiness, which is especially challenging for asset-poor communities – including communities engaged in subsistence farming – lacking savings or income generating activities. The extension of credit to such communities has been limited due to the lack of assets such as property, land, and even agricultural produce, which are conventionally considered to be collaterals for loans. Together with the absence of laws to protect credit institutions and borrowers, there is reluctance among institutions to extend their services to the rural poor.

While recognizing the importance of trees as valuable assets that make up a substantial proportion of smallholdings (FAO 2005), regulatory regimes have largely excluded trees as collateral. This is due to a number of reasons, including the long maturity period for trees compared with other sources of capital and a lack of documentation, certification, rights to land, guaranteed buyers, security over market prices and the understanding and capacity at the government level to facilitate the process. Historically, professional forestry has also tended to ignore trees in villages (including those growing in individual gardens), on farmland and trees that fall outside of plantations and are clearly designated as crops (Chambers and Leach 1982). Western forestry practices are also founded on the experiences of high-income countries in temperate climates where tree growth rates are a tenth of those in the tropics, resulting in trees not being regarded as valuable assets beyond their value as timber (Chambers and Leach 1982). Mechanisms enabling forest assets to be used as collateral for micro-loans are needed to circumvent the particular conditions of developing economies, such as the lack of regulatory support and capacity and weak governance and legal structures (Douglas 1982).

When implemented with care and within an environment of sound government policy, regulatory systems and technical assistance, the extension of credit can be beneficial not only to smallholder borrowers, but can also serve as a foundation for enterprise and the delivery of financial services to previously underserved communities. To demonstrate the scope of considerations, possibilities and limitations of implementing a collateralization scheme for asset-poor households, this report reviews the lessons learned from an ongoing tree certification initiative within a larger community forestry project in Bokeo province in Lao PDR. The project, ForInfo [1], is implemented by the RECOFTC – The Center for People and Forests with funding provided by the Government of Finland. The Lao Provincial Organization for Forestry and Agriculture (PAFO), the Lao Department of Agriculture and Forestry, as well as other local partners, have provided implementation support since the project's founding in March 2011, Together with its partners, RECOFTC works with local communities in Bokeo to improve smallholder teak growers' harvesting techniques and knowledge and enhance access to the income-generating benefits of teak holdings. In spite of the long history of teak growing in the area, Bokeo smallholders – facing increasing interest from timber middlemen and challenges in selling, transporting and harvesting teak – were inclined to sell teak below potential maturity. To increase the benefits of rising teak prices for smallholders, the project aims to increase the capacities of communities to harvest, transport and sell their own timber.

The launch of teak tree certificates was one of these mechanisms. Certificates document the age of trees, dimensions of stands and the trees' coordinates and distance from roads and rivers. The market value of stands are also included in the certificates with the intent to build collateral value into tree holdings. This report documents the scientific and social basis for the value estimation of trees based on existing forestry principles adapted to an asset-poor rural household economy. Specifically, in considering the question of collateralization, there is a need to address property and governance regimens that do not conform to scenarios under which conventional collateral schemes were developed. Land is not often owned by communities, but rather merely leased or granted in the form of usage rights. Even where smallholders own land, they face the risk of losing an asset they are heavily dependent upon. Moreover, structural factors such as the lack of bank branches in rural areas and high rates of interest imposed by the state – a situation common across Southeast Asia – present difficult barriers for the entry of credit institutions into the uptake of small loans.

This report has relevance for development and forestry practitioners, inter-governmental and non-governmental organizations, national forestry agencies, agriculture, environment and rural development ministries, banks, credit agencies and those working in rural development and community forestry who are interested in exploring smallholder credit schemes involving rural development initiatives.

1 For more information on the ForInfo: Livelihood Improvement through Generation and Ownership of Forest Information by Local People in Products and Services Markets project, see http://www.recoftc.org/project/forinfo.

Trees as collateral assets: A literature review

The value of trees as assets has long been recognized. While farmers are often land-poor, surveys across developing countries show that many smallholders have cattle and tree assets of value. Cerdas (2005) found that six out of 69 Costa Rican families surveyed had cattle and 29 had trees. The average value of these assets were US$ 1 800 for cattle and US$ 2 557 for trees per family. The survey found that for smallholders without conventional sources of collateral like mortgages or land, non-conventional collaterals allowed them to meet the needs for small loans, to circumvent the otherwise high interest rates on loans and to mitigate the limitations of conventional credit, especially the risk of land as collateral.

For many households, putting land up for mortgage carries a high risk since land is especially critical to livelihood (Willoughby 2004). Many people do not have titles or cannot transfer titles to land (Cerdas 2005). In China for example, collective forests make up 58 percent of forestland (Xu, *et al* 2010) and 94 percent of all cultivated land (Kram, *et al* 2012). If land were to be used as the sole means of collateral, forest-based smallholders would continue to be largely excluded as microfinance clients since many farmers lack the means to meet collateral requirements (Peque 2005). Non-traditional collaterals such as trees, reduce risks for banks, allowing banks to charge lower interest rates, loan more money and make loans available to people who are otherwise unqualified (Willoughby 2004). The same tree could also be used repeatedly as collateral against new loans.

The collateralization of trees has been taking place for years in Southeast Asia through informal exchanges. For example, tree farmers in Misamis Oriental in the Philippines borrow money from private traders and use young trees as collateral. When loans reach maturity, trees are cut and sold to pay the debt (Magcale-Macandong, et al. 1998). But in such cases there is the possibility of exploitative middlemen, a problem which must be addressed by a stronger legal framework for transparent and fair transactions. Where collateral schemes involving trees have been integrated into land reform processes, they have helped to stimulate investment. In China, where forest asset mortgaging was implemented in 2009, Yi, et al. (2014) found that rights to mortgage, together with rights to transfer forest land to other villagers and to change forest type, helped to stimulate household investment into forest lands.

In spite of the demand for and proven advantages of trees as collateral, there has been limited implementation of credit schemes based on trees as mortgage. The implementation of tree collateral schemes has been hampered by the high risks faced by potential borrowers and lenders in developing countries, as well as an unsupportive regulatory environment. Reasons include a lack of skills and knowledge to maximize profit of trees, the need to establish a long track record of good credit standing (Peque 2005, Cerdas 2005), and most notably, the lack of a policy acceptance of trees as collateral in many countries (Peque 2005, FAO 2005). Farmers, especially those working on a small scale, sometimes lack the technical skills necessary for ensuring healthy and viable plantations (Peque 2005). A lack of information and access to markets is also a disadvantage to smallholders. Studies found that there is a need for governments to help mediate between financiers and borrowers, act as guarantors, find markets for tree products, ensure tree products are sold at competitive prices and help farmers ensure the production of healthy plantations (Peque 2005, FAO 2005).

Mao and Chen (2009) also describe a number of challenges met by the forest asset mortgage program implemented in Lishui, China. These challenges included: inadequate capitalization due to dissonant time frames for forestry production and loan repayment; high interest rates; inadequate competition of rural lenders leading to low rates of use and even lack of fulfilment of loans; small loan amounts leading to inadequate capitalization; excessive pressure on the monetary system caused by guaranteed amounts far exceeding the capital; and inadequate assessment methodology. For example, high lending rates in China are obstacles to wider implementation of tree-based loan schemes. Banks offering loans on forest right mortgages adopt a floating interest rate of not more than 50 percent. However, banks currently involved in lending are largely rural credit cooperatives, which reside in cities, counties and districts and have the autonomy to determine how much interest rates float around the municipal benchmark of 50 percent. As a result, average interest rates have reached up to 1.5 times the benchmark rate. Although farmers enjoy subsidiesthe high interest costs have deterred a number of ordinary mortgage lenders (Mao and Chen 2009).

Transporting teak timber to the main road using a tractor.

Banks offering the loans also face risks because forests and agriculture-based assets are vulnerable to natural disasters and diseases. Tree planting is risky because it is a long-term enterprise with little short-term investment gain. For example, a region-wide drought in Guatemala in 1996-97, which killed livestock and trees, left banks with nothing to seize (Cerdas 2005). Another example can be found in China where there are several obstacles to mortgage financing of forest rights due high assessment fees, complex mortgage valuation processes, an imperfect forest factor market and a lack of risk protection mechanisms, especially to lending institutions (Wei and Ge 2011). Because forest resources cannot be freely traded, are easily stolen and are subject to natural disasters, financial institutions and farmers that are still not well-ameliorated by insurance institutions, face considerable risk (Cerdas 2005).

Institutional reforms are vital in providing security to borrowers and lenders. In Sudan, for instance, an inadequate legal framework has hindered the development of a strong, sustainable microfinance industry, and subsidized credit programs encourage incorrect borrowing patterns by customers. Such an environment – inadequate professional skills, difficulties accessing long-term funding, lack of attractive financial services – hampers the success of credit associations. For example, producers see the local Elmirehbiba Gum Arabic Producers Association merely as a credit delivery mechanism and the association has failed to mobilize savings from its members (FAO 2005). Similarly, in Peru, the case of Brazil nut harvesting, as reported by the Department of Madre de Diós, shows how, in the absence of adequate awareness, support and clear provisions regulating the forest concession system, specific economic activities requiring sectorial knowledge can discourage microfinance institutions from entering the small-scale enterprise market, even when supply chain actors are providing microcredit profitably (FAO 2005).

Interventions to encourage tree collateralization

While there must be the implementation of laws and regulations to govern microlending and the use of non-conventional collateral, establishing the necessary conditions for documentation and awareness-raising can help smooth the transition to eventual adoption. Possible solutions range from institutional interventions, to preparatory data collection, to the careful design of credit programs. Tree collateral programs, moreover, could be designed so that farmers do not cut tree holdings when they lack the ability to repay their loans. These programs could also use only the trees that can be sustainably harvested as collateral (Willoughby 2004). Other strategies include combining tree collateral with other kinds of collateral to provide extra security for lenders while reducing interest rates for farmers. Placing restrictions on the percentage of income-generating assets that can be used towards collateral help prevent risk, with the percentage determined by the size of the farm and creditworthiness of the borrowers (Willoughby 2004). The value of the loan would be less than the value of the tree, thus encouraging the borrower to repay rather than forfeit the more valuable trees.

The existence of good data on tree growth, farmer incomes and market conditions is often a key requisite for establishing appropriate tree collateral programs. Willoughby, et al.

(2004), in their study of ten microfinance banks on Leyte Island of the Philippines, found that the absence of data is a major obstacle for lenders. Such data, seen as necessary for ensuring loan security, includes income profiles of clients, rates for lenders, tree conditions and characteristics, logging statistics, potential market of the product and land or plantation titling systems (Willoughby, et al. 2004; Peque 2005). Presently, most banks on Leyte Island provide credit to small landholders but none provide financial support for forestry activities. Credit institutions must also be educated on ways to minimize risk while fulfilling the need for collateral. For example, Cerdas (2005) found that financial institutions should diversify their portfolios geographically to minimize the risk of natural disasters wiping out all mortgage assets should borrowers be located in a single region. Such a strategy is used in Colombia when institutions create investment vehicles linked to titles for cattle. Not more than 15 percent of the funds can be invested in cattle of one particular location. Another strategy employed to minimize risk is to create a secondary market for liabilities such as cattle titles or loans for farmers. Such a secondary market distributes risk among more investors so that the financing institution will not lose all assets if the loan is not repaid and the cattle collateral cannot be seized.

Commitment to securing tenure rights for communities and individual households also plays an important role in creating a favorable environment for loans. The case of community forest enterprises in Petén, Guatemala, shows how clear forest tenure rights and the legal establishment of forest concessions successfully drew two commercial banks – Banco de Desarollo Rural (BANRURAL) and Banco del Café (Bancafé) – into servicing small-scale timber enterprises. Technical assistance and business development helped micro-entrepreneurs prepare sound annual operating plans and consolidate their financial needs, thus facilitating their access to the banks (FAO 2005).

In El Salvador, Guatemala and Nicaragua, the law does not permit the use of trees as collateral; only the trees' fruit is accepted. The countries' respective ministries for the environment also do not include trees from forest plantations as collateral when owners have access to loans and wish to use their trees as collateral (Cerdas 2005), though there is one exception: loans are granted to pay for environmental services to people with plantations or forests, provided they have formal management plans (Ibid. 2005). Loans are also granted for a lien on cattle; even so, state banking entities that allow cattle as collateral only do so for customers who have a long track record with the institution, as well as good credit standing.

The government's role is vital in creating a safe credit environment through the brokering of relations between financiers and borrowers and helping to ensure fair prices and available markets. Peque (2004) found that microfinance on Leyte Island would be most effective if the Department of Environment and Natural Resources of the Philippines created policies that were investor-friendly; served as intermediaries for banks, borrowers, buyers and processors (for agricultural produce as a form of collateral); and were to find markets for tree products at competitive prices to increase the confidence of smallholders to find buyers for their tree products (Peque 2004). In China, for instance, tree collateral systems formed part of land and forest tenure reforms instituted in the 2000s. In 2008, the Central Committee issued the No. 10 Document proposing collective forest tenure reform, promoting sustainable forest development and increasing farmers' incomes and productivity by providing easier access to loans. This reform proposed to give individual farmers the rights to use farmland on leases of 30, 50 or 70 years, which could be extended indefinitely. These new titling arrangements opened the way for new loan products to be made available to farmers. A public-private partnership, which included banks, forestry commissions and the Ministry of Finance, launched the 'Guidance on Financing Services for the Support of Forestry Development in Context of Collective Forest Tenure Reform,' permitting farming households to obtain loans from banks using standing timber on their contracted forest lands as collateral (Xiao, et al. 2010). By the end of the year, 25 provinces had launched forest tenure mortgage schemes to a total of RMB 22 billion yuan (Xiao, *et al*. 2010). The central government and provincial government subsidized insurance premiums for 30 percent and 25 percent respectively. Timber harvesting is also subject to quotas and the annual rate of timber growth must exceed consumption.

Technical assistance could also help create a conducive environment for loans by helping bring financial institutions and government agencies together, and by developing the capacities of farmers, agricultural officers and financial institutions to design and implement appropriate credit programs. Willoughby, et al. (2005), examining the use of trees and cattle as collateral in El Salvador and Zona Norte in Costa Rica, found that the most successful credit programs were the ones combined with technical assistance programs, which helped farmers deploy loans in more profitable and productive ways. In another example of technical assistance, in Parbat, Nepal, group lending in support of micro-enterprises (not exclusively forest-based) is provided through the Agriculture Development Bank of Nepal under a government initiative with support from the United Nations Development Programme (FAO 2005). It was found that effective provision of business development services such as the selection of good potential micro-entrepreneurs; the development of entrepreneurship, technical and managerial skills; the promotion of market linkages; and the transfer of technology are essential to the success of small-scale enterprises, and, therefore, for credit repayment performance (FAO, 2005).

ForInfo teak certification project

Background

In 2009, RECOFTC began implementing the ForInfo (Livelihood Improvement Through Generation and Ownership of Forest Information by Local People in Products and Services Markets) project. The project's aim is to enhance local communities' access to markets for forest products and environmental services through the development of new methodologies for increasing local people's share of benefits from community forestry, especially through people's ownership of locally-generated information that is rendered marketable and usable. More broadly, the aim is to lay the groundwork for a sustainable, efficient and competitive forest-based livelihood system through the use of innovative approaches and close collaboration between smallholders, forestry officials, sawmill owners, timber traders and credit associations. The ForInfo project's technical experts have trained forestry officials on the use of tools like Global Positioning Systems (GPS), Geographic Information Systems (GIS) and mapping software, as well as in conducting on-site plantation registration surveys, forest inventories, and issuance of plantation certificates. In Bokeo province in the Lao People's Democratic Republic (Lao PDR), RECOFTC is working together with the Lao Provincial Agricultural and Forestry Office (PAFO) to help farmers generate, manage and distribute information through innovative methods that maximize smallholders' benefits from teak plantation management. ForInfo project staff trained PAFO in database management of the certificates to give smallholders more information and thus greater market access to sawmills and traders. The ForInfo project builds on the benefits already accruing to certification: increase rotational harvesting time, possible land titling, and recognition of certificates by financial institutions.

The next sections details the rationale for focusing on teak, the conceptual foundations for teak stand valuation and the challenges of extending credit based on teak tree collateral.

Why teak? A history of teak plantations in northern Lao PDR

Lao PDR has the highest ratio of forestland per capita in Southeast Asia. About 30 000 smallholders contribute to the country's plantation sector. Teak plantations in northern Lao PDR began forming in the 1950s, but it was not until the early 1980s that smallholders in northern Lao PDR began planting teak in earnest (Newby, *et al*. 2010). It is estimated that by 2007, teak plantations occupied 40,000 hectares (ha) of land, largely concentrated around Luang Prabang (Midgley 2007, cited in Bianchi, et al. 2013a), which is regarded as an example for the successful uptake of teak plantations for the northern provinces.

The expansion of smallholder teak plantations was due to a confluence of government teak promotion projects beginning in 1975, as well as land allocation policies, which began in the 1990s. In 1950, the Department of Forest and Water encouraged shifting cultivators to plant teak and food crops between trees. New land allocation policies were instituted in the 1990s. These decrees, together with new land and forestry laws, aimed to replace shifting cultivation with sedentary agriculture, including tree plantations (Newby, et al. 2010). Moreover, the Forest Law of Lao PDR provides for participatory, sustainable forest management (PSFM) in production forest areas (PFAs). Village Forestry Organizations (VFOs) organized since 1996 evolved into PSFM in 2004. Under the National 2020 Forest Sector Strategy, plantations are expected to make major contributions to the national timber supply. In light of these initiatives, the total area of teak planted increased from 500 to 10 000 ha in 2007 (Midgley, et al. 2007).

Land is not privately owned but distributed for use to households through village labor units. Each labor unit is allocated 25 ha of land, which is distributed among households with one to three ha allocated per household. Three out of three 25 hectares allocated are 'degraded forests,' defined as former forestland previously used for shifting cultivation, which are now without forest or barren. If a plot is abandoned for more than three years, the land will be returned to the village committee and is then redistributed. As a result, farmers have planted teak on plots left unused to thus retain tenure over them. Other reasons for the increase in total area of teak planted include the expansion of roads, a growing market for young teak timber, an increase in the establishment of permanent villages and the increase in private investment and financial support for plantations (Kolmert 2001).

Current challenges for smallholder teak plantations

Today, much of the teak from the teak plantation boom of the 1990s has come into maturity and an economy has grown around exchanges for teak trees. Teak harvesting, moreover, is made more attractive by the increase in teak prices over the last two decades. With high demand for teak wood in the global market, there is potential for high returns from teak growing especially in relation to present household incomes (Newby, *et al*. 2010:1). Teak prices increased 8.5 percent per annum between 1997 and 2007 (ITTO, cited in Bianchi, et al. 2013b). Considering the declining supply coming from natural teak forests, the long-term prospects for plantation-grown teak appear promising and demand is likely to increase (FAO *Teak Resources and Market Assessment* 2010, cited in Bianchi, et al. 2013b). In Bokeo, income from teak can range between 25 and 55 percent of the smallholders' annual cash income (Bianchi, et al. 2013b).

However, in spite of the high income-generating value of teak, trees are often harvested prematurely to meet the cash needs of smallholders before trees reach higher commercial value. In Indonesia, for example, Kurniawan and Roshetko (2009) found that, out of the smallholders studied, only 14 percent removed trees at the optimum rotation age. Premature harvesting, moreover, is often accompanied by the practice of removing bigger and more vigorous trees to sell first, leaving trees with little potential for additional increments in value behind for long periods. This practice not only degrades the quality and the value of stands left behind but also undermines site potential (Bianchi, et al. 2013a). According to Bianchi, et al. (2013a), this practice is consistent with case studies on smallholder teak producers elsewhere. Moreover, the improved management of teak is still lagging behind the expansion of teak plantations. Newby, et al. (2010:9) showed that less than 34 percent of household survey respondents had heard about pruning, only 23 percent had heard about thinning and 14 percent had had actual training in thinning.

The long-term prevalence of teak plantation in the region, together with new market opportunities, provides an opportunity to pilot new instruments for increasing livelihood security and alleviating poverty while encouraging sustainable forest management practices. Projects involving smallholders also offer opportunities for the participation of local communities that may not be available in a foestry sector dominated by government and large industry interests.

Teak tree certificate projects – from LPTP to ForInfo

Increasing integration of forest products from Lao PDR (such as timber, plantation crops and non-timber) into the regional and global supply chains necessitate the securing of more proportionate benefits for smallholders engaged in teak cultivation as a means of livelihood. Starting in 2007, the Luang Prabang Teak Project (LPTP) issued plantation management certificates to smallholders, giving them rights to cultivate teak on designated plots for rotation times of up to 30 years. The LPTP was implemented in partnership between Kok Gniew village, the Luang Prabang Provincial Forestry Section, the Government of Lao PDR, the Lao Provincial Agriculture and Forestry Office and The Forest Trust (TFT). The certificates were issued under a larger project and were not the only goal of the project.

The LPTP successfully facilitated the use of teak certificates as collateral by smallholders in Luang Prabang. First, when potential buyers realized that delaying harvest could yield significant financial gains, they made arrangements with farmers to buy or barter these trees and whole stands well ahead of a fixed harvest date. Second, on the basis of the documented valuation of the certificates, sawmills bought standing trees up to two years in advance of harvesting. Third, more than 20 cases of microloan collaterals using these plantation management certificates were granted by the Luang Prabang Savings and Credit Union. However, these collaterals were granted on a case-by-case basis with estimated timber values. The increase of rotational harvesting time was already observed in the LPTP phase (Bianchi, et al. 2013a). The certificate served as the smallholder's agreement that they will consult with the committee before selling their teak holdings. In turn, Department of Agriculture and Forestry officials have confirmed that all smallholders who have held certificates thus far consulted their village committees before engaging in the sale of their teak holdings. Overall, the existence of certificates has resulted in stronger and clearer teak tenure rights in Bokeo province.

Through the ForInfo project, RECOFTC has built on the successes and furthered the gains already made by TFT by extending the distribution of the certificates and refining the information provided to allow certificates to serve as instruments for mortgaging teak tree stands for small-scale loans. By issuing these certificates, RECOFTC hopes to end the premature harvesting of teak, protect teak stands as assets and help smallholders meet their immediate cash needs. To further this goal, the ForInfo project added an estimation of the trees' market value to the certificates using clear financial and allometric principles based on an appropriate measurement of tree stumpage value and designed with specific land ownership and legal conditions in mind.

Existing plantation management practices

Preliminary studies began in August 2012 to determine current practices of the measuring, valuing and trading of teak. Market information was collected through interviews with five sawmill operators between August and October 2012 and was then updated in 2013. The sawmill yards were located in both Huay Xai and Paktha districts. The information collected included the names and contact details of owners, the location details (through GPS coordinates), the marketing strategy and the pricing system.

When teak trees are sold as standing trees, their price is established by determining the tree size using a measuring tape at 'above the head' height. Operators use this method to approximate a diameter reading closer to the average of the final log. The price is then adjusted according to the quality of the tree. The 'girth above head' measurement varies by the operator, but it can generally be estimated that the diameter at that height is two centimeters (cm) smaller than the diameter at breast height (DBH).

Table 1 indicates the average price[2] farmers obtain for the sale of standing trees based on DBH. All sawmills accept trees with a minimum DBH of around 23 cm, not always smaller.

Table 1. Average value of standing trees.

DBH of standing tree	Average value (THB)	Average value (USD)
21 cm	250	8
23 cm	300	10
26 cm	400	13
29 cm	600	20
32 cm	800	27
34 cm	1 000	33
36 cm	1 200	40

2 Prices are displayed in Thai Baht (THB) throughout the document since it is the currency in use for timber sales. On average, US$ 1 = 30 THB.

More commonly, however, tree owners prepare the round logs themselves and sell them at the nearest roadside where sawmill operators can pick them up with small trucks or hand tractors. The price is then based on the actual volume over bark of the round logs and their smallest diameter (Table 2). The maximum length of logs picked up is about 2.1 meters (m). This is mainly due to the impossibility of moving bigger logs by hand. The minimum diameter required for logs differs between different operators: only one reported that he would accept logs of 10 cm, once reported that he accepts 15 cm logs and all operators accept logs of 20 cm and up. Beams of 13x13 cm with a length of 1-2 m are the smallest products found in the sawmill yards.

Table 2. Average value of logs at roadside.

Smallest diameter of logs	Average value (THB/m³)	Average value (US$//m³)
10 cm	1 500	50
15 cm	3 000	100
20 cm	4 000	133
25 cm	4 500	150
30 cm	5 000	166

In terms of harvesting costs, it was found that in most cases, the sawmill owner reimburses costs to the farmer at the time of the sale of the logs. The cost of felling is generally estimated at around 60 THB/tree. Transportation costs are less clear. The most common price appears to be 100 THB/tree for a distance of 100 m from the road, or 20-30 THB/log (with the expectation of 4-6 logs per tree). Although the price of harvesting was estimated to be 200 THB/person/day, this figure does not include any information on productivity. Only one sawmill claimed to use a winch powered by a modified hand tractor wheel. However, common transportation is carried out by hand from the plantation to a road accessible by either a truck or a hand tractor. Sawmill operators are generally buying only medium to large teak trees; therefore, it is possible that they have no experience in estimating costs for the small DBH trees that are the target of thinning operations. Thus, small trees remain in the stands, which negatively affects the growth of dominant trees.

RECOFTC valuation of trees

Stumpage value vs. predicted value

The choice of methods for the financial valuation of timber depends on the purpose of the valuation, the availability of data and various socio-economic conditions that influence the risk profiles of households and credit institutions alike. The most important criterion for the choice of a value estimate is the decision maker's use of the estimate (Beuter 1971). Foresters select a valuation method depending on whether the timber is being slated for immediate or future harvest. The two most common values used in commercial forestry around the world are stumpage value and predicted value. The following sections also use the German terminology as defined in the original documents in order to avoid any misunderstanding or misinterpretation.

Stumpage value, also known as stand value (*Abtriebswert*), derives the value of a stand by multiplying the volume of timber volume with the day's market price for the timber of that particular species. Stumpage values are estimated using timber market reports and site inventories for timber volumes. Stumpage value is also referred to as "immediate harvest value" and is the value given to timber slated for immediate cutting. Harvesting costs are excluded from the valuation except when standing trees are sold. Present value of different forest types was first derived by Faustmann (1849, cited in Wagniere 2011). These forest types are as follows: even-aged forest plantations (*aussetzender Betrieb*), plantations before they are established (holzleerer Waldboden), overgrown forests (*gegenwärtig bestandener Boden*) and a variety of sustainably managed forests (*nachhaltiger Betrieb*). Faustmann integrated forestry-specific revenue and cost structures into these formulas (Faustmann 1849, pp. 441-455, cited in Wagniere 2011). With the help of the land expectation value (LEV) formula, Faustmann calculated the NPV of bare land as: perpetuity with the length of the rotation, with the revenues and establishing costs of the forest compounded to the end of the rotation period, reduced by the annuity of the management costs.

Predicted value (also referred to as "expected value" or *Bestandeserwartungswert*) calculates the expected future financial return from harvesting a mature stand at the day's value, usually corrected for expected inflation. The purpose of predicted value calculations is primarily to compare forestry investments to other investments in terms of the opportunity cost of planting trees for timber. To obtain the expected or predicted value is to calculate the expected future financial return in today's dollars. This calculation takes into consideration the length of the growing period as well as a discount rate. To conduct a valuation of a tree that is expected to be harvested at 10 years or 30 years, the price expected for selling the tree in 10 or 30 years must be considered, minus the discount rate or a rate of interest, to bring this value down to prices of the day. The key value is rotation age: once a rotation age is chosen, the expected value of standing timber cut and sold at that age is then applied as a discount rate for each year until harvest (Wagniere 2011).

Predicted value is most useful for practitioners trying to determine whether the rate of return from continuing investment in the trees is worth more than the rate of return received from investing that money or land in other opportunities. As Beuter (1971:2) explains, the estimated value is "subject to the objectives, assumptions, limitations, and judgment of the person" who makes the estimate. Predicted value also does not account for the stumpage volumes of teak available for harvesting at that point in time. Rather, it applies the discount rate to the expected volume and sale price of the tree at its expected point of maturity.

An important characteristic of predicted value is that, compared to stumpage value, it tends to project much higher prices for teak at every age. At the point when a tree is viewed as reaching its peak DBH (around 40 years of age), both stumpage and predicted values plateau. Although this has considerable utility for growers who need to account for the opportunity costs of tree planting versus other uses for the land, estimating with higher values can result in difficulties for growers for whom the opportunity cost of land is not a consideration. This carries special risk for growers for whom tree valuation is employed primarily as a means of assessing the size of a mortgage or collateral.

When applying for loans, mortgages reflecting higher values can be extremely risky for mortgage applicants operating in cash-poor economies. These applicants have fewer opportunities for livelihood diversification and are therefore at higher risk of defaulting on their loans. In these cases, stumpage value provides a more accurate assessment of the amount a grower receives at a certain growth stage, should they decide to liquidate their tree assets. The financial risk of applying stumpage value is lower than applying predicted value, which assumes trees are always felled at the expected DBH at maturity.

Volume estimation

Before an estimate of market value can be conducted, it is necessary to estimate volume. Since commercial tree volume is dependent on DBH and commercial height, it was necessary to understand the relationship between these two parameters, a basic step for all forest mensuration studies and subsequent volume calculations. Due to the previously described market situation in Bokeo, commercial height has been defined by studies (Bianchi 2014) to be when trunk diameter reaches 15 cm. Measurements were carried out in August 2012 in seven plantations. 15 to 20 trees were selected in each plantation, distributed evenly among all the dimension classes. Measurements were taken using a fixed caliper mounted on a bamboo pole with a measuring tape attached.

A correlation between DBH and commercial height was found. The R^2 value is generally higher for regressions of individual plantations than when all plantations are considered together, the latter, which resulted in a higher sum of errors. It was thus decided to create site-specific regression curves in each plantation during the certification process. Logarithmic regressions resulted in more precise correlations. However, since the differences between logarithmic and linear regressions are not significant, PAFO and DAFO officers employed linear regression for ease of application.

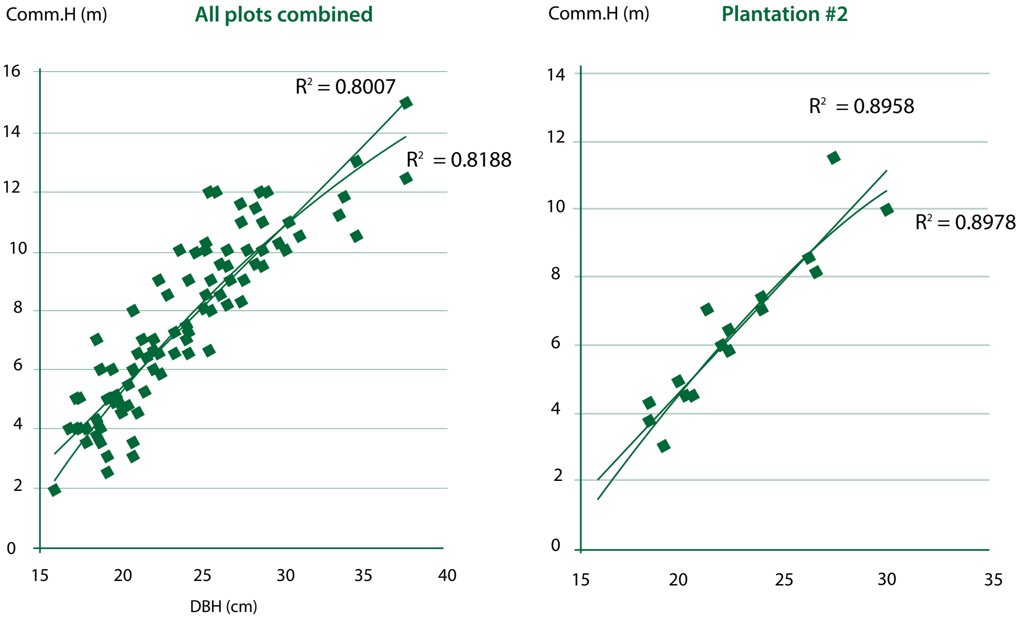

Figure 1: Relationship between commercial height and DBH for individual plantations and all plantations combined

Commercial timber volume over bark was then estimated since local studies on teak allometry between diameter and volume for Bokeo province had not yet been carried out. The formula used to estimate this considered the trunk as a cylinder with a diameter based on the average of DBH and the top of the commercial trunk (15 cm) and with a length equal to commercial height. Although this tends to underestimate the total volume, the formula is more likely to give a conservative estimate and thus helps to accommodate the less than average general quality of trees in Bokeo province, as well as lead to a conservative market value estimation.

The volume estimated by the ForInfo project methodology was found to be 70 percent of the volume calculated by methodologies of other studies (Bianchi 2014), which focused on Thai teak trees that, due to better plantation management, are generally larger with higher commercial volumes. Overall, an underestimation of the volume for Bokeo teak will bring about conservative market value estimations to absorb high institutional risk. Therefore, stumpage value is a preferred valuation methodology. Stumpage value is only positive after a certain point, (e.g. 10 to 12 years for Lao PDR).

Destructive sampling was carried out in August 2014, in which the DBH and commercial heights of ten trees in a 19-year-old plantation were measured while standing and then when felled (Bianchi 2014). The real commercial volumes recovered for each tree were compared to those calculated by applying the ForInfo project methodology and the Thai case (see previous section). While the the ForInfo project methodology estimated a conservative 81 percent of the Thai tables, real measured volume was consistently higher

(120 percent) than the ForInfo project estimated volume and significantly similar to the Thai tables. If height estimates were to be replaced by measured commercial height in the ForInfo project methodology, the real volume is now only five percent higher than the estimation (Bianchi 2014). These findings again confirm that the ForInfo project methodology is a conservative one.

The following details some other conditions of teak growing in the Bokeo area that influence decisions on volume and market estimates employed:

Higher tendency to harvest before maturity. Given the tendency for premature harvesting, there are significant differences in the quality and growth potential of teak remaining on smallholders' plots. Projecting forward to a tree's potential value at age 40 gives a potentially error-prone assessment of the present value of the tree. When stumpage values are used, this risk is lessened, and loan defaults occurring before the tree reaches 15 cm in terms of diameter at breast height (DBH), leave the householder with a lower repayment obligation than if they had to repay a loan the equivalent of the timber's net present value. This is also reflected in the fact that before the minimum harvest age, stumpage value is negative because tree volume is too low to be harvested.

Poor thinning and pruning practices leading to high potential trees felled and lower potential stands left behind. Smaller-sized, growth-suppressed trees do not increase in value because their growth remains suppressed over time. Such trees are proposed targets for the first round of thinning and can be harvested earlier. Valuing these trees using stumpage value avoids the tendency to over-estimate the value of these trees. Meanwhile, the ForInfo project is attempting to increase the marketability of these growth-suppressed stands slated for first thinning by exploring innovative processing methods for such materials. One example is to process such timber for finger joints, which are made by interlocking two pieces of wood with complementary rectangular cuts. Initial studies show that collateral value for first-stage thinning material can range from US$ 1 000 for low-quality sites far from roads (up to a distance of two km) to US$ 2 500 for high quality sites close to roads (Bianchi, et al. 2013a).

Sale of teak by growers to middlemen at low prices compared to potential earnings higher up in the timber value chain. Current timber sales in Bokeo have disproportionate benefits for smallholders, compared to more regulated situations. Many growers sell their timber via a middleman contractor who visits their plantation and makes an agreement with them on a price for individual trees. This middleman often provides felling and transportation services, therefore reducing the price paid to the grower for his timber. Moreover, the prices of tree harvesting and transportation are set in an arbitrary fashion through negotiation with individual smallholders. Surveys of prices paid for timber at different points in the value chain show a large jump in market value of logs cut and transported to roadsides as opposed to standing timber (Figure 3). A serious problem remains in the fact that taxation on teak timber is uniform for all diameter classes, thus discouraging the purchase of small diameter trees.

The need to account for the relatively high cost of harvesting. The ForInfo project adjusted its stumpage values to account for harvesting costs. This was necessary due to the high cost of harvesting. Improved harvesting technologies are currently being tested to improve efficiency and reduce harvesting costs. Preliminary results indicate that improved harvesting efficiency will be crucial in increasing collateral value, particularly for smaller trees. Initial findings show that if the cost of harvesting and transportation to the roadside is included in stand valuation, the extraction of smaller-sized thinning material (below 12 cm DBH) is not economical in smaller-diameter classes (Bianchi, et al. 2013a). The ForInfo project has also attempted to improve the consistency and accuracy of the estimation of harvesting costs by ensuring that certificates bear information on the distance of a plantation to the road.

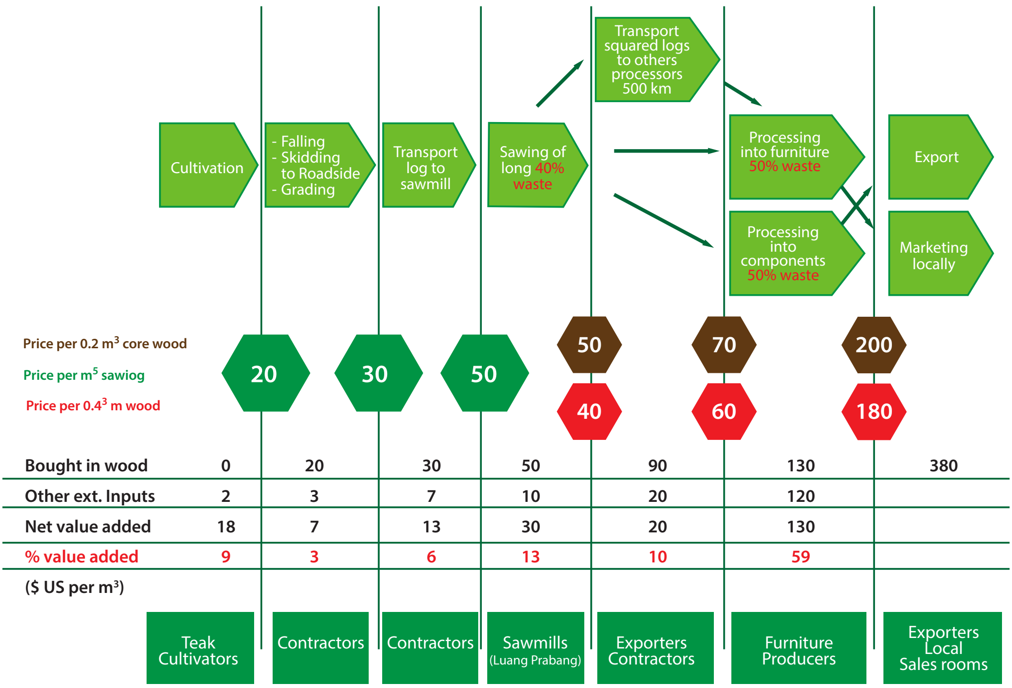

Figure 2. Teak timber value chain showing value added at different stages of the production process from Mohns (2009).

The need to maximize the benefits accrued by existing plantations and conditions rather than future/planned plantations. While teak plantations proliferated in the 1980s and 1990s due to strong encouragement by Lao PDR government policies, currently, little teak is being planted. Predicted value helps planners compare the opportunity cost of using land for timber cultivation with other potential uses. In the case of northern Lao PDR and other contexts where such planning is absent, using stumpage value over predicted value deals with more immediate concerns of maximizing the benefits accruing to maturing teak plantations. Teak cultivation also takes place in the absence of mechanisms such as insurance policies against agricultural failures and thus more conservative valuation measures are needed.

With prices of stumpage at market value reflected on collateral certificates, RECOFTC hopes that local growers will gain greater incentive to postpone harvesting, as well as to harvest their own teak. Moreoever, RECOFTC also hopes that with the help of collateral certificates, as well as improved harvesting and transportation methods, growers will begin to plant on less than ideal conditions on steeper slopes further away from the road, utilizing land that has lower opportunity cost. Even though predicted value gives a higher valuation of a given stand, stumpage value is a more conservative value, one that decreases the risks for smallholders and banks alike.

RECOFTC financial valuation

The market value in the certificate was considered as the present value of timber as round logs at roadside, the most common practice in Bokeo province. Market value is derived by using the following formula:

*Market Value (baht)=[Volume (m^3)*Value of logs (baht/m^3)–Felling cost (baht/tree)–Transportation cost (baht/tree)]*

The ForInfo project uses stumpage value as a means of financially valuing smallholders' teak stands in Bokeo. The final value also takes into consideration estimated harvesting costs and thus these costs are deducted from stand values. Using stumpage value is an attractive option because it provides assurance to farmers of a price that is similar to the prevailing market value. Predicted or net present value is viewed as a theoretical number that assumes future demand for (mature) teak is equal to present demand. Stumpage value, on the other hand, is based on the day's actual prices. As a result, estimates of timber using predicted value are usually higher than estimates of stumpage value.

Stumpage value is chosen because the situation is not one of planning for future teak plantations, but instead, of maximizing the returns of existing plantations established under less-than-ideal growing regimens. For example, it is necessary to take into account harvesting costs because of the current high costs of harvesting and transportation (see below). This is crucial for the ForInfo project's work in Lao PDR because it is operating in a setting where teak was planted with the absence of a long-term economic plan, as well as the lack of resources for the surveillance and regulation of timber supply chains.

Microfinance considerations

In the case of a loan default, the microfinance institution and/or the farmers will organize the sale of the trees as round logs. This requires coordination between all the operators, including the sawmill owner, as foreseen by the ForInfo project. The value of the logs recoverable differs by DBH class (Table 6). Trees belonging to classes smaller than DBH 20 cm are considered not to have a market in Bokeo, according to the present situation, and are therefore excluded from the market value assessment. Of trees within the DBH class 20 cm, only the smaller logs are obtainable (top diameter 15 cm, average value of 3 000 THB/m^3), while those of bigger DBH classes – more valuable logs – are likely to be recovered (4 000-5 000 THB/m^3). Further studies must be conducted to estimate the recoverable value of logs. Nonetheless, considering a conservative value of 3 000 THB/m^3, with a felling cost of 60 THB/tree and an average transportation cost of 100 THB/tree, the estimated value of logs recoverable from a single tree is always higher than the single lump sum farmers receive from the sale of a standing tree (Figure 8); this value is almost double in the sale of round logs. This confirms previous findings[3] that identified the possibility of doubling the profit of tree owners if they undertake the first steps of the value chain themselves. Direct conversations with farmers in Luang Namtha province seem to confirm this as well.

Certificates

The ForInfo project added the estimated financial value of trees, taking into account harvesting costs, as well as information on distance to the nearest road, to the original TFT certificates. The certificates, therefore, document both stand and financial valuation. Timber is given a collateral value independent of land value with the aim of strengthening local people's claims to land and other assets and increasing incomes earned from selling teak while providing a starting point for smallholders to gain access to loans by using teak as collateral. This standing timber valuation method is used because smallholders were not maximizing their gains from the rising value of teak due to premature harvesting of teak and the processes by which standing timber is sold. Middleman contractors take in a large portion of profits by taking over the processes of harvesting and transporting felled logs from individual plantation sites to roads and rivers. The ForInfo project has attempted to address this in two ways: 1) By implementing innovative methods for smallholders to harvest and transport their own teak in order to capture the value accruing to teak that is already harvested and transported; and, 2) By establishing a valuation method that meets the needs of smallholders operating in resource-poor situations, which helps secure existing teak holdings as valuable assets.

Stand valuation includes site quality assessment according to: the age-height relationship, the diameter and the height distribution with subsequent commercial volume estimations. These benchmarks are used for financial valuation, which also takes into account harvesting costs in relation to the distance to roads and the volume-per-piece ratio. The ForInfo-updated certificates now consist of the following components:

- A description of the land user/owner and a land registration number if available;
- A location sketch map with cadastral or GPS coordinates and details of the nearest road to assess harvesting distance to roadside (with an overlay of a Google Earth map added by the ForInfo project);

3 Mohns, B and Laity, R 2010, Local processing of logs to increase smallholder share, Lao PDR, in: Chainsaw milling: supplier to local markets. ETFRN News Issue 52, p. 38 -- 41.

- Inventory of standing trees by diameter classes;
- Financial valuation of trees taking into account harvesting costs;
- Provision for updated inventory data after removal of trees; and,
- A short descriptive section.

Presently, PAFO and DAFO teams have issued a total of 95 plantation certificates displaying the values for commercial volume and market value in both Paktha and Huay Xai districts. In Huay Xai district, rapid assessments[4] have been carried out in an additional 26 plantations and the corresponding certificates have been released, although they currently lack information on volumes or market values. In Paktha district, 79 plantation certificates have been issued to 59 farmers since 2012, covering a total area of 23.4 ha. The total commercial volume of trees is estimated at 632 m^3, an average of 27 m^3/ha. The potential market value of all standing trees is about 1 500 000 THB (approximately US$ 50 000), with an average of approximately US$ 2 200 per hectare. The average age of plantations is 15 years, the average area is 3 000 m^2 and the average market value is 20 000 THB per plantation (approximately US$ 660). The DBH classes 10 cm and 15 cm are on average the most represented in all younger plantations until the age class of 25 years, which is an indication of poor management and absence of thinning operations.

Silvicultural considerations

A problematic aspect of tree loans is the risk that tree loans could also be limiting and delaying timely thinning operations. Plantation trees may not react with increased growth if thinned too late. In a worst case scenario, tree loans may even lead to substantial financial losses if thinning is delayed. Realistically, this could only happen in loans of over five years.

To assess the issue, a small study was carried out in 2014 on the diameter increment of plantation teak for both dominant and suppressed trees. Forty teak logs stemming from two clear-cut sites in Bokeo province were selected in a sawmill for growth analysis. The logs ranged from 10 to 27 cm in DBH. Discs were cut at log position assumed to be close to breast height (1.30 m above ground). Discs were planed and polished to allow clear identification of annual rings. The radial annual increment was measured in millimeters (mm) along four axes representing maximum and minimum DBH.

Given the pattern of annual tree ring increment, the sample apparently covered the whole range of dominant, co-dominant and suppressed trees since the age of DBH did not differ more than two years in the sample (15 to 27 years).

4 Rapid assessments involve a survey of the area covering three kumban (a cluster of villages, comparable to a commune), including interviews with farmers, GPS surveys of plantation vertices and inventories of trees during atransect walk between the two most distant vertices (Bianchi 2014). The commercial heights are not measured and the market value is not assessed. Crown heights are measured for the five or six larger trees in the plantation inorder to estimate the dominant height.

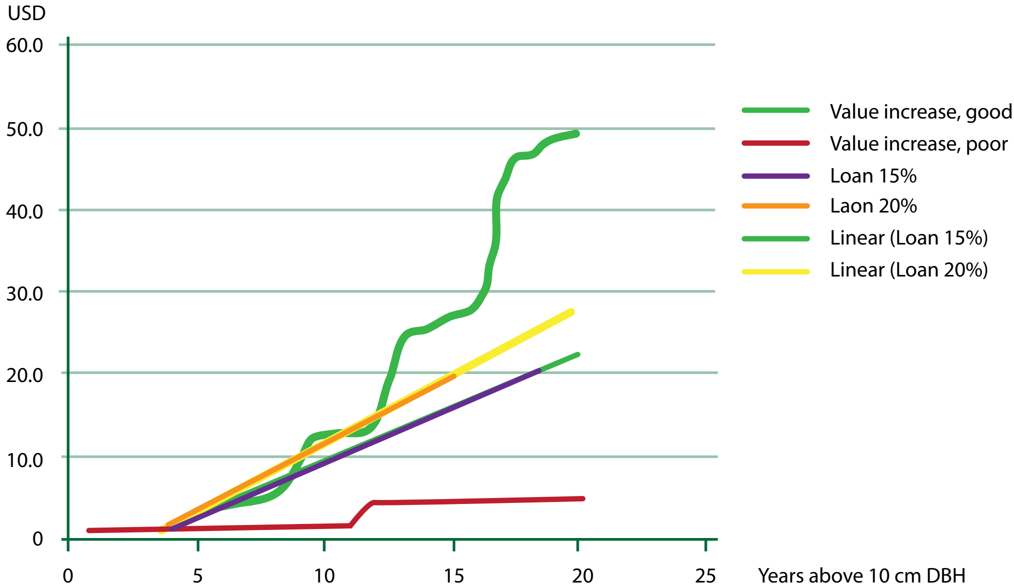

Figure 3. Increment over time of commercial timber value for dominant and suppressed teak trees above 10 cm DBH in relation to loan costs (interest rates of 15 percent and 20 percent).

A "minimum commercial diameter" of 10 cm was reached at ages between six and nine years for all logs sampled. From this point onwards, strong competition must have set in between the trees resulting in diameters from 10 to 27 cm. In order to assess the commercial timber value increment, an average annual diameter increment was calculated for each of the five fastest growing (dominant trees) and slowest growing (suppressed trees). Commercial volume and value increment according to Table 6 was calculated. As shown in Figure 3, dominant trees achieve an annual value increment that could cover loan interests of 15 percent to 20 percent in the first 10 years. Thereafter, they exceed these rates considerably. On the other hand, suppressed trees cannot grow at rates that would justify loan repayments. From both a financial and silvicultural viewpoint, these trees should be removed in thinning operations to allow dominant and co-dominant trees to grow at increased rates.

Transporting teak timber to the main road using a rubber-tracked crawler.

Conclusions and recommendations: Challenges for forest asset mortgaging

While the value of trees and their potential as mortgage assets and collateral are recognized, collateralization of such assets are still perceived as risky. It is clear that adequate legal and regulatory support for the implementation of forest mortgage asset regimens must be in place. However, these must go together with other means of ameliorating risk for borrowers and credit institutions alike. This risk comes in many forms, such as the lack of skills and knowledge to maximize profit, insufficient technical know-how among farmers to maintain healthy plantations, a lack of information about markets and the absence or limitation of access to such markets.

The suggested interventions include preparatory data collection, diversification of collateral types and regulations such as placing restrictions on the proportion of one's assets that can be mortgaged. Other recommendations include creating a secondary market for loans catering to smallholders and titles for trees and cattle. These strategies could be combined with technical assistance to ensure the buy-in of key government actors, create key linkages between community-level microfinance improvement schemes and improve governance of the supply chain.

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