



Australian Government

**Australian Centre for
International Agricultural Research**

Final report

project

Improving economic outcomes for smallholders growing teak in agroforestry systems in Indonesia

project number

FST/2005/177

date published

April 2012

prepared by

Dede Rohadi, Centre for International Forestry Research

*co-authors/
contributors/
collaborators*

James M. Roshetko and Aulia Perdana, World Agroforestry (ICRAF,
International for Research in Agroforestry)

Dr Michael Blyth, Australian National University

Dr Nunung Nuryartono and Nuning Kusumowardani, Bogor Agriculture
University (IPB)

Agus Astho Pramono, Nurin Widayani and Anis Fauzi, Forestry Research
and Development Agency

Drs M. Joko Sasono and Purnomo Sumardamto, District Government of
Gunungkidul

Philip Manalu, Center for International Forestry Research

approved by

Mr Tony Bartlett, Research Program Manager Forestry, ACIAR

final report number FR2012-11

ISBN 978 1 921962 67 7

published by ACIAR
 GPO Box 1571
 Canberra ACT 2601
 Australia

This publication is published by ACIAR ABN 34 864 955 427. Care is taken to ensure the accuracy of the information contained in this publication. However ACIAR cannot accept responsibility for the accuracy or completeness of the information or opinions contained in the publication. You should make your own enquiries before making decisions concerning your interests.

© Australian Centre for International Agricultural Research (ACIAR) 2012 - This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without prior written permission from ACIAR, GPO Box 1571, Canberra ACT 2601, Australia, aciarc@aciarc.gov.au.

Contents

1	Acknowledgments	4
2	Executive summary	5
3	Background	7
4	Objectives.....	9
5	Methodology	11
6	Achievements against activities and outputs/milestones.....	20
7	Key results and discussion	28
8	Impacts	46
8.1	Scientific impacts	46
8.2	Capacity impacts.....	48
8.3	Community impacts	50
8.4	Communication and dissemination activities	54
9	Conclusions and recommendations	58
9.1	Conclusions	58
9.2	Recommendations	59
10	References	61
10.1	References cited in report.....	61
10.2	List of publications produced by project	62
11	Appendixes	64

1 Acknowledgments

The Project Team would like to acknowledge all partner institutions who have supported the implementation of this research project, namely the Center for International Forestry Research (CIFOR), The World Agroforestry Centre (ICRAF), Winrock International, Forestry Research and Development Agency (FORDA), Australian National University (ANU), the International Center for Applied Finance and Economics (InterCAFE), Institut Pertanian Bogor, Kelompok Kerja (Pokja) Hutan Rakyat Lestari and the District Government of Gunungkidul. Specifically the Project Team expresses their appreciation to the Bupati of Gunungkidul, Mr Suharto SH (period 2007-2010) and Ibu Hajjah Badingah (period 2010-present) for all the support they have given to this project.

Acknowledgements are also due to the Project Advisory Group (PAG) members, who provided positive feedback and suggestions during project implementation, specifically to Dr. Nur Masripatin (Chair 2007-2008), Dr. Putera Parthama (Chair 2008-2010), and Mr. Wisnu Prastowo (Chair 2010-present) of FORDA; Prof. Dudung Darusman from Institut Pertanian Bogor; Ibu Yuana Sutyowati Barnas from the Ministry of Cooperatives and Small and Medium Enterprise Development, Mr. Billy Hindra (2007 -2010) and Mr. Haryadi Himawan (2010-present) from the Directorate General of Land Rehabilitation and Social Forestry; Mr. Nurcahyo Adi (2007-2009), Ms. Nur Maliki Arifiandi (2009-2010) and Mr. Aditya Bayunanda (2010-present) from the WWF, Mr. Ahmad Dawam from the Provincial Office of Forestry and Estate Crops of Yogyakarta, and Mr. Joko Sasono from the District Government of Gunungkidul.

The project team greatly appreciated the assistance, support and participation that were provided by the people of the District of Gunungkidul in the implementation of various project activities, especially the farmers living in the village where the project sites were located, specifically the Village of Candirejo in Semin Sub District, the Village of Katongan in Nglipar Sub District, the Village of Bejiharjo in Karangmojo Sub District, the Villages of Karangduwet and Karangasem in Paliyan Sub District, the Village of Dadapayu in Semanu Sub District, the Village of Giripanggung in Tepus Sub District and the Village of Giripurwo in Purwosari Sub District. In addition the Project Team also conveys many thanks to the District Forestry Office and the Forestry Extension Office in the District of Gunungkidul for the participation of their staff in the implementation of project activities.

The Project Team would like to thank Mr. Tony Bartlett (Forestry Program Manager, ACIAR), Dr. Russell Haines (Former Forestry Program Manager, ACIAR) and Ms. Rebecca Wayne (Program Assistant, ACIAR) for all their administrative and management support in the implementation of this project. The Project Team would also like to thank Dr. Glen Kile of ACIAR, who did the project evaluation and provided useful feedback to improve the report.

2 Executive summary

This is the final report of the 4-year research project entitled "*Improving Economic Outcomes for Smallholders Growing Teak in Agroforestry Systems in Indonesia*" (FST/2005/177) that was implemented in Gunungkidul District, Yogyakarta Province, Indonesia. The project aimed to improve the livelihoods of smallholders growing teak in Indonesia through work toward three main objectives, namely: (a) to improve returns for smallholder teak producers by introducing and adapting silvicultural technologies, (b) to provide incentives for smallholder participation in profitable teak production by identifying and designing financing schemes, and (c) to enhance market access by smallholder teak producers.

Teak is among the most valuable timber species in Indonesia and is used for many purposes. The demand for teak wood for both international and domestic use is always greater than its supply. Two major sources of teak wood are available in Indonesia, i.e. industrial teak plantations, which are concentrated in Java, and the smallholder plantations, which are spread across the country. While the supply of teak from industrial plantations is declining, the share from smallholder plantations supply is increasing. In the project area within the Gunungkidul District, about two-thirds of the region's forest is smallholder teak plantations. About 63% of the farmers have less than one hectare of teak plantings and teak sales contribute about 12% of household income. However, the development of smallholder teak plantations in Indonesia is still facing various impediments. In summary, the significant impediments to profitable smallholder teak plantations include: (a) Low quality of wood due to poor silviculture; (b) Lack of capital to invest in teak planting and inability to wait the duration of a teak rotation before obtaining returns; (c) Limited access to market information/linkages leading to prices that are well below market rates, with high transaction costs for timber merchants; and (d) Unfavorable policies in smallholder teak production and marketing.

The research project contributed to overcoming these problems by conducting various project activities through participatory processes. Farmers need help to improve their knowledge and practical skills in applying better silvicultural techniques. Project activities, such as cross visits, training, establishment of Farmer Demonstration Trials and a Silvicultural Manual have improved farmers' knowledge and skills in silvicultural techniques that will be useful for improving the productivity and quality of smallholder teak plantations through better silvicultural practices. Early results from the Farmer Demonstration Trials showed that diameter growth and height increment are both increased by silvicultural treatments such as thinning, singling and pruning. In these trials, diameter growth was increased by 60% and height increment increased by 124% over two years. The importance of access to better teak germplasm rather than relying on wildling seedlings was also demonstrated.

As teak plays an important role as a "household saving account", the project found that 84% of teak producers harvest their teak prematurely when they are faced with an urgent need for cash. This practice prevents farmers from realizing greater potential benefits from their teak plantations. Teak farmers need better access to funding sources to avoid this practice, but many financial institutions are reluctant to lend money for teak plantations, because of the long investment periods and the farmer's lack of collateral. The project has tried to improve the understanding of farmers and decision makers of the importance of micro finance institutions in accordance with farmers' financing needs and behaviors. Various project activities, such as comparative studies, Focus Group Discussions and the establishment of a farmers' micro finance institution (the LKM Gunung Seribu), which covered 300 farmer households, have increased farmers' capacity by providing access to micro finance. Group-based lending schemes, which are controlled by farmers and operate on a revolving fund basis, are

considered appropriate for meeting the financial needs of smallholder teak growers. The farmers do not need collateral as the group guarantees the loan will be paid back using the teak trees as collateral. This trial showed that group managing the micro finance needs training and support in the initial stages of operations.

In the project area, farmers sell their teak trees to middlemen who cut and transport the logs and then on sell them to wood processors. Farmers operate from a low bargaining position and need some assistance on developing timber marketing strategies to obtain higher teak prices. This strategy can be advanced by providing farmers with better market information, in particular on the grading system and quality standards of teak used in industry, and to improve their capacity to estimate the value of teak trees. Farmers also need assistance to develop mutually beneficial business ties with wood industries, especially the furniture industry. Teak farmers have great potential to be involved in the processing of teak wood into value-added products. The project supported the development of a collective marketing system, through the same farmer group that was established to assist with micro finance, and initiated a market network with companies producing certified teak furniture products. The project also developed policy options to simplify the regulation of wood transport at the local authority level and thereby reduce transaction costs.

The presence of this project has provided positive impacts to teak farmers at Gunungkidul district and could provide useful lessons for teak farmers outside the project sites. Some farmers are using silvicultural techniques that were introduced by the Project Team. Farmer Demonstration Trials could be used for training activities where farmers could learn how silvicultural treatments could improve teak growth. Some project findings have been published and presented to wider society through presentations at seminars and conferences on both national and international levels. Lessons learnt from the projects have been disseminated through various meetings that will contribute to better knowledge of strategies to improve the economic benefits from teak plantations to households. The project also provided better preconditions for smallholder teak plantation development efforts in the District of Gunungkidul. The experience will also be useful for developing smallholder timber plantations in other areas. The project recommends that better strategies of business cooperation between farmers' groups and the wood processing industries be developed.

3 Background

Teak is among the most valuable timber species in Indonesia and used for many purposes. Teak timber is commonly used to produce furniture, housing materials, crafts, ships and many other products. The wood is durable, strong but easy to work, stable and has both a good color and grain. The specific gravity of mature wood ranges between 0.62 and 0.75 (Martawidjaja, 2005). For some of Indonesian ethnic groups, such as the Javanese people, teak has become part of their culture and is considered more desirable than other wood species in the country (Muhtaman *et al*, 2006).

Demand for teak wood both internationally and domestically is always higher than supply. With per capita global wood consumption at about 0.54 m³/year, Keogh (2009) has estimated the total steady increase of world wood consumption from around 3.7 billion m³ in 2010 to 5.1 billion m³ in 2050. If the share of tropical hardwood timber is maintained at 3.5%, the total demand for tropical hardwood timber will be around 97.9 million m³ in 2010 to 136 million m³ in 2050. As teak is the most dominant species for planted tropical hardwood timber, these figures more or less could represent the future demand for teak wood at global level.

Teak production and furniture manufacture is a major industry in Java, Indonesia. Perham Perhutani supplied the industry with more than 680,000 m³ of teak logs and sawn timber, valued at nearly AUD 115 million in 2001 (Perhutani, 2002). In 2005, in Jepara, a main centre of the teak furniture industry in Java, more than 15 thousand small-scale teak furniture industries were operating, employing around 170 thousand people and creating added value with a turnover of around Rp 12 trillion (about US\$ 1.2 billion) per year. The total teak wood intake at that time was estimated at between 1.5 to 2.2 million m³/year (Roda *et al*, 2007).

Two major teak wood sources are available in Indonesia, i.e. industrial teak plantations which are mostly located in Java and currently managed by a state-owned company “Perum Perhutani”; and smallholder plantations which are spread across the country. While the supply of teak from industrial plantations is declining, the share of the teak supply that is produced on smallholder plantations is increasing. This increasing production from smallholder plantations has become an important source of teak for furniture producers in Java.

The extent of smallholder teak plantations in Indonesia is poorly documented, although millions of households throughout the country are planting this species. The census which was conducted in 2003 revealed that the total number of households that own teak trees on their private lands has reached more than 3 million. The total standing stock of teak trees managed by smallholders was around 80 million trees, with about 23% out of it was ready for harvest. Most plantations (about 63%) were located in Java. In Java, smallholder teak plantations are concentrated in three provinces, i.e. Central Java (26.47 %), East Java (21.28%) and Yogyakarta (8.89 %), while outside Java plantations were concentrated in Nusa Tenggara (about 11.7% of the total and 13.2% of all harvestable trees), South Sulawesi (about 4.5% of the total and 7.6% of all harvestable trees) and Lampung (about 3.1% of the total and 5.5% of all harvestable trees) (Pusat Inventarisasi dan Statistik Kehutanan, 2004).

Farmers are the main actors in the smallholder timber plantation business. The role of timber in improving these households' economic status has been documented; for example felling planted trees to raise cash helps these households send their children for higher education (PERSEPSI 2003, Nawir *et al.*, 2006). Overall, teak and other timber act as a savings bank, providing the household with ready cash in case of emergencies. However, the current situation in Indonesia indicates that timber plantations have not yet attracted farmer investment effectively. The total area of smallholder timber plantations throughout the country equals only

about 1.8 million ha, far below the potential land area that would be suitable for developing these plantations. Obviously, there are many factors that may have caused this situation. Scholars and decision makers (Wijayanto, 2006; Darusman and Hardjanto, 2006; Hindra, 2006) have suggested three main key problems related to production, marketing and institutional aspects.

Smallholders often manage their timber plantations using poor silvicultural practices. Poor silvicultural practices lead to low quality timber, but this can be difficult for smallholders to improve due to lack of capital to invest in teak planting and limited ability to wait for the completion of a teak rotation before requiring returns. With limited access to capital/credit for investing in teak planting and the financial inability to wait for trees to reach the minimum diameters required by industry, smallholders find it difficult to compete with state and private plantation companies (Maturana *et al.*, 2005).

Smallholders also tend to take prices that are often well below market rates because of their limited access to markets, limited market information, and inability to overcome transaction costs. Smallholders often sell their products to middlemen in the absence of sufficient marketing information about current prices and practices, and they are often not in a position to negotiate higher prices (Holding and Roshetko, 2003; Tukan *et al.*, 2004). Given that timber merchants buying from smallholders have to deal with numerous producers offering timber of variable quality and quantity, transaction costs are high, leading to lower prices to producers. Furthermore, government policies restrict smallholder involvement in timber production, as regulations designed for large-scale timber production (e.g. cutting and transportation permits, registration procedures) are applied to smallholders.

In summary, there are significant impediments to profitable smallholder teak planting, namely:

- Low quality due to poor silvicultural practices,
- Lack of capital to invest in teak planting and inability to wait for the completion of a teak rotation before obtaining returns,
- Limited access to market information/linkages leading to prices that are well below market rates, with high transaction costs for timber merchants,
- Unfavorable policies.

Despite all of those challenges, there are considerable causes for optimism. In particular on smallholder teak plantations, there are some good examples of smallholder teak plantations that have successfully expanded. Farmers, such as the teak growers in the District of Gunungkidul, are eager to adopt technologies that demonstrate benefits. There is also a pool of knowledge on silvicultural practices that could be modified to suit the needs of smallholder plantation systems. The Indonesian government is also putting priority on facilitating smallholder involvement in timber plantations. High demand for teak products has also driven industries to seek more teak timber produced by smallholders. All of these factors open opportunities for developing more profitable teak plantations by smallholders. The opportunity is there, but some constraints for smallholders to being involved in more profitable production must be overcome. This background material demonstrates the intricate connection between household finances and management of teak trees; this highlights the need for an approach that addresses multiple components of the smallholder teak system.

4 Objectives

The long-term goal of this project is to improve the livelihoods of smallholders growing teak in Indonesia. This objective was strategically approached through three project themes. The first theme was the introduction and adaptation of silvicultural technologies employed by teak farmers. Improvements in silvicultural technologies are expected to increase productivity and the quality of the teak wood produced by farmers. The second theme was designing financing schemes for farmers that provide incentives to profitable teak production. Easy access and appropriate funding schemes for teak farmers will increase the potential of higher farmer investments in the teak plantation business. The third theme was enhancing market access for smallholder teak wood. Improvement of market access will provide better prices of smallholder teak wood and increase farmers' household incomes. Higher profits from selling teak will further stimulate farmers to intensify their teak plantations for higher productivity and wood quality. Details of these project themes, activities and expected outputs are discussed below.

Objective 1: To introduce technologies and adapt silvicultural technologies that improve returns for smallholders teak producers.

The project aimed to improve silvicultural technologies employed by farmers on their smallholder teak plantations. This objective was achieved through introducing farmers to the benefits of the best silvicultural practices for increasing teak productivity and adapting available silviculture technologies for teak to the conditions and capacities of teak farmers. To achieve this objective, the project team initiated its activities with the identification and evaluation of common silvicultural practices currently undertaken by farmers. Through various project activities, such as field observation, household surveys, teak farm inventories and interviews with resource persons (community leaders and officials in relevant agencies at the district level), the project identified a variety of weaknesses in smallholder silvicultural practices. The project improved farmers' perceptions and knowledge of the benefits of applying the best silvicultural practices for teak productivity and quality by involving farmers in various project activities, such as cross-visits, Focus Group Discussions (FGD) and training. Together with farmers, the project team established Farmers' Demonstration Trials (FDT) and applied some silvicultural treatments to farmers' teak stands. The results were jointly observed and evaluated by the project team and the farmers, so that farmers could directly see and understand the effects of these silvicultural treatments on their teak stands. The Project Team worked with farmers to produce a silvicultural manual for smallholder teak plantations. Preparation of this book, done in a participative manner and the use of farmer practices as part of these silvicultural techniques, facilitated the farmers' understanding of the recommended silvicultural practices.

Objective 2: To identify and design financing schemes providing incentives for smallholder participation in profitable teak production.

Limited capital often limits teak farmers investments in teak plantations. Unfortunately, credit scheme availability provided by formal financial institutions, such as banks, often does not match the needs and characteristics of farmers' financial status. Regarding this issue, the Project Team sought to analyze the financial aspects of smallholder teak plantations, evaluate the financial needs and financial behavior of farmers, as well as analyze government policies and programs related to the provision of micro credit to farmers. Based on these findings, the Project Team tried to develop suitable micro-credit schemes for farmers, which were adapted to farmers' needs and tradition of farmers' practices regarding savings and loans. The development of a suitable funding model was carried out through a participatory process. Farmers were directly involved and practiced employing the model micro credit funds through a

newly established farmers' microcredit institution, the Lembaga Kredit Mikro (LKM) Gunung Seribu.

Objective 3: To enhance market access by smallholders teak producers.

Teak farmers often are in the position of price takers in the process of teak sales. These conditions are detrimental to farmers and not conducive to sustaining a teak plantation business. To address this issue, the Project Team evaluated the value chain of teak wood from farmers to wood processing industries. The project team sought to understand the characteristics of teak wood required by the market and disseminated this knowledge to teak farmers. Various constraints on the teak marketing process by farmers were analyzed, including some government policies or regulations that could potentially lead to disincentives for farmers. Working with farmers, the Project Team developed better marketing strategies that would allow smallholder teak to gain a more fair economic return for teak farmers.

5 Methodology

This project applied an action research approach, with activities not limited to data collection, analysis and presentation of project findings, but combined analytical approaches with active participation of the targeted stakeholders, in particular the smallholder teak growers at the project sites, to improve the institutional capacities of the targeted farmers. Various activities were completed during the duration of the project; these can be categorized into three groups, data collection and analysis, training and capacity building activities, and dissemination of project findings.

5.1. Project management

The project involved many collaborators from various institutions. The Center for International Forestry Research (CIFOR) lead this project with core partners coming from The World Agroforestry Center (ICRAF); Winrock International; the Forestry Research and Development Agency (FORDA), the Ministry of Forestry of Indonesia; the International Center for Applied Finance and Economics (InterCAFE), Bogor Agricultural University (Institut Pertanian Bogor); Kelompok Kerja or Pokja Hutan Rakyat Lestari (a consortium of NGOs working under the coordination of the District Government of Gunungkidul); and the Australian National University. Personnel involved in the project, their current positions, and their roles in the project are presented in Table 1.

As stated in the footnotes, some project personnel left the project before it was completed for various reasons. However, most of the personnel remained as the core team of the project until it was completed. In addition to the project personnel listed in Table 1, there were some personnel who were involved as consultants who provided specific services to the project.

Coordination among the project members was conducted through many types of communication. Email communication was the most effective way to deliver messages or a plan of activities among project members, although sometimes these email messages had to be followed up by telephone communications. Project meetings were conducted using many different approaches. Around 25 meetings were completed during the duration of the project.

Some of the meetings are noted here. At the beginning of the project, we conducted a project inception meeting on the CIFOR campus in May 2007. That was the initial planning meeting where we discussed a plan of activities of the project and the research methodologies. The second planning meeting was conducted at the Bupati of Gunungkidul office in July 2007. That was the project launch meeting where consultations with local stakeholders were conducted to collect inputs on how to best implement project activities. Afterwards, annual project meetings were held and attended by all project members and the Project Advisory Group (PAG). Project annual meetings were conducted at the Quality Hotel in Yogyakarta (2008), at the Wanagama Research Station in Gunungkidul (2009) and at the Arma Resort in Ubud, Bali (2010). In 2008 and 2009, the project's annual meetings were accompanied by annual seminars attended by around a hundred participants. The last project seminar was held at the Jayakarta Hotel in Yogyakarta in May 2011.

PAG members are selected representatives from various institutions that presumably had significant roles in channeling research findings and recommendations into a decision making process. The PAG consisted of seven persons and was chaired by the Secretary General of FORDA. A list of PAG members is presented in the Table 2. During the annual meetings, the project team report on the progress of the project to the PAG members and sought their feedback on project implementation.

Table 1. Project personnel of the ACIAR Teak Project FST/2005/177.

No.	Name	Institution	Specialist/ Disciplines	Roles in the project
1	Dede Rohadi	CIFOR	Forestry Policy	Project Leader
2	Ani Nawir Adiwinata ¹	CIFOR	Economist	Project Proponent
3	Philip Manalu	CIFOR	Forestry	Data Manager
4	Nani Djoko	CIFOR	Secretary	Secretarial services
5	Henni Linawati	CIFOR	Finance	Finance Manager
6	Dhamar Adhibawono	CIFOR	Finance	Finance Officer
7	Sylvia Kartika	CIFOR	Finance	Finance Officer
8	James M. Roshetko	ICRAF & Winrock International	Trees and Market Specialist	Task Manager for the objectives 1,
9	Aulia Perdana	ICRAF	Market Specialist	Task Manager for the objective 3
10	Lia Dahlia	ICRAF	Secretary	Secretarial services
11	Retno Utaira	ICRAF	Finance	Management Service Leader
12	Gerhard Sebastian Manurung ²	ICRAF	Silviculturist	Scientist under Objective 1
13	Iwan Kurniawan ³	ICRAF	Market Specialist	Scientist under Objective 3
14	Agus Astho Pramono	FORDA	Tree Seed Specialist	Scientist under Objective 1
15	Nurin Widyani	FORDA	Tree Seed Specialist	Scientist under Objective 1
16	Anis Fauzi	FORDA	Silviculturist	Scientist under Objective 1
17	Ika Heriansyah ⁴	FORDA	Silviculturist	Scientist under Objective 1
18	Sulistya Ekawati ⁵	FORDA	Socio-economist	Scientist under Objective 3
19	Nunung Nuryartono	InterCAFE IPB	Micro credit specialist	Scientist under Objective 2
20	Nuning Kusumawardani	InterCAFE IPB	Sociologist	Scientist under Objective 2
21	Jaenal Effendi	InterCAFE IPB	Micro credit specialist	Scientist under Objective 2
22	Rima Rosita	InterCAFE IPB	Economist	Research Assistant under Objective 2
23	Heni Hasanah ⁶	InterCAFE IPB	Economist	Research Assistant under Objective 2
24	Joko Sasono	District of Gunungkidul	Secretary of Gunungkidul District	PAG member
25	Triana Anggraenie	InterCAFE IPB	Economist	Scientist under Objective 2
26	Purnomo Sumardamto	District Forestry Office of Gunungkidul	Forestry Policy	Research officer
27	Murbani	District Forestry Office of Gunungkidul	Forestry Officer	Research officer
28	Michael Blyth	Australian National University	Economist	Scientist
29	Suparman	Village Katongan	Farmers	Field Coordinator

Table 2. List of PAG members.

No.	Names	Occupation/Institution
-----	-------	------------------------

¹ Leave for study (PhD program) since the beginning of the project

² Leave for study (PhD program) since year 2 of the project

³ Leave the project since 2009

⁴ Leave for study (PhD program) since year 2 of the project

⁵ Leave the project since 2009

⁶ Live the project since 2009

1	Dr. Nur Masripatin (2007 to 2008) Dr. Putera Parthama (2008 to 2010) Wisnu Prastowo (2010 to present)	Secretary General of FORDA
2	Prof. Dudung Darusman	Dean of Faculty of Forestry, IPB (2007 to 2009) Senior Lecturer, Faculty of Forestry, IPB (2009 to present)
3	Ir. Yuana Sutyowati Barnas, MM	Minister Adviser on Inter-organization Affairs, Ministry of Cooperatives and Small and Medium Enterprise.
4	Ir. Billy Hindra (2007 to 2010) Haryadi Himawan (2010 to present)	Director of Social Forestry Development, Directorate General of Land Rehabilitation and Social Forestry, Ministry of Forestry of Indonesia
5	Mr. Nurcahyo Adi (2007 to 2009) Mr. Aditya Bayunanda (2009 to present)	Coordinator of Global Forest and Trade Network, WWF-Indonesia.
6	Ir. Ahmad Dawam	Head of Forestry Division, Forestry and Estate Crops Provincial Office, Yogyakarta (2007 to 2010) Head of Forestry and Estate Crops Provincial Office, Yogyakarta (2010 to now).
7	Joko Sasono	Deputy of Bupati Gunungkidul (2007 to 2010) Secretary General of Gunungkidul District (2010 to present)

5.2. Project sites

The project was implemented in eight villages in the district of Gunungkidul, province of Yogyakarta. A map of project sites is presented in Figure 1. The district of Gunungkidul was selected during proposal development through discussions among project members. Gunungkidul district was selected as a research site as the district has been experiencing fast growing expansion of smallholder teak plantations. It was reported that in the 1950s, the district was among the most degraded areas in Indonesia with little forest cover, about 3% of its total land area (Filius, 1997). It was reported that at present the total forest cover in the area has reached more than 42 thousand hectare or about 28.5 % of the total land area. More than 29 thousand hectares (69%) of these forests are farm forests dominated by smallholder teak plantations (Badan Pusat Statistik Kabupaten Gunungkidul, 2008).

Detailed site selection (at village level) was conducted through a consultation process with local stakeholders. For this purpose, a project launch meeting was held on 18 July 2007 at the district government office in Gunungkidul, Yogyakarta. The project received full support from local government with Bapak Suharto SH (Bupati of Gunungkidul district at that time) himself chairing the meeting. During the discussion, inputs were collected from regional office representatives, including a recommendation of project sites. Seven villages within the district were selected during the meeting. The selected sites represented the three zones of the district; these included the zones of Baturagung Mountain Range (in the northern zone), Ledok Wonosari (in the central zone) and Gunung Seribu Mountain Range (in the southern zone). The selected villages were Candirejo in Semin Sub District, Katongan in Nglipar Sub District, Bejiharjo in Karangmojo Sub District, Karangduwet in Paliyan Sub District, Giripanggung in Tepus Sub District and Giripurwo in Purwosari Sub District. Later, the village of Karangasem in Paliyan Sub District was included as a project site since the surveyed sampled respondents in fact were distributed in these two adjacent villages.

The District of Gunungkidul is one of the five districts in the Province (Special Region) of Yogyakarta. The district is located between 7° 46'– 8° 09' latitude and 110° 21' – 110° 50' longitude. The capital city of Gunungkidul District is Wonosari, which is located 39 km to the southeast of the city of Yogyakarta. The district has 18 sub-districts, 144 villages, and 1,536 *dusun* or hamlets, with a total area of 1,485.36 km² (Badan Pusat Statistik Kabupaten Gunungkidul, 2008).

The District of Gunungkidul is characterized by hilly topographic terrain, with half of the district having a slope of more than 15%, in particular in the northern zone (Baturagung) and in the western, southern, and eastern zones (Gunung Seribu). Only the central zone is relatively flat (Ledok Wonosari). The northern zone (Baturagung) lies at an altitude between 200 and 700 m above sea level. The zone includes the Sub Districts of Patuk, Nglipar, Gedangsari, Ngawen, Semin and the northern part of Ponjong. In these areas rivers are available and people can dig wells to a depth of around 6 to 12 meters. The central zone (Ledok Wonosari) lies around an altitude between 150 and 200 meters above sea level. The zone includes the Sub Districts of Playen, Wonosari, Karangmojo, the northern part of Semanu, and the central part of Ponjong. This zone is the centre for agro-farming activities in the district. The southern zone (Gunung Seribu) lies at an altitude between 100 and 300 meters above sea level. The zone includes the sub districts of Tepus, Tanjungsari, Panggang, Purwosari, Paliyan, Saptosari, Girisubo, Rongkop, the southern part of Semanu and Ponjong. This region is characterized by *karst* topography containing an underground *karst* river system at a depth of 200 m. Currently the rivers are utilized as sources of drinking water for the area. The average rainfall around the district is between 1,500 and 2,500 mm per year. Due to the *karst* condition, the rain water cannot be stored within the soil, but seeps quickly into the underground river (Gunungkidul Regency. 2005).

Based on the population census of 2000 and a population survey in 2005, the total population in the district was projected to be 685,210 people. About 66.5% of the total population consisted of productive workers, with most of them (about 82%) working as laborers or family employees. Agriculture is the main sector for employment in the district. Gross Regional Domestic Product (GRDP) in the district in 2007 based on current prices was Rp 4,872,123 million, with 34% of this gross income contributed by the agriculture sector. The gross per capita income in 2007, based on current prices was Rp 7,110,408. Within agriculture, the largest contribution came from food crops (64.05%), followed by forestry (27.27%), animal husbandry and its products (6.33%), plantation crops (1.69%), and fisheries (0.66%).

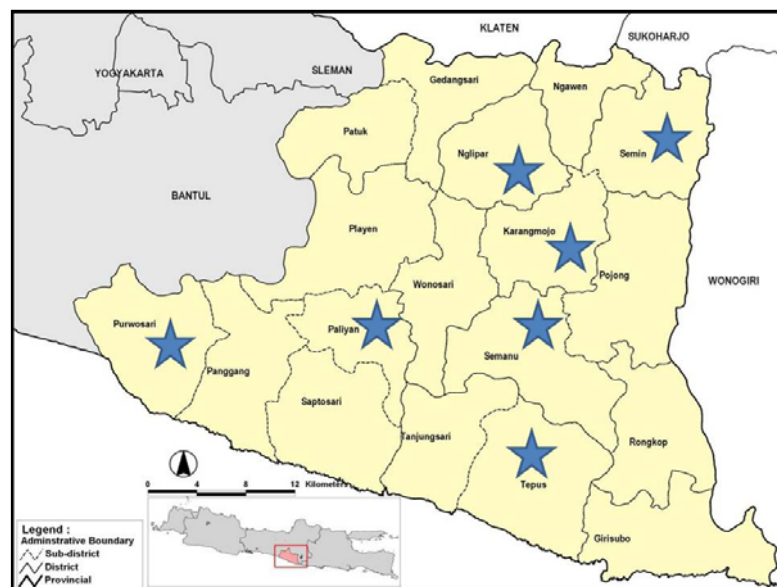


Figure 1. Map of the project sites

5.3. Data collection, handling and analyses

Data were collected in many different ways. Following the project inception meeting in Bogor and the project launch meeting in Gunungkidul, a household survey was conducted in August and September of 2007 at the selected project sites. The household survey was intended to collect baseline information on farmers' livelihoods and their farm activities at project sites. In addition to the household survey, in-depth interviews on specific issues were conducted by project members with key informants in the project sites. These in-depth interviews were conducted to complement data collection done during the household survey. Several Focus Group Discussions (FGD), mostly at farmer level were completed to gain farmers' perspectives on silvicultural practices, financing activities, and marketing aspects of smallholder teak plantation systems. Regarding silvicultural aspects, the project team conducted farm inventories to better understand the characteristics of smallholder teak plantations. Silvicultural trials were also conducted through the establishment of Farmer Demonstration Trials (FDT) and direct measurement of some sample trees in the FDTs. Market surveys were conducted to identify market channels used by farmers, the challenges faced by teak farmers and traders, and possible solutions to those challenges. Concerning marketing aspects, the team conducted value chain observations of teak trading from the farmer's yard to the processing units, to identify the actors in the chain and their current marketing practices. A rapid market appraisal was also conducted to identify current market situations, and identify factors that hinder the potential economic values of teak.

Household surveys

We interviewed 275 farmer respondents during the household survey. The respondents were selected to represent the variation in farmer's welfare, based on the sizes of the land areas they owned. Table 3 presents the distribution of the selected farmer respondents during the household survey. A structured questionnaire was used in the household survey. The survey was conducted by project members, helped by trained enumerators.

In-depth interviews

In-depth interviews were conducted with some selected key informants at the project sites. The interviews were done to gain comprehensive understanding on the three main project themes, i.e. the silvicultural practices of smallholder teak plantations, their financial behavior, and strategies for fulfilling the financial needs of farmers and the marketing aspects of teak wood produced in smallholder plantations. Included in these in-depth interviews was a survey to collect financial data on smallholder teak plantation activities applied to 31 farmer respondents.

Focus Group Discussions

Focus Group Discussions (FGD) were used as a tool for collecting information from and building the capacity of farmers, farmer groups, and some traders. The first FGD was conducted in an integrated fashion by all project members in December 2007 to gain farmer perspectives on various aspects related to their activities on teak plantations. The first FGD included about 60 farmers' group representatives and 10 local traders. In each following year, several FGD were conducted to discuss more specific issues of one or more project themes, with fewer participants. The last integrated FGD was conducted in February 2011, in the form of a Farmers Field Day (FFD). The event was held to deliver a summary of project findings to farmers' group representatives at the project sites.

Teak farm inventory

A teak farm inventory was completed in March 2008 on 227 parcels of land (in total 20.5 ha) documenting existing farmers teak systems, and providing a valuable crosscheck for household survey results and secondary data. The activities were held to evaluate tree species richness, tree density, teak standing stock and current teak silvicultural practices utilized by smallholder farmers in the three zones (Baturagung, Ledok Wonosari and Gunung Seribu) of Gunungkidul area. Teak-based farms were selected through the *Proportional Stratified Random Sampling* method to be representative of both the smallest (0.0055 Ha) and largest (3.0 Ha) farmer landholdings. *Quadrangle Sampling Units* (400 m²) were used to record standing stock per tree species, including seedlings. The sampling unit was replicated to represent 10% of the total area of teak-based farms.

Table 3. The selected farmer respondents during the household survey.

No.	Villages	Total number of household	Total number of hamlets	Total selected hamlets	Selected hamlets	Total number of household respondents
1	Bejiharjo	3,986	20	4	Gelaran II, Munggur, Sokoliman I, Sokoliman II	80
2	Candirejo	1,913	15	4	Klumpit, Lemah Bang, Ngelo, Sumber	36
3	Dadapayu	1,916	20	11	Dayakan Tengah, Karang Tengah, Kauman, Kerdon, Ngalang Ombo, Nogosari, Nongkosingit, Pok Dadap, Sempon Kulon, Sempon Wetan, Sendang	38
4	Giripanggung	1,152	14	5	Gunung Butak, Klopoloro 1, Palgading, Pringapus, Trenggulung	23
5	Giripurwo	1,885	10	5	Gumbeng, Jlumbang, Klampok, Temo, Widoro	38
6	Karangasem	1,997	11	1	Banjaran	5
7	Karangduwet	1,566	9	3	Karang Duwet, Paliyan Tengah, Surulanang	26
8	Katongan	1,160	9	4	Jeruk Legi, Kepuhsari, Ngrandu, Panggul	29
	Total	15,575	108	37		275

Farmers Demonstration Plots (FDT)

Six Farmers' Demonstration Trials (FDT) were established on farmers' lands in November 2008 to apply some silvicultural treatments to smallholder teak plantations. The FDTs were used as on-site trials to convince farmers of the benefits of adopting proper silvicultural practices. The FDTs were also used as farmers' training places on best-bet silvicultural practices. The establishment of FDTs was done through a participative process with local teak growers. Farmers were actively involved at all stages: the planning process, establishment, and data collection. A list of FDTs and related information is presented in the Table 4.

Data handling and analyses

All collected data from the field were pooled and managed by a member of the project staff (Philip Manalu) who was appointed for this task. Raw data from the household survey were verified, compiled and transferred into SPSS or excel format. Data was then made accessible to all project members who will use it for further analyses. Farm inventory data and financial data on teak farm activities were treated in a similar way. Other information was collected from project activities and stored in the form of Word documents, such as in the form of trip reports, cross-visit reports and FGD reports.

Data were analyzed in various ways; depend on the objectives of the analyses. In the case of the household survey data, a series of SPSS analyses were completed to get descriptive information regarding the smallholder teak system. Cluster analysis was applied to the teak farm inventory data to summarize the typology of smallholder teak system. Net Present Value (NPV) and Benefit Cost Analyses (BCA) were completed to analyze the financial performance of smallholder teak plantation and other farm activities. Other qualitative narrative data were used in data analyses and discussion of project findings.

Table 4. List of Farmers' Demonstration Trials at the project site.

No.	Land Owners	Locations (Hamlet, village, sub district)	Silviculture trials
1	Subardi	Temon, Purwosari, Giripurwo	Coppice thinning (control and singling)
2	Karsukiyo	Karangduwet, Paliyan	Coppice thinning (control and singling)
3	Kardi Utomo/Ngadiran	Karangduwet, Paliyan	Coppice thinning (control and singling)
4	Citro Widarso	Sokoliman I, Bejiharjo, Karang Mojo.	<ul style="list-style-type: none"> • Thinning (control) • Pruning (control, 50% and 60% pruned)
5	Suwarto	Sokoliman I, Bejiharjo, Karang Mojo.	<ul style="list-style-type: none"> • Thining (control and \pm 40% thinned) • Pruning (control, 50% and 60% pruned)
6	Giyono/Budiyono	Munggur, Ngawis, Karang Mojo.	<ul style="list-style-type: none"> • Thining (control and \pm 40% thinned) • Pruning (control, 50% and 60% pruned)

5.4. Capacity building activities

This project put significant attention on capacity building activities. These activities were completed in various ways, including cross visits, FGD, training and intensive assistance to farmers' group organizations. Capacity building activities were completed as part of the action research approach, with project members building up their knowledge and understanding of the smallholder teak plantation system through intensive interaction with the research object, i.e. the teak farmers and other directly related stakeholders.

Cross visits

Cross visit activities were conducted for both project members and farmers' group representatives. The first cross visit activity was conducted in November 2007 and attended by project scientists to review current teak management practices and identify possible improvements that could be applied to smallholders' teak production systems. Places visited included teak processing factories around Yogyakarta and Jepara, a state owned teak plantation company (Perum Perhutani) at Cepu, teak producing communities at Wonogiri and Gunungkidul districts and nursery centers in Gunungkidul. The second cross visit was attended by around 30 farmers' group representatives in the same places and conducted in December 2007. In 2010, the annual meeting was conducted in the Ubud area, Bali, and provided an opportunity for project members to conduct a cross visit to some advanced community micro finance organizations around Ubud (Lembaga Perkreditasi Desa/LPD Peliatan and LPD Mas). The last cross visit was conducted in 2010 by bringing some representatives from farmers'

micro finance organizations to the project site (LKM Gunung Seribu) to some advanced farmers' micro finance organization in Bogor.

Training

Two kinds of training were completed by the project. The first one was training for project members and the other was for the smallholder teak farmers at project sites. Training for project members was conducted through writing workshops. The first writing workshop was conducted in December 2008 and facilitated by a professional trainer from New Zealand (Peter Frost). The workshop was held to provide project members with knowledge and skills in scientific writing. The second writing workshop was conducted in February 2011 and was held to draft a technical report book on smallholder teak plantations.

Training for farmers was held to provide farmers with knowledge and skills on specific project themes. On silvicultural aspect, several training sessions were completed. In September and November 2008, on-site training in silviculture practices was delivered to teak farmers during the design and establishment of FDTs at project sites. This training was attended by around 80 farmers from the project sites and 10 team members. In September 2009, the project team conducted a field test of the smallholder teak silvicultural manual (see section 5.5. for the explanation of this silvicultural manual). Ninety-three farmer participants and fourteen local forestry extension officers were involved in this field test. This field trial was followed by a Farmer Field Day (FFD) in October 2009, attended by 107 farmers, local extension officers and other local stakeholders. A second FFD in March 2011 was attended by 80 farmers, local extension officers and other local stakeholders. During this FFD, farmers were shown how to proactively manage teak plantations for timber production and quality, guided by the silvicultural manual book and practices at FDT sites.

On the marketing theme, the project completed training on Verification of Legal Origin (VLO) - Wood Tracking System in February 2008. The training was held to improve market linkages of smallholder teak producers with certified wood product companies. During the training, farmers were introduced to the Chain of Custody (CoC) system and trained in tree marking systems and wood legality documentation. Sixty participants attended the training course including teak farmer representatives, local traders, local press with facilitation by project members and SENADA staff (a USAID funded project on the Indonesia Competitiveness Program). Another training session was completed in July 2008 to provide knowledge to farmers on the stumpage value measurement system. The training was held to improve farmer's understanding of how to predict the value of their teak trees, to improve their bargaining power and negotiations in teak marketing.

On the micro finance theme, training to strengthen farmer motivation for collective action was completed in February 2008 with the participants in the training on VLO - wood tracking system. The training session was designed to develop a strong foundation for the establishment of a farmers' microfinance institution, the LKM Gunung Seribu. In November 2009, a training course on accounting and a cattle raising program was provided to the 27 farmer participants, who are members of the LKM Gunung Seribu. During the training, a micro credit contract was developed for the LKM members.

In addition to specific theme training provided by the project, a more general type of training was completed by a local project partner, the Pokja Hutan Rakyat Lestari. Working in collaboration with the District Forestry Office, Pokja Hutan Rakyat Lestari completed training to extend sustainable forest management principles in December 2009 in 7 villages of the project sites. The training sessions were attended by around 225 participants in total, comprising farmers, village officers, timber traders and extension officers. During this training, the topics of collective action, forest management and timber trade administration were discussed with the participants.

Intensive assistance on farmers' micro finance organization

The project also provided some assistance services to farmers on micro finance organization. This activity was completed between August 2008 and January 2009 by hired local staff (Bapak Maryono). The assistance services were conducted by helping a farmers' group become members of the new established farmers micro finance organization, the LKM Gunung Seribu. The hired staff facilitated the farmers' group through periodic monthly meetings to discuss institutional aspects of farmers' organizations, in particular their rules of representation and the concept of microfinance.

5.5. Dissemination of project findings

The project disseminated project findings and lessons learnt through various media. A short video clip about the background of the project and project activities was produced in 2008. This short video was made available on the internet (YouTube at the addresses <http://www.youtube.com/watch?v=Bl9fqxdghlo>, and http://www.youtube.com/watch?v=8ojuDzIQ_cs). Two project newsletters were produced in 2007 and 2009 respectively. The newsletters were distributed to PAG members, partner institutions, government institutions within the district of Gunungkidul and other related stakeholders at national level. Every year, the project conducted annual meetings; some of the meetings were accompanied by seminars on the progress of the project.

The project also used publications to disseminate project findings. A practical silviculture manual for smallholder teak plantations was produced through a participative approach including farmers and forestry extension officers. The manual was published in two languages, Bahasa Indonesia and English. The Bahasa Indonesia version was distributed to a large number of teak farmers in Gunungkidul and also made available on the CIFOR website. The English version will be distributed to related stakeholders and also published on the CIFOR website. Posters and seminar papers were also produced and presented in various national and international seminar events.

6 Achievements against activities and outputs/milestones

All of the planned project activities were carried out and the output targets were achieved. Some additional activities and outputs were also completed. The main achievements are summarized in sequence, following project objectives.

The first project objective was to introduce and adapt silvicultural technologies that improve returns for smallholder teak producers. Three activities were implemented to achieve the objective, i.e. the identification and evaluation of farmers' current silvicultural practices, the establishment of silvicultural trials under farmers' actual conditions on farmers' land; and the development of guidelines for improving smallholder teak production.

In year one (January 2007 to May 2008), activities focused exclusively on the first activity. Through the household survey, farmers' practices on smallholder teak plantations were recorded from 275 families. In addition, an inventory of 227 parcels of smallholder teak farms was completed to identify the physical conditions of their teak farming system. The data from this household survey and farm inventory are available in SPSS and excel formats. The project facilitated farmers' visits to industrial teak plantations and the Teak Improvement Centre under Perum Perhutani management, and neighboring community teak plantations to identify 'best practices' for smallholder teak production. Thirty farmer representatives participated in the visit. The visit was followed up by a Focus Group Discussion (FGD), which was attended by around 60 farmers to discuss their challenges with teak production and possible solutions. A literature review of relevant teak management and smallholder timber management documents was also conducted. Findings were reviewed with farmers, the project team, and other relevant stakeholders in various venues. A technical report on current management practices on smallholder teak plantations was included in the Second Annual Project Report in May 2009.

In the year two (June 2008 to May 2009) the silviculture team initiated work on the other two activities. Information generated from the first activity was beneficial to the activity implementation in year two. The silviculture team met after the first annual meeting to initiate design of the farmer trials. Draft designs were available in August 2008. A silvicultural trial design workshop and training was conducted with 60 farmers and team members in September 2008. Six trials were finalized and established with the participation of 40 farmers and team members in November 2008; three trials focused on thinning and pruning and the other three trials focused on singling (coppice thinning). Thinning was tested at two levels: control and maximum of 40%-45% (targeting tree density of 625/ha). Pruning was tested at three levels: control, 50% of total tree height, and 60% of total tree height. Singling was tested at two levels: control and thinning to one stem. All trials were established in even-aged farmer plantations of 4-6 years old. Data collection was conducted every six months. Farmers were actively involved in all stages of trial design, establishment, and data collection. Trials were subsequently used as venues for farmer days and field trips to promote appropriate silviculture practices.

The Project Team completed the first draft of the silviculture manual in August 2008, which was then reviewed by the silvicultural team and other forestry professionals. After consolidated input from all sources, the next draft of the manual was field tested with 93 farmers and 14 extension staff in September 2009. Following an additional internal review of the input from farmers and extension staff, the manual was published in 2010 in a Bahasa Indonesia version and distributed to relevant stakeholders. The manual was developed based on the knowledge of the silviculture team, input from other forestry professionals, a review of relevant literature regarding teak and smallholder timber management, results of the farmer trials, and input from farmers.

The English version of the manual has also been published and will soon be distributed to related stakeholders. Both versions are available on the CIFOR website. Key information from the manual has been published as posters and handouts to extend practical silviculture information to teak farmers and other stakeholders. The manual has been used to support the implementation of farmer days. Table 5 summarizes outputs/milestones and other critical information regarding the three activities under the silviculture objective.

Table 5. Achievements under objective 1: Introduce and adapt silvicultural technologies that improve returns for smallholder teak producers.

No.	Activities	Outputs/ Milestones	Completion Dates	Comments
1.1	Identify and evaluate current and potential silvicultural management practices, through participatory rural appraisal, and review of company and smallholder experiences nationally and globally.	Evaluation of current and potential silvicultural practices internalized by farmer partners and local extension agencies.	<ul style="list-style-type: none"> - Field activities to collect baseline data (the household survey, Participatory Rural Appraisal (PRA), Focus Group Discussion (FGD), cross-visits and smallholder plantation inventory) were completed in March 2008. - The household survey and farm inventory data are available in SPSS and excel formats. - The technical report was completed and submitted with the second annual report. - The main findings have been presented at four forums: the Second Annual Project Meeting in Yogyakarta, February 2009; the World Agroforestry Congress in Nairobi, Kenya, August 2009; the International Seminar on Plantation Forest Management in Bogor, November 2009; and the Joint ICRAF-CIFOR Board Meeting in Yogyakarta, November 2009. - The findings have also been shared at local and national meetings. 	<ul style="list-style-type: none"> - The technical report entitled "Smallholder Teak-based Farming Management in Gunungkidul, Yogyakarta: Current Practices, Obstacles and Improvement Options" is attached as Appendix 1. - Posters presented at 2 international forums - Updated with findings from project activities implemented in Year 3 and 4, the technical report will be presented as a book chapter entitled 'Silvicultural practices to improve returns for smallholder teak producers'.

1.2	Conduct a series of farmer silvicultural trials using existing smallholder plantations.	Farmer Demonstration Trials (FDT) established in collaboration with farmer partners and used as a training venue to enhance the technical capacity of farmers.	<ul style="list-style-type: none"> - Participatory trial design was conducted with landowners of the trial sites and other interested farmers in September-November 2008. - Data collection from the trials was conducted every 6 months. - The trials were used as venues for Farmer Filed Days in October 2009 and February 2011 to enhance farmers' awareness of silvicultural management and the benefits of those practices. - The trials were used as venues for the Joint ICRAF-CIFOR Board Meeting and local leaders. 	<ul style="list-style-type: none"> - Design, establishment, and data collection involved the active participation of farmers. - The trials proved to be effective tools to demonstrate the benefits of proper silviculture practices, enhance farmers' knowledge and skills, and foster farmer adoption. - Data from the trials will be used to write a research article for an international journal.
1.3	Develop and evaluate guidelines for improving smallholder teak production.	Manual on best silvicultural practice for smallholder teak production developed and in use by farmer partners and local extension agencies.	<ul style="list-style-type: none"> - First draft of the field manual was prepared in August 2008. The draft was reviewed by colleagues on the project silviculture team. - The second draft was reviewed by other forestry professionals. - The third draft was field tested by 93 farmers and 14 extension staff in September 2009. - The fourth draft was internally reviewed in silviculture team during the first quarter 2010. - The final manual was published in bahasa version and distributed in 2010. - The manual was translated to English, reviewed and revised in the first quarter of 2011. - The English version of the manual was published in June 2011. 	<ul style="list-style-type: none"> - The manual was developed based on the knowledge of the authors and a review relevant literature regarding teak management and smallholder timber management. - The manual was revised based on results from the trials and input from other members of the silviculture team, other forestry professionals, and farmers. - The English version of the manual was revised to address conditions relevant to farmers across the tropics. - The English version of the manual is presented in Appendix 2.

The second project objective is to identify and design financing schemes providing incentives for smallholder participation in profitable teak production. This objective was approached through three main activities, i.e. undertaking participatory financial and economic analysis of current management practices, including social and ecological costs and benefits; evaluating rural financing schemes, financing behavior, and the relevant policy and regulatory frameworks, through participatory appraisal and review; and developing and testing model of financing schemes. Achievements under this project objective are presented in Table 6.

Activities 1 and 2 under this objective were started simultaneously in Year 1. As part of activity 1, baseline data on the economic aspects of current teak plantation management practices were collected through a household survey and FGD (see activity 1.1). Data were analyzed and the main findings were presented in many occasions, including during the project's second annual

meeting and at a national symposium held in Bogor in 2009. An additional survey on financial aspects of smallholder teak plantations was completed in February 2010. The survey collected financial data that were required for the Net Present Value (NPV) and Benefit-Cost Analysis (BCA). Findings of the analyses were presented in an international conference in Montpellier, France in March 2010. The findings were also included in a poster presented at the Indonesian Wood Researchers Association (IWoRS) Annual Seminar in November 2010.

As part of activity 2, the behavior of rural financing schemes was studied using the household survey data, and followed up through in-depth interviews with some key informants. The main findings were presented during the project's second annual meeting in 2009 and the report was attached to the project's second annual report. In 2009 the project team reviewed government policies and regulations on micro finance and conducted some visits to financing institutions in the project area. The report was documented and attached to the project's third annual report in 2010. In Years Three (June 2009 to May 2010) and Four (June 2010 to May 2011) the project team combined previous findings obtained in Year 1 and 2 with the analysis to identify the determinant factors that influenced household access to credit. The results were then fed into a proposed scenario for financing smallholder teak plantations as part of activity 2.3. The summary of findings about financing schemes for smallholder teak plantations was recently presented in the project seminar held in Yogyakarta in May 2011. In addition, recommendations on micro finance to support smallholder teak plantations were included in the project policy brief and delivered to the Government of Gunungkidul District (see Appendix 6).

Analyses of the household survey data and subsequent activities, such as PRA and FGD completed in 2008 identified potential financing schemes that would fit with smallholder conditions. This knowledge was used to develop appropriate models of financing for smallholders. Through intensive participation by smallholders in various activities, including cross-visits and group discussions, the project team facilitated ten farmers groups to establish a micro finance institution named the *Lembaga Kredit Mikro (LKM)* Gunung Seribu. The project team provided some technical assistance to this new institution to familiarize farmers with collective action in micro financing. The lessons learnt from this LKM were analyzed and the results were presented in the project seminar held recently in Yogyakarta in 3rd May 2011.

The third project objective is to enhance market access by smallholder teak producers. The objective was approached by three activities, i.e. evaluation of the production to consumption chain, including current processing options; review of policy disincentives that hinder smallholders' production, marketing and processing of teak; and conducting action research with smallholder teak producers to improve their market linkages and derive best practice marketing guidelines. Achievements under this project objective are presented in Table 7.

The activities were started by collecting information regarding teak marketing practices by smallholders and other actors in the marketing chain at the project sites. Data collection was conducted through the household survey in the Year 1, followed by in-depth interviews with local traders. Data analysis was documented in a report titled "Community Teak Wood Marketing in Gunungkidul District, Yogyakarta Province", completed in 2009. In improving market awareness of smallholders, cross-visits to some teak furniture industries in Jepara were conducted in November 2007. Thirty farmers' representatives participated in this activity. Training was provided to farmers to introduce the potential market of certified teak products. Working in collaboration with the USAID SENADA project, the project team conducted training on Verification of Legal Origin (VLO) and Wood Tracking System in 2008 and together developed a manual on Implementation of VLO standards for the furniture industry. Collaborating with farmers and traders, the project team developed a method for valuing standing teak trees. This method would be useful for smallholders in estimating the price of teak stands and help them in negotiating a selling price.

Table 6. Achievements under objective 2: Identify and design financing schemes that provide incentives for smallholder participation in profitable teak production.

No.	Activities	Outputs/ Milestones	Completion dates	Comments
2.1	Undertake participatory financial and economic analysis of current management practices, including social and ecological costs and benefits.	Financial and economic assessment of the current management practices (including assessment of gender equity) evaluated with farmer partners, local development agencies.	<ul style="list-style-type: none"> - Baseline data of current management practices of smallholder teak plantations was collected through the household survey that was completed in March 2008. - Main findings from the household survey were presented at project second annual meeting in May 2009 and the Indonesian Wood Researchers Society (IWoRS) Symposium in November 2009. - Additional surveys on financial aspects of smallholder teak plantations were completed in February 2010. - Research findings from the household and financial surveys were presented in an international community forestry conference in March 2010, in Montpellier, France. - A poster summarizing the research findings was presented at The IWoRS Annual Seminar in November 2010 in Bali. 	<ul style="list-style-type: none"> - The household survey data was collated in SPSS format. - The financial survey data of smallholder teak plantations was collated in SPSS format - A conference paper was presented in Montpellier. - A poster was presented at the IWoRS Annual Seminar
2.2	Evaluate rural financing schemes, financing behavior, and the relevant policy and regulatory frameworks, through participatory appraisal and review.	Scenarios of cost effective smallholder financing schemes with minimal risks and consequences to tree producers discussed and evaluated with key financing and government institutions.	<ul style="list-style-type: none"> - Rural financing behavior was analyzed using the household survey data that was completed in March 2008. Preliminary analysis of this financing behavior was presented during the second project annual meeting. - Review of government policies and regulations on micro finance, and the linkages among them with the existing microfinance institutions were conducted in 2009 and the report was presented in the 2010 project annual report. - Determinant factors that influencing household access to credit was analyzed and the results were presented during the project seminar in May 2011. - Integrated policy brief, covering the whole project themes was presented to the Government of Gunungkidul District in January 2011 and during the project seminar in May 2011. - An integrated report of this financing scheme will be presented as a book chapter as an additional output of the project. 	<ul style="list-style-type: none"> - Preliminary analysis report was prepared in Bahasa on rural financing behavior - A review was prepared in Bahasa of government policies, regulations and the linkages among them and the existing microfinance institutions - The integrated policy brief is presented in the Appendix 6.

2.3	Develop and test model financing scheme.	Model for sustainable financing scheme for smallholders (that do not disadvantage women or marginalized groups) discussed and evaluated with farmer groups, local development agencies, key policy decision makers.	<ul style="list-style-type: none"> - The identification of potential financing schemes was conducted through analyses of data collected by the household survey, PRA and FGD. Those activities were completed in 2008. - Several cross-visits were completed to provide farmers with experiences on micro finance institutions. The first cross-visit was completed in November, 2007 during the study tour that was attended by some farmers' representatives. Cross-visits by the project team to farmers' organizations were intensively conducted during August 2008 to February 2009 at nine farmer groups in Gunungkidul. The last cross visit was conducted in January 2011, participated by several farmers' representatives from Gunungkidul to visit some advance micro finance organizations in Bogor. - Some training was provided to farmers' organizations during August 2008 to February 2009. A workshop on cattle rising was completed in November 2009. - The project facilitated ten farmers' groups to establish a microfinance institution, named as <i>Lembaga Kredit Mikro (LKM) Gunung Seribu</i>. Facilitation and technical assistances were provided to this organization to develop collective action on micro finance and teak marketing. The facilitation includes assistances to link the organization with teak wood industries and other development agencies. 	<ul style="list-style-type: none"> - The lessons learnt from assisting farmers' micro finance organization show some major challenges related with the organization capacity. These lessons were discussed in a report that will further be presented as a book chapter entitled "Financing Schemes to Support Smallholder Participation in Profitable Teak Production". - A policy brief related with the micro financing scheme was provided in the Appendix 3..
-----	--	---	---	--

As part of activity 2, the project team reviewed government policies and programs related to the smallholder teak plantation system in Gunungkidul district. A policy brief specifically addressing teak marketing aspects was produced in 2010. The policy brief entitled "*Strategi Pengembangan Industri Berbasis Jati*" had as its main message the suggestion that the Government of Gunungkidul foster the development of smallholder teak processing industries. Engagement of smallholders in teak processing would increase the added value of teak and share of income from teak in the household income structure. The project team also took notes on the regulation of wood transport documents. The current system through the application of *Surat Keterangan Sahnya Hasil Hutan (SKSHH)* and *Surat Keterangan Asal Usul Kayu (SKAU)* tends to create high transaction costs in teak marketing. Suggestions to eliminate or simplify this regulation has been forwarded to the Government of Gunungkidul District in the integrated policy recommendation given by the project (see Appendix 6).

The ultimate goal of this project objective concerning marketing aspects is to establish better linkages between smallholders and timber buyers (traders and industries) and motivate farmers to embrace better marketing strategies. This objective was advanced using action research under the activity 3.3. In this activity, the project team combined all knowledge and experiences gathered from activities 3.1 and 3.2 to improve farmers' capacity to establish linkages and apply best practices in teak marketing. The project team and farmers learned together through implementing various activities, which included cross visits, FGD and training. The existence of

the LKM Gunung Seribu also provides avenues for learning in smallholder collective marketing of their teak trees.

Table 7. Achievements under objective 3: Enhance market access by smallholder teak producers

No.	Activities	Outputs/ Milestones	Completion dates	Comments
3.1	Evaluate the production to consumption chain, including the current processing options, through rapid market appraisal (RMA).	Market awareness of farmer partners and local development agencies enhanced.	<ul style="list-style-type: none"> - Analyses of data collected through the household survey (completed in 2008), combined with in-depth interviews with nine local traders (completed in July 2008) and cross-checking data on teak log prices produced a report discussing market specifications, market agents and their roles, market channels, current processing practices, and problems and opportunities. The report is titled "Community Teak Wood Marketing in Gunungkidul District, Yogyakarta Province". - Cross visit to some teak furniture industries in Jepara was conducted in 2007 and followed up by an FGD to share and discuss of the experiences. - A manual for "Verification of Legal Origin (VLO) Standards for the Furniture Industry" was completed. The manual was developed in collaboration with and published through the USAID SENADA project. This manual provides practical steps to verify the legal origin of teak timber along the chain from trees to furniture products, and hence useful on marketing of certified products. The manual was used in teak marketing training participated by 50 farmers and traders in 12-13 February 2008 - A method for valuing standing teak trees was completed in 2009. The method can be used for estimating the price of teak trees and used by teak producers to improve their bargaining power on teak marketing. 	<ul style="list-style-type: none"> - The report provides general description on smallholder teak market system in Gunungkidul district. The report is Appendix 4. - The manual of VLO standard is available only in hard copy. - Standing Tree Valuation method was embedded as an attachment in the silviculture manual of smallholder teak plantations.

3.2	Review policy disincentives that hinder smallholders' production, marketing and processing of teak.	Policy briefs to address regulatory disincentives that hinder the development of smallholder timber marketing discussed with key policy decision makers.	<ul style="list-style-type: none"> - Two policy briefs were produced. The first one is a marketing strategy paper entitled "<i>Strategi Pengembangan Industri Berbasis Jati</i>" and was completed in 2010. The second discusses strategies to build a strong microfinance institution. - A booklet, summarizing main findings from the project activities, was completed and presented during the joint CIFOR and ICRAF BOT field visit to project location in November 2009 - An integrated policy recommendation, covering the whole aspect of the project was presented to the Government of Gunungkidul in 14 January 2011. This policy brief was based on research findings and lessons learnt derived from the project. 	<ul style="list-style-type: none"> - Microfinance and marketing policy briefs are presented in the Appendix 3. - The booklet is provided as Appendix 5. - The integrated policy recommendation is presented on the Appendix 6.
3.3	Action research with smallholder teak producers to improve their market linkages and derive best practice marketing guidelines	Market linkages established between smallholders and timber buyers, and best practice marketing guidelines in use by farmer partners and local development agencies (including a focus on women and marginalized groups to ensure equity in project benefits).	<p>Many activities have been completed to build strong linkage between smallholder teak producers, teak traders and teak wood industries. These activities comprises among others:</p> <ul style="list-style-type: none"> - Cross-visit to teak furniture industries in Jepara was conducted in November 2007 and participated by around 30 farmers representatives, consisted of teak producers and teak traders. - Focus Group Discussion conducted in December 2007 was attended by 60 farmer representatives, including teak traders in the region. The FGD provide a venue for better understanding between teak producers and traders regarding market demand on teak qualities. - Training on Verification of Legal Origin and Wood Tracking System was conducted in February 2008. The training was attended by 60 participants including teak producers (38), local traders (12), NGOs (4), local journalists (4) and government officers (2) where 5% of the participants were women. - Assist collective teak marketing by smallholders through the LKM Gunung Seribu since the establishment of this LKM in 2009. - Farmer Field Day (FFD) was conducted in February 2011, attended by 80 farmers from the 7 villages of project sites. Two companies and a large scale furniture association representative from the teak industries were invited as resource persons to discuss potential collaboration between teak producers and teak industries. 	<ul style="list-style-type: none"> - All activities, including the cross-visits, FGD, training and FFD have provided avenue for teak farmers and traders to collaborate in the improved marketing strategies. Teak producers became more market-oriented, including raising their awareness of value-added options to maximize the value of smallholder timbers. Traders and teak industries acknowledged for further collaboration with famers and farmers associations. - FGD and training report were prepared - The microfinance organization (<i>LKM Gunung Seribu</i>) provides opportunities for teak producers on collective marketing.

7 Key results and discussion

Key results of the project are presented in sequence following the three main themes of the project, including findings from the silviculture, micro credit and marketing themes. General recommendations of the project are presented at the end of this section.

The main results have been disseminated through various media, including through seminar papers, presentation materials or posters at several project annual meetings and at national and international seminars or conferences. Some of the results have been published, although none has been published in referred scientific journals. Some project reports are being processed for submission to various scientific journals. A list of publications that have been produced are presented in Section 10.2 of this report. A technical report book that will summarize key results of this research project is under preparation and will be an additional result of this project.

7.1. General overview of smallholder teak plantations in Gunungkidul district

Based on a literature review, teak was introduced from India to Java by Hindu missionaries around the second century. Teak extraction and use for ship building in Java may have started in the 10th century. The first teak plantations in Java are believed have been located in the areas of Bojonegoro and Madiun during the 13th century (Simatupang, 2000). The Dutch colonial government established intensive teak plantations in Java in the late 19th century (Simon, 2000). In 1963, the responsibility to manage teak plantations in Java was given to Perum Perhutani, a state owned company (Simon, 2000).

In Gunungkidul district, smallholder-initiated teak plantations were widespread by the mid-1960s. Another writer (Sutarpan, 2005) stated that smallholder teak plantations on private lands were initiated around 1946 in Pringsurat village, in the sub district of Nglipar. Sutarpan (2005) furthermore states that by the mid-1960s, when state owned teak plantations in Nglipar were heavily threatened by illegal logging, the teak on private land was safe and maintained. Personal communications with several senior farmers and key informants⁷ revealed that smallholder teak plantations attracted many farmers in the early 1980s. By this time teak was being used as an alternative household asset for future income. Taufik (2001) stated that the central government initiated a reforestation program in 1980 and this may also have influenced the development of smallholder teak plantations in the Gunungkidul area.

Smallholder teak plantations grow vigorously in the district of Gunungkidul. In 1950s, this region was well known as a degraded area with little vegetation. The total forest cover was only about 3% (Filius, 1997). At present the forest cover has reached around 41,773 ha or about 28% of the total district area. More than 68% of the forest area is smallholder teak plantations (Gunungkidul Regency, 2005).

Household survey data show that most smallholder teak growers (63%) occupy less than 1 ha of land and many even less than 0.5 ha (37%). Only about 12% of farmers manage land areas of more than 2 ha (see Figure 2). With this limited land ownership, however farmers allocate around 10% of their lands on average for growing teak in a woodlot system, locally known as *kitren*. Farmers also plant teak trees on their lands that they mainly use for agricultural crop production, locally known as *tegalan*, as well as in their home gardens (see Figure 3). More detailed explanations of this teak based farming system are discussed in the next section.

⁷ Some senior farmers were interviewed at the beginning of project implementation to collect information related to the history of smallholder teak plantations in the project sites. Informants included Bapak Somo Jamin in Katongan village and Bapak Wirorejo in Kedungkeris village.

Figure 3 shows that teak is an important timber commodity in farmers' farming systems in this region.

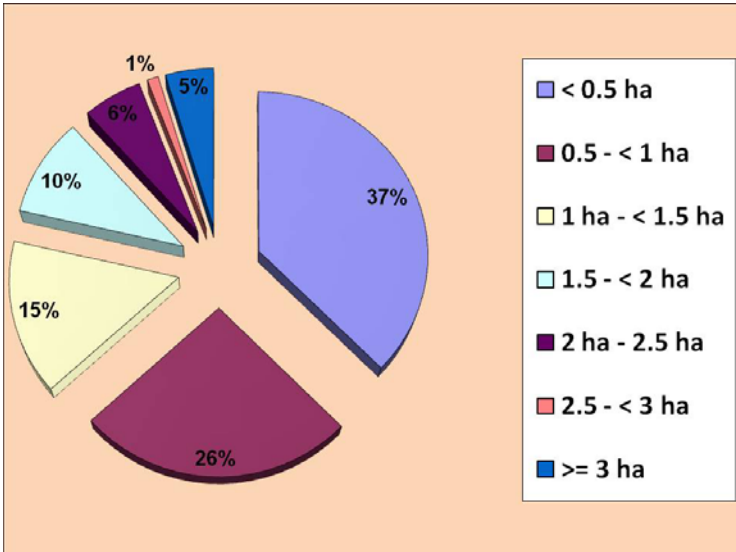


Figure 2. Land occupation of smallholder teak producers at Gunungkidul district

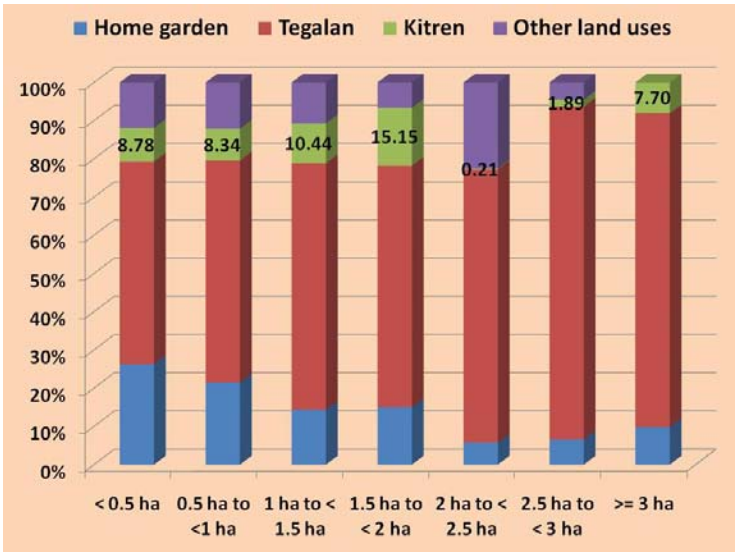


Figure 3. Land use allocation among smallholder teak growers

The important position of teak in the household farming system is also reflected by the household income structure as presented in Figure 4. Figure 4 shows that farmers tend to diversify their income sources and teak sales contribute about 12% of the household income. As revealed by the household survey, teak trees serve as household saving accounts, which if necessary can be cashed in to fulfill urgent household needs, such as income during hard times, support for wedding ceremonies or for sending children to school. Farmers in Gunungkidul usually sell their teak trees as the last resort, when other resources such as motorcycles, electronic goods, jewellery and dairy animals are unavailable. The harvesting time of smallholder teak therefore depends on farmers' needs for urgent cash. This practice phenomena of harvesting teak trees to fill urgent needs is locally known as *tebang butuh*.

Figure 4. Teak sales as share of household income by different sizes of landholding.

7.2. Key findings from silviculture activities

The first silviculture activity on \ was to understand the typology and current management practices of smallholder teak plantations. The household survey interviews and farm inventories on 227 parcels of farm land revealed four main categories of smallholder teak plantation systems. These teak farming systems are:

- Tegalán system is a rain-fed farming system that produces both teak and agricultural crops. In this system teak is planted in an agroforestry system. In general, tegalan is located around 1 to 1.5 km from the farmers' houses.
- Home-garden system, a land use system situated adjacent to farmers' houses. In this system also teak is generally interplanted with agricultural crops or other tree species. Due to its location, the home-garden received the most intensive maintenance by farmers. Fruit trees are commonly found in home-garden systems.
- Kitren system, a rain-fed smallholder woodlot system where the main objective is teak production. Agricultural crops may also be cultivated during the earlier stage of teak plantation. Kitren is usually located at 1 to 1.5 km from farmers' houses, similar to tegalan.
- Sawah system, an irrigated rice production system. Teak is commonly planted along the borders at wide spacing.

The illustration of these land use system is presented in Figure 5. The key characteristics of each teak system are presented in Table 8. As shown in Figure 3, the tegalan system dominates farmers' land use systems and occupies on average around 69% of total farmers' land areas. Most farmers (82%) practice tumpangsari or intercropping of agricultural crops and teak, with the timber trees benefiting from fertilization of food crops. Various agricultural crops are cultivated in the agroforestry system with the most common commodities being rice (*Oryza sativa*), cassava (*Manihot utilissima*), peanuts (*Arachis hypogaea*), soy beans (*Glycine max*), corn (*Zea mays*), bananas (*Musa spp*) and other vegetables.



Figure 5. Different systems of smallholder teak plantations at Gunungkidul district
(a) Kitren (b) Tegalán (c) Homegarden (d) Sawah

Table 8. Typology of smallholder teak plantation system at Gunungkidul District based on farm inventory.

Land use system	% from the total parcels	Average size	% from the total land area	Average number of tree species	Average number of trees
Tegalán	53.9	0.32	66.5	8	1,072
Pekarangan	23.8	0.16	14.7	13	1,177
Kitren	9.1	0.24	8.5	5	1,532
Sawah	8.5	0.24	7.8	7	138

Some significant impediments to profitable smallholder teak plantations were identified in their poor silvicultural techniques that lead to low quality of teak timber produced from smallholder plantations. Teak trees are established half by natural regeneration and half by planted seedlings. When planted, teak is usually planted close together, at 2 x 2 m or 2 x 3 m planting distances. Most teak growers continue to depend on natural regeneration of their teak seedlings, either through natural seedlings or wildings (about 70% of the teak growers) or local nursery seedlings (about 30% of the teak growers). About 20% of teak growers also depend on coppicing for teak regeneration. Few teak growers (only 12%) have started to use improved seedlings for the plantations. Smallholders have difficulty in accessing higher quality teak seedlings.

Teak stand management is non-intensive. Most farmers do not fertilize teak, except during intercropping with agricultural crops. Teak trees also benefit from weed control and soil cultivation carried out to improve the production of agricultural intercrops. Most farmers do not practice thinning and pruning for high quality timber. Thinning is more likely to be carried out on high grade timber, as farmers often cut the biggest tree to sell when they need the cash. Some farmers (about 65%) practice pruning, but mainly to collect fuel wood from branches, rather than controlling timber quality. Branches are cut using a machete, leaving 15-20 centimeter long-branch stubs. Growers lack motivation to improve their silvicultural practices because of their limited knowledge and capital as well as the lack of market incentives.

Current smallholder silviculture practices lead to overstocking of teak plantations, slow growth, low productivity as well as low timber quality. The prevailing smallholder harvesting model, 'tebang butuh' system, does not necessarily reduce the quality of teak timber, if the harvesting is restricted to trees that have reached a minimum diameter. However, farmers are often forced to sell their teak trees below optimal size due to their urgent need for cash. The practice reduces farmers' future opportunity to gain more profit by selling larger diameter trees. These conditions suggest that improving silviculture practices alone would increase economic benefits to farmers. For optimal benefit to farmers, improvement of silviculture practices should be combined with providing farmers with micro credit that would prevent them from cutting teak trees below optimal sizes.

The project established six farmer demonstration trials (FDTs) to apply and show the benefits of best silviculture practices to teak production. Measurements of tree growth on these FDTs showed that thinning and pruning treatments improve diameter growth. The effects were more noticeable during rainy seasons, whereas during dry seasons differences between treatments and controls are smaller and not significant. Figure 6 shows that the effect of silviculture treatments reached the highest points during September and November to May where rainfall is

high. Average annual increment over the 2-year period shows that the thinning-60% pruning treatment increased diameter at breast height (DBH) by 60% and tree height by 124% compared to the control (no pruning, no thinning). The effects were also noticed at singling treatments (see the Figure 7) that show farmers the benefit of managing teak coppice by thinning to a single healthiest stem. The following conclusions can be drawn from the 2-year FDT trials. Thinning has positive impacts on DBH and height growth increment. Pruning had a positive impact on growth increment for the first measurement period following pruning (6 months). Diameter at breast height growth increment was also statistically significant, but the statistical significance of height growth increment was inconsistent.

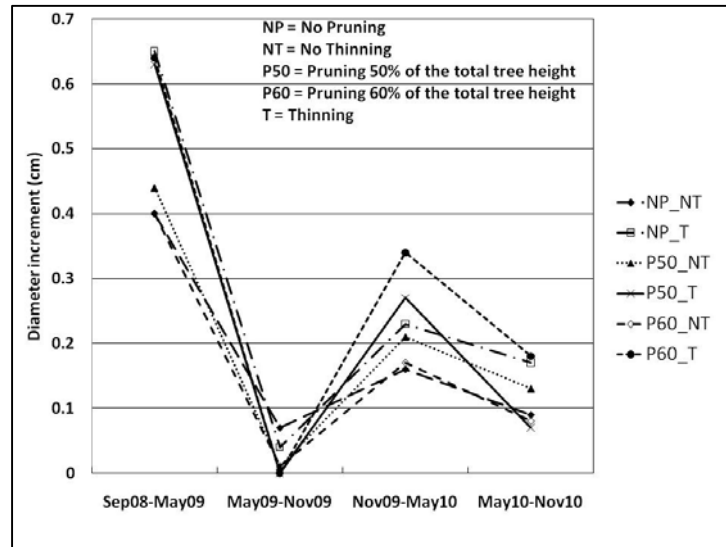


Figure 6. The effect of thinning and pruning on tree growth.

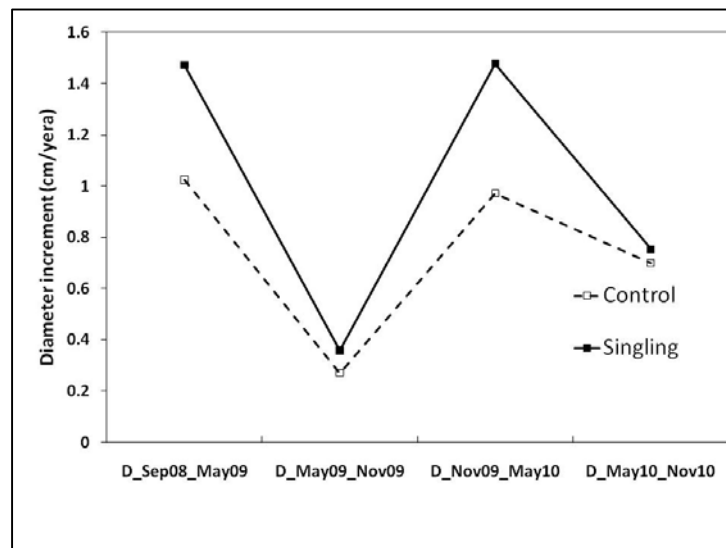


Figure 7. The effect of singling treatment on tree growth.

Besides their research value, the FDTs also provided an opportunity for teak growers to learn and apply recommended silvicultural practices. The FDTs also served as venues for training activities. During the project 400 farmers received silvicultural training in the FDTs. Additionally, more than 50 farmers adopted silviculture practices in their own plantations after observing

results in the FDTs. The FDTs are an excellent public relations tool for any interested farmers or practitioners to see the advantages of appropriate silviculture practices.

The project produced a manual for smallholder teak plantations in two language versions. The manual was based on the experience of team members, a review of relevant literature (approximately 100 documents), input from other silvicultural professionals, and field testing by farmers and extension officers. The bahasa version is titled "*Pengelolaan Hutan Jati Rakyat: Panduan lapangan untuk petani*" and has been printed in 400 copies and distributed to key stakeholders in Gunungkidul district, including farmers, forestry extension officers, NGOs and some related district government officers. The manual also was distributed to other related institutions within the Ministry of Forestry. The English version (Appendix 2) is titled "Managing Smallholder Teak Plantations: Field guide to farmers" and soon will be printed and distributed. Both versions are available on the CIFOR website (<http://www.cifor.org/nc/online-library/search/publication-search-by-author/search/Fauzi%2C%20M.A..html>).

The manual contains practical guidelines for managing smallholder teak plantations, in particular on silvicultural practices. The content covers information related to seed and seedling procurement, planting, maintenance and harvesting of smallholder teak plantations. The manual was developed through a participative process with teak farmers and extension officers. The manual combines professional knowledge and experiences from project scientists, literature references and is enriched by collected information and lessons learnt through various project activities. Before publishing, the manual was reviewed by extension officers and meticulously corrected by teak growers for their use.

Project activities under the silviculture component, derived from the analyses of collected data and results as well as the active collaboration of farmers and other stakeholders, yield the following conclusions and recommendations for improving economic returns for smallholder teak producers:

- (a) Smallholder teak plantations differ from industrial teak plantations in many ways, including the size of operation, objectives and management practices; and the potential for improvement in production and timber quality. Current harvesting systems with teak trees cut when farmers need urgent cash is not necessarily bad for sustainable production, as long as farmers cut the trees after they reach optimal sizes and can yield profits. Farmers should be helped to prevent them from having to prematurely harvest, significantly reducing the potential benefits of teak plantations.
- (b) Productivity and quality of smallholder teak plantations could be improved if farmers adopt better silvicultural practices, specifically: the use of quality germplasm (seed and seedlings); thin stands to medium stocking (625 trees/ha at 4-6 years); prune trees to 60% of total height and do not leave branch stubs; and thin coppice to one healthy stem. It is also noted that farmers would benefit from training to establish and operate tree nurseries, to produce quality seedlings for their own use and market sale.
- (c) Farmers need some help to have a better access to improved teak seeds or seedlings.
- (d) Improving farmers' silvicultural knowledge and skills can be achieved by providing farmers with practical silviculture information, combined with field assistance regarding how to apply these silvicultural practices. The continued management of FDTs at the project sites should be conducted by the District Forestry Office and used as a vehicle for promoting best silviculture practices and training farmers.
- (e) The silviculture manuals (both languages) provide practical guidance for smallholders in applying best silvicultural practices. The project recommends that the District Forestry Office and local NGOs upscale this manual for wider training programs within the district. At

the national level, the project recommends that this manual be used in their training program to improve farmers' knowledge and skills in silvicultural management of teak and other timber species.

- (f) The project recommends to the smallholder teak growers and related institutions to adopt these project findings on silvicultural aspects and integrate these findings with other recommendations as proposed by other project themes on the aspects of micro financing and marketing schemes.

7.3. Key findings from the microfinance aspect

The household survey results provide an overview of the role of teak plantations in the household income structure. The contribution from teak sales to household income (that is about 11.6%) is important in farmers' strategies of income source diversification. The additional survey conducted with 31 farmer respondents gave additional explanations of the financial aspects of smallholder teak plantations.

Benefit Cost Analysis (BCA) and Net Present Value (NPV) calculations of smallholder teak plantations based on the above survey are presented in Table 9. Table 9 presents financial analyses of two different teak-based farming systems, i.e. the kitren and tegalan. For kitren, we assumed monoculture teak plantation of 1 ha on a farmer's land. For the tegalan system, we took 5 samples of farming systems where most of the lands were used for agricultural crop activities, with some teak trees planted in an agroforestry system. A high degree of variability in the financial analyses was found with the tegalan system due to different types of agricultural commodities as well as management intensity applied by farmers. Table 9 shows that teak plantation (kitren) is financially feasible, although the benefit and cost ratio (BCR) in general is lower than with the tegalan system (crop plantations). When compared to other farming activities, such as food crops, teak plantations may not be the best option for farmers' investment due to low BCR and NPV. The advantage of teak plantation as seen on the Table 2 is the relatively low cost of plantation establishment.

Table 9. Cost and benefit analysis of smallholder teak-based farming system (per ha).

No.	Types of plantation	Cost of establishment		Maintenance cost until the first harvest		Potential income per month		Net Present Value		B/C ratio
		million Rp	US\$	million Rp	US\$	million Rp	US\$	million Rp	US\$	
1	Kitren system	3.51	369	1.03	108	0.83	88	15.07	1,586	2.35
2	Tegalan system:									
	- Respondent 1	1.67	176	1.58	166	0.44	47	44.62	4,697	4.31
	- Respondent 2	14.71	1,549	14.59	1,536	0.73	76	73.05	7,690	1.59
	- Respondent 3	5.14	541	4.99	525	2.18	230	220.43	23,203	6.21
	- Respondent 4	23.68	2,493	23.53	2,477	4.89	515	494.07	52,008	3.49
	- Respondent 5	7.97	839	7.87	828	1.45	153	185.40	19,516	3.20

The financial aspect seems not the only factor to be considered by farmers in the teak plantation business. As described in the previous section (see section 7.1), teak plays a very important role as the household saving account. The cost of planting teak and its labor requirement is considered relatively low, this make it suitable as part of farmers' strategies of diversifying sources of household income. The household survey data provided more explanations of the reasons farmers have for planting teak (see Figure 8). The figure shows that about 53% of

farmer' respondents plant teak for household savings and safety nets to help farmers during the hard times or difficulties. The other significant reason (23%) was the cultural aspect where planting teak has become a cultural heritage. Only a small portion (about 15%) of farmers who plant teak do so due to market influence, while the rest plant teak for various other reasons.

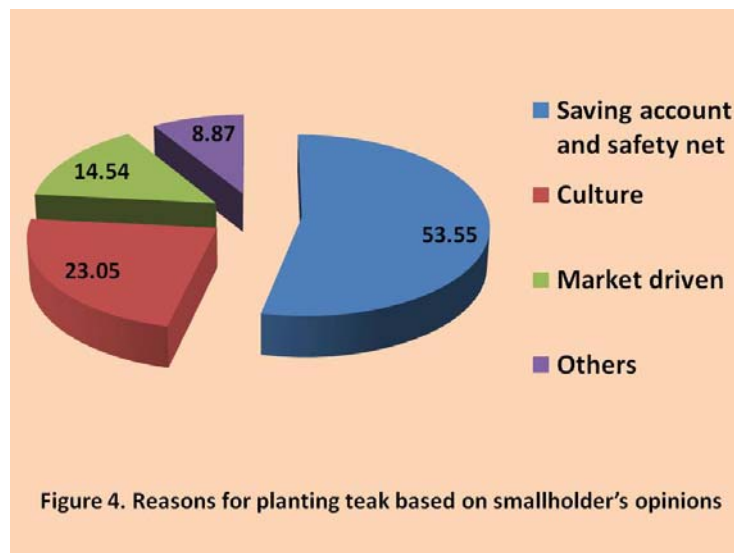


Figure 8. Farmers' perceptions of planting teak based on the household survey.

The household survey data analyses describe the financial behavior of farmers in meeting their daily needs or farming activities. Most of the farmers experienced financial difficulties and their strategies to fulfill their needs are described in Figure 9. As seen in Figure 9, most farmers (46%) tend to sell their agricultural products whenever they need cash. About 34% of the respondents tend to borrow money from relatives or other lending sources, whereas about 18% of the respondents choose to sell their livestock. Only a small proportion (2.3%) of the respondents will sell their teak trees to get cash. When household assets, as mentioned before are not available, then the majority of farmers (87%) would seek a loan. The results demonstrate the important role of cash loan availability for farmers to prevent them from selling their productive assets.



Figure 9. Farmers' strategy to fulfill their urgent need for cash

The amount of money needed by farmers as loans varies considerably and depends on the source of loans. From informal sources, loan size varies from only about Rp 50,000 up to about Rp 1 million with the average value of Rp 650.000. Most farmer respondents (67%) make use of such lending. The rest (37%) tend to borrow from formal or semi-formal sources, such as banks or other financing agencies. Their loans vary between Rp 100,000 and about Rp 10 million, with an average value of Rp 6 million. Different sources of formal and informal loans are shown in Figure 10. With informal sources, family relatives and Rotating Saving and Credit Associations (ROSCA) were the two most frequent sources of loans used by farmers. With formal or semi-formal sources, farmers typically used banks. The frequency of loans generally was higher in the case of informal sources than the formal sources.

The household survey also revealed that most of the loans were used to fulfill farmers' daily needs or urgent payments, such as children's school fees (see the Figure 11). Only about 12% of respondents were using the loans for long-term investment activities, such as purchasing fertilizers and farming equipment. This finding is important to consider by policy makers, especially within government or finance institutions, as many formal finance credit schemes initiated by the government and other finance institutions require farmers to submit a business plan document for their proposed loan.

There are some micro finance institutions operating in the District of Gunungkidul. These institutions and their micro financing schemes are summarized in Table 10. Despite their existence, smallholder teak growers in general have some difficulties in accessing loans, in particular if the loan is going to be used to finance their teak plantation business. Formal banks, both government and privately owned, are reluctant to provide credit for teak plantations for several reasons. These reasons include the high risk of the timber plantation business due to the long investment period and insufficient or unavailable collateral of farmers. Formal banks do not have specific credit schemes to finance this timber plantation business.

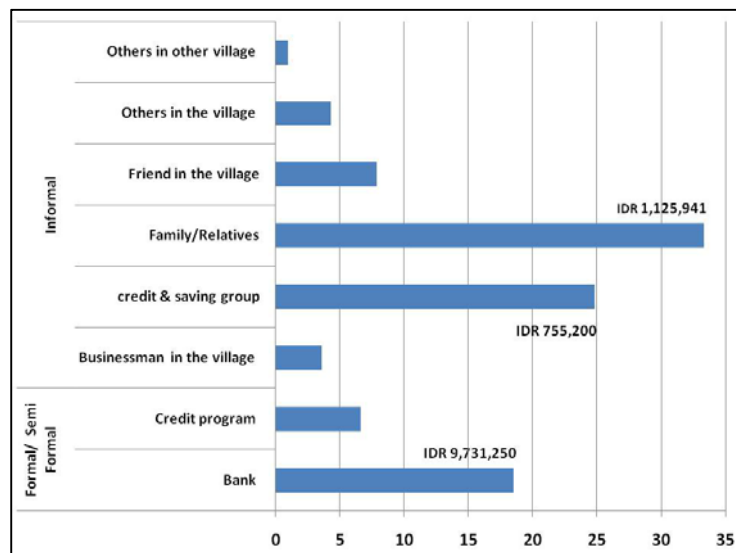


Figure 10. Common loan sources for farmers.

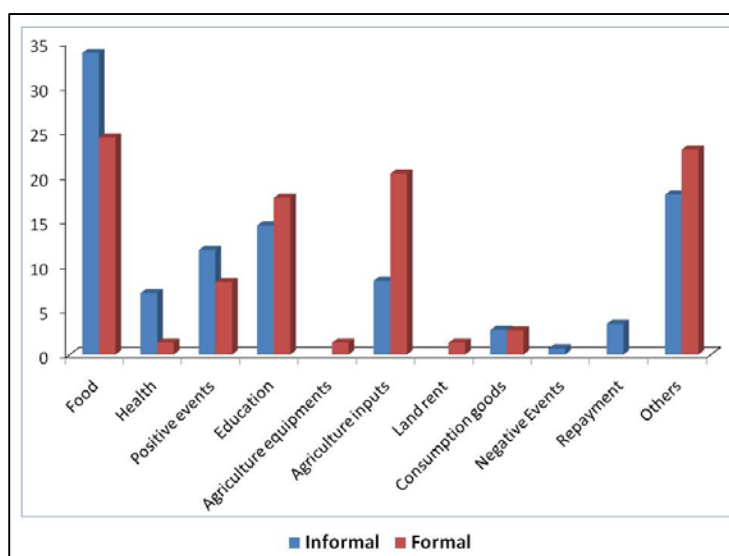


Figure 11. Uses of loans by farmers

The project however identified some potential strategies to improve smallholder access to loans. The access of farmers to loans could be improved through strengthening the institutional capacity of various ROSCAs which already existed and were widely employed by farmers. Improving the capacity of these ROSCAs and developing links between ROSCAs and some alternative lending institutions would help smallholder teak growers to have better access to capital to support their teak plantation activities. Based on this proposition the project team facilitated some farmers' groups to establish and develop a farmers' micro finance institution. This institution was established in February 2009 and named the Lembaga Kredit Mikro (LKM) Gunung Seribu. Ten farmers' groups, which in total covered around 300 farmer households joined this institution. The initial capital was provided by the project in the amount of Rp 30 million. This capital was provided as a revolving fund to add to the member fee of Rp 150,000 for each group member. The objectives of this LKM were determined by the member farmers' groups, while the project team assisted with the administration and organizational development. Some training to improve organizational capacity of this LKM were provided by the project. The main activities of the LKM were initiated by supporting group members with collective marketing of their teak.

Table 10. The operating micro finance institutions in Gunungkidul district.

No .	Micro finance institution	Target groups	Mechanism	Initiator	Constraints
1	Bank Perkreditan Rakyat (BPR)	Public Usaha Mikro Kecil dan Menengah (UMKM) or Micro Small and Medium Scale Enterprises	<ul style="list-style-type: none"> - Loan/business plan - Collateral (land certificate, vehicle certificate or Buku Kepemilikan Kendaraan Bermotor/BPKB) - Interest rate: 2–2.5% per month 	Bank of Indonesia (BI)	<ul style="list-style-type: none"> - The requirement for collateral restricts some target groups. - High interest rate - Complicated procedures and high transaction cost
2	Baitul Mal wa Tanwil (BMT)	Public Small and Medium Scale Enterprises	<ul style="list-style-type: none"> - Loan/business plan - Collateral (land certificate, vehicle certificate) 	Pusat Inkubasi Bisnis Usaha Kecil (PINBUK), Ministry of Cooperative and Small-scale and	<ul style="list-style-type: none"> - The requirement for collateral restricts some target groups. - High interest rate

			- Profit sharing	Medium Enterprises	- Complicated procedures and high transaction cost
3	Cooperative (Koperasi)	Cooperative members	- Proposal - No need for collateral for the permanent members	Ministry of Cooperative and Small-scale and Medium Enterprises	
4	Program Nasional Pemberdayaan Masyarakat (PNPM)	Poor community groups	- Interest rate varies from 1.5 to 2% per month - Business proposal with 20% interest rate per year	Coordinating Minister of People Welfare or Menteri Koordinator Kesejahteraan Rakyat (MENKO KESRA)	- Restricted to very poor individual.
5	Program Penanggulangan Kemiskinan di Perkotaan (P2 KP)	Objected for infrastructure development	- Grant (infrastructure facilities) - 2. Interest rate 18% per year for loan.	MENKO KESRA	- Restricted target groups
6	Pengembangan Usaha Agribisnis Pedesaan (PUAP)	Farmers, through farmers' group association (GAPOKTAN)	- Business proposal - Interest rate 5% per month (3% will be delivered to GAPOKTAN, 1% returned to the lending institution, 1% for administrative fee)	Ministry of Agriculture	
7	Unit Pelayanan Pinjaman Kegiatan Produktif (UPPKP)	District UPPKP	- For the first loan, the maximum amount is Rp. 5 million. - Interest rate 0.5% per month.	District Agriculture Office of Gunungkidul	Restricted to agriculture production inputs.

After two years of the project team's assisting and providing supervision for the activities of the LKM, there are some important lessons that need to be considered in developing micro credit institutions at farmer level. The first lesson is that organizational capacity is very important for developing the ability of LKM to provide services to its members. The LKM needs support in creating trusted leadership and effective control mechanisms by the members. The LKM also needs relatively intensive assistance from development agencies, in particular at the initial stage of operations. Among other lessons are that the business units of LKM should not be limited only to savings and loan services, but need to be tailored to farmers' needs and their financial behavior. Therefore, the services provided by the LKM need to give attention to some specific conditions, such as support for farmers who are experiencing emergencies or illness. The function of the LKM should integrate financial and non-financial services such as is presented in Figure 12.



Figure 12. The ideal function of LKM to support smallholders' financial patterns.

The project initiated linkages between the LKM Gunung Seribu and some potential lending institutions. One of the lending institutions that has been approached was the Lembaga Pengembangan Ekspor Indonesia (LPEI), based in Jakarta with a branch office in Yogyakarta. LPEI is the state owned enterprise responsible for assisting the development of micro and small enterprises through a linkage program. LPEI plays a role in providing subsidized loans to the LKM. Assisted by the project team, the management of LKM Gunung Seribu has prepared a micro finance scheme as presented in Table 11.

In summary, the model of a micro finance institution that has been developed by the project was designed to meet smallholders' needs and motivate them to collectively work as a group. Credit was delivered to the group to maintain trust and transparency among the members. No collateral is necessary in the system as the group itself will guarantee that the loan will be paid back. For individual loans within the group, teak trees may be considered as collateral, although this scheme still need more evaluation to test its effectiveness. The microfinance model should not limit its function in delivering credit, but should also provide smallholders with group assistance to improve smallholder teak production and marketing systems. Government and development agency support is required to strengthen the institutional capacity of this micro finance model through regular extension services.

Table 11. Loan schemes for future LKM operations

Loan schemes	Characteristics
Type of loan	Group lending
Amount of loan	Maximum Rp 20 million per group
Objective of loan	To support productive business activities
Interest rate	12 % per year (1 % per month).
Pay back period	50 weeks
Collateral	Group or business activities run by the group.
Pay back mechanism	<ul style="list-style-type: none"> - Monitoring and evaluation will be held every week or two weeks. - Each farmer group will deposit to the LKM Gunung Seribu at the date of 25th from : 13.00-16.00 in the LKM office.
Profit distribution	<ul style="list-style-type: none"> - Profit shared to credit lending institutions (e.g. LPEI): 6 % per year - Profit shared to the LKM: 3 % per year

7.4. Key findings on marketing aspects

As mentioned earlier in Section 7.1, farmers commonly harvest their teak when they have an urgent need for cash, which generally is associated with special events, such as weddings, sending children to school, or during financial difficulties caused by crop failure. The implication of this harvesting pattern is the absence of definite cutting rotations on smallholder teak plantations. Farmers' reasons for determining the harvesting time are summarized in Figure 13, with most farmers (80%) harvesting teak to meet their urgent needs for cash. Approximately 14% of the respondents harvest teak when the trees are considered to have reached their biological/economic maturity age. This perceived rotation varies among farmers across the villages. In average, it was considered as optimal when the trees reached 22 years old or 30 cm in diameter.

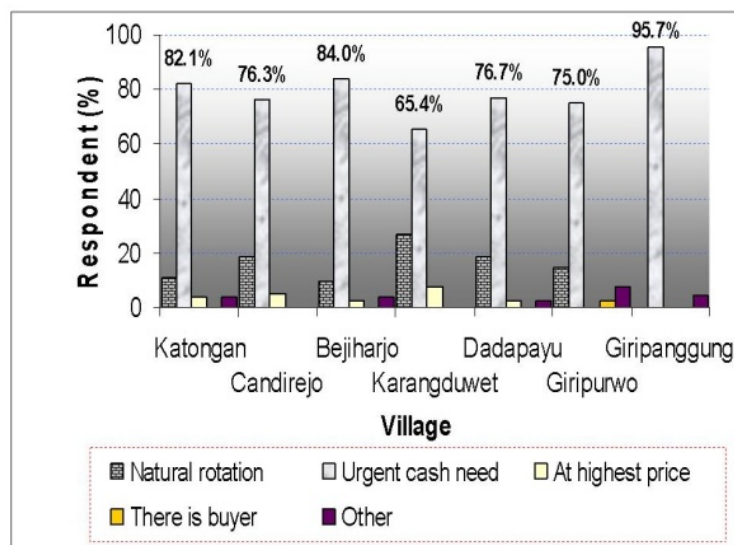


Figure 13. Farmers' main considerations in determining the harvesting time of teak.

Farmers sell their teak in the form of trees directly to middlemen who conduct the cutting and transporting of teak timber for further trading purposes. Basically, there is no standardized sale price for standing teak trees. The middlemen estimate the price of trees by measuring the girth and merchantable height. Sometimes middlemen use volume tables as a reference. When the price is offered, the farmers will negotiate until an agreed price is set. Farmers generally have a lower bargaining position, because in the end they tend to accept the price offered by the middlemen. This marketing system incurs some risks for both farmers and the middlemen. Farmers may be disadvantaged due to under valuation of the trees, but the middlemen must also put up with severe wood defects, such as hollow stems, which are invisible until the tree is cut down. Furthermore, the middlemen are also responsible for costs that arise from the harvesting and transporting process, which includes obtaining timber transport documents (certificate of legal roundwood or Surat Keterangan Sahnya Kayu Bulat/SKSKB) from the District Forestry Office.

Based on farmers' perceptions, the common problems that farmers must face in selling their teak are the relatively low farm-gate price and low bargaining position when negotiating prices with middlemen. Although the number of middlemen at each village is quite competitive (about 2 to 5 traders), the farmers' selling pattern are always narrowed down to limited options in obtaining a more reasonable price because the middlemen keep information on market prices to

themselves. They will only give information on price as an opening bid so farmers must rely on their own prior sales experience, and their neighbors and not on the actual market. Most farmers are also unaware of the quality specifications for teak required by the market.

Based on the Rapid Market Appraisal (RMA), the project team focused on three strategies to improve the current smallholders' teak marketing system. These strategies were channeled through improving market information and bargaining positions of farmers in the marketing process and developing networking with new market segments. The project motivated teak farmers to be more market-oriented in their teak production. A cross-visit activity following several focus group discussions was undertaken to help farmers become more aware of market opportunities at the downstream level (teak wood industries) as well as having better understanding of the quality standards required by the industry. Teak farmers and middlemen at the village level were motivated to achieve higher selling prices of their teak wood by improving the quality of the teak wood they produce. Market information is also important in improving farmers' bargaining positions during the negotiation process with the middlemen, and at the same time improving the bargaining position of middlemen when they negotiate with higher level value chain actors.

The project team also tried to strengthen the bargaining position of teak farmers through collective marketing. This activity was done through the establishment and facilitation of the LKM Gunung Seribu, at the same time through project activity 2.3 on institutional strengthening of farmers' micro credit association. Collective marketing increases the economies of scale of merchantable teak and allows farmers to trade with larger market players, such as wood processing industries or wholesalers. Collective marketing will also reduce transaction costs on many levels. These collective action efforts involved middlemen at village level to prevent their being disadvantaged by the downside of project activities. The main goal of this strategy was to obtain a higher profit margin in teak marketing at the village level, thus an increased selling price can be enjoyed by both teak farmers and middlemen.

The project team initiated the development of a market network with companies producing certified teak furniture products. Currently, there are several farmers groups at the project sites that supply certified teak logs under the Forest Stewardship Council scheme (FSC). The project team, in cooperation with USAID project SENADA held farmers training on Verified Legal Origin (VLO) to introduce farmers to the procedures of chain of custody (CoC) of certified products. The project team also introduced farmers groups (through the LKM Gunung Seribu) to a number of teak processing industries in Yogyakarta, that have been exporting certified teak furniture products. Farmers' Field Day and a national seminar on smallholder teak plantations which was held in the last year the project (2011) also aimed at building closer relationship between farmers' groups and the industry. Unfortunately, when the project ended, a joint contract between the LKM and potential companies had not yet been completed. It may take a considerable amount of time to establish cooperation and make it operational. The project team has delivered this message to the policy makers at the district government level and recommended continued facilitation in developing partnerships between the LKM and teak industries.

The project team found that some government policies relating to timber trade regulation tend to create high transaction costs for smallholders and, hence, would be a disincentive for smallholders' investment in teak plantations. At present, the SKSKB is applied to smallholder teak traded in the region and should be obtained by teak traders at the District Forestry Office. The project team proposed to simplify the regulation, so that wood transport documents could be obtained at the village or even hamlet level to reduce transaction costs.

The key findings under the marketing theme concluded with some recommendations to improve economic benefits of teak plantations for smallholders. The conclusions are:

- Improving market information for smallholders, for example by introducing teak farmers to log grading and pricing systems which are applied by the timber industries can have considerable impact in motivating farmers to improve their timber quality. This will lead to farmers' investment in applying better silvicultural practices to their teak plantation management. Regular market information on teak prices and qualities should be provided through local mass media, such as radio.
- Developing linkages between teak farmers and teak industries, such as certified furniture exporters could provide new market opportunities for farmers. Farmers can be trained to apply a wood tracking system that is required for certified products. In return, farmers may get higher premium prices for their timber. Collaboration with teak processing industries could further be developed by involving teak producers in furniture processing, for instance, by supplying semi finished furniture components to the companies.
- Simplifying timber trade regulations is necessary to minimize transaction costs in smallholder teak marketing. Simpler procedures in obtaining timber transport documents would provide incentives to smallholders to invest in teak plantations.

7.5. Overall project key findings

Key findings from the research project on the three project themes, namely silviculture, micro financing and marketing resulted in several conclusions and recommendations to improve economic benefits of teak plantations to smallholders. The recommendations will be more effective if they are carried out in synergy with other themes because they are inter-related. In crop management patterns, teak farmers prefer to practice mixed cropping on their land. Mixed cropping systems reduces risk and enhance the diversity of products and household sources of income. Farmers are aware that teak plantations also provide some environmental benefits, as well as that planting teak has become part of their culture. Local knowledge and practices of farmers on teak plantations as mentioned above, need to be maintained with some improvement of the management practices for more optimal returns. For example, in the application of silvicultural techniques, farmers should be encouraged to use good quality teak seedlings and apply thinning and pruning to produce better quality teak. Teak farmers need some assistance to get better access to good quality seeds, including the skill to produce good seedlings for themselves from the local nursery. Farmers need support in market information, in particular the standard quality of teak wood required by the industry. More market oriented farmers will be encouraged to apply better silvicultural techniques on their teak plantations.

On financing aspects, farmers need some assistance to overcome funding difficulties when faced with urgent needs, so that they may avoid premature harvesting of their teak. Support to improve farmers' capacity for participation in microfinance institutions will be very useful in helping farmers have better access to loans. The LKM Gunung Seribu can be as a model for learning how to develop farmers' microfinance institutions. The LKM could also be used for collective marketing of smallholder teak wood. Collective marketing, accompanied by some improvements in marketing strategies will increase farmers' bargaining positions to obtain better prices for their teak. Local governments can play an important role in these efforts to improve institutional capacity through better extension programs with better targeting to the needs of farmers' groups. Local government should also revise or simplify timber marketing procedures to reduce transaction costs.

The project team developed an integrated policy brief (Appendix 6) and has delivered some recommendations to district government. These policy recommendations are presented in Table

12. Some of these recommendations, for example on the extension programs and the simplification of timber trade regulations or timber transport documents may also be relevant to conditions in other places in Indonesia and need to be brought up to national level to support the development of smallholder teak plantations in Indonesia.

The project has also identified some opportunities to increase economic benefits of teak plantations to rural people. Teak farmers need to be involved in the wood processing sector, especially in furniture industries. Engagement of farmers in furniture industries may provide opportunities to farmers to receive benefits from the added value of their teak wood. Developing a sound strategy to strengthen cooperation between farmers' groups and the furniture industry would be an interesting theme to be captured in the further project activities.

Table 12. Summary of project recommendations to the District Government of Gunungkidul.

No.	Background	Recommendation	Actions required by key actors	Expected impacts	Supporting evidences
1	<ul style="list-style-type: none"> - Current smallholder silviculture practices produce teak wood of limited quantity and quality. 	<ul style="list-style-type: none"> - Support the dissemination of the silviculture manual (produced by the project) for smallholder teak plantations to promote proactive teak management by farmers. 	<ul style="list-style-type: none"> - Bupati to recommend financial support through regional budget line (APBD) for the program. - District Forestry Office in collaboration with Extension agency to implement training program to socialize the silviculture manual. 	<ul style="list-style-type: none"> - Improved knowledge by wider number of teak farmers on how to manage teak stands with more efficient and effective. - Increased teak productivity and teak wood quality at district level. 	<ul style="list-style-type: none"> - Project report on the current practices of smallholder teak plantations. - Silviculture manual book
2	<ul style="list-style-type: none"> - Smallholders have difficult accessing to high quality teak seeds and seedlings. 	<ul style="list-style-type: none"> - Develop a program to distribute high quality teak seeds or seedlings to farmers. 	<ul style="list-style-type: none"> - Bupati to recommend financial support through regional budget line (APBD) for the program. - District Forestry Office as executing agency 	<ul style="list-style-type: none"> - Wide application of high quality teak seeds and seedlings on smallholder teak plantations. - Increased teak growth yield. 	<ul style="list-style-type: none"> - Project report on the current practices of smallholder teak plantations. - Teak farm inventory data.
3	<ul style="list-style-type: none"> - Generally smallholder teak plantations are only marginally profitable, partially due to restrictive regulatory requirements. As a result farmers limit their investment (time and funds) in teak production systems. . 	<ul style="list-style-type: none"> - Minimize regulations that potentially incur high transaction costs (eliminate SKAU, SKSHH for teak wood). 	<ul style="list-style-type: none"> - Bupati to send a letter to MoF on the exclusion of smallholder teak wood from the obligations of SKSKB/SKSHH. - Bupati to issue simplified model of SKAU. 	<ul style="list-style-type: none"> - Increased profit to smallholders from selling their teak wood. - Increased farmers' motivation to invest in teak plantations. 	<ul style="list-style-type: none"> - Project report on financial analyses of smallholder teak plantations. - Project report on value chain analyses of smallholder teak wood.
4	<ul style="list-style-type: none"> - Farmers often forced to harvest their teak trees at premature ages due to their urgent needs for cash, while other alternative financial supports are unavailable. - Large diameter trees have higher price. - The project has initiated a farmer collective action on microfinance (LKM Gunung Seribu), participated by ten farmers' group (kelompok tani) in the project site. 	<ul style="list-style-type: none"> - Strengthen institutional capacity of LKM Gunung Seribu 	<ul style="list-style-type: none"> - District Cooperative Office in collaboration with Extension agency to implement regular extension services. 	<ul style="list-style-type: none"> - Improved institutional capacity of LKM Gunung Seribu. - More farmers' organizations adopt institutional model on farmer's microfinance, taking the lessons from the LKM Gunung Seribu. 	<ul style="list-style-type: none"> - Project reports on micro finance activities.

5	<ul style="list-style-type: none"> - In most cases, smallholder teak growers' access to market is limited only to middlemen. - In most cases smallholder teak growers are the price takers, reducing their potential financial return from teak selling. 	<ul style="list-style-type: none"> - Provide incentives to strengthen market linkages between smallholder teak growers' associations and certified teak furniture companies. - Provide regular market information on teak prices and qualities through local mass media, such as RRI (radio) station. 	<ul style="list-style-type: none"> - The district government (Bupati and District Forestry Office) to promote the production of certified teak and teak products from Gunungkidul. - District Forestry Office to release the obligation for SKSKB/SKSHH for all smallholders' certified teak that sold under the partnership scheme. - District Information Agency to include information regarding local teak prices and qualities in their program. 	<ul style="list-style-type: none"> - Increased financial return to smallholder teak growers from their teak selling. - Improved the sustainability of smallholder teak plantations in Gunungkidul area. 	<ul style="list-style-type: none"> - Project marketing reports.
---	--	---	--	---	--

8 Impacts

This research project has produced and disseminated a variety of outputs to target beneficiaries in the areas of the project sites and for broader communities. Evidence indicates that the project has led to many positive impacts increasing the economic benefits of smallholder teak plantations to teak farmers and people in the district. In the long run, with the increasing adoption of project results by stakeholders, the impacts will be more significant.

Some project findings have been documented and presented at various local, national and international events. These key findings addressed scientific issues and identified appropriate approaches for developing and sustaining productive and profitable smallholder teak plantations. The information generated by the project resulted in better understanding of smallholder teak plantation systems and furnishes a base for more appropriate policies and strategies to support the development of these plantations.

During project implementation, various activities such as cross-visits, Focus Group Discussions (FGD), training, establishment of Farmers' Demonstration Trials (FDT), preparation of the silviculture manual and Farmers Field Days (FFD), attracted active participation by the target farmers in the project sites. The participation increased the awareness, knowledge and skills of farmers in applying better management to their teak plantations. There are indications that some farmers have transferred their knowledge and skills to other farmers outside the project sites. Various methodological approaches and experiences gained by project members during the implementation of project activities provided new knowledge and skills and increased their capacity to conduct research activities.

For people in the District of Gunungkidul, the project will contribute to increased economic benefits for smallholder teak plantation growers. Information and policy recommendations have been presented to the district government aimed at addressing various problems faced by farmers and identifying strategic options for solving those problems. With this information and the adoption of project recommendations, the district government of Gunungkidul could develop better policies and programs for developing smallholder teak plantations in the region. Project activities have also attracted interest from some teak wood processing industries located in the vicinity of Yogyakarta. Activities to develop linkages between farmers' groups and these industries, which were facilitated by the project, have initiated mutually beneficial business cooperation among them. In the future, the business practices of smallholder teak plantations will be more market oriented and will contribute to higher incomes for households.

For the wider community at national and international levels, various key findings, presentations and publications on the results of the project provided useful references for developing smallholder teak plantations. The range of positive impacts produced by the project is described in the following sections.

8.1 Scientific impacts

Scientific impact of the project is expected to be more evident with several scientific publications currently in progress. Some scientific impacts, however, could be observed at present based on early indications. For example, the project team has produced technical reports on the three project themes, i.e. the silviculture, micro finance and marketing aspects, and presented the results at various events at local (villages and district), national and international levels. Conference papers and posters presenting lessons learned that have been acquired by the project and expected to contribute to scientific information about smallholder teak plantations. A

technical report book containing comprehensive project findings is being written and will be published for the scientific community. Some scientific articles are being written for submission to scientific peer-reviewed journals.

Various experiences and research methods developed by the project team have been used by researchers at partner institutions. For example, the questionnaire developed and implemented for the household survey and the sampling procedures for farmer respondents have been used by CIFOR Researchers in a research project in South Kalimantan and Riau Provinces. Some research findings have been utilized by ICRAF's partners in Laos and Vietnam in their research activities.

This project has provided useful information as well as facilities to many parties interested in the smallholder teak plantation system. Encouraged by the dissemination activities of the project, some students from the Institut Pertanian Bogor have selected smallholder teak plantations as their main research subject and the project has encouraged them to conduct in-depth studies on the topic by visiting project sites (see the capacity impact section for more detailed information). Just recently, a group of visitors numbering about 15 people from the Provincial Forestry Office of East Nusa Tenggara, visited the project site during their comparative study for the development of community forestry in the province of East Nusa Tenggara.

In the early stage of project implementation, the project team discovered the *tebang butuh* traditions as a current teak harvesting practice by teak growers in Gunungkidul district. The terminology was controversial and differently understood by many stakeholders, in particular on the proposition whether this tradition was causing positive or negative impacts to the sustainability of teak plantations in the region. The Project Team has contributed to clarifying the understanding of *tebang butuh* to various stakeholders. Some stakeholders consider *tebang butuh* be a negative habit that threatens the sustainability of smallholder teak plantations. The Project Team corrected this assumption by pointing out that *tebang butuh* is not necessarily bad if it is properly implemented. *Tebang butuh* may support plantation sustainability and can be seen as a selective cutting practice in the smallholder plantation system. Negative impacts of *tebang butuh* would occur when farmers harvest the trees at young ages and miss the potential to gain higher profits when selling teak. This message was delivered by the project team at various events including discussions and seminars to the wider community of stakeholders.

This project established six Farmers' Demonstration Trials (FDT) to show the effects of silvicultural treatments on the growth of teak stands. Silvicultural treatments which were tested in the demonstration plots included thinning, pruning and singling. From a scientific perspective, the FDTs have provided observation data that are useful for understanding the most suitable silvicultural system for smallholder teak plantations. It should be noted that the time frame of observations at the FDTs is relatively short, but observations during the past 2 years have provided positive indications of the benefits of thinning and pruning treatments on teak stand growth. The FDT data showed that better silvicultural practices on smallholders' teak stands have yielded significant improvements, compared to baseline measurements. The project team has recommended that the local government and research agencies continue maintaining these FDTs to collect more observations for more reliable analyses in the future. It is expected that the FDTs will contribute important information for the development of knowledge on silviculture in smallholder teak plantations. The FDTs have also been used as an effective tool for training farmers and for validating research results. It is expected that the FDTs will be useful as showcases and effective avenues for field training for those who want to learn about silvicultural practices for smallholder teak plantations. The project has suggested to the District Forestry Office and FORDA that they maintain and use these FDTs in collaboration with landholders for future research and training purposes.

The project produced and disseminated a silviculture manual for smallholder teak plantations. The manual has been published in two languages, Bahasa Indonesia and English, and is expected to be a useful reference for those interested in sustainable development of smallholder teak plantations. Similar to the FDTs, this manual was designed through a participative process and carefully addressed farmers' needs and limitations. The manual was designed using easy to understand language for farmers and adapted to the practical needs as well as the limitations of farmers. The manual has been distributed to farmers, extension officers and related stakeholders in the Gunungkidul area as well as at the national level, including the Forestry Research and Development Agency (FORDA) and some District Forestry offices. This manual has been used by forestry extension officers in Gunungkidul district in their extension programs. It is expected that the book will provide useful guidance for extension officers in Indonesia for improving the knowledge and skills of farmers in managing their teak plantations.

8.2 Capacity impacts

The project has enhanced the capacity of project team members, partners, target beneficiaries and interested stakeholders. Collaborating scientists involved in the project were from two international research organizations (CIFOR and ICRAF), a national research organization (FORDA), two universities (InterCAFE IPB and ANU) and a consortium of NGOs led by the District of Gunungkidul (Pokja Hutan Rakyat Lestari). These project members were actively involved in planning processes and implementation of various project activities, such as household surveys, cross-visits, FGD, FDT establishment, the preparation of the silviculture manual, establishment and development of LKM Gunung Seribu, and organizing various training sessions, discussions and seminars. These project activities provided excellent knowledge and experiences for the members and enhanced their capacity for conducting research and organizing various project activities that involve different stakeholders.

The project organized two writing workshops, one of which was guided by a professional facilitator to help project members to improve their knowledge and skills in scientific writing. Due to their involvement in the project, several project members have had the opportunity to get scholarships for post graduate studies. Mr. Gerhard Manurung from ICRAF received a scholarship from the John Allwright Fellowship (JAF) and currently is doing his PhD at ANU. Mr. Iwan Kurniawan from ICRAF also received a JAF scholarship but later on he decided to accept a promising job at the United Nation Development Program (UNDP) Indonesia. Mr. Ika Heriansyah from FORDA received a scholarship to take his PhD degree in Malaysia. Mr. Jaenal Effendi from InterCAFE IPB currently is doing his PhD program at the Georg August University Germany supported by a DAAD scholarship and Ms. Rima Rosita is studying for her Masters degree in Beijing University. Two undergraduate students from IPB (Ms. Dian Octavianingsih and Ms. Yeni Marlina) completed their undergraduate degrees with their research based on smallholder teak plantations at the project site. The project has also assisted three IPB PhD students (Mr. Edi Kurniadi, Ms. Tuti Herawati and Ms. Tien Lastini) who were interested in learning about smallholder teak plantations, for their dissertations. These students made some visits to the project sites to make particular observations. As part of their studies they helped the project to assess stakeholders' perceptions regarding the project activities and provided feedback to the Project Team.

The government of Gunungkidul District, represented by the Pokja Hutan Rakyat Lestari, is a partner institution that has received benefits from the implementation of this project. Involvement of Pokja personnel in the project as well as various project documents that have been produced and distributed including to this institution is expected to improve the capacity of this group in developing smallholder teak plantations at Kabupaten Gunungkidul. Taking lessons from project

activities, the Pokja group has organized a series of extension activities towards sustainable forest management in the district. These extension activities were attended by around 225 participants from seven villages in the district, comprising teak farmers, village officers, timber traders and extension officers. This activity will further strengthen the capacity impacts of the project at the local level.

For the project target groups, especially the teak farmers and other stakeholders in Gunungkidul District, the project has contributed various positive impacts on their capacity towards better management practices of smallholder teak plantations. More than 500 teak producing households at the project site were directly involved in the implementation of various project activities. The project team organized cross visits for farmers and extension officers to various places. The visits were made to Perhutani's industrial teak plantations in Cepu, some teak furniture industries in Jepara, the provincial government's nursery centre in Gunungkidul and community teak plantations managed by neighboring farmers. Cross visits were continued with the FGD to discuss farmers' opinions on visit experiences that included the three project themes of silviculture, micro-finance and marketing access. These activities have provided farmers with new perspectives on their way on managing teak plantations and inspired them to the potential for improving their teak productivity and quality.

The project team organized various training activities such as Verification of Legal Origin (VLO) training, design and establishment of FDT and provided assistance to 10 farmers' groups to develop their micro finance institution. About 130 farmers were directly involved in such activities. In these training activities, farmers practiced various skills that were taught directly by the Project Team, such as tree inventory and measurement procedures for certification processes; some silvicultural treatments, such as thinning, pruning and singling; and some organizational skills, such as developing internal group rules, group program procedures, and bookkeeping skills. On the silviculture theme, the project donated 10 sets of pruning equipment to farmers' groups. In addition, six FDT facilities were built and can be used as tools for silviculture training in the future. On the micro-finance theme, the project has facilitated the establishment of LKM Gunung Seribu and provided this new institution with a revolving fund in the amount of Rp 30 million to help establish the micro-finance program. The LKM provides facilities to farmers' groups to learn how to manage micro -finance institutions.

Direct involvement of farmers in project activities provided them with knowledge and skills which are useful for improving the management practices of smallholder teak plantations. These skills are expected to be passed on to other farmers through activities within the group. Some farmers and extension officers were directly involved in the preparation of the silviculture manual for smallholder teak plantations. The discussions that developed during the process of preparation and testing of the manual improved farmers' knowledge and skills on appropriate silvicultural practices. Farmers were also involved in various activities in the dissemination of research outputs. Farmer representatives were always invited to participate in project seminars, where the Project Team presented project results. Towards the end of the project, the Project Team organized Farmers Field Days at village level to present summaries of project results directly to farmers. The interaction between farmers and project members, as well as with other invited resource persons (such as wood processing industry representatives) provided new insights to farmers for developing their teak plantation business.

To other related stakeholders, the impacts on capacity building may not have been significant, but are expected to increase within the next few years. Some forestry extension officers in the district have been following project activities and are expected to incorporate project results and recommendations in their extension programs. For example, the silviculture manual that has been developed by the project and distributed in the district of Gunungkidul as well as to some FORDA research institutes throughout the country can be used by the officers and researchers

in advising teak farmers on the best practices of teak silviculture in Indonesia, in particular in the District of Gunungkidul.

8.3 Community impacts

The project has inspired positive community impacts resulting in social, economic, and environmental changes outside the project's immediate target groups with the uptake of new silviculture, finance and marketing knowledge generated through project activities. Although the evidence for such community impacts is difficult to measure accurately, some indications from observations show that positive changes are highly likely. Individuals not involved directly in project activities and farmers who live in neighboring villages have observed the impacts of the project and have spontaneously adopted the technologies and practices promoted through the project. The posters, information sheets, manuals and videos produced by the project have been made available to a wide range of individuals and organizations (including both NGOs and government organizations) encouraging adoption of improved practices related to the management and production of smallholder teak plantations. The policy brief that was presented to the district government and the networks that have been developed to link the farmers' groups with teak wood industries generated closer collaboration among them on teak production and marketing. Additionally newsletter articles and project reports have ensured that information generated by the project has been made available to a broad array of interested stakeholders. The following sub-sections summarize the projects' economic, social, and environmental impacts.

8.3.1 Economic impacts

Estimates can be made of the project's economic impacts based on the likely responses of small scale teak growers to project outputs. In this section indications of potential economic impacts generated by the project are discussed, based on measurable project results. A more detailed analysis of long-term project economic impacts is included in the technical report book on the project. The impacts derived from the project can be described as shown in Figure 1. Adoption of the outputs from the three project themes has the potential to increase the value of timber sold by farmers and contribute to improvements in smallholders' livelihoods, especially for farmers in the district of Gunungkidul, and improvement in environmental services.

Figure 1. Project impacts

Adoption by smallholders of improvements in teak silvicultural practices is expected to result in higher teak productivity and quality. The project contributed to improving farmers' knowledge and skills for a number of silvicultural practices. Project assessments carried out by IPB students reported that about 70% of farmer respondents at the project sites stated that their knowledge and perceptions have increased in relation to the application of thinning, pruning and singling methods. More than 50% of the respondents have been practicing these new techniques on their teak stands and more than 30% of the respondents have been transferring their knowledge to other farmers. For farmers outside the project sites, awareness and knowledge of improvements are still relatively low at about 30%. Around 20% and 15 % of farmers' respondents respectively have practiced these techniques and transferred their knowledge to other farmers. These figures provide a good indication of future adoption which is expected to increase in the long term.

Better access by farmers to micro-finance will prevent them from cutting trees of sub-optimal size. Based on a financial analysis conducted for the project, the value of a teak tree with a 10 cm to 20 cm diameter, or younger than 20 years of age, was only around Rp 35,000. A teak tree of 20 to 40 years or with a diameter of about 20 cm to 30 cm was valued at Rp 80,000. If a tree is maintained until it reaches 30 cm to 40 cm diameter, the value could increase significantly to around Rp 450,000. Farmers are expected to benefit more if they have access to micro-finance to meet their urgent short-term cash needs, which allows their trees to grow to commercial maturity and improve profitability. Easy access to loans may also allow farmers to invest more in their teak plantations, such as by buying improved seedlings and fertilizers, which will further increase the productivity of the trees.

The project assessment by the students reported that more than 40% of farmer respondents at the project sites stated that their awareness and knowledge had increased, in particular on the aspects of bookkeeping procedures and developing alternative productive activities. Improvement of farmers' perception and knowledge on the role of micro-finance institutions (like the LKM Gunung Seribu) was only stated by around 20% of farmer respondents. More than 20% of the farmers have been applying their knowledge of book keeping and alternative productive activities, but only about 5% of the respondents have practiced or engaged in LKM Gunung Seribu activities. For farmers who are located outside the project sites, the number of farmer respondents who were aware of the activities of LKM Gunung Seribu was relatively low, at around 5%. The services of the LKM to farmers are expected to increase in the future, along with a plan to develop business cooperation between the LKM and several funding agencies, such as Lembaga Pengembangan Ekspor Indonesia (Indonesian Export Development Agency) and some teak furniture industries in Yogyakarta.

Improvements in the marketing strategies of teak farmers are expected to provide farmers with significant economic benefits. Analyses conducted by the Project Team found that more objective measurement and valuation of standing teak trees could increase sale prices for farmers by up to 10%. In this context, the tree valuation method that was developed by the project can be used by farmers to improve their bargaining position when selling their teak trees to buyers. More benefits could be available for both farmers and middlemen if they are able to engage in the furniture production system (such as by producing semi-finished furniture components) and obtain the added value from their teak wood. Marketing strategies of smallholders should be tailored to meet wood quality standards and wood dimensions as demanded by timber industries. In this context, the project conducted some training to improve the knowledge of farmers and middlemen of the teak grading system applied by most of timber industries. Potential increases in farmers' incomes could also be achieved through marketing of certified timber products. During the last two years of the project, the Project Team initiated

business linkages between farmer groups and certified furniture industries surrounding Yogyakarta.

Project assessment by IPB students reported that improved knowledge and behavior on marketing strategies was experienced by around 25% of the farmers' respondents. A higher figure of around 40% was achieved in improving farmers' perceptions and knowledge of the advantages of delaying harvest until their teak has reached an optimal age. However, actual implementation of this knowledge remains low, with just 10% of the respondents applying this practice.

Farmers' incomes from teak could be improved through reforms to simplify current regulations on timber transport. Simplification of the regulation of the *Surat Keterangan Sahnya Kayu Bulat* (SKSKB) or timber transport document will reduce significantly the transaction costs of marketing teak, which potentially could result in higher farm gate prices. The Project Team submitted a proposal to simplify this SKSKB to the government of Gunungkidul district. At the national level, the Project Team (represented by the Project Leader) in collaboration with researchers from FORDA presented policy recommendations to revoke the need for timber transport documents on timber produced from private smallholder plantations to the Directorate General of Forestry Business Development (*Ditjen Bina Usaha Kehutanan*/Ditjen BUK), the Ministry of Forestry. The prospect of change is promising as some high decision makers at the Directorate General Offices of FORDA and BUK have put priority on this issue and they agree to establish a joint team between FORDA and Ditjen BUK to draft a revision of this regulation. In the new regulation, it is expected that this timber transport document will be revoked or at least simplified so that the document can be obtained by farmers or middlemen at village or even hamlet levels. This revision will eventually reduce transaction costs in teak marketing for all small scale private growers.

8.3.2 Social impacts

Similar to the economic impact, the impacts of project activities and outputs on social aspects are rather difficult to measure. This section will discuss indications of potential impacts seen so far, which are expected to grow in the future. The project assessment discussed in the economic impacts section (Section 8.3.1), mentioned that farmers as target beneficiaries have increased their perceptions and knowledge on the three project themes, although the magnitude varies according to the theme. Also it was explained that the impacts on farmers who live at the project sites are generally higher than on farmers who live outside the project sites. This is logical, as farmers who live at the project sites tended to be directly involved in various project activities.

On teak cultivation practices, the Project Team observed enthusiasm of farmers to participate in various project activities. The fact that some farmers in the project area have started to implement thinning, pruning and singling treatments and even transfer their knowledge and skills to other farmers in the surrounding areas, indicates that there has been positive social change in teak cultivation practices, at least among some farmers. During the early years of the project, thinning was considered by most farmers as useless or even detrimental to teak stands as it cut down trees that are not eligible or of very low value for sale. But, along with participation of farmers in various project activities, a better understanding of the purpose of these treatments was grown. Now thinning is believed to be a useful silvicultural treatment to improve productivity of teak stands at least among some farmers as described above. Similarly, pruning has now been practiced to improve teak quality.

On the micro finance aspect, the project team has developed a farmers' micro credit institution, i.e. the LKM Gunung Seribu. Farmers' activities in this new institution provide them new

experiences on managing larger loan funds. The LKM Gunung Seribu provides a learning tool for farmers to manage a finance institution professionally. The LKM was also designed to provide a learning tool on teak collective marketing, although the activities within this objective remained limited during the duration of the project. Farmers' experiences in running this micro finance institution will be useful in fostering entrepreneurship and will stimulate farmers' groups to manage more profit-oriented teak plantations in the future.

On the marketing theme, the project introduced new knowledge and stimulated insight among teak farmers on the potential to gain a better price for their teak. These will improve the bargaining position of farmers, putting them in more equal position with middlemen in the marketing process and not continually caught up as price takers. Better knowledge of farmers of the effect of silvicultural treatments on productivity and quality of teak wood produced, as well as wood quality standards required by the industry will hopefully drive farmers to increase their investment in the teak plantation business with more market oriented management. Thus, the smallholder teak plantation business in the future will not only serve as family savings, but can become a business to increase farmers' incomes and welfare.

The existence of this research project in Gunungkidul District increased the attention of district government to the development of teak plantations in the area. Triggered by project activities which were carried out at seven villages, the district government planned to select these seven villages as producer areas of certified teak wood. At the national level, findings and recommendations of the project increased the Ministry of Forestry's attention to developing more supportive policies and programs dedicated to developing smallholder timber plantations in Indonesia, including through a plan for simplifying the regulation of timber transport documents for smallholder timber.

8.3.3 Environmental impacts

In the 1950s, Gunungkidul district was well known as a degraded area with very low forest cover of about 3% of the total district area. At that time this area was very poor and food shortages were a common phenomenon. Land was highly eroded causing low productivity of food crops (Filius, 1997). Forest cover has since increased to about 29% of the total district area. Nearly 70% of these forests are smallholder teak plantations on farmers' private lands (Badan Pusat Statistik Kabupaten Gunungkidul, 2008). Current environmental conditions in Gunungkidul district are much better than they were six decades ago. With this historical background, the people in Gunungkidul district understand the benefits of forest expansion on the quality of the environment.

The presence of this research project was expected to contribute to efforts to improve management practices of smallholder teak plantations. Various project activities, covering silviculture, micro-finance and market access aimed to increase the economic benefits of teak plantations and eventually, farmers' welfare. If improvement in economic benefits is realized, teak plantation will become an attractive business option for smallholders. If the economic benefits that teak plantations deliver to smallholders rise in the future, the extent and management intensity of smallholder teak plantations will increase and sustain teak the plantation business in the region. The existence and maintenance of forest cover in the area has positive impacts on the environment, including the micro climate and hydrological system of the region. Farmers stated that the existence of teak plantations contributes to creating a cooler atmosphere and increases the availability of ground water in the region.

8.4 Communication and dissemination activities

The Project Team made various efforts to communicate all project plans and disseminate project results among its members and to all stakeholders. Communication and dissemination occurred through meetings, discussions, training, seminars and various research publications. Communication among project members was mostly done through email. Meeting among project members were held periodically, at least every 4 months or prior to the implementation of project activities that involved all of the project teams. The inception meeting, where the project team discussed the grand plan of project implementation, was held at CIFOR, Bogor on 28-30 May 2007. The inception meeting was attended by all project members, the Project Advisory Group (PAG) and some invited institutions which were closely associated with the project themes. The consultation meeting with the district stakeholders was conducted in July 2007 at the Bupati's office. The Bupati of Gunungkidul (Mr Suharto, SH. at the time) and his staff, who were representing government agencies in the district, participated in the meeting. The progress of project was reported annually at project annual meetings attended by PAG members as well as project team members. The project annual meetings were conducted in April 2008 at Quality Hotel, Yogyakarta; in May 2009 at the Wanagama Research Station, Gunungkidul; and in July 2010 at the Arma Resort, Ubud, Bali.

Simultaneously with the project annual meetings in 2008 and 2009, project seminars were held one day prior to the annual meetings. The seminars were attended by approximately 100 participants. On May 3, 2011, the project held a national seminar at Hotel Jayakarta Yogyakarta. The seminar was attended by around 100 participants, representing farmers from the project sites, district government officials, scientists from several research institutions and universities, provincial government officials of Yogyakarta and several representatives from the Ministry of Forestry in Jakarta. Project key findings were presented by project members during this seminar.

In addition to seminars organized by the project, some project team members participated in various seminars and conferences, at both national and international levels, to present lessons learnt and findings from the project. Some national and international events that were attended by the project members included:

- a. Small-scale Forestry Conference organized by the International Union of Forestry Research Organizations (IUFRO) 3.08 at Geradmer, France in June 2008. For this event, Dede Rohadi presented a poster entitled "Harvesting better business outcomes for smallholders growing teak in Indonesia".
- b. A workshop in Jakarta on developing certification guidelines for the wood furniture industry that was held on November 27, 2008. At this event, project members from ICRAF delivered some lessons learnt from the project activities.
- c. The visit of Myanmar's delegation under the ITTO-funded project 'Ex-situ and in-situ conservation of teak (*Tectona grandis* Lf) to support sustainable forest management', ITTO Project PD 270/04 Rev.2 [F], conducted in January 2009. At this event, project members from FORDA conveyed some project findings to the delegates.
- d. The Indonesian Round Table Discussion that was held at the Ministry of Forestry on April 7, 2009. The discussion was jointly organized by CIFOR and FORDA. During the event, Dede Rohadi presented some information about the project activities and some results that had been achieved.
- e. The International Symposium of the Indonesian Wood Researchers Society (IWoRS) or Masyarakat Peneliti Kayu Indonesia (MAPEKI) that was held in Bogor on 2 - 3 November 2009. At this event, Dede Rohadi presented some lessons learnt from the project activities.

- f. The World Agroforestry Congress that was held in Nairobi in August 2009. On this occasion, James M. Roshetko and Iwan Kurniawan presented posters describing some project results.
- g. The International Seminar for Research on Plantation Forest Management was held in Bogor in November 2009 and organized by FORDA. On this occasion, James M. Roshetko and Iwan Kurniawan presented posters.
- h. CIFOR and ICRAF Joint Board Members' Field Visit was held on 14 - 17 November 2009 at project sites. On this occasion, the project team delivered a range of information about project activities and the results that had been achieved so far.
- i. National Seminar on Agroforestry that was held in January 2010 in Mataram, Lombok. On this occasion, Purnomo Sumardamto from the Pokja Hutan Rakyat Lestari and Anies Fauzi from FORDA presented lessons learnt from project activities.
- j. The International Conference on Community Forestry that was held in Montpellier, France, in March 2010. Dede Rohadi presented a paper focusing on financial analyses and farmers' perspectives on smallholder teak plantations, taking the lessons from the project.
- k. The XXIII IUFRO World Congress that was held in August 2010 in Seoul, Korea. Some project team members, namely Dede Rohadi, James M. Roshetko and Aulia Perdana presented some research results of the project.
- l. Submission of a policy brief on project recommendations to the Government District Gunungkidul January 2011 in Wonosari.
- m. Policy brief presentation to revise regulation of timber transportation documents was held on April 25, 2011 and organized by FORDA. Dede Rohadi participated in the discussion and brought the experiences from project, to support the revision of SKAU (*Surat Keterangan Asal Usul Kayu*) or the timber transport document that is required for traded smallholder timber.

On publications, the project has produced various materials. Most of these publication materials are still in the form of project reports or in the publishing process. These publication materials include:

- a. Project annual reports that were submitted annually to ACIAR and to all PAG members and partners' institutions. The reports were submitted at the end of May of each year. The project produced three annual reports.
- b. Some technical reports on each project theme. These technical reports are being used as materials in finalizing the technical report book which is currently under progress. The materials are also used in preparing scientific articles to be submitted to peer-reviewed journals. The list of completed technical reports is presented in Table 13.
- c. Two series of Project Newsletters were published in Indonesian and English. Project Newsletter No. 1 was issued in December 2007 and Project Newsletter No. 2 was issued in June 2009. Project Newsletters were distributed to PAG members, partners' institutions, and other related stakeholders.
- d. Two articles about project cross-visits and training were published respectively in the Weekly Newsletter Vol. 5 No. 21 and Monthly Newsletter (The Tales Vol. 1 No. 2, March 2008). The articles were written by Iwan Kurniawan.
- e. Some posters were produced and these are presented in Table 14.
- f. The Silviculture Manual was published in Indonesian and English. The Indonesian version is titled "Pengelolaan Hutan Jati Rakyat: Panduan Lapangan untuk Petani". The book was

written by Agus Astho Pramono, M. Anis Fauzi, Nurin Widyani, Ika Heriansyah and James M. Roshetko. The English version is titled "Managing Smallholder Teak Plantations: Field Guide to Farmers" and was translated by Haruni Krisnawati.

- g. A documentary film describing current conditions of smallholder teak plantations in Gunungkidul district and various activities conducted by the project. This 16-minute documentary film was produced in May 2008. The film has been uploaded to YouTube at the address:

<http://www.youtube.com/watch?v=BI9fqxdghlo>, and

http://www.youtube.com/watch?v=8ojuDzIQ_cs.

Currently, the Project Team is working to finalize a technical report book that covers project activities and findings of all whole project themes. The book is expected to be completed in 2011.

Table 13. List of technical reports produced by the project.

No.	Title	Type of article	Authors
1	Improving Economic Outcomes For Smallholders Growing Teak in Agroforestry System in Indonesia	Booklet	Dede Rohadi
2	Economic Incentives And Household Perceptions on Smallholder Timber Plantations: Lessons From Case Studies in Indonesia.	Conference paper	Dede Rohadi, Maarit Kallio, Haruni Krisnawati and Philip Manalu
3	Rural Credit Market	Literature review	Nunung Nuryartono, Rizki Sabilly Firdaus, and Rima Rosita
4	Teak and Smallholder Tree Farming	Literature review (compilation)	James M. Roshetko, Gerhard E.S. Manurung, Agus Astho Pramono, Nurin Widyani, Anies Fauzi and Purnomo Sumardamto.
5	Farmer Demonstration Trials (FDTs): Design, Establishment and Monitoring	Project report	James M. Roshetko, Gerhard E.S. Manurung, Denta Anggakusuma, Agus Astho Pramono, Nurin Windyani, M Anis Fauzi, Sumardamto, and Suparman
6	Strategi Pengembangan Industri Berbasis Kayu Jati	Policy brief	Iwan Kurniawan & James M. Roshetko
7	Building a Strong Microfinance Institution: Enhancing Teak Smallholders Access To Finance	Policy brief	Nunung Nuryartono
8	Strategi Mencari Nilai Dari Rantai Nilai Pohon Jati: Kekonstruktifan Pedagang Kayu Jati di Gunungkidul Daerah Istimewa Yogyakarta	Policy brief	Aulia Perdana
9	Rekomendasi Kebijakan Dari Hasil-Hasil Penelitian: Pelajaran Yang Dapat Dipetik Dari Proyek Penelitian Peningkatan Manfaat Ekonomis Usaha Hutan Rakyat Jati Dalam Sistem Agroforestry di Indonesia (ACIAR Teak Project	Policy brief	Dede Rohadi

	FST/2005/177)		
10	Government Policies And Regulations on The Different Microfinance Schemes Gunungkidul, Yogyakarta	Project report	Nunung Nuryartono, Nuning Kusumowardani, Jaenal Effendi and Rima Rosita
11	Standing Tree Valuation Practice of Smallholder Teak Grower in Indonesia	Project report	Iwan Kurniawan
12	Smallholder Teak-Based Farming Management in Gunungkidul, Yogyakarta: Current Practices, Obstacles And Improvement Options	Project report	Gerhard E. Sabastian Manurung, James M. Roshetko, Denta Anggakusuma, Agus A. Pramono, Ika Heriansyah and Anies Fauzi
13	Aspek Finansial Petani Jati Gunungkidul	Project report	Nunung Nuryartono, Nuning Kusumowardani, Jaenal Effendi, and Heni Hasanah.
14	Community Teak Wood Marketing in Gunungkidul District, Yogyakarta Province: Current Practice, Problems and Opportunities	Project report	Iwan Kurniawan, James Roshetko and Denta Anggakusuma
15	Result of Garden Inventory Analysis	Project report	Denta Anggakusuma

Table 14. List of posters produced by the project and presented at various events.

No.	Title	Authors
1	Harvesting Better Business Outcomes for Smallholders Growing Teak in Indonesia	Dede Rohadi
2	Smallholder Teak Production System in Gunungkidul, Indonesia	James M. Roshetko and Gerhard E.S. Manurung
3	Market Risks and Production Uncertainty: Drivers of Land Use Diversification of Smallholders' Teak Grower in Gunungkidul District, Indonesia	Iwan Kurniawan and James M. Roshetko
4	Improving Economic Outcomes for Smallholders Growing Teak in Agroforestry System in Indonesia	Dede Rohadi and Philip Manalu

9 Conclusions and recommendations

9.1 Conclusions

Smallholder teak plantations play very important roles for rural people, in particular for people in Gunungkidul district, Yogyakarta. Their important roles are reflected in the farmers' land use, where on average, around 10% of the farmers' lands are allocated for teak woodlots locally known as *kitren* within their very limited landholdings. Farmers also plant teak trees in agroforestry systems in their home gardens or *tegalan*, a piece of land mainly used for agricultural crops. Although the economic contribution of teak wood sales to household total incomes is relatively low (on average is around 11.6%), teak trees could easily be converted to cash and provide significant amounts of money. Teak plantations act as household saving accounts, which if necessary can be cashed to fulfill household needs, including during economic downturns, for wedding ceremonies or for sending their children to school. The people of Gunungkidul usually will sell their teak wood as a last resort, when other resources such as motorcycles, electronic goods, jewellery and livestock are unavailable. This pattern of harvesting teak trees to fulfill urgent household needs is locally known as *tebang butuh*.

Some significant impediments to profitable smallholder teak plantations were identified in their poor silvicultural techniques that were used and that lead to low quality timber. Most teak growers continue to depend on natural regeneration of their teak plantations. Trees are established half by natural regeneration and half by planted seedlings. About 70 percent of seedlings can be traced from wildings and 30 percent from local nursery seedlings, and are usually planted close together (2 x 2 or 2 x 3 m). Smallholders have difficulty accessing higher quality teak seedlings. Weeding and fertilizing are mainly carried out on their intercropping crop plants. Most farmers do not practice thinning and pruning for high productivity and quality of timber. Pruning is done to collect fuel wood from branches, rather than for controlling timber quality. Branches are cut using a machete, leaving 15-20 centimeter-long branch stubs. Thinning is more likely to be carried out on high grade timber, as farmers often cut the biggest tree to sell when they need the cash. Teak farmers lack motivation to improve their silvicultural practices as a result of their knowledge and capital limitations as well as the prevailing market incentive system.

The project provided some important lessons to improve the productivity and quality of smallholder teak plantations. Teak farmers can be guided to apply better silvicultural practices if they believe that the practices will increase their teak productivity and quality, and will yield higher economic benefits. Improving farmers' knowledge and skills in silviculture can be achieved by providing farmers with practical silvicultural knowledge, combined with field assistance on how to apply these silvicultural practices. Farmers Demonstration Trials were very effective for improving farmers' skills as a way to practice the recommended silvicultural techniques and for monitoring by farmers of the response of plants to these silvicultural treatments. Farmers also need reference materials that are easy to understand, such as those in the silviculture manual generated by this project.

The smallholder teak plantation system differs from industrial teak plantations in many ways, so that the application of silvicultural techniques to these smallholder teak plantations needs to be adjusted based on local conditions. In general, however some silvicultural practices that can significantly improve the productivity and quality of smallholder teak include the use of improved seeds or seedlings, the application of thinning on overstocked teak stands and or singling on coppice stands, and the application of proper pruning that prevents excessive branch stubs.

Current systems of smallholders teak harvesting with its *tebang butuh* practices is not necessarily bad for sustainable production, as long as farmers cut the trees after they reach optimum sizes to gain more profitable prices. Farmers need help to prevent them from having to prematurely harvest and significantly reduce the potential benefits of their teak plantations. In this regard, farmers need loan facilities with appropriate funding schemes that meet their needs, especially when farmers are facing financial difficulties. Suitable financing schemes for farmers should provide easy and quick processes with minimum requirements to get the loans. Simple procedures for accessing loans need to be emphasized as many financing programs developed by the government or financial institutions are not effective due to high transaction costs, including the necessity to submit business plans by the farmers. In fact, the research project showed that only about 12% of farmers borrow money for investment purposes, while most of the rest were borrowing money to fulfill their daily needs or emergency needs.

To effectively guarantee loan repayment, the financing scheme should be developed on group lending basis. Supervision by the group of the use of credit by farmers will allow it to run more effectively. The project learned that strong institutional capacity was a very important factor in the development of group-based lending schemes. Farmers' microfinance institutions need technical assistance and extension services from government institutions or development agencies, especially during the early stage of development. Technical assistance is needed to help farmers in preparing various rules for the group, including setting up detailed plans of the credit scheme for members. Leadership in the group is a very important element that will determine the success of the group.

Improvements in silvicultural practices and good access to financing facilities for farmers need to be complemented with improvements in marketing strategies for smallholder teak wood. Current teak marketing systems tend to disadvantage farmers in many ways, including the low bargaining position of farmers, limited market information and high transaction costs in marketing. Timber transport policies applied by the government also create disincentives for farmers to get involved in better teak marketing practices. Improvements on timber marketing strategies can be done through dissemination of better market information to farmers, in particular on the wood grading system and quality standards that are required by the timber industry; the development of business cooperation between farmer groups and timber industries, for example, to meet the demand for certified furniture products; and by revising or simplifying timber trade regulations applied to smallholder timber to minimize transaction costs in the marketing process.

9.2 Recommendations

This project recommends to the related stakeholders, especially teak farmers and local governments to adopt project findings and use the materials that have been generated by the project to improve smallholder the teak plantation system. The various project recommendations are presented below:

- a. To use the silviculture manual that has been generated by the project in extension programs to increase farmers' knowledge and skills in applying the best silvicultural practices on their teak plantations.
- b. To continue maintaining the FDTs by the competent agencies in the District of Gunungkidul and use them as a means for training farmers.
- c. To improve access for farmers to high quality teak seeds or seedlings with the assistance of competent institutions under the district government and/or the Ministry of Forestry.

- d. To strengthen institutional capacity of farmers' microfinance institutions through intensive extension services.
- e. To provide better market information to farmers, in particular on the grading system and quality standards for teak demanded by wood processing industries.
- f. To develop business cooperation between farmer groups and wood processing industries, in particular on products with specific market segments such as certified furniture products.
- g. To revise or simplify timber trade regulations for smallholder teak wood by the Ministry of Forestry.

The project found that the benefits of teak plantations to farmer households could be significantly increased if farmers are involved directly in wood processing to produce high value-added products, such as furniture. Strategies to enhance effective business cooperation between farmer groups and the wood processing industries should be among the challenging topics for future research activities supported by donor agencies, including the ACIAR.

10References

10.1 References cited in report

- Badan Pusat Statistik Kabupaten Gunungkidul, 2008. Gunungkidul Dalam Angka Tahun 2008. Badan Pusat Statistik bekerjasama dengan Badan Perencanaan Pembangunan Daerah Kabupaten Gunungkidul. Wonosari.
- Darusman, D. dan Hardjanto. 2006. Tinjauan ekonomi hutan rakyat. Makalah Seminar Hasil Litbang Hasil Hutan. Pusat Litbang Hasil Hutan. Bogor.
- Departemen Kehutanan 2005. Data Potensi Hutan Rakyat (Updating Data Hutan Rakyat). Direktorat Jenderal Rehabilitasi Lahan dan Perhutanan Sosial dan Biro Pusat Statistik. Jakarta.
- Filius AM. 1997. Factors changing farmers' willingness to grow trees in GunungKidul (Java, Indonesia). *Netherlands Journal of Agricultural Science* 45: 329-345.
- Gunungkidul Regency. 2005. ATLAS Gunungkidul Regency. Gunungkidul Regency in cooperation with Regional Development and Poverty Reduction Program, Department of Settlements and Regional Infrastructure. Wonosari.
- Hindra, B. 2006. Potensi dan kelembagaan hutan rakyat. PROSIDING Seminar Hasil Litbang Hasil Hutan 2006: 14-23. Bogor.
- Holding-Anyonge, C., and J. Roshetko. 2003. Farm-level timber production: orienting farmers towards the market. *Unasyuva* 212 (54):48-56. Maturana, J., C. Simon, and Ismayanti (2005). Learning more about private teak (*Tectona grandis* L. f.) plantations in Java: proper incentives to promote better income for the poor (forthcoming).
- Keogh, R. M. 2009. The Future of Teak and The High-Grade Tropical Hardwood Sector. Planted Forests and Trees Working Paper Series. Working Paper FP/44E. Forestry Department, Food and Agriculture Organization. Rome, Italy.
- Martawidjaja, A., Kartasujana, I., Kadir, K. and Prawira S. A. 2005. Atlas Kayu Indonesia. Jilid I. Badan Penelitian dan Pengembangan Kehutanan, Departemen Kehutanan. Bogor.
- Maturana, J., Simon, C. and Irmayanti. 2005. Learning more about private teak (*Tectona grandis* L.f.) plantations in Java: proper incentives to promote better income for poor.
- Muhtaman, D., P. Guizol, J.M. Roda and H. Purnomo. 2006. Geographic Indications for Javanese teak: a constitutional change. Paper presented at the 11th Biennial Global Conference of The International Association for the Study of Common Property (IASCP) on 19–23 June 2006 in Bali, Indonesia.
- Nawir, A.A., Murniati and Rumboko, L. (Editors). 2006. Forest rehabilitation in Indonesia: where to after three decades? Review of forest rehabilitation initiatives: Lessons from the past. Center for International Forestry Research (CIFOR). Bogor.
- Perhutani, P. 2002. Statistik tahun 1997-2001. Jakarta, Direksi PT Perhutani.
- PERSEPSI and WWF. 2003. Studi identifikasi unit manajemen dalam rangka menuju sertifikasi hutan jati rakyat dan pengembangan akses pasar yang berkeadilan. Wonogiri.

- Pusat Inventarisasi dan Statistik Kehutanan. 2004. Potensi Hutan Rakyat Indonesia 2003. Jakarta: Departemen Kehutanan.
- Roda, J. M, Cadène, P., Guizol, P., Santoso, L., Fauzan. A. U. 2007. Atlas Industri Mebel Kayu Di Jepara, Indonesia. Bogor: Center for International Forestry Research (CIFOR). ISBN 978-979-1412-13-1. 54p.
- Tukan, J.C.M., Yulianti, J.M. Roshetko, and Dudung Darusman. 2004. Pemasaran Kayu dari Lahan Petani di Provinsi Lampung. *Agrivita* 26: 131-140.
- Wijayanto, N. 2006. Strategi pengelolaan hutan rakyat lestari. Makalah Seminar. Pekan Hutan Rakyat Nasional. Loka Litbang Hutan Monsoon. Ciamis.

10.2 List of publications produced by project

- CIFOR. 2008. Teak Farm for the Future. Video clip. CIFOR. Bogor.
- Kurniawan, I. 2007. Smallholders Growing Teak Field Trip. Bogor Tales, ICRAF Bogor Weekly Newsletter. Volume 5 No. 21. The World Agroforestry Center. Bogor.
- Kurniawan, I. 2008. Training on Wood Tracking System, Group Dynamics and Financial Management. SEA, The Tales. Vol. 1 No. 2. The World Agroforestry Center. Bogor.
- Kurniawan, I. and Roshetko, J. M. 2009. Market's Risk and Production Uncertainty: Drivers of Agroforestry Land Use Diversification of Smallholder Teak Grower in Gunungkidul District, Indonesia. Poster presented at The 2nd World Congress of Agroforestry. Nairobi.
- Pramono, A.A., Fauzi, M.A., Widyani, N., Heriansyah, I. and Roshetko, J.M. 2010. Managing Smallholder Teak Plantations: Field Guide to Farmers. CIFOR, Bogor, Indonesia.
- Pramono, A.A., Fauzi, M.A., Widyani, N., Heriansyah, I. dan Roshetko, J.M. 2010. Pengelolaan Hutan Jati Rakyat: Panduan Lapangan untuk Petani. CIFOR, Bogor, Indonesia.
- Rohadi, D. 2007. Improving Economic Outcomes for Smallholders Growing Teak in Agroforestry System in Indonesia. 2007. Project Newsletter No. 1. CIFOR. Bogor.
- Rohadi, D. 2007. Peningkatan Manfaat Ekonomis Usaha Hutan Rakyat Jati dalam Sistem Agroforestry di Indonesia. 2007. Project Newsletter No. 1. CIFOR. Bogor.
- Rohadi, D. 2008. Harvesting better business outcomes for smallholders growing teak in Indonesia. Poster presented at Small-scale Forestry Conference, International Union of Forestry Research Organizations (IUFRO) 3.08. Geradmer, France.
- Rohadi, D. 2009. Improving Economic Outcomes for Smallholders Growing Teak in Agroforestry System in Indonesia. 2009. Project Newsletter No. 2. CIFOR. Bogor.
- Rohadi, D. 2009. Peningkatan Manfaat Ekonomis Usaha Hutan Rakyat Jati dalam Sistem Agroforestry di Indonesia. 2009. Project Newsletter No. 2. CIFOR. Bogor.
- Rohadi, D., Kallio, M., Krisnawati, H. and Manalu, P. 2010. Economic incentives and household perceptions on smallholder timber plantations: Lessons from case studies in Indonesia. Paper presented at The International Community Forestry Conference. Montpellier, France.
- Rohadi, D. and Manalu, P. 2010. Improving Economic Outcomes for Smallholder Growing Teak in Agroforestry System in Indonesia. Poster presented at Indonesian Wood Researchers Society Annual Seminar. Bali.

Roshetko, J. M. and Manurung, G. E. S. 2009. Smallholder Teak Production System in Gunungkidul, Indonesia. Poster presented at The 2nd World Congress of Agroforestry. Nairobi.

11 Appendixes

- Appendix 1. Smallholder Teak-based Farming Management in Gunungkidul, Yogyakarta: Current Practices, Obstacles and Improvement Options.
- Appendix 2. Silviculture manual for smallholder teak plantations (English version).
- Appendix 3. Building a Strong Microfinance Institution: Enhancing Teak Smallholders Access to Finance. Microfinance policy brief.
- Appendix 4. Community Teak Wood Marketing in Gunungkidul District, Yogyakarta Province.
- Appendix 5. Improving Economic Outcomes for Smallholders Growing Teak in Agroforestry System in Indonesia. Project booklet presented during the Joint CIFOR and ICRAF Board Members Field Trip and CIFOR Annual Meeting in 2009.
- Appendix 6. Lessons learned from the ACIAR Funded Project (Project Code: FST/2005/177) “Improving Economic Outcomes for Smallholders Growing Teak in Agroforestry System in Indonesia”. Summary of project recommendations presented to the Government of Gunungkidul District.