Commercial community tree-growing inside state forests: an economic perspective from eastern Indonesia

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SUMMARY

Small-scale timber plantations have increasingly become an important source of wood supply in Indonesia. One important government-driven community tree-growing strategy inside state forests was initiated under the Community Forestry Scheme (CFS). The paper explores the feasibility of this strategy as the basis for developing commercially competitive management. The primary challenge to feasibility had been the high dependency of local communities on land inside state forest for cultivating food and cash crops. Feasibility was also determined by low current standing stocks of planted timber, as a result of illegal logging and forest encroachment under open access conditions due to the delay in involving communities. Ways forward include easing the bureaucratic procedures to hand over exclusive rights in state forest management to local communities. In order to maintain long-term community commitments to the tree-growing programme, it is important to have secured timber benefits, improving community business skills, as well as ensuring cost-effective government investment.

Keywords: community forestry, cost-benefit analysis, small-scale commercial tree-growing, state forest management

Plantation commerciale dans les forêts d'etat par les communautés locales: une perspective économique de l'est de l'Indonésie

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En Indonésie, les plantations de bois communautaires sont devenues une source de plus en plus importante d'approvisionnement en bois. Dans le cadre de son programme de reboisement communautaire (PRC), le gouvernement a mis en place une stratégie de plantations communautaire sur les terres administrées par le Ministère des Forêts. L'article explore la faisabilité de cette action en tant que fondation d'une gestion commerciale compétitive pour les communautés. Le principal défi est la forte dépendance de ces communautés à l'agriculture pérenne et annuel sur ces même terres de l'Etat. La réussite d'un tel programme est également influencé par la pauvreté des stocks actuels de bois planté, dûe à l'exploitation illégale et la conversion à d'autres utilisations avant l'engagement des communautés locales. Pour l'avenir et le succès de telles initiatives, un assouplissement des procédures bureaucratiques apparaît obligatoire, notamment de confier la gestion de certaines terres forestières d'Etat aux communautés du lieu. Afin de maintenir l'engagements à long terme des communautés pour le programme de plantation, il est important de leur assurer plus de bénéfices liés au bois, de les aider à améliorer leur compétences en matière de business, mais aussi d'assurer la co-existence d' investissements rentables du gouvernement.

Plantaciones de árboles comerciales por parte de las comunidades locales dentro de los bosques del estado: una perspectiva económica del este de Indonesia

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Las plantaciones a pequeña escala se han convertido en una importante fuente de suministro de madera en Indonesia. Una estrategia de plantación comercial dentro de los bosques estatales fue iniciada por el gobierno en el contexto del Plan de Desarrollo Forestal Comunitario. Este documento explora la viabilidad de tal estrategia como base para el desarrollo de una gestión comercial competitiva. El principal reto fue la gran dependencia de las comunidades locales dentro de los bosques estatales para la agricultura. La viabilidad también fue definida por los bajos rendimientos de madera plantada debido a la tala ilegal y a la invasión de los bosques bajo condiciones de libre acceso debido a retrasos en la participación comunitaria. Todavía falta incorporar la facilitación de los trámites burocráticos con el fin de entregar las funciones de gestión de los bosques del Estado a las comunidades locales. Para llevar a cabo los compromisos a largo plazo de las comunidades en el programa de plantación, es importante asegurar los beneficios de la madera y la mejora de las habilidades empresariales comunitarias, así como asegurar inversiones públicas rentables.

INTRODUCTION

Global deforestation, at the rate of 13 million hectares (ha) per year, has continued to cause a scarcity of wood; this is mainly due to the conversion of forests for intensive agricultural practices (FAO 2006a and FAO 2009). Increasingly, small-scale forest plantations in forest areas and on farms are becoming an important source of industrial wood supply in many parts of the world (Bampton and Cammaert 2007, Nawir *et al.* 2007b, Williams 2000). The increase in the area of forest plantations[1] is mainly due to the three-fold increase in the ownership of small-scale tree-growing (12% in 1990–2000 to 32% in 2000–2005) (Carle 2007, FAO 2006b). This has grown rapidly due to the devolution and decentralisation policies that have occurred as part of the transformation in the governance of forest management from central to local government, such as in Indonesia (Agrawal and Gupta 2005, White and Martin 2002).

Even though the rate of deforestation has declined in the last ten years, Indonesia has lost about 72% of its original natural forests, and timber production from natural forests has decreased significantly (FAO 2009, FWI/GFW 2002). Estimated from MoF data (2010) following a steady total annual growth from all timber production sources in the last 20 years, the national wood production was estimated to reach 42.4 million m^3 in 2010, which is considered to be optimistic and leads to a wood gap estimation at 29.2 million m^3 in failing to meet the total of 71.7 million m^3 of round wood demanded. Using a lower estimation of timber production scenario, the wood gap could almost double at 48.9 million m^3 (Indonesian Working Group on Forest Finance 2010). Following a two-year moratorium policy on new logging concessions in primary forests and peat lands applied since 2011, the timber production may be predicted to be lower and could lead to significantly higher wood gaps (ITTO 2011). Timber production coming from smallholder plantations can potentially fill some of the gaps and enhance local livelihoods.

As discussed in this paper, one important strategy for smallholder timber production inside state forest is the community tree-growing scheme developed by the Ministry of Forestry (MoF). Rights granted to cooperatives[2] are allocated under Community Forestry Schemes (CFS) or *HKm-Hutan Kemasyarakatan*. Specifically, tree-growing is developed as part of inter-cropping[3] integrated practices (Hindra 2005, Nawir *et al.* 2007a). CFS complements other strategies for involving communities in state forest management: the Community-based Plantation Forestry Programme (*Hutan Tanaman Rakyat - HTR*) formalised in 2009 (MoF 2009) and Village Forest Scheme *(Hutan Desa)*. The *HTR*'s aims are for communities to develop commercial timber plantations similarly to the Industrial Timber Plantation Scheme developed by private companies (*Hutan Tanaman Industri – HTI*) (Nawir and ComForLink 2007). Under *Hutan Desa*, state forest is formally allocated to the village community that traditionally has been managing the area, to support the livelihoods and welfare of the community (Partnership for Governance Reform 2011).

In addition to the three aforementioned initiatives, it is important to mention the *Hutan Rakyat* or farm forestry, which is commonly established in the form of agroforestry. Farm forestry is established on individual plots of privately owned lands outside state forests, and was initially promoted under a government-assisted reforestation program in the early 1970s (Darusman and Hardjanto 2006, Hindra 2006, Nawir *et al.* 2007f, Sumedi, n.d.). The growing local and export markets for value-added products has been the major factor in motivating households to become involved in farm forestry practices, especially in Java; these products are made mainly from high-value timber, such as teak *(Tectona grandis)*, and lower value timber, such as *falcataria (Paraserianthes falcataria)* and *gmelina (Gmelina arborea)*. Small-scale plantations developed under this scheme have been well-advanced compared to initiatives implemented inside state forests (Darusman and Hardjanto 2006, Hindra 2006, Nawir *et al.* 2007f, Sumedi, n.d.).

Reflecting the urgency to fill the gaps in meeting the wood demand, MoF has set a high target, to be achieved by 2015. The set targets are: 5.4 million ha for *HTR*, 2.1 million ha for the Village Forest Scheme, 2.1 million ha for CFS and 2.1 million ha for *Hutan Rakyat* (Partnership for Governance Reform, 2011). Progress has been very slow due to several challenges: the difficulties for provincial and state governments to decide on eligible land due to unclear tenurial arrangements on the ground; complicated legal and loan disbursement arrangements under *HTR* Scheme; uncertain financial feasibility; and unclear linkages to a secure market (Nawir and ComForLink 2007, Noordwijk *et al.* 2007, Schneck 2009, Obidzinski and Dermawan 2010).

This paper aims to present different components affecting the feasibility of the management practices of community tree-growing under CFS; therefore, this will make it clearer for government to provide a policy framework and supporting regulations for enhancing small-scale commercial tree-growing inside state forests. Despite the focus on CFS, the results presented are useful as an input to the implementation of other programmes mentioned earlier. Schemes in two districts, Sumbawa and Bima, in West Nusa Tenggara Province of eastern Indonesia, were selected (Figure 1). The district

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[1] The term plantations used here follows the FAO definition (FAO, 2006b): productive forest plantations mostly inside state forest, which are primarily established in defined forest areas for wood and fibre production.

[2] Cooperative refers to a tree grower or a farmer group that is registered with the Ministry of Cooperatives and Small and Medium Enterprises, such as those who were granted rights formally under CFS in Sumbawa. In Bima, tree growers are more in the form of an informal community group. To simplify, in this paper the term community group is used, and the term cooperative is used if it is irreplaceable.

[3] Intercropping refers to growing two or more crops in the same field at the same time in a mixture, especially in alternating rows or sections (Nair 1993).

governments in these districts were among the few that proactively have implemented the collaborative forest resource management under CFS. For example, in Sumbawa this was started by the launching of an overarching policy framework at the district level in 2002. The other few districts include: Wonosobo (Central Java), Districts of West and North Lampung, and Tanggamus (Lampung Province), and Konawe (Southeast Sulawesi) (Adi *et al.* 2004, ARuPA 2002, Cahyaningsih *et al.* 2006, Royo *et al.* 2010, Suwito 2007, and Watala 2008). Overall, West Nusa Tenggara Province has among the lowest socioeconomic level in Indonesia, ranked at 31 from a total of 33 provinces based on the Human Development Index (SMERU 2009); therefore, defining a poverty alleviation strategy suited to local livelihood conditions has been a priority.

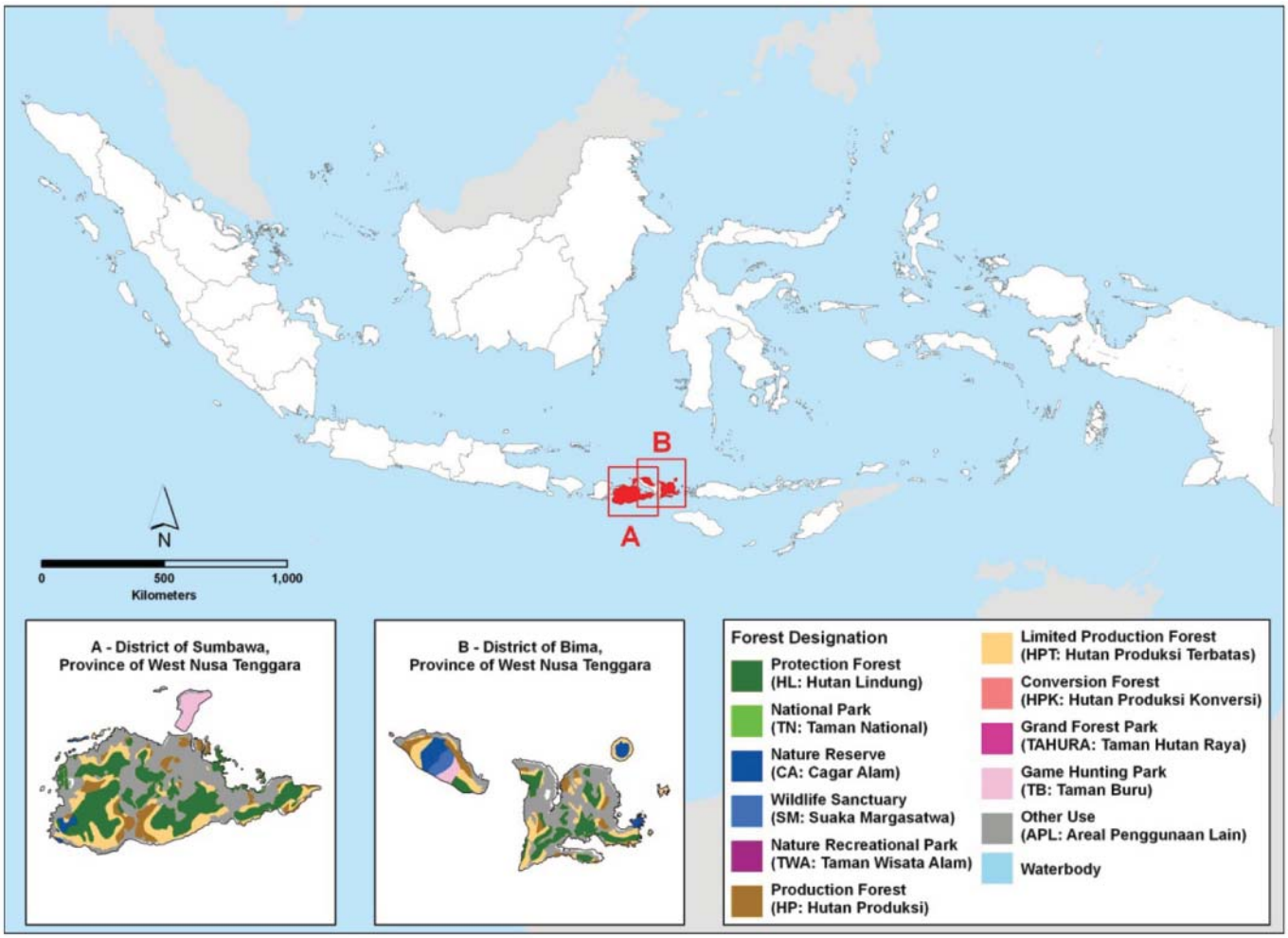
This paper is structured as follows. Firstly, the conceptual framework for commercially feasible small-scale tree-growing is presented. Secondly, the context for community tree-growing scheme is set. Thirdly, research designs are further presented. Next, results and discussion focuses on the financial feasibility of the tree-growing scheme. Conclusions and recommendations for ways forward complete the paper.

CONCEPTUAL FRAMEWORK FOR COMMERCIALLY FEASIBLE SMALL-SCALE TREE-GROWING

Small-scale tree-growing refers to the management of tree plantations as common or individual property, or a combination of both, sometimes through a collective body, and developed with monoculture or inter-cropping technique with multiple objectives including sharing the economic benefits (Arnold 2001, Harrison *et al.* 2002, Harrison and Suh 2004, Snelder and Lasco 2008). In this paper, commercially feasible and profitable small-scale tree-growing refers to the management of timber plantations for commercial production to obtain the most favourable socioeconomic benefits possible, in comparison to other economic alternatives using the same resources of land and capital (e.g. labour) (Nawir 2012).

There are two determining components for commercially feasible and profitable small-scale tree-growing. Firstly, socioeconomically feasible management is ensured. Secondly, favourable conditions for small-scale tree-growing to be competitive commercially by ensuring an incentives framework, either direct or indirect incentives, do exist.

FIGURE 1 *Geographical location of Sumbawa and Bima Districts, West Nusa Tenggara Province of eastern Indonesia*



Sources: MoF (1999a, b, 2000) and BPS (2003)

Ensuring socioeconomically feasible management

Factors affecting small-scale tree-growing management are important in ensuring socioeconomically feasible management. These factors can be generally categorised into internal and external factors. Firstly, internal factors include household endowment resources, which are a given factor defined by the household characteristics, and mainly refer to the availability of land, labour and capital (Enters *et al.* 2004, Meijerink 1997, Scherr 1997, Warner 1997). Endowment factors can also be in the five forms of capital as part of the sustainable livelihoods framework: natural, physical, financial, human, and social capital (Carney *et al.* 1999, DFID 1999, Warner 2002). In relation to the community tree-growing inside state forests discussed in this paper, social capital is very relevant. Social capital refers to the set of social relationships on which people can draw to expand livelihood options (Carney *et al.* 1999, DFID 1999). The most relevant social relationships in the case of small-scale tree-growing inside state forests, for example, are membership of formal groups and partnership contracts that provide loans, grants and other forms of insurance. This is unlike tree-growing implemented outside state forests, such as farm forestry or *Hutan Rakyat*, in which informal networking is more important than the formal one (Hindra 2006, Kartodihardjo 2010).

However, deciding which endowment factors are to be used for commercial tree-growing is influenced by several reasons, such as who owns more parcels of land, and the location of these lands some distance from the village (Emtage 2004, Predo and Francisco 2008). Further, those who were ever involved in community forestry training and were a member of a community organisation are more likely to be interested in planting timber trees for commercial purposes, as are those who know how to complete the tree registration procedure as part of the requirements for planting and harvesting (Emtage 2004). Investment towards either more subsistence or commercially oriented tree-planting should also be in line with households' economic objective, which is differentiated by social status (Emtage 2004, Godoy 1992b, Meijerink 1997).

Secondly, the external factors include market, institutional and policy conditions. Market condition takes into account timber supply and demand characteristics as part of the timber market structure, market requirements on timber quality, timber price, market niche, and factors affecting competitiveness (Harrison 2005, Pearse 1990, Sedjo 1983). Related challenges in this regard include low timber quality and productivity, unclear link to a market/no guaranteed market, weak bargaining position, and unbearable transaction costs in relation to harvesting and trade (Angelsen and Wunder 2003, Arnold 2001, Byron and Arnold 1999, Charnley and Poe 2007). Institutional and policy conditions cover a regulatory framework of operational activities that includes timber harvesting and trade, tenurial and right conditions, and roles of grower associations (Klemperer 1996, Ostrom 2000, Perman *et al.* 1996, Scherr 1995, 1997, Nawir *et al.* 2007b, Roshetko *et al.* 2007, Snelder and Lasco 2008). Challenges include that the regulatory and incentives framework is not based on a clear understanding of costs and returns, and overly regulated operations (Antinori and Bray 2005, Montambault and Alavapati 2005, Nawir and ComForLink 2007).

Levelling incentives framework: favourable conditions to be more competitive commercially

In this paper, incentives are defined as policy instruments that increase the comparative advantages of small-scale tree-growing to become more competitive commercially compared to other plantation development and management strategies (Enters 2004, Meijerink 1997). There are direct and indirect incentives (see Appendix 1). Indirect incentives cover variable and enabling incentives. Variable incentives include sectoral incentives, for example those incentives that focus on drivers as part of macro-economic conditions (Enters 2004, Meijerink 1997). Enabling incentives are favourable factors that affect tree growers' decisions in their management.

One of the most important enabling incentives is the link between trees and security of tenure; this determining factor in decision-making for planting among communities was highlighted in the early 1980s, and is still an unresolved issue (Byron 1995, Fortman 1985). Tenurial and rights conditions define the level of management intensity in tree-growing, within a range from subsistence to commercial-oriented tree-growing (Emtage 2004, Simmons *et al.* 2002, Warner 1997). Lack of secure tenure conditions is the main constraint on the poorest groups in the communities having full access to harvest timber at the end of rotation, since their land is usually allocated to them under a certain tree-planting project with a limited time frame (Angelsen and Wunder 2003, Nawir *et al.* 2007b, Vedeld *et al.* 2004). However, if the relative price of timber trees is sufficiently higher than agricultural crops and this continues to increase steadily, timber crops may encourage villagers to plant a tree for commercial ends, even though they may have insecure tenure (Godoy 1992b). This might also occur without extensive assistance from local governments or aid agencies (Godoy 1992b).

SETTING THE CONTEXT: THE NATIONAL POLICY FRAMEWORK AND DISTRICT LEVEL INITIATIVES

For more than ten years, the status of state forests as state property in Sumbawa and Bima could not be enforced due to illegal farming and grazing, which was driven by the limited lands available outside state forests for cultivating agricultural crops and managing livestock (Forestry District Agency (FDA) Sumbawa staff 02/09/2003, FGD (Focus Group Discussions) in Nggelu Village 04/03/2005 and FGD in Ntori Village 03/03/2005). This intensive illegal farming and grazing led to degraded forest conditions (FDA Sumbawa staff 02/09/2003).

The MoF assigned a state-owned company to rehabilitate degraded state forests in West Nusa Tenggara, including in Sumbawa and Bima, during the period of the early 1990s to early 2000s (Muktasam and Hakim 2007, Supardi *et al.* 2006). The reforestation of state forests was implemented under the

framework of *HTI* development involving local communities, who mainly worked as paid labourers for tree planting and maintenance; and/or were given the opportunity to carry out inter-cropping between the planted teak trees or as it was commonly called, *pesanggem* (FORKOD HKm NTB & PKSK Unram 2001, Supardi *et al.* 2006). In return, the community members maintained and supervised the main timber crops with no expectation of enjoying the benefits from tree harvesting (Supardi *et al.* 2006).

The boundaries of state forest property could be enforced during the implementation of the reforestation programme. However, when the state-owned company finished its assignment in the late 1990s, there was no clear plan on who would take over the follow-up management (FDA Sumbawa staff, 02/09/2003, Jabir and Julmansyah 2003). One of the impacts of unclear plan, for example, was that the planted forests in Sumbawa had returned to open access property over a period of about four years; this resulted in about 25% of the area being deforested due to forest encroachment by illegal farming following illegal timber cutting (FDA Sumbawa staff, 01/09/2003) (FDA Staff, pers. comm., 2 September 2003, Supardi *et al.* 2006). Recurring open access problems in both districts were also due to the lack of local forest management rules on grounds that were mutually respected by different stakeholders, mainly outsiders. Therefore, involving communities in state forest management became an option for managing open access state forests.

In both districts, the initiatives in involving local communities in tree-growing inside state forests had been greatly influenced by the CFS policy framework set out at the national level in MoF Decree No. P. 37/Menhut-II/2007 (MoF 2007). As stated in this regulation, a cooperative can be granted the usufruct rights for 35 years to manage a certain allocated area after an approved proposal submitted to the Minister of Forestry. Rights can be renewed subject to a five-yearly evaluation. The community can collectively harvest existing timber up to a maximum of 50 m^3 per year for non-commercial purposes. However, if timber trees were planted by the cooperatives, they have exclusive rights to manage the timber trees for commercial purposes. The regulation also defines the proportion of 70 % to 30%, for timber and non-timber respectively, to ensure timber trees will be dominant inside state forests. As the case in Sumbawa and Bima Districts shows, CFS has been mainly intended as means for implementing reforestation programmes (FKKM 2010, Murniati *et al.* 2007). The reforestation was mainly focused on tree planting, with less priority on improving communities' commercial and business knowledge and skills in managing plantations.

Despite referring to the same CFS policy framework, local government responses in the two districts were very different with different implications. The different responses were mainly affected by the political changes after Reformation in 1998 and the implementation of Decentralisation Policy in 1999[4]. Sumbawa was very responsive and produced a local policy framework for collaborative management involving local communities that aimed to reduce the conflicts over 'open access' state forests (Jabir and Julmansyah 2003, Sabani *et al.* 2003). The local policy framework caused the central government CFS initiatives to be implemented in this district. On the other hand, the district government in Bima had been behind in producing a local overarching policy framework, but they created smaller scale local programmes supported by funding from district and provincial governments, since there was not enough support from central government.

RESEARCH DESIGN

Data and information

Data and information from the two case study districts were collected and analysed during 2000–2005 through survey interviews, in-depth interviews, and FGD with various stakeholder groups: tree growers, government officers, NGO staff, traders, and brokers/middle-men. A total of 130 community members were involved in the survey in both districts, and a total of 200–300 people were involved the FGD. The FGD aimed to involve wider communities in the neighbouring villages to complement findings from the survey. FGD were also conducted at the end of the study to validate the interpretation of the results of the analysis. A workshop held at the district level was also conducted for a final validation involving broader stakeholders, such as local government agencies. Financial analysis was conducted by using the year 2009 as the base year, so comparison with other secondary data is possible. Prices were adjusted by using the CPI (Consumer Price Index) (BPS 2003-2009).

Descriptive analysis and quantitative analysis: financial Cost Benefit Analysis

A comparative analysis of the case studies in the two districts was the main methodological framework used; this includes both quantitative and qualitative analysis. Quantitative analysis consisted of conducting a Cost Benefit Analysis (CBA). Descriptive qualitative analysis was used to analyse the overarching policy framework and the arrangements for institutional, tenurial, and management aspects. Further, it also enriches in-depth interpretation of the results of the quantitative analysis.

Under CBA, the investment effectiveness criteria used are: Net Present Value (NPV), Internal Rate of Return (Markowitz *et al.*), Net Benefit Investment Ratio (NBIR), return to labour, Equal Annual Equivalent (EAE), and Land Expectation of Value (LEV) (Appendix 2) (Pearse 1990, Perkins 1994, University of Florida 2010). Decision rules on investment

[4] Reformation Era was the period that started in 1998 after the former second president (Suharto) stepped down and ended more than 30 years of the New Order Era.

effectiveness in this paper are based on the understanding that the investment in small-scale tree-growing is an independent project and not a mutually exclusive one. The decision rule for NPV is that investment with positive value provides a profitable management option. IRR represents the maximum interest rate that the project could afford to pay on its funds and still recover all its investment and operating costs (Perkins 1994). As an independent investment, all alternatives with an IRR greater than some target rates of return (r) are feasible. The ratios greater than one for NBIR and return to labour reflect a greater level of feasibility of the investment.

The real discount rate was used in this analysis; constant prices were also used for all inputs and outputs (Perkins 1994). For Indonesia, the average interest rate for commercial loans at banks at the regional level in 2008 was 13.52%, and the expected inflation rate for 2010 was 5% (±1%), (Bank of Indonesia, 2009). Using these data and following the formula, the real discount rate used in this thesis was 8%. Under current government regulations on CFS, community group members do not have the right to harvest timber, especially if the timber trees were planted as part of the government programme on reforestation. Therefore, the analysis of the financial feasibility has to be based on the hypothetical assumption that eventually the tree growers were granted the rights to harvest the timber.

Scenarios and assumptions for financial Cost Benefit Analysis

The financial analysis was conducted on an integrated timber and inter-cropping management scenario, as well as a timber management without inter-cropping scenario. The basis for calculating the revenue were the existing stocks that remained after the illegal logging and forest encroachment that occurred during the open access period, where the state forests were being left by the state-owned company and community groups had not been involved. The standing stocks were only 55% and 37% of the initial trees planted in Sumbawa and Bima, respectively. Analysis at the full standing stock condition was conducted, so the losses during the open access period could be estimated. Timber revenues were calculated based on the thinning and harvesting of existing standing stocks in a given year (ages). Timber species include: teak (*Tectona grandis*), *Cassia siamea,* rosewood (*Dalbergialatifolia*), and mahogany (*Swietenia macrophylla*).

Following the silviculture guidelines of the state-owned company, thinning operations cut out 20% of the tree population in years 5, 10 and 15. The need for thinning depended on tree density per hectare, for example, where density was low due to severe illegal logging in some areas, thinning might not be required. Final harvesting was scheduled at a full rotation (25 years) for all timber species. Standard timber volumes per tree at different age class took into account the influence of dryer climatic conditions in eastern Indonesia (Bustomi *et al*. 2006, FORDA 2006). Revenues from inter-cropping came from crops planted between timber trees. Inter-cropping mainly used a combination of dry-field paddy, mungbean, corn, and soybean or cashew nuts. The harvesting frequency was dependent on the ages of timber trees and the tree density per hectare, since bigger trees and dense trees allowed less sunshine through for growing these crops productively.

Cost components include government investment costs spent through the state-owned company, and community expenses. Government investment costs included plantation development costs, such as for land preparation, seedlings, planting, fertilisers and maintenance. In Sumbawa, government also invested in institutional development for setting up cooperatives. Due to limited information on the actual government expenses on past programmes, data were estimated based on documents on state planning, budgeting and expenditures, adjusted to current values (2009). Community labour costs were mainly for maintenance and supervising the areas to prevent encroachment and illegal logging. Labour costs were calculated by using wages for paid labour working in the agricultural sector. These were calculated from the average working day (eight man-hours a day) allocated to the whole area, including for planting and maintaining food crops, and taking into account rainy (four months) and dry (eight months) seasons. Timber maintenance cost was estimated based on 20% of total labour costs allocated to manage the total area for inter-cropping as specified above.

Timber prices were based on the local market of wood bought by the local processing industries differentiated by the age of the wood. The standard local costs per cubic metre of harvesting included the costs for renting a chain saw and operators, and for buying fuel, and the labour required for wood skidding. These costs include the cost of transporting timber from the farm gate to the nearest saw mills, and administrative fees for endorsing the certificate of validity of forest products.

RESULTS AND DISCUSSIONS: FINANCIAL FEASIBILITY AND FACTORS AFFECTING IT

This section focuses on two main topics: the financial feasibility of community tree-growing schemes in Sumbawa and Bima including the impacts on community livelihoods; and factors affecting the financial feasibility.

Financial feasibility analysis of community tree-growing schemes in Sumbawa and Bima

Estimated net benefits: reflecting the high level of a community's dependency on land inside state forests

As shown in Table 1, land managed inside state forests accounts for 42% and 46% of total land managed by households in Sumbawa and Bima, respectively. Community group members in Sumbawa manage about 2.5 ha of land per household, which is higher than in Bima. With 1.6 ha of land managed per household in Bima, this figure is less than half of the average land managed per household at the district level (3.8 ha). Land used by respondents in Sumbawa for inter-cropping was only 15% of the total land available inside the state forests, and the remaining area (85%) was reserved for the existing standing timber stocks. On the other hand, in

TABLE 1 *Land ownership and management characteristics among survey respondents in Sumbawa and Bima*[a]

Description	Community tree-growing schemes	
	Sumbawa	Bima
A. Land managed per household		
1. Total land (ha)	2.5	1.6
2. Land inside state forests		
a. Areas (ha)	1.1	0.7
b. Percentage of total land	42%	46%
3. Land outside state forests (ha)		
a. Areas (ha)	1.5	0.9
b. Percentage of total land	58%	54%
4. Average at district level (ha)[a]	2.1	3.8
B. Land allocated for timber and intercropping		
a. Timber	238 (85%)	6 (42%)
b. Intercropping	42 (15%)	8 (58%)
Total	280 (100%)	14 (100%)

Sources: Preliminary data collected (2000–2005)
a. BPS Sumbawa (2008) and BPS Bima (2010)

TABLE 2 *Net benefits from timber and intercropping under community tree-growing schemes in Sumbawa and Bima*[a]

Description	Community tree-growing schemes	
	Sumbawa	Bima
1. Timber and intercropping management		
a. Total financial benefit		
Rp million	(435)	918
USD	(46 270)	97 588
b. Financial benefit per ha		
Rp million	(0.28)	65
USD	(29)	6 877
c. Internal Rate of Return (IRR)	8%	98%
d. Net Benefit Investment Ratio (NBIR)	1.02	0.16
2. Timber management		
a. Total financial benefit		
Rp million	(3 304)	245
USD	(351 420)	26 099
b. Financial benefit per ha		
Rp million	(9)	27
USD	(947)	2 827
c. Internal Rate of Return (IRR)	6%	18%
d. Net Benefit Investment Ratio (NBIR)	0.76	5.49

Notes:
( ) = negative value
a. Financial net benefit is estimated based on NPV (Net Present Value) following CBA using 8% discount rate taking into account transportation cost and land rent and tax.
Sources: Preliminary data collected (2000–2005)

Bima, the areas used for inter-cropping and timber are almost similar, at 58% and 42% respectively. These figures reflect that pressures for utilising land demanded by households inside state forests were higher in Bima, and that the land was mainly used for inter-cropping. Community involvement was strongly driven by communities' needs for land to grow agriculture crops as part of the inter-cropping practices. Therefore, having significant and continuous benefits from being involved in managing state forests provides a strong incentive for the community to maintain its commitment in the longer term.

At the existing standing stocks level and land allocation proportion as explained, the analysis of integrated management showed negative financial benefits in Sumbawa at Rp 435 million (USD 46 270) for integrated timber and inter-cropping management (Table 2). The management regime applied in Bima was found to be more feasible for both integrated management at Rp 918 million (USD 97 588) and independent timber management, at Rp 245 million (USD 26 099). The analysis of NBIR for timber management in Sumbawa also resulted in a lower ratio than in Bima, which does not reflect cost-effective investment since the estimated benefits were lower for every unit of money invested. NBIR in Sumbawa is 0.76 compared to 5.49 in Bima. The analysis in Bima shows promising benefits from integrating timber and inter-cropping management due to more equal proportion of land allocated for both crops. However, in the long term, the combination provides IRR of 98%. This reflects that in the long term, the integrated management is more expensive to fund compared to the investment on timber management alone. Overall, feasible management in Bima was mainly due to the much smaller proportion of investment costs following smaller-scale management compared to the nature of management in Sumbawa (see the section 'The nature of the dominant costs…').

Despite opportunities existing for the community to gain access to land inside state forests, there were no clear incentives for local communities to shift investment to timber. Current practices, with a higher allocation to inter-cropping than the 30 % for feasible net benefits, are not in line with the proportion of timber and non-timber crops inside state forests, according to CFS regulation. Targeting 70 percent of land for timber seems unrealistic, particularly for areas where there are high pressures on forest lands for agricultural production. Further, incentives to provide secured benefits in return for managing timber are unclear. Moreover, community groups require assistance to bear the costs of developing timber plantations, considering the schemes implemented in both districts require significant investment costs.

Estimated potential impacts on the livelihoods of the households of those who are involved in commercial tree-growing

As shown in Table 3, a community could receive benefits from both inter-cropping and timber. In Sumbawa, a household can potentially receive a total annual income of Rp 366 320 (USD 39), which would be contributed mainly from timber. In Bima, total income per household per year is significantly higher due to the higher income coming from inter-cropping. As discussed in the section 'Estimated net benefit. . .', almost 60% of the land was allocated to inter-cropping in Bima, compared to Sumbawa, which had only 15% (Table 2), so potential revenues from inter-cropping would contribute significantly to higher total household income in Bima.

The total annual income in Sumbawa and Bima is higher than the level of income of households involved in the CFS Programme in other districts in West Nusa Tenggara Province, and higher than the average total income at the household level in rural areas. The income generated per household in other districts was an average of Rp 1.6 million (USD 174), and the average household income in rural areas of West Nusa Tenggara Province was Rp 1.26 million (USD 134) per year (BPS 2005b, FORKOD HKm NTB & PKSK Unram 2001). Based on the current existing standing stocks, the estimated income from timber and inter-cropping in Sumbawa and Bima contributes potentially an additional up to three times more to the current household income in rural areas of West Nusa Tenggara Province.

As shown in Table 4, the average ratio for return to labour for current practices is higher than one. This applies for both joint management timber and inter-cropping and timber management only (12). Further, analysis shows the return to labour was higher than the current wage rate per man working day, which was Rp 23 812 (USD 2.53), except for timber management in Sumbawa at (Rp 7 948) or (USD 1). This was mainly because timber management had been very cost effective due to no intensive management being required, and the community did this in conjunction with inter-cropping practices. Timber management provided negative minimum wages in Sumbawa, considering it was not a feasible option due to high cost government programme, as discussed in the section 'The nature of the dominant costs…'.

Overall, the results of the analysis have shown that as part of the household income strategy, community tree-growing management provides a promising livelihood opportunity for the local people. This was reflected in the potential annual income at household level, which would be higher than the average income received by households implementing similar programmes in other districts, as well as the average income for households in rural areas in the same province. Further, the estimated return to labour was higher than the current wage rate per man working day, as well as the return to labour on average being higher than one.

TABLE 3 *Annual net benefit per household from community tree-growing schemes in Sumbawa and Bima* [a]

Description	Unit	Community tree-growing schemes	
		Sumbawa	Bima
1. Total annual net income	Rp/hh	366 320	4 528 792
	USD/hh	39	482
2. Income from timber	Rp/hh	257 034	1 941 972
	USD/hh	27	207
3. Income from intercropping	Rp/hh	109 075	2 585 521
	USD/hh	12	275

Notes:
a. Annual value was estimated based on EAE (Equal Annual Equivalent)
hh: households
Sources: Preliminary data collected (2000–2005)

TABLE 4 *Return to labour ratio and return to labour in Sumbawa and Bima*[a]

Management	Community tree-growing schemes	
	Sumbawa	Bima
1. Timber and intercropping		
1a. Return to labour ratio	7	8
1b. Return to labour		
Rp/person working day	79 050	194 834
USD/person working day	9	21
2. Timber		
1a. Return to labour ratio	12	12
1b. Return to labour		
Rp/person working day	(7 948)	133 382
USD/person working day	(1)	14

Notes:
( ) = negative value
a. Return to labour was estimated at break even point (NPV = 0)
Sources: Preliminary data collected (2000–2005)

Factors affecting financial feasibility of the community tree-growing scheme

Besides the high level of dependency of the local community on land inside state forests, there are three main factors defining the financial feasibility. First, the nature of the dominant costs and the distribution of costs borne by stakeholders involved. Second, the relative advantages of the investment in timber compared to alternative cash crops. And lastly, delay in decisions made by the government to involve communities in managing state forests.

The nature of the dominant costs and distribution of the costs borne by stakeholders involved

As the results in Table 5 show, the investment costs of combined timber and inter-cropping and timber alone contributed

TABLE 5 *Proportion of different cost components under timber and intercropping management in Sumbawa and Bima*[a]

Cost components	Community tree-growing schemes			
	Sumbawa		Bima	
	Combined	Timber	Combined	Timber
1. Investment [b]	59%	68%	26%	36%
2 Intercropping and timber expenses				
2.1. Farming tools	0.8%	0.4%	3%	1.6%
2.2. Intercropping crops	13%	28%		
2.3. Timber				
a. Labour	6%	7%	8%	12%
b. Timber harvesting	8%	10%	12%	18%
c. *SKSHH* [c]	1%	1%	5%	7%
d. Membership fees				
d1. Registration fees	0.01%	0.02%	–	–
d2. Annual fees	0.01%	0.01%	–	–
e. *PSDH* [d]	4%	5%	4%	6%
f. Land rent and tax	0.2%	0.2%	0.2%	0.3%
Total 2.3.	19%	23%	30%	43%
3. Transporting timber	8%	9%	13%	20%
Total costs (1 + 2 + 3)	100%	100%	100%	100%

Notes:
a. Estimation of present value following CBA using 8% discount rate
b. Investment cost allocated by state-owned company and government at central, provincial and minor contribution from district government
c. SKSHH – *Surat Keterangan Sahnya Hasil Hutan* (Certificate of validity of forest products)
d. PSDH – *Provisi Sumber Daya Hutan* (Forest resource provision)
Sources: Preliminary data collected (2000–2005)

a range from 59% to almost 70% of the total cost components in Sumbawa, compared to a range from 26% for integrated management of timber and inter-cropping to 36% for timber management alone in Bima. The higher investment costs in Sumbawa reflect timber investment costs made mainly by the state-owned company for the tree-growing schemes and by the central government for the replanting programme to restore the standing stocks that were illegally logged.

A comparison of the total cost per ha confirmed the higher total production cost per ha in Sumbawa compared to Bima, the difference being Rp 413 million (USD 43 924) (Table 6). One of the reasons for this higher production cost per ha was because the current standing stocks were lower than the initial standing stocks as discussed earlier. The cost per ha for developing timber without inter-cropping ranges from Rp 59 million (USD 6 250) in Bima to Rp 723 million (USD 76 843) in Bima, which is 6 to 70 times higher than the government standard cost per ha for developing the latest *HTR* Programme, which is Rp 10 million (USD 1 064)[5].

Following government investment costs, the second highest cost component was shared between the costs for managing inter-cropping crops and those for timber-related activities, such as labour cost for timber maintenance. In Sumbawa, adding up the cost of transporting timber to local saw mills resulted in a higher proportion of these costs in Sumbawa, at 27%, compared to inter-cropping. Since inter-cropping is more dominant in Bima, the cost proportion is higher at 28% compared to timber, which is higher than the proportion for costs on inter-cropping in Sumbawa at 13%.

In day-to-day practices, the costs of timber-related activities, such as for transporting timber and related administration costs, except for labour and annual fees as community group members, are usually borne by wood-buyers/middle-men. Table 7 shows that the proportion of this cost ranges from 25% in Sumbawa to 52% in Bima. The role of brokers/middle-men is potentially quite significant in supporting community tree-growing operations, especially to fill the gap in the initial capital investment by the tree-grower community

[5] Based on MoF Decree No P. 64/Menhut-II/2009 on the costing standard for Industrial Timber Plantation *(HTI-Hutan Tanaman Industri)* and Community-based timber plantation *(HTR-Hutan Tanaman Rakyat).*

TABLE 6 *Cost per hectare for intercropping and timber crops in Sumbawa and Bima*[a]

Management	Community tree-growing schemes			
	Sumbawa		Bima	
	Rp (million)	USD	Rp (million)	USD
Intercropping	434	46 187	21	2 238
Timber	723	76 843	59	6 250

Note:
a. The cost per hectare was calculated based on the areas existed with the remaining standing stocks after illegally logged and/or forest encroachment
Sources: Preliminary data collected (2000–2005)

groups if they are going to market their timber. On the other hand, wood-buyers/middle-men often use this as a reason to suppress the timber buying price offered to tree growers.

As discussed in the section 'Setting the context. . .', government investment had a significant role in community tree-growing schemes initiated in Sumbawa and Bima. The community groups' contributions ranged from 8% to 14% in both districts. Considering this contribution, a clear benefit-sharing mechanism[6] between community group and government should be introduced at district level. This benefit-sharing mechanism would create clear and direct incentives that are more effective in practice to stimulate tree-growing. As highlighted during FGD at village level in both districts, community groups had high expectations of receiving a share of the benefit from existing standing stock, considering their involvement in maintaining and supervising the remaining standing stock (FGD in Lamenta village 25/05/2005; FGD in Nggelu Village 14/06/2005, FGD in Ntori Village 13/06/2005, FGD in Semamung village 26/05/2005).

As the analysis has shown, factors that determine the financial profitability include the level of involvement of the central and provincial governments in initiating the schemes. The implementation of the community tree-growing scheme in Bima was concentrated on management at a smaller scale, since the schemes were mostly initiated and funded by provincial government as an immediate solution to resolve conflict over land due to forest encroachment. In contrast, community tree-growing schemes initiated in Sumbawa covered larger areas and involved higher investment costs, which were provided by the central government (MoF). The cost was mainly for replanting deforested areas of formerly reforested areas by the state-owned company.

Relative advantages of the investment in timber compared to alternative cash crops

Under the conditions of land scarcity, the level of commercially competitive land use is mainly determined by other investment alternatives in agricultural crops planted using the same forest lands. There are four possible combined options for agriculture crops planted on all areas managed inside state forest replacing timber trees (Table 8). Only option 2 practised by the community in Bima provides feasible annual financial benefits at the current productivity level. This option refers to long-term perennial crops with high local and exported value commodities combining cashew and candle nuts. The benefit is Rp 1.2 million (USD 122).

Another profitable financial benefit could accrue from a combination of paddy and mungbean, which are planted by

TABLE 7 *Costs borne by each stakeholder for existing standing stocks*

Community tree-growing schemes	Unit Total	Government [a]	Community groups [b]	Wood buyers[c]	Total
Sumbawa	Rp million	7 575	789	2 076	10 440
	USD	805 679	83 876	220 800	1 110 355
	Proportion	68%	8%	25%	100%
Bima	Rp million	100	54	249	404
	USD	10 686	5 780	26 532	42 998
	Proportion	36%	14%	51%	100%

Notes:
a. Government costs involved investment initially made by the state-owned company, and also subsequent investment allocated by Forestry District Agency under the National Social Forestry Program (NSF)
b. Community groups bore the costs of farming tools, planting intercropping crops, labour on timber maintenance and supervision, community group membership fees, and government land rent and tax
c. Wood-buyers at farm gate could include middle-men/brokers and local saw mill owners, who bore the costs for timber harvesting, acquiring certificate of validity of forest products *(SKSHH)*, forest resource provision *(PSDH)*, and transporting timber to the nearest wood processing point.
Sources: Preliminary data collected (2000–2005)

[6] For a paper on the proposed benefit sharing agreement see Nawir *et. al.* (2007b).

TABLE 8 *Comparisons with other land use alternatives*

Investment alternatives [a]	Financial benefits			
	Annual financial benefits[b]		Values of land [c]	
	Rp/year/ha	USD/year/ha	Rp/ha	USD/ha
a. Current productivity [d]				
1. Paddy, corn, soybean, and sesame	(2 864 244)	(305)	(35 692 884)	(3 796)
2. Cashew nuts and candle nuts	1 146 398	122	14 285 880	1 519
3. Turmeric and ginger	(3 994 213)	(425)	(49 927 658)	(5 310)
4. Paddy and mungbean	7 120 317	757	89 003 957	9 466
b. Higher productivity [d]				
1. Paddy, corn, soybean, and sesame	(803 557)	(85)	(10 013 557)	(1 065)
2. Cashew nuts and candle nuts	5 805 539	617	72 345 950	7 694
3. Turmeric and ginger	323 330	34	4 041 625	430
4. Paddy and mungbean	15 137 756	1 610	189 221 956	20 125
c. Timber investment	42 216 749	4 490	6 005 298	639

Notes:
( ) = negative value
a. Investment alternatives were based on practices carried out by community and used as intercropping analysis using 8% discount rate
b. Estimated based on EAE (Equal Annual Equivalent, see further Appendix 2)
c. Estimated based on TEV (Land Expectation of Value, see further Appendix 2)
d. Current productivity is based on the survey data and higher productivity is based on the average productivity at the district level
Sources: Preliminary data collected (2000–2005)

the community as inter-cropping crops in Sumbawa. The benefits are Rp 7.1 million (USD 757). Estimated at higher productivity using the average at district level, the most unprofitable option is the combination from using paddy, corn, soybean, and sesame at (Rp 803 557) or (USD 85), despite it being estimated as using higher average productivity at the district level. Despite the lower value of estimated annual financial benefits from investment alternatives, the estimation of the values of land agriculture investment options provided much higher values compared to the values for timber investment: for example, investment option 2 with total value of land Rp 14.29 million (USD 1,519) and option 4 with total value of land Rp 89 million (USD 9 466). These values are much higher than the value of land for timber investment at Rp 6 million (USD 639). These values were mainly due to the low current standing stocks, so the present values of land on timber are not paid off compared to agricultural investment.

It is assumed by community households and investors that due to the long-term nature of timber management, financial benefits are much lower than for the short-term agricultural crops as the alternative investment (Godoy 1992, Byron 2001). The analysis shows this is not necessarily the case, considering there are limitations on current agriculture crop productivity due to the less intensive technology and practices used by the local community. Communities do not necessarily have access to the latest technology and the financial capital that would meet the standards required by this technology. The financial benefits from timber and alternative crops are therefore comparable, and timber investment can be a profitable and feasible alternative to agricultural crops, particularly if the full standing stocks can be maintained.

Delay in decisions made by the government to involve communities in managing state forests

As discussed in the section 'Setting the context. . .', there had been open access periods when communities had not been involved in managing the state forests, which resulted in significant financial losses at both government and household level. As can be analysed from Table 9, for example, government loss in Sumbawa was about Rp 206 million (USD 21 962) per year, while wood-buyers lost about Rp 52 million (USD 5 505) per year. Further, the community lost about Rp 4 734 million (USD 52) per household per year. Compared to the estimated financial benefits as discussed in the section 'Estimated potential impacts on livelihoods. . .', in Sumbawa, government lost the most at ten times of revenues from the existing standing stocks. On the other hand, in Bima, wood-buyers lost the most at three times of revenues from the existing standing stocks. These results show that delaying community involvement in state forest management caused high losses to households, government and potentially to the wood industry. These losses could have been prevented if the communities had been involved much earlier.

This economic loss has not taken into account the losses in revenues coming from timber tax through forest resource provision, and administrative fees paid to endorse the certificate of validity of forest products. Further, the second

TABLE 9 *Estimated annual losses in potential net benefits due to deferring assigning rights to local community to manage state forests*

Description	Unit	Community tree-growing schemes	
		Sumbawa	Bima
1. Government	Rp (million)	206	(1)
	USD	21 962	(68)
2. Community group			
a. Total	Rp (million)	4 734	1 634
	USD	52	147
b. Per household	Rp/household	14 040 355	8 324 558
	USD/household	1 493	885
3. Wood buyers	Rp (million)	52	147
	USD	5 505	15 601

Note: ( ) = negative value
Sources: Preliminary data collected (2000–2005)

government investment for replanting on deforested areas in former state-owned reforested areas, as in the case of Sumbawa, could have been saved.

The lack of secured rights to harvest and/or to receive secured benefits from timber can weaken communities' commitments in the long term. This could result in communities giving up maintaining and supervising the remaining standing stocks and replacing them with agricultural crops. As an example, the state forests managed by the same state-owned company in Java during the beginning of the Reformation Era in late 1990s/early 2000s showed that surrounding communities did not prevent illegal logging cases in teak plantations by people coming from outside the villages (Adi *et al.* 2004, Poffenberger and Smith-AHanssen 2005, Suwito 2007). Having the surrounding local communities involved as *pesangem* for more than three decades by giving them the rights for inter-cropping was not enough to secure their commitment to prevent illegal logging. This is particularly likely if the economic rents from timber are significantly higher and have been enjoyed by the state-owned company for more than three decades and no significant shares have been transferred to the local community (Nawir and Santoso 2005).

CONCLUSIONS

Despite some remaining challenges and problems in its implementation, the Decentralisation Policy has opened up more opportunities for district governments to accommodate local communities' involvement. Particularly since the Reformation Era, there have been growing demands from communities for their rights over state forest management to be recognised. The existing policy framework, institutional, management, and tenurial arrangements have affected the financial feasibility of community tree-growing schemes and affected whether the determining factors for the schemes can become commercially feasible. Community tree-growing schemes in Sumbawa and Bima have proved to be effective as part of the government's management strategy for reforesting state forests in West Nusa Tenggara. Conditions where there has been a high demand for land inside state forests for cultivating cash crops have created many cases of conflict over forest resources due to the highly competitive uses of these areas. There are several implications for, and challenges to the government's tree-growing under CFS, as summarised here.

Compared to Sumbawa, the lack of an overarching policy framework for community-based management in Bima had caused two main challenges for community tree-growing initiatives inside state forests. Firstly, local government failed to provide secure rights for existing community group initiatives and practices that had proven to be applicable under local conditions and mutually respected by community members inside and outside the village. Secondly, the lack of an overarching policy framework of local strategies for developing and managing community tree-growing schemes had resulted in uncoordinated programmes, which were very confusing to the local community and resulted in the programmes initiated by provincial and central government, which lacked consideration of local conditions, being implemented haphazardly.

This research has identified that community tree-growing schemes integrating timber and inter-cropping promise higher benefits for local communities than the timber-based management only. However, only at full standing stock condition does timber-based management provide higher potential financial benefits. One of the most important features influencing the financial profitability of community tree-growing schemes is the proportions of land allocated for timber and inter-cropping. Estimated financial benefits identified in this research reflect the community's priority in allocating the land as part of their livelihood strategies. High community dependence on land inside state forests for agricultural crop-based inter-cropping has caused difficulties in enforcing the proportion of 70% for timber to 30% for inter-cropping set down by government regulation. Two main factors contribute to this trend. First, the limited amount of land outside state forests causes high pressure on forest lands for agricultural practices. Secondly, unclear incentives from secured timber benefits for the community have contributed to less interest from community members in shifting their investment from inter-cropping to timber.

The proportion of land allocated to food crops and timber depends on the incentives created by each option. Presumably, a higher proportion of land allocated for inter-cropping than timber will be reserved, if there are secure and clear incentives from timber management. Tree growers in Sumbawa depended less on forests for inter-cropping compared to those in Bima due to the higher pressures on land demanded for farming. Observed from the two cases, the greater the dependency of a community on the forests, the more likely the community tree-growing schemes are to be successful, as

long as all of the other supporting conditions, such as secure long-term tenure, are in place.

High-cost government programmes implemented with large-scale coverage are indicated not to be feasible and do not fit with the nature of the management of small-scale community tree-growing. As in the case of community tree-growing schemes in Sumbawa, government investment accounted for more than 50% of total costs, which was higher than the schemes implemented in Bima. With the remaining standing stock at only 37% of the initial standing stocks, these investments are not paid off by estimated potential net benefits taking into account all of the marketing costs required to market all of the crops.

Options to involve the community actively in managing state forests are seen as the last choice, which leads to financial and ecological loss. There were significant estimated financial losses at both government and household level when communities were not involved in managing the state forests. These losses could have been prevented if communities had been involved much earlier. At full standing stock condition, timber-based management will provide higher potential financial benefits as well as return to labour than the integrated timber and inter-cropping management, as long as there is a cost-effective government investment. As the analysis has also shown, under the current limitations on agriculture crop productivity due to the underdeveloped technology and practices applied by communities, the financial benefits accruing from timber and alternative crops are comparable. The results of the analysis, therefore, do not support the common presumption that investment in timber management cannot always compete with other short-term land use alternatives.

WAYS FORWARD

Although there are significant potential benefits from community tree-growing schemes managed commercially, there are four recommendations as ways forward in stimulating commercial tree-growing as the basis for developing a levelled-incentives framework for promoting small-scale tree-growing that will be competitive with other strategies. Although the recommendations are based on specific cases in Indonesia, the following points are relevant elsewhere, particularly for countries prioritising the management of state forests by involving local communities.

First, opportunities for facilitating local communities' involvement in managing state forests by district governments should be better supported by easing the bureaucratic procedures by the central government to hand over the full rights to local communities to manage state forests. This is because under the current MoF regulation, despite strong support from the district government towards communities' involvement, cooperatives have to apply for the formal CFS rights to MoF. Thus, in relation to state forest management, MoF is still in control in terms of granting the final formal endorsement of the collective rights granted to the cooperatives. The procedures are complicated. For example: in submitting the application, the community group has to be registered formally as a cooperative; further, working plans and digitised maps with clear boundary marks have to be attached. Without close facilitation by external agencies, such as NGOs, the requirements have proved to be burdensome to community groups. Central government should act more as the facilitator, particularly in cases where local district governments, such as in Sumbawa, have a clear and strong vision for developing strategies to involve communities based on participatory approaches.

Second, having secured timber benefits can help to maintain and ensure the proportion of 70% of timber to 30% of inter-cropping as imposed by MoF regulations. For areas with higher need for agricultural lands, having a lower proportion of land allocated for timber should be considered, so different scenarios can be introduced and considered by forestry district agencies. The benefits received from timber can serve as incentives to communities to maintain their commitment to managing state forests. While government and community can directly receive shared benefits, wood-buyers and middle-men can be encouraged by having more efficient, simplified regulations and procedures so their costs can be minimised and a fair price can be offered to growers. More importantly, district government can play a more prominent role in ensuring transparent negotiation between community groups and wood-buyers/middle-men.

Third, programmes for stimulating community tree-growing should not only focus on tree planting, but be more comprehensively designed to improve the business skills in the communities involved, so they have the capacity to analyse different benefits, costs, and financial risks of different investment alternatives and be able to make the right decisions. This is essential in ensuring the long-term management sustainability.

Fourth, having cost-effective investment taking into account a practical management scale tailored to community management capacity should be considered carefully by the central/provincial/district government before initiating any community tree-growing activities specifically, and community-based forestry management, in general.

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APPENDIX 1 *Incentives framework for small-scale commercial tree growing*

1. Direct incentives

These are granted directly by various agencies, such as governments, development agencies, non-governmental organisations and the private sector. Types of these incentives include: seedlings, subsidised loans, and cost-sharing arrangements.

2. Indirect incentives

These incentives are applied indirectly to timber produced by smallholders, but have impacted the condition for timber to be commercially feasible. These incentives include variable incentives and sectoral incentives.

2a. Variable incentives (i.e. sectoral incentives and macro-economic drivers) and enabling incentives

2a1. Sectoral incentives

Incentives indirectly resulting from policy and regulation imposed on related inter-related sectors, such as agricultural and forestry sectors. Sectoral incentives include harvesting and trade restrictions through production taxes, and/or timber transportation tariff. Impacts are subject to the extent these incentives are applied in comparison to other alternative commodities produced by using similar land-based resources.

2a2. Macro-economic drivers

Incentives that have an effect on the net returns for producers to earn from plantation activities. Incentives under the macro-economics aspect include interest rate policies and fiscal and monetary measures (e.g. income taxes).

2b. Enabling incentives

For small-scale tree growing, the most important incentive is the enabling incentives. This includes those factors that influence producers' decisions that are not concerned with directly bringing about changes in the management through financial or other forms. Examples include: land tenure and resource security, accessibility and availability of basic infrastructure (ports, roads, electricity, etc), market development, credit facilities, and research and extension.

Sources: Adapted from Meijerink (1997); FAO (1999); and Enters *et al.* (2004)

APPENDIX 2 *Investment effectiveness criteria for assessing investment alternatives*

Net Present Value (NPV) is the discounted net benefit stream (present value, PV)	$NPV = \sum_{t=0}^{n} \frac{(B_t - C_t)}{(1+r)^t}$ (Equation 1)
Internal rate of return (IRR) is the discount rate that, if used to discount an investment's costs and benefits, will make the NPV equal to zero	Internal rate of return is the discount rate, *r*, at which: $NPV = \sum_{t=0}^{n} \frac{(B_t - C_t)}{(1+r)^t}$ (Equation 2)
Net Benefit Investment Ratio (NBIR) is a project ratio of the present value of the project's benefit, net of operating costs, to the present value of its investment costs	$NBIR = \frac{\sum_{t=0}^{n} \frac{B_t - O_t}{(1+r)^t}}{\sum_{t=0}^{n} \frac{IC_t}{(1+r)^t}}$ (Equation 3)
Return to labour ratio is the ratio of the sum of the project's discounted benefits to the sum of its discounted labour costs.	$\text{Return to labour} = \frac{\sum_{t=0}^{n} \frac{B_t}{(1+r)^t}}{\sum_{t=0}^{n} \frac{\text{LabourC}_t}{(1+r)^t}}$ (Equation 4)
Return to labour value to estimate the labour wage in comparison to other investment alternative	Wage rates of labour estimated at NPV equal to zero
Equal Annual Equivalent (EAE) is the annual value of NPV for the period for the life of the investment	$EAE = \frac{NPV[i(1+i)]^n}{[(1+i)^n - 1]}$ (Equation 6)
Land Expectation of Value (LEV) or Soil Expectation Value (SEV) is the present value of bare forest land assuming the project will be replicated an infinite number of times in the future	$LEV = \frac{NPV(1+i)^n}{[(1+i)^n - 1]}$ (Equation 7)
Where, B_t are project benefits in period *t* C_t are project costs in period *t* O_t are project operating costs in period *t* I_t are project investment costs in period *t*	*r* is the appropriate financial or economic discount rate *n* is the number of years for which the project will operate

Sources: Pearse (1990), Perkins (1994), and University of Florida (2010)