



# Impacts of industrial timber plantations in Indonesia

An analysis of rural populations' perceptions in Sumatra, Kalimantan and Java

Romain Pirard

Henri Petit

Himlal Baral

Ramadhani Achdiawan



# **Impacts of industrial timber plantations in Indonesia**

An analysis of rural populations' perceptions in Sumatra, Kalimantan and Java

Romain Pirard

Henri Petit

Himlal Baral

Ramadhani Achdiawan

Occasional Paper 149

© 2016 Center for International Forestry Research



Content in this publication is licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0), <http://creativecommons.org/licenses/by/4.0/>

ISBN 978-602-387-027-1

DOI: 10.17528/cifor/006037

Pirard R, Petit H, Baral H and Achdiawan R. 2016. *Impacts of industrial timber plantations in Indonesia: An analysis of rural populations' perceptions in Sumatra, Kalimantan and Java*. Occasional Paper 149. Bogor, Indonesia: CIFOR.

Photo by Murdani Usman/CIFOR  
Teak plantation, Central Java

CIFOR  
Jl. CIFOR, Situ Gede  
Bogor Barat 16115  
Indonesia

T +62 (251) 8622-622

F +62 (251) 8622-100

E [cifor@cgiar.org](mailto:cifor@cgiar.org)

**[cifor.org](http://cifor.org)**

We would like to thank all funding partners who supported this research through their contributions to the CGIAR Fund. For a full list of the 'CGIAR Fund' funding partners please see: <http://www.cgiar.org/who-we-are/cgiar-fund/fund-donors-2/>

Any views expressed in this publication are those of the authors. They do not necessarily represent the views of CIFOR, the editors, the authors' institutions, the financial sponsors or the reviewers.

# Contents

<b>Acknowledgments</b>	<b>iv</b>
<b>Executive summary</b>	<b>v</b>
<b>List of acronyms</b>	<b>vi</b>
<b>1 Introduction</b>	<b>1</b>
<b>2 Methodology</b>	<b>3</b>
2.1 Q method	3
2.2 Household survey	5
<b>3 Results</b>	<b>11</b>
3.1 Q method	11
3.2 Household survey	15
<b>4 Discussion</b>	<b>22</b>
4.1 Lessons from the Q method	22
4.2 Lessons from the household survey	23
4.3 Combining results from household survey and Q method	24
<b>5 Conclusions and recommendations</b>	<b>28</b>
<b>6 References</b>	<b>30</b>

## List of figures and tables

### Figures

1	The board used for the experiment, with one statement in blue as example.	4
2	Location of study areas.	8
3	Group 1: The enthusiasts.	12
4	Group 2: Plantation impedes local development.	14
5	Group 3: General dissatisfaction.	14

### Tables

1	Distribution of the sample.	5
2	Characteristics of sample villages.	6
3	Statistical tests supporting the determination of the number of factors.	11
4	Factor scores for each representative Q-sort and for each statement.	13
5	Socioeconomic characteristics of respondents.	15
6	Significance of the links between plantation types and selected variables.	16
7	Employment data.	17
8	Perceptions of services and benefits provided by plantations.	18
9	Perceptions of negative impacts caused by plantations.	20
10	Relative size of the groups determined with the Q method.	25
11	Significance of the link between affiliation to group 2 vs. 3 and selected variables.	26

# Acknowledgments

This research was supported by funding from DfID with the Know-For grant. It benefitted from the extremely valuable assistance and inputs by researchers from our partner organization Balai Penelitian Teknologi Kehutanan Pengelolaan Daerah Sungai Solo (BTKPDAS), an implementing agency of the Ministry of

Forestry Research Center, FORDA: Susi Abdiyani, Nana Haryanti, Uchu Waluya Heri Pahlana, Pamungkas Buana Putra, Nining Wahyuningrum, C. Yudilastiantoro.

The valuable suggestions made by two reviewers are gratefully acknowledged.

# Executive summary

Industrial timber plantations are controversial in many parts of the world. Indonesia is an interesting case, given its history of conflicts over land use and its ambitious plans to expand areas under plantation. Therefore, policy makers and investors need clear information about the impacts of industrial timber plantations in order to better design and manage plantations and to facilitate their integration into the rural landscape.

This study assessed the perceived impacts of industrial plantations in rural populations across Indonesia. We used a participatory approach to elicit subjective opinions from villagers living near the plantations, such as their views on positive or negative economic and environmental impacts. Thus, the study was not designed to present an objective assessment of these impacts, but to provide a comprehensive view of rural people's perceptions and expectations of industrial forest plantations.

Two methods were applied: First, we conducted a household survey of 606 respondents across three islands (Java, Borneo and Sumatra), three tree species (acacia, teak and pine) and three end uses (pulpwood, timber production and resin production). Second, we undertook a Q-method analysis in one site with an established pulpwood plantation in order to identify significantly different groups of villagers with respect to their viewpoints. Combining an extensive household survey sample with the Q method is an innovative approach that gives a representative view of villagers' perceptions and expectations of these plantations.

Results from the household survey show that pine and teak plantations are viewed differently than acacia pulpwood plantations in several ways. They have a higher number and greater variety of benefits and services, a higher number of perceived positive impacts in general, and better

environmental goods and services. Pine and teak are also perceived as providing more opportunities for villagers to use plantation land (e.g. for intercropping) and products for rural livelihoods than acacia.

Populations adjacent to acacia plantations place greater emphasis on economic development and infrastructure. Villagers tend to acknowledge past achievements in terms of employment, and to a lesser extent credited the plantations with opening up remote areas and providing some of the infrastructure and services that are traditionally the responsibility of the state. But they also express yet-to-be-met expectations for future progress.

Use of the Q method led to the identification of three groups with contrasting viewpoints about acacia plantations: a first group exhibits enthusiasm over the development of the plantation, including recognition of ecosystem goods and services provided; the other two groups express dissatisfaction, either generally on all aspects or with a focus on the plantation as an obstacle to local development.

Data were disaggregated by gender to enable further analysis. Women and men do not differ significantly in their views on whether the plantation substantially changed the living environment and in what ways. Importantly, we find that women and men tend to give similar responses about positive and negative impacts, with women forming slightly better opinions of events. This provides a general indication that plantation development has not affected women more negatively than men.

Our analysis leads to several suggestions for the improvement of plantation management. The role of the state must be clarified and potentially reinforced, unless the burden of development – including that of

infrastructure – is to remain on the shoulders of the companies. Lessons can be drawn from the teak and pine cases in Java on the performance of institutions that act as intermediaries between companies and people; these seem to hold potential for improving local perceptions of plantations.

Contributions by communities should be invited early in the planning stage, when there is time to correct mistakes that could lead to substantial

negative impacts. In particular, this consultation phase is critical for addressing: land claims, the organization of the labor force (including the assignment of privileged working contracts), the spatial distribution of the plantation and its impact on areas of local value, and to options for land sharing. Taking villagers' expectations and perceptions into account when developing plantation management plans is a major avenue to fruitful co-existence with local populations.



# List of acronyms

APP	Asia Pulp and Paper
APRIL	Asia Pacific Resources International Holdings
CIFOR	Center for International Forestry Research
FGD	Focus Group Discussion
FORDA	Ministry of Forestry research center
HTI	Hutan Tanaman Industri
LMDH	Lembaga Masyarakat Desa Hutan
NGO	Non-Governmental Organization
P&P	Pulp & Paper
PCA	Principal Component Analysis
PHBM	Pengelolaan Hutan Bersama Masyarakat
SE	Standard Error
SL	Significant Loading
SQR	Square Root
TRH	Tanjung Redeb Hutani



# 1 Introduction

The role of planted forests is increasingly prominent globally, particularly in terms of timber supply. With wood production from natural forests declining since the late 1980s (Warman 2014), plantations contributed about one-third of global industrial roundwood production in 2012 (Jurgensen et al. 2014). They also provide non-timber forest products and a number of ecosystem goods and services (Brockerhoff et al. 2008, 2013; Bauhus et al. 2010; Baral et al., 2013, 2014), and commonly support local livelihoods and rural development, especially when established by smallholders (Rohadi et al. 2010, Nambiar et al. 2015). According to recent estimates, the global area of planted forests (including semi-natural forests) increased from 167 million hectares to 280 million hectares from 1990 to 2015 (Payn et al. 2015), with more than 100 million hectares of productive plantations (Del Lungo et al. 2006) and 54 million hectares of industrial fast-growing plantations (Indufor 2012), the remaining plantation estates being dedicated to protective functions such as soil and water conservation or carbon sequestration.

The global planted area increased by an additional 5 million hectares annually in the decade to 2010. In 2015, 56% of planted forests are in the temperate zone, 20% in tropical, 15% in boreal and 9% in subtropical (Payn et al. 2015). There is a diversity of situations across countries, with North America and Europe relying on long-established large estates, but other countries in Asia or Latin America pursuing aggressive development strategies (FAO 2010). As a matter of illustration, countries such as China (Xu 2011) and Vietnam (Government of Vietnam 2011) are pursuing rapid growth of timber plantations. The trend is indeed for industrial timber plantations to expand in the future, because of the declining capacity of natural forests to deliver the increasing global demand for wood products, including pulp and paper, and their assumed higher productivity and efficiency compared to plantations established by smallholders.

Depending on the scenarios used, planted forests are predicted to cover anywhere from 303 to 345 million hectares by 2030, with most of the absolute increase taking place in Asia and under company management (Carle and Holmgren 2008). Plantations established for industrial roundwood production are likely to dominate, although plantations are increasingly established for other commercial purposes, with an estimated 403,000 hectares of plantations established for commercial carbon sequestration worldwide by September 2011 (Diaz et al. 2011), and a growing area of plantations being established for bioenergy production (Hedenus and Azar 2009).

Many controversies remain around the expansion of planted forests: such expansions are praised by some for their capacity to produce large amounts of wood products efficiently, alleviating pressure on natural forests, to create jobs that support rural development, or to provide a range of ecosystem services especially when established on degraded lands that require restoration efforts (Bauhus et al. 2010; Baral et al. 2013, 2014). However, many others point to their negative social impacts, such as the many conflicts related to land tenure and the limited value provided to landowners or reinvested locally, and to negative environmental impacts when a single species is planted on large estates, sometimes on previously forested areas. These controversies are important to substantiate because of the increasing role of industrial plantations in meeting global demand for fiber and fuel.

Indonesia stands as a good example for several reasons. First, many licenses have been issued for industrial timber plantations (*Hutan Tanaman Industri*, HTI) with 254 concessions, as of 2013, covering 10.1 million hectares, which represents a spectacular increase from nine concessions in 1995. Over the period 2010–14, the planted area within these concessions has increased from 0.9 million hectares to 2.25 million hectares, although sources from the same ministry state this may even be as high

as 5 million hectares (unpublished statistics from Ministry of the Environment and Forestry).

This expansion happens in a context where the main pulp and paper groups have seen their access to natural forest conversion considerably reduced as a source of raw material, and with the National Forestry Plan proposing ambitious targets for timber production. This also means that there is room for further expansion of the planted area especially as the Government of Indonesia is showing renewed interest in promoting this sector of the economy.

Second, these developments have been marked with numerous problems, and especially conflicts, as tenure insecurity has been a constant and still largely unsettled problem in the country. The conflicts are well documented (e.g. Gerber 2011 for a global overview). Yet, research has been biased because case studies have targeted conflict areas, thus providing little, if any, information about general perceptions towards the industrial plantations. We argue that perceptions towards these plantations as a specific land use tend to be concealed behind local reactions triggered by competition for access the land. In other words, conflicts and hence negative perceptions are likely to be caused by the appropriation of the land by an outside entity rather than by timber plantations as a specific land use; mining or other agricultural crops would have probably generated the same reactions.

Even more important, industrial timber plantations in the tropics tend to be associated with pulpwood, which is misleading. This is exemplified by Indonesian teak and pine plantations that have been established for a long time, cover very large areas and are managed industrially for high value timber production and non-timber forest products (i.e., resin). Their area in Java, under the ownership and management of the parastatal company *Perum Perhutani*, amounts to 2.4 million hectares and is thus close to the area planted with acacia or eucalyptus for pulpwood supplies. A number of conflicts have been documented over these plantations. These may differ to those described above as they have been present in the landscape often for decades. The tenure issues also differ from those of Sumatra or Borneo, for instance, where the vast majority of pulpwood plantations are established.

Previous studies have examined aspects of small-scale production, including socioeconomic characteristics,

perceptions, silvicultural practices, and plantation quality and productivity in Indonesia (e.g. Rohadi et al. 2010; Kallio et al. 2011, 2012; Maryudi et al. 2015). Yet these studies do not deal with industrial plantations, which is the focus of our research. For example, Kallio et al (2011) analyzed farmers' socioeconomic characteristics and silvicultural practices. They found that farmers with more active silvicultural management either controlled larger areas or had more household members. In all cases, additional policies related to market identification or training were required. Rohadi et al. (2010) examined the socioeconomic value and challenges of smallholder tree plantations in Central Java and South Kalimantan. Their results indicate that the smallholders generally understand the benefits of timber plantations but actual investment in plantations depends on production outputs and existing market opportunities.

Maturana et al. (2005) evaluated the potential of community–company partnerships to mitigate land claims. Their results are surprising. They show that the greater the community development expenses paid by pulpwood plantation companies, the more land claims by local populations. One interpretation is that claims are then encouraged and opportunistic behavior appears. However, none of these studies provides information on the perceptions of rural populations towards industrial timber plantations.

In such a dynamic context, local perceptions thus represent a matter of concern for policies and investment decisions. Indeed, from a landscape perspective (i.e. how do industrial tree plantations fit in a given rural area that goes beyond their boundaries), it is assumed that the nature and design of these plantations determine their level of integration in the landscape and acceptability by local populations with different environmental and social impacts.

The overall objective of the study is to provide a comprehensive view of rural populations' perceptions and expectations of industrial forest plantations in Indonesia in order to contribute to the reshaping of public policies and investments in this sector. This study will explicitly isolate perceptions (and expectations) of plantations as a specific land use, from the issues of land tenure and related conflicts. Knowledge of these perceptions and expectations would be useful to improve the integration of plantations in the landscape.

# 2 Methodology

Two different complementary methods were used: the Q method and a large household survey. Each method has its own weaknesses and strengths: the Q method emphasizes groups with differing viewpoints and unveils discourses associated with each group; the household survey enables us to examine a broader set of issues and, most importantly, produces statistics that are critical to conducting the analysis in more depth.

## 2.1 Q method

The Q method is increasingly popular as a powerful approach to studying subjectivity or perceptions on a particular topic. This method was first devised by Stephenson (1935) and developed by Brown (1980). It features a distinctive set of psychometric and operational principles that aim to combine the strengths of both qualitative and quantitative analysis (Dennis and Goldberg 1996). Rather than finding the average opinion in a group, the Q method aims to identify different patterns or shared ways of thinking that are independent of the researcher. Therefore, the Q method is particularly suitable for studying highly debated phenomena (Barry and Proops 1999), such as stakeholders' perceptions of industrial tree plantations in Indonesia.

In addition to studies concerning perspectives on participatory planning, the Q method has been widely used in social sciences, the arts, religious studies, education, psychology, and forestry and natural resources management (Anderson et al. 2013; Lansing 2013; Chapman et al. 2015). For example, the Q method has been applied to stakeholders' views on carbon forestry projects (Lansing 2013), stakeholders' perspectives on regional forestry programs (Kangas et al. 2010), the perspectives of farmers and conservationists on the management of marginal farmland (Visser et al. 2007), stakeholder opinions on energy options

from biomass in the Netherlands (Cuppen et al. 2010), and to community perceptions of plantation forestry in Australia (Anderson et al. 2013).

This method was valuable and informative for our study because it helped us to identify the potential diversity of views on industrial forest plantations, and groups of individuals who share similar patterns of thinking about the rural landscape. Indeed, rather than assessing correlations between variables for a sample of individuals, this method assesses correlations between individuals for a sample of variables (pre-defined statements on which respondents agree or disagree).

### 2.1.1 How it works: the theory

The overall procedure of Q-methodology comprises six key stages.

The first stage is to identify the discourse of interest and relevant population, referred to as the "concourse".

The second stage is to interview a sample of relevant populations in order to obtain a series of statements that reflect their views and interests beside material from the literature (Barry and Proops 1999).

The third stage involves screening the statements and selecting a manageable number, typically less than 60 (Cuppen et al. 2010).

The fourth stage is Q-sorting. The respondents (P-set) are presented with statements in the form of a deck of cards (Q-set) that they position on a board whose shape follows a normal distribution curve (see Figure 1). The board is made up of a number of columns with associated values that statements must reflect based on their position, usually ranging from "most agree with" to "most disagree with" (or alternatively "most important" to "least important", depending on the topic and study objectives).



We compiled 30 key statements (see Table 4; factor scores result from the application of the method and will be explained later) that covered the range of issues mentioned by individuals or the literature. The main challenge was to make them both short and easy to understand. Redundancy was also avoided, although the same topic could be addressed from different angles in several statements if deemed important. For instance, labor was addressed in seven statements in order to reflect its crucial role in interactions between the plantation and the community, as indicated in the focus group discussion. Language could clearly be an issue as several ethnic groups live in Suaran, so we decided to use Bahasa Indonesia, the national language that everybody could speak – albeit with different levels of fluency. Those responsible for the study were present during the exercise and could provide clarification whenever needed.

The choice of participants was based on a disproportionate (due to a lack of information concerning the parent population) stratified random sample to give a good representation of women, of people who had interactions or not with the company, of villagers who migrated only after the establishment of the plantation and of villagers who experienced this radical change in their own landscape. The sample of 31 participants is summarized in Table 1. Each participant was presented with the board and printed statements, and the rules were explained – emphasizing that time was unlimited and assistance would be provided for any further clarification. Three people participated simultaneously, sitting in such a way that they could not see choices made by the others. Each session lasted between 20 minutes and 1 hour, and once all statements were placed on the board, we asked participants to justify some choices in order to make sure they had fully understood

the rules and made choices that genuinely reflected their perceptions. Participants would usually make changes after trying to justify their choices in response to our questions, but only final decisions were recorded.

## 2.2 Household survey

### 2.2.1 Study site selection

The study was conducted in four plantation sites, representing three tree species and spreading over three islands in Indonesia, namely Java, Sumatra and Kalimantan, which is the Indonesian part of Borneo (Figure 2). To increase the representativeness and reduce biases due to specific local conditions, we undertook the survey in at least two villages for each plantation. The sample contains more villages with acacia plantations, reflecting the very different conditions in Kalimantan and Sumatra. Furthermore, with more controversies arising with the expansion of the pulp and paper (P&P) sector and national plans to boost investments, we considered that this plantation type should be prioritized to inform debates.

Sites were selected to minimize the risk of focusing on either conflicts or model cases. Plantations were first chosen based on the main geographical areas of expansion in the country with attention paid to a representative sample. For instance, Kalimantan has low densities of population inland and retains large areas of natural forests, whereas Sumatra (and especially Riau Province) has experienced dramatic rates of deforestation for years, hosts the bulk of P&P processing capacity and recent investments, and internal migrations are incessant. Conflicts are thus more frequent in Riau, as land available for development is scarcer.

**Table 1. Distribution of the sample.**

	Living in Suaran prior to plantation establishment		Moved in Suaran after plantation establishment	
	Male	Female	Male	Female
Has worked at the plantation <sup>a</sup>	2	4	4	2
Has never worked at the plantation	1	0	12	6

<sup>a</sup> This information is considered at the household level, not at the individual level. This category includes those who have worked at least once, and does not mean that the participant or household member is still working or has worked for a long time.

Once the plantations were identified, we went into the field and picked villages that had the following eligibility conditions randomly: located on the border or within 5 km of the concession boundary, reaches the critical size of a thousand people, and has no documented conflicts. This latter condition was the most sensitive and we had to avoid the opposite bias of choosing unusually peaceful villages in a country where conflicts are extremely common due to tenure uncertainty, rapid population growth and migrations. We could

verify *ex post* that this condition was met, as 45.7% of acacia plantation-related respondents have claimed land in the concession at some point in time.

## 2.2.2 Brief description of the sites and specific plantation management systems

As shown in Table 2, nine villages were included in the sample. Their location is indicated on the map in Figure 2.

**Table 2. Characteristics of sample villages.**

Villages	Establishment of plantation	Plantation type	Number of villagers (households)	Proportion interacting with plantation (%)	Distance to closest urban center	Main economic activities
Jabung (Java)	Before independence in 1945	Pine	3,066 (845)	15%	15 km	Rice, dryland farming
Slahung (Java)	Before independence in 1945	Pine	11,000 (2,600)	Not available	Slahung is an urban center	Various, developed area
Nglebur (Java)	Before independence in 1945	Teak	5,673 (1,503)	70%	15 km	Rice, dryland farming, wood crafting, cattle raising, migrations
Bangunrejo Lor (Java)	Before independence in 1945	Teak	2,490 (939)	75%	23 km	Rice, dryland farming, wood crafting, cattle raising, migrations
Suaran (Kalimantan)	1992	Acacia	(700)	50%	45 km	Oil palm, cacao, rubber, pepper, fishing, rubber
Buyung-Buyung (Kalimantan)	1992	Acacia	1,868 (477)	15%	80 km	Rice, dryland farming, fishing, pepper
LubukJering (Sumatra)	1996	Acacia	1,085 (267)	Not available	40 km	Oil palm, rubber
Pinang Sebatang Barat (Sumatra)	1996	Acacia	5,334 (1,556)	30%	6 km	Oil palm, rubber
Rantau Bertuah (Sumatra)	1997	Acacia	2,470 (498)	15%	33 km	Oil palm

Source: local key informants



### **Pine plantations in East Java Province, Java Island**

Jabung and Slahung have been surrounded by pine plantations since they were established by the Dutch in the first half of the 20th century. From the perspective of villagers, they have de facto always been part of the landscape. Yet interactions remain limited to a minority of people, especially in the case of Slahung, which looks more like a town with distinct districts: areas located on the plantation border are connected to its activities and constitute the main source of labor supply, but other areas are much more urbanized, and there, knowledge about the plantation is almost nonexistent.

Pine plantations have long rotations (~40 years) under the management of the parastatal company Perum Perhutani. While not as well-known as the company's teak plantations in Java, they represent its major source of profits, from the production of resin and, to a lesser degree, timber. Their management is thus more intensive and requires labor over the entire rotation. The system that was put in place relies on the allocation of use rights to individuals on plots of 0.25 to 1.5 ha in order to tap resin. An important feature is the creation of intermediary institutions named LMDH (*Lembaga Masyarakat Desa Hutan*) that operationalize the local development and benefit-sharing programs established at the end of the 1990s in order to improve relationships with neighboring communities. These LMDHs also play a critical role in managing the labor force, as resin tappers actually deal with the LMDH and have no direct contact with the company. The LMDHs also buy the product at a price decided by the company.

There is therefore a reciprocal dependency between the company and villagers and an interest in producing at full potential. The intensity of resin tapping is not very high and a few days per month are sufficient for collection. Productivity is variable between sites, and Jabung seemed to be at the lower end with suboptimal tapping techniques. The labor market is also variable and the company is worried that it might face a shortage of labor availability in the coming years. A lack of interest was reported among younger generations. Still, for those families holding use rights to resin tapping, it represents a critical source of income. Evidence of this comes from the recent decisions by the company to extend the rotation

from 35 to 50 years under social pressure. Indeed, doing so prioritizes resin production over timber production, as plantations remain productive for resin after 35 years and timber is only produced at the end of the 50-year rotation.

### **Teak plantations in East and Central Java provinces, Java Island**

The villages of Nglebur and Bangunrejo Lor are also located in Java but are associated with teak plantations. The plantations were established before independence and are a prominent and familiar feature of the local landscapes. Perum Perhutani represents the state in the understanding of villagers, and as such is expected to deliver a number of services and to promote local development. In addition, its presence is not disputed and the land is usually unclaimed, contrary to the cases of the more recent pulpwood plantations of our sample, which are under private management and located on other less developed islands.

Similar to pine, these plantations have relied for some time on quite advanced programs for local development, named *Pengelolaan Hutan Bersama Masyarakat* (PHBM). Their success made them a source of inspiration for mandatory requirements issued by the Ministry of Forestry, which aimed to create similar programs with private concessionaires managing industrial pulpwood plantations. The PHBM creates a LMDH institution in each village that interacts with the teak plantation. The LMDH hires people working at the plantation and manages the rights to practice intercropping within the concession area. It negotiates the benefit sharing with the company and channels funds to cooperatives to develop economic activities.

Intercropping is a central component of the interactions between villagers and the plantation, and is considered to be much more important and valuable than work at the various stages of plantation management from land clearing to harvesting and transport. Plantation management is also less attractive to the younger generations than jobs at the factory in nearby towns. The farmers (*pesanggem*) usually cultivate less than a hectare during the first 2–3 years of the plantation. Evidence of the preference for intercropping labor at the plantation is provided by the shorter rotation periods applied in areas due to demographic and social pressure, typically from 20 to 35 years

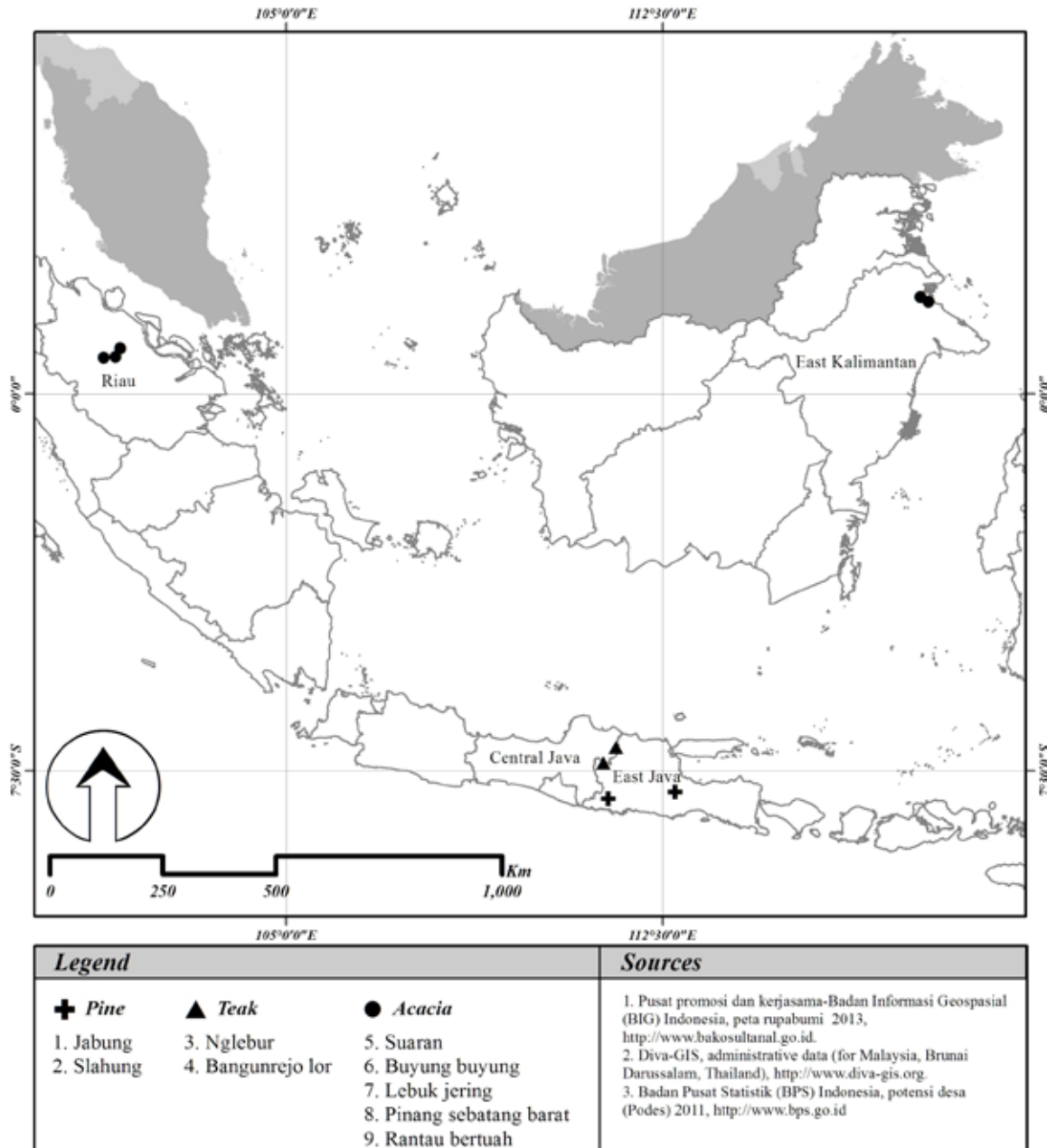


Figure 2. Location of study areas.

in order to provide more opportunities for cultivation. This contrasts with the pine plantations, where profits from resin tapping led to a decision in favor of longer rotations.

**Acacia plantations in East Kalimantan Province, Borneo Island**

Suaran and Buyung-Buyung are located in East Kalimantan Province on the edge of a large-scale acacia plantation. Conditions in Suaran have evolved spectacularly over the last two decades. When the surrounding timber plantation was

established, the village hosted a mere couple of dozen families and only local Dayak people, known for practicing shifting agriculture for a living. In subsequent years, migrants have come in large numbers from other parts of the archipelago, mainly Bugis from Sulawesi Island with their own means, and Javanese transmigrants benefiting from a governmental program aimed at populating Borneo Island (of which Kalimantan is the Indonesian part), and from other sizeable islands with very low population densities. These waves of arrivals have resulted in a mixed population at the time of this study and much higher pressure on

land, and have led to frequent land appropriation by migrants within and outside the plantation concession (interactions with local Dayak were not documented in this study). People were subsequently allowed to cultivate land within a distance of 500 m on both sides of the road that crosses the plantation concession. Tree cultivation is not seen as valuable or competitive by Suaran villagers. Past experiences with the company have left bitter memories of manipulated prices with little, if any, real profit for the villagers. Intercropping has not been successful, even though the company has allowed villagers to experiment with growing regimens; this is probably due to the characteristics of acacia (e.g. the canopy is closed 2 years after planting).

Buyung-Buyung, established in the 1950s, is located further south of the same concession and is mostly made up of migrants from Sulawesi. Its creation was prompted by floods in the older village, with displacement from the coast to further inland. This explains the prominent economic role of shrimp farming, as the coast is close by. Many households have claims on concession land, even if the intensity of their protest remains low. Here, again, prior experience has left traces of dissatisfaction, as a number of people have rented land to the plantation company with payments associated with production over one rotation. However, the low levels of production have been disappointing, with the last harvest in the area carried out in 2005.

Incorporated in 1992, the company *Tanjung Redeb Hutani* (TRH) controls a concession area (*Hutan Tanaman Industri*, HTI) of 187,920 ha and had gradually planted about 60,000 ha, almost exclusively with *Acacia mangium*<sup>1</sup>. Production stopped in 2014, but at the time of our visit in March 2015, the management was optimistic about the renewal of investments in the near future. It was obvious during our interviews that these fluctuations in the level of activity had negative consequences on the level of trust by the villagers.

The plantation can offer daily jobs to the villagers for manual activities such as land clearing, planting, nursery work, maintenance and harvesting, and positions are usually filled

with the village head as intermediary. Payments are made per task in most cases, and seem to be more or less in line with minimum wages set by the law in the province, according to interviews. A few villagers have also been successful in becoming subcontractors for some of the plantation operations.

### Acacia plantations in Riau Province, Sumatra Island

Riau Province has traditionally been the center of P&P expansion. The main pulp mills are located here and are owned by the two groups that dominate the sector in the country, i.e. Asia Pulp and Paper (APP) and Asia Pacific Resources International Holdings (APRIL). The province is rich, with large production volumes of oil and gas, palm oil and P&P. This attracts waves of migrants and investors from other provinces, and the province has faced close to total disappearance of its natural forests except for a few patches whose fate will depend on the implementation of sustainability and conservation commitments by the main P&P and oil palm groups.

The three villages Pinang Sebatang Barat, Rantau Bertuah and Lubuk Jering, are located on the borders of different HTI plantations belonging to the two groups APP and APRIL. Pinang Sebatang Barat is located a few kilometers from a huge pulp mill and, as such, represents a case of strong potential interactions with the plantation business and also with its downstream side, e.g. jobs at the factory, infrastructure development and rural electrification. However, there are also various annoyances, such as high levels of truck traffic. A high-intensity conflict occurred approximately 3 years ago when oil palm plantations established by villagers were removed by the company. Since then, negotiations have led to recent decisions to maintain remaining oil palm plots under local management and to an agreement on revised concession boundaries. Villagers are a mix of indigenous Melayu and migrants, and usually refuse job offers at the plantation because of difficult working conditions and low salaries. Jobs are eventually filled by other migrants from the very poor Nias Island who live on the plantation in poor conditions.

Rantau Bertuah is an enclave inside a HTI concession, and used to be a transmigration village for oil palm. Lubuk Jering qualifies as *Kampung*

<sup>1</sup> More information on this plantation can be found in Pirard and Cossalter (2006).

*adat* (customary village), as it is constituted of indigenous Melayu people, and faces low-intensity conflicts with the concessionaire.

To summarize, the sites in Riau cover a range of situations found in the province – an enclave, conflicts, interactions with downstream industry, indigenous and migrant populations – and are located on the borders of concessions owned by the two main groups.

### 2.2.3 Questionnaire design and application

The questionnaire was developed through several stages and benefitted from a stakeholder workshop held at the Center for International Forestry Research (CIFOR) headquarters in Bogor, Indonesia, in October 2014 with company, government and NGO representatives, and from testing in the field for refinement. Training was provided to enumerators from our research partner organization Balai Penelitian Teknologi Kehutanan Pengelolaan Daerah Sungai Solo (BTKPDAS), an implementing agency of the Ministry of Forestry Research Center, FORDA. It is important to note that the six Indonesian enumerators used over the course of the survey are permanent researchers and therefore have extensive experience of field research, which provides a guarantee of our rigorous data collection.

The questionnaire includes seven sections as follows:

- Respondent identity with associated identification number to secure anonymity during the data analysis phase
- Declaration of acceptance for the interview to be conducted
- Demographic and socioeconomic characteristics
- Knowledge of plantation operations and employment interactions, such as work experience at the plantation, status and intensity of the work, plans and opportunities to work more, etc.
- Various positive and negative impacts, such as listing of benefits, annoyances, expectations, etc.

- Perceptions of the main changes caused by plantation development, such as role in the landscape, access to natural resources and forest areas, etc.
- Other information such as the evolution of the general appraisal of the plantation, prospects and main potential areas for improvement, or whether the respondent has ever claimed rights on the plantation land.

Questions follow different patterns, i.e. they are open or closed and have or do not have previously defined codes for answers based on field testing. Apart from a couple of exceptions where qualitative information was kept as such (e.g. “Give two examples of substantial changes caused by the plantation development”), all of the other open questions were coded *ex post* in order to enable statistical treatment. This is the case for the range of positive and negative impacts that respondents mentioned, as this was a necessary step to make comparisons between survey sites. Due to the wealth of responses, as much as 20 codes had to be created to capture their diversity and nuances. Yet, for the sake of the analysis, we also created broader categories such as ‘local development’ or ‘ecosystem services’. In all cases, though, the original qualitative information was retained so as to provide precise illustrations and add flesh to the analysis.

In terms of questionnaire application, despite our efforts to have a balanced gender presence, less than a third of the sample were female respondents. Apart from this, while the respondent identification was random, the search was done in different districts of each village or town of our sample in order to avoid biases such as high or low representation of villagers having interactions with the plantation. Indeed, sometimes the sites were very clearly divided with respect to the interactions with the plantation, usually because of their proximity, as illustrated by Jabung town, with urban and rural areas. Interviews took approximately an hour each.

# 3 Results

## 3.1 Q method

### 3.1.1 Data analysis

Technical data analysis was conducted using the open-access software PQMethod2.35 developed by Peter Schmolck (see Schmolck 2015). First, a correlation matrix is calculated to reveal information about the degree of similarity between the Q-sorts. A principal component analysis is completed to condense information based on correlations between respondents (Q-sorts). A critical step is to determine how many factors are significantly distinct, as the analysis of perceptions among villagers very much depends on how many groups are represented (Table 3). However, there is no straightforward rule or procedure to determine

this number, so in Table 3 we describe the options available in terms of statistical tests.

Results from the various tests led to the decision to keep three factors, however, two or four factors would also have been a possible choice. In this case, we applied qualitative knowledge of the context. We compared the final results (after rotation and computation of the factor scores) using a different number of factors (two, three and four factors) and it appeared that keeping three factors made more sense for our analysis because (i) it splits one group of respondents who were generally unsupportive of the plantation into two groups with different motivations for their lack of support, and (ii) a fourth factor would not bring much additional valuable information.

**Table 3. Statistical tests supporting the determination of the number of factors.**

Method	Description	Results
Kaiser–Guttman criterion	Keep the factors that have an eigenvalue superior or equal to 1.	8 factors
Screplot	Based on a graph of the eigenvalues, look at the bend and keep the number of factors that are above this bend.	3 factors
Cumulative variance	Cumulative explained variance by the factors, moving from the factor with the highest eigenvalue to the one with the lowest (choice of threshold is with the researcher).	2 factors = 44% 3 factors = 54% 4 factors = 60%
Humphrey's rule	Keep a factor if the cross product of the two highest loadings is superior to 2 SE (Walker 2013). Brown suggested that a less extreme criteria may be used by keeping cross products superior to 1 SE (Brown 1980). SE = $1/\sqrt{31} = 0.1796$ 2 SE = 0.3592	Factor 1 > 2SE Factor 2 > 2SE Factor 3 > 2SE Factor 4 > 1SE
Number of significant Q-sorts	Keep factors with at least two significant loadings. Significant loadings at the 1% level are those superior to $2.58 \cdot \sqrt{\text{number of items in the Q-set}}$ , and superior to $1.96 \cdot \sqrt{\text{number of items in the Q-set}}$ at the 5% level 1% significant if > 0.4711 5% significant if > 0.352	Factor 1: 19 SL (1%), 21 SL (5%) Factor 2: 7 (1%), 9 (5%) Factor 3: 6 (1%), 9 (5%) Factor 4: 1 (1%), 6 (5%)

SE = standard error

Once this choice was made we moved to factor rotation. This step provides “a best-fit solution to include all participants’ sorts and reduce the number of confounded sorts” (Walker 2013). A confounded sort is a sort loading significantly on more than one factor – thus increasing correlation between factors, whereas the purpose of the factor analysis is to create as few correlated factors as possible. There are many possible ways to rotate factors, but these can be split into two broad categories: theoretical/judgmental or objective. With the former, a ‘hand-made’ rotation is performed in order to test an assumption or intuition, usually developed during the course of the study. With the latter, the rotation is based on a statistical principle (e.g. varimax or quartimax) so that the process is more straightforward. We decided to use the varimax rotation that minimizes the number of high loadings per factor while assuming orthogonality between factors (Abdi 2003).

The next step was to create representative Q-sorts for each group (factor). To do so, the scores were computed for each statement on each factor using weighted scores from Q-sorts (Dasgupta 2005) because initial loadings differ (Brown 1993). We could then create a model Q-sort for each factor, interpreted as the Q-sort of a fictional respondent with a 100% loading on the factor. The three representative Q-sorts are presented below in Table 4 and Figures 3, 4 and 5.

**3.1.2 Group 1: The enthusiasts**

This group generally shows satisfaction with the plantation for a number of reasons. Most of the positive impacts are related to ecosystem services (statements 8, 22, 27); the plantation shows good integration into the ecological landscape in the

minds of group representatives (Figure 3). That this group paid special attention to environmental aspects is also reinforced by the identification of one promising improvement to the plantation: the introduction of multiple species (statement 30) as opposed to a monocultural acacia plantation as it stands now. This is an interesting characteristic because such large-scale industrial plantations have been criticized a lot for their alleged negative impacts on the environment. However, their status remains clearly ambiguous as they can also be praised for sequestering carbon or other services. In this particular group, the perceptions are positive in this respect, but having multispecies plantations would go a step further and such requests tend to be consensual among stakeholders. The main obstacles are that these management and silvicultural systems are less familiar to companies’ forest engineers, that their yields are assumed to be lower, and less standardized production might affect the production of commodities such as pulp, whose properties matter at the marketing stage.

Another aspect highlighted by members of this group is the legal framework and its enforcement (statements 3 and 11). Interestingly, not only do the participants consider that the company was forced to meet its legal requirements – such as respecting the boundaries of the concession, setting aside patches of natural forest or providing space for ‘livelihoods plantations’ (*tanaman kehidupan*) – but also that positive impacts materialized only under these law enforcement circumstances. It is, therefore, not taken for granted that the plantation is a good thing in the landscape, but that all depends on proper management. Another illustration of this is that statement 6 generated strong disagreement: if ever the regulations on the protection of riparian forests were not fulfilled, this would create problems.

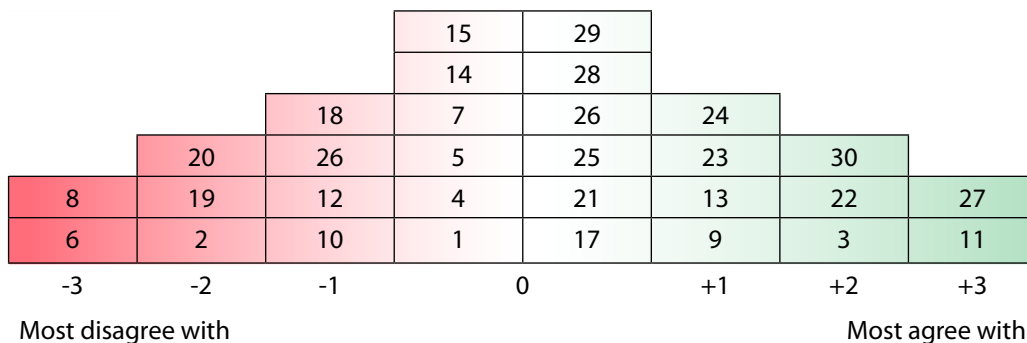


Figure 3. Group 1: The enthusiasts.

**Table 4. Factor scores for each representative Q-sort and for each statement.**

No	Statements 1	Factor scores		
		1	2	3
1	The decrease in TRH activities is a problem.	0	0	0
2	An intermediary organization between the company and the people is not needed.	-2	0	-1
3	TRH is beneficial if legal regulations are enforced.	2	1	0
4	It is easy to get a job at TRH.	0	-1	0
5	The main road was built due to the presence of TRH.	0	-2	-1
6	Forest logging along the river has a good impact.	-3	-1	-2
7	Natural forest is more beneficial than the acacia plantation.	0	2	1
8	The plantation looks awful.	-3	0	0
9	TRH has supported the construction of public infrastructure.	1	0	0
10	TRH has attracted migrants so that employment opportunities have decreased.	-1	0	2
11	The government forced TRH to meet legal requirements.	3	1	1
12	Farming is more profitable than working at the plantation.	-1	3	2
13	TRH's land that is not planted has to remain under TRH's management.	1	-3	0
14	TRH has to release land if the population increases.	0	3	3
15	TRH supports economic growth.	0	-2	0
16	It is better to work with a contractor than with TRH.	-1	0	0
17	TRH pays decent salaries.	0	-1	-1
18	TRH is useful as a secondary source of income.	-1	0	0
19	Most of TRH's benefits take place outside of the village.	-2	0	2
20	People should be allowed to plant any species in the plantation.	-2	2	3
21	Trade has intensified due to TRH's presence.	0	-3	0
22	The plantation has reduced erosion.	2	0	-2
23	The plantation has helped to protect wildlife.	1	0	-3
24	TRH should provide permanent salaries.	1	1	1
25	It is better to work at the plantation than in the city.	0	0	0
26	It is better to plant another species than acacia.	0	2	1
27	TRH prevented floods.	3	0	-2
28	Communication with TRH is satisfactory.	0	-1	-1
29	Intercropping with acacia yields good results.	0	1	-3
30	It is better to have a multispecies plantation.	2	-2	0

Note: TRH = Tanjung Redeb Hutani, plantation concession company

The above statements were translated from Indonesian to English by the authors.

Even if globally enthusiastic, this group still identifies a few areas for improvement. Apart from the desire to have multispecies plantations, this group would welcome interactions with the company through an intermediary entity, which does not currently exist. In the Indonesian context, where social relations play a central role and socialization of activities is extremely important, especially when a new company

generates very significant changes in the landscape, this makes a lot of sense. Other plantation companies have put such structures in place: In Java, the intermediary institution is mandatory in order to manage the distribution of benefits and deal with employment for the parastatal plantation company, Perum Perhutani, that is in charge of the teak and pine estates.

### 3.1.3 Group 2: The plantation impedes local development

This group is generally disappointed by the plantation and focuses its criticisms on economic and development aspects. This is illustrated clearly by the statements placed on both extremes of the board as they deal primarily with land scarcity, lack of employment opportunities, lack of value generated by the plantation compared to agriculture, under-use of the concession land and lack of contribution to infrastructure (Figure 4). In other words, the establishment of the plantation is an obstacle to local development as opposed to creating new opportunities and potentially opening up the area.

Most complaints are related to the increasing pressure on land because of rapid population growth, which is in turn mostly caused by in-migration from other islands rather than indigenous groups. Tensions might therefore be exacerbated by the mix, and interviews suggested that most claims to land or even encroachment are made by newcomers, not by representatives from the Dayak tribes. In such a context, the plantation represents extensive land use with low returns per hectare and poor redistribution to

villagers. Thus, it is not surprising that members of this group very strongly agree that farming is a better land use than acacia plantations (statement 12), and that part of the concession should be redistributed for cultivation of other crops in a context of population growth (statement 14). This is reinforced by disagreement with the statement that idle land within the concession should remain under the responsibility of the company (statement 13).

Other motives for dissatisfaction relate to overall plantation management, as not only do people want to be able to undertake intercropping activities for any species of their choice (statement 20), but they would also like to get rid of acacia (statement 26), which has a bad reputation because of its low value and their past experience with unfruitful partnerships in acacia plantations on private land.

### 3.1.4 Group 3: General dissatisfaction

The third group shares an overall feeling of dissatisfaction with the second one, but it might be seen as even more hostile to the plantation, as its grievances cover all aspects, beyond local development (Figure 5).

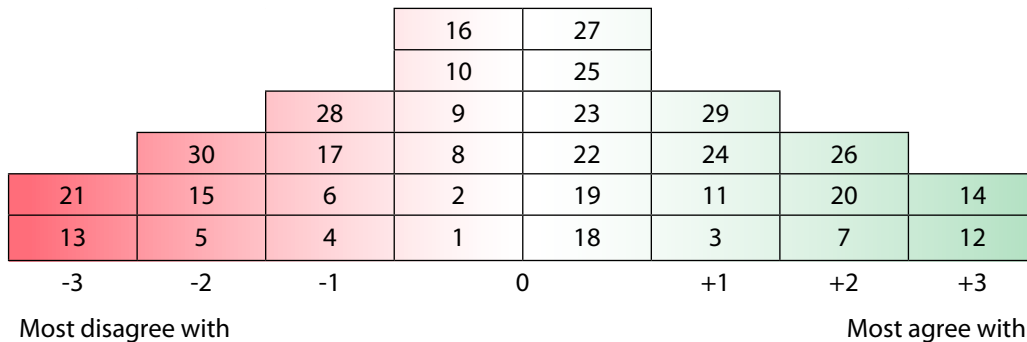


Figure 4. Group 2: Plantation impedes local development.

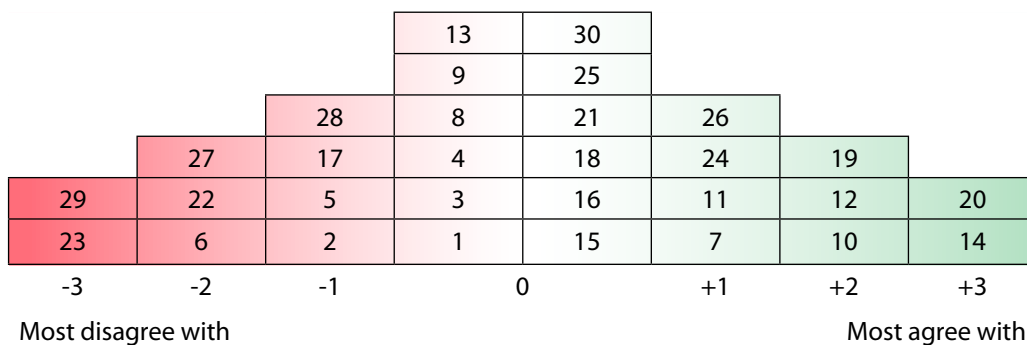


Figure 5. Group 3: General dissatisfaction.



Emphasis on local pressure on land is similar to the previous group, as exemplified by statement 14 that points to the wish that the company release land in the face of increasing population, and in a context of difficult access to jobs because of in-migration (statement 10).

This is supported by the belief that profits generated by the plantation from the sale of pulpwood are not captured locally, thus fueling an impression of inequity that is all the more disturbing as local development is perceived as unsatisfactory (statement 19).

What is striking with this group is that even environmental aspects are assessed as only negative, which is in contrast with the first group and shows how perceptions are difficult to anticipate. Apart

from the issue of logging along the river, which is an obvious problem that no participant seriously agrees with, this group strongly disagrees that the plantation would have contributed in any way to the conservation of wildlife (statement 23), prevented floods (statement 22) or reduced erosion (statement 22). While some of these statements are likely to reflect actual impacts on the ground, the fact that all aspects are emphasized by the group shows a strong belief that the plantation should not be in their landscape.

### 3.2 Household survey

As many as 606 respondents were included in the survey, with basic characteristics and distribution among sites as summarized in Table 5.

**Table 5. Socioeconomic characteristics of respondents.**

	Total	PINE		TEAK		ACACIA				
		Jabung	Slahung	Nglebur	Bangunrejo Lor	Suaran	Buyung-Buyung	Pinang Sebatang Barat	Rantau Bertuah	Lubuk Jering
Number of respondents	606	35	94	92	94	76	77	55	55	28
% of female respondents	29	43	44	30	34	34	25	13	15	7
<b>Age (%)</b>										
18–35	22	26	21	28	29	25	16	16	13	21
36–55	58	51	54	49	59	64	74	51	65	54
>56	19	23	24	23	13	11	10	33	22	25
<b>Education level (%)</b>										
None	9	3	12	12	7	4	3	24	4	7
Elementary	51	71	37	54	49	50	68	49	40	46
Secondary/high school	35	20	48	25	41	43	27	18	44	39
Higher education	5	6	3	9	2	3	3	9	13	7
Number of motorbikes (average)	1	1	1	2	1	1	1	2	2	2
% of migrants	43	26	11	9	28	70	56	87	93	36
Number of people in household (average)	4	4	4	4	4	5	5	4	5	5
% land claims	22	0	0	0	0	25	42	49	69	61

Preliminary indications on the relation between perceived local impacts and plantation types (acacia, pine, teak) are provided in Table 6 with results from tests of the correlation links (for all types and for pairs of types).

A first observation is that all variables show significant links with plantation types, except for employment, which seems to be specific to local dynamics in each of the study sites. A second observation is that acacia exhibits differences to pine and teak for most variables, with more significant links between variables and pine/acacia and teak/acacia than between variables and the pair pine/teak. This suggests that within all three plantation types, acacia follows a special pattern, either positive or negative.

We broke down the survey questions into four broad topics, namely interactions of village/

plantation with employment and use of land, positive impacts, negative impacts, and evolution of perceptions over time.

### 3.2.1 Interactions in terms of employment and use of plantation land

Significant differences exist between plantation types with respect to the use of the land by neighboring populations. The share of respondents that admitted to using the land under the ownership or management of the company is lowest for acacia (26%), moderate for pine (64%) and highest for teak (87%). This is likely to be related to the greater demographic pressure in Java and the wide implementation of the intercropping system, which has become a classic feature of teak plantations' integration in the rural landscape. In contrast, acacia is managed more intensively, and shared use of the land is a less accepted practice.

**Table 6. Significance of the links between plantation types and selected variables.**

Variable	Plantation	N	Pearson's Chi <sup>2</sup> (degrees of freedom)	Cramer's V	Interpretation (significance/strength of relationship)
Do you use plantation land for your own activities? (yes/no)	all	603	177.57*** (2)	0.54	high/high
	pine/teak	313	19.75*** (1)	0.25	high/medium
	pine/acacia	417	58.53*** (1)	-0.37	high/medium
	teak/acacia	476	167.00*** (1)	-0.59	high/high
Have you ever worked at the plantation? (yes/no)	all	606	4.10 (2)	0.08	not significant
	pine/teak	315	3.91** (1)	0.11	medium/low
	pine/acacia	420	2.59 (1)	0.08	not significant
	teak/acacia	477	0.36 (1)	-0.03	not significant
Number of benefits listed by the respondent (0–1, 2–3, more than 3)	all	606	201.35*** (4)	0.41	high/high
	pine/teak	315	0.54 (2)	0.04	not significant
	pine/acacia	420	126.94*** (2)	0.55	high/high
	teak/acacia	477	158.87*** (2)	0.58	high/high
Number of negative aspects listed by the respondent (0–1, 2–3, more than 3)	all	606	195.73*** (4)	0.4	high/medium
	pine/teak	315	5.50* (2)	0.13	medium/low
	pine/acacia	420	99.18*** (2)	0.49	high/high
	teak/acacia	477	166.99*** (2)	0.59	high/high
How have your general perceptions of the plantation evolved? (worse/similar/better)	all	603	299.52*** (4)	0.5	high/high
	pine/teak	314	9.37*** (2)	0.17	high/low
	pine/acacia	417	244.98*** (2)	0.77	high/high
	teak/acacia	475	209.46*** (2)	0.66	high/high

Notes: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01.

For two variables, the number of respondents is 603 because we removed those who did not provide an answer.

**Table 7. Employment data.**

(%)	Acacia (n = 291)	Pine (n = 129)	Teak (n = 186)
Worked at least once at the plantation	48.8	40.31	51.61
Daily workers	49.65	17.31	88.54
Contractual workers	12.06	0	7.29
Permanent workers	14.18	0	1.04
Paid by the task	17.73	80.77	3.13
Works 1–10 days/month on average	15.6	78.43	38.54
Works 11–20 days/month on average	19.15	13.73	21.88
Works 21–30 days/month on average	61.7	7.84	39.58

However, there are significant variations between acacia villages – although all of them exhibit lower figures than for other plantation types – with percentages in the range of 8–39%. Interestingly, two villages with lower percentages are Buyung-Buyung, whose population of migrants is involved in fishing and aquaculture, and Rantau Bertuah, whose population of transmigrants is involved in intensive oil palm cultivation on part of their territory. They declared limited need to expand their land use, probably because of lack of capital or labor availability. This indicates that the presence of migrants is not necessarily related to encroachment in concessions.

Employment of respondents at the plantations is roughly the same for all plantation types, in the range of 40–52%, but the variations between villages are slightly greater. While it is difficult to know whether these variations are due to the use of random samples or to specific local conditions, we stress that the share of respondents with employment experience never goes below a third, which is an indicator of substantial labor opportunities for settlements around plantations in all cases.

This relative homogeneity is not verified when looking at the type of contractual relationship, which is obviously critical in assessing the potential for villagers to access stable labor markets with associated benefits. Indeed, for pine, the majority of workers are paid by the task, which reflects the system of resin tapping contracted to villagers through the allocation of rights to specific plots. For teak, the majority are classified as seasonal workers, which is another term for daily labor without contracts. For acacia, the situation is more diversified, where about half are seasonal workers

and the rest evenly distributed between contractual (short-term contracts), permanent staff and those who are paid by the task. While this pattern tends to remain at the village level (e.g. permanent positions for acacia workers only, workers are paid mostly by the task for pine), there are still significant differences among sites with either pine or acacia plantations.

Going one step further, for work intensity, we unexpectedly find related results. The vast majority work 1–10 days a month at the pine plantations, which reflects the low intensity of resin tapping, among other factors. For teak, the diversity of situations among seasonal workers, who can handle various tasks with various intensities depending on the tasks and on their own availability, is reflected in a fairly even distribution in terms of how many days are worked per month. Acacia is more intensive over the year for those lucky enough to have penetrated the working environment of the company, as almost a third work 21–30 days a month. All villages follow similar trends for each plantation type.

To shed light on this quantitative information, which constitutes a snapshot of the situation at the time of the survey, we added questions about the willingness to work more and the reasons for not working more. Overall, significant numbers of people expressed their interest in working/working more, totaling between one-fifth and more than two-thirds of respondents across villages. For those who did not express this wish, we asked why they were satisfied with the current situation and obtained a range of answers. For all villages, the main reason is the lack of time, which supports the idea that these plantations provide complementary sources of livelihoods in the rural landscape (Pirard

and Mayer, 2008). This is exacerbated in the case of teak (76%) and pine (47%), which is likely because of the higher level of development of these Javanese areas. Low incomes were only cited by about 15% of respondents in three villages, and all of them work on acacia plantations. If we combine 'too demanding' and 'too old', assuming that the latter reflects to some extent the difficulty/physical requirements of the job, we obtain significant percentages of the respondents, representing more than one-fifth for all plantation types.

### 3.2.2 Services and benefits

Due to the critical importance of the perception of impacts in this study, we asked two related questions as follows: "What did you enjoy that was provided by the company?" and "What benefits/positive aspects are associated with the plantation?" We realized that the former was interpreted in personal terms as relating to services that would have been directly provided to the respondent (e.g. jobs), whereas the latter was understood much more broadly as referring to impacts in the area, including local development aspects or ecosystem services. We decided to focus the analysis on the second question because it provided a greater wealth of information

and better reflects local perceptions towards plantations. For example, villagers at pine sites were generally very positive in informal discussions about their landscape, yet provided 0–1 ratings of benefits in answer to the first question. In contrast, several benefits were mentioned at acacia sites, where people showed greatest dissatisfaction during informal discussions and initiated most claims to the land. This led us to the conclusion that perceptions were better captured by the second question.

Data analysis shows that the majority of the respondents cited one or no positive impacts with acacia development, which is in stark contrast to pine and teak sites, where more than two-thirds of respondents cited at least three positive impacts. The impacts are diverse and were coded *ex post* with 18 options, ranging from better local climate to employment, and included the distribution of seedlings or infrastructure. To facilitate the presentation of results and their understanding by the readership, we created four broad thematic categories: contribution to local development; provision of ecosystem services; various types of support to villagers, from loans to schools or training; and others, such as places of worship or hospitals (see Table 8).

**Table 8. Perceptions of services and benefits provided by plantations (% of respondents replying spontaneously).**

Services and benefits	Pine			Teak			Acacia						Entire sample
	A	B	Total	C	D	Total	E	F	G	H	I	Total	
<b>Local development</b>	86	89	88	99	100	99	84	90	86	89	60	82	89
Employment	51	31	36	47	49	48	75	84	25	73	35	65	53
Livelihoods	43	74	66	53	59	56	46	27	21	38	7	30	45
Infrastructure	6	3	4	15	1	8	32	19	64	55	29	35	20
Provision of goods/ land access	69	80	77	98	88	93	5	0	0	0	0	1	46
<b>Ecosystem services</b>	66	71	70	61	73	67	13	5	0	2	2	6	38
Water-related	46	59	55	59	67	63	11	3	0	0	0	3	33
Erosion-related	20	44	37	16	49	33	4	5	0	0	2	3	19
<b>Support</b> (training, loans, education...)	11	5	7	18	11	15	9	1	7	18	4	8	10
<b>Others</b>	3	1	2	5	0	3	8	5	14	4	18	9	5
<b>None</b>	0	1	1	0	0	0	13	8	11	9	31	14	7

Note: A = Jabung, B = Slahung, C = Nglebur, D = Bangunrejo Lor, E = Suaran, F = Buyung-Buyung, G = Lubuk Jering, H = Pinang Sebatang Barat, I = Rantau Bertuah.

In the case of acacia, respondents focused almost exclusively on local development as a positive consequence of the development of the plantation (82% cited at least one related benefit, and the lowest proportion was in Rantau Bertuah, still with 60%). The other broad categories were neglected in a consistent manner across acacia sites, with 6%, 8% and 9%, respectively, for ecosystem services, support and other factors as broad categories. In other words, these large-scale plantations established in remote areas are perceived as opening up poorly accessible sites with road infrastructure among others, and as stimulating local trade and business, as well as providing jobs, the main component of this category in terms of citations. However, improvements to infrastructure and local conditions have not been pursued further by plantation owners, and there has certainly been no positive impact on the environment.

When asked about additional benefits that the company was expected to provide, communities around acacia plantations mostly mentioned the local development and support categories (63% and 24%, respectively), which shows a high level of expectations in this regard in addition to the benefits already provided. Emphasis was placed on better roads and increased access to concessions for use by villagers. This shows that, first, in these poorly developed and often remote areas where the state is not very visible or active, these companies are seen as agents of development and expectations of them are high; and second, they lack legitimacy to control such large pieces of land and need to be more integrative in the use of their concession areas.

Pine and teak plantations are perceived to produce many positive impacts locally, as illustrated by 88% and an impressive 99% for local development, respectively, and very satisfactory rates of about two-thirds for both plantation types for ecosystem services. This is a very robust result, as variations between villages are limited. Water and reduced erosion (implicitly with sustainable yields for local cultivation) were cited by a number of respondents. These results contrast with extremely low rates of citation for infrastructure (mostly roads and bridges) in all pine and teak sites, which can certainly be explained by the long-term presence of these plantations in these rural landscapes, and therefore dramatic changes in the local infrastructure cannot be associated with the company. Pine/teak plantations in Java contrast

with acacia plantations in other islands: the former were established in areas where there is now some higher level of development, but the latter are more recently established in frontier areas that they contributed to opening up.

Another contrast between pine/teak and acacia is the provision of goods and access to plantation land, with 77%/93% and 1% of respondents citing these, respectively. The latter figure is all the more telling as respondents for four out of five acacia sites did not mention this benefit at all. This shows a clear difference in perceptions between plantations with longer rotations that have become a legitimate and active part of the landscape and those that are more recent with shorter rotations for fast-growing species in disputed areas. The former tend to provide more access to resources such as fuelwood and land for intercropping, hence providing a large set of benefits beyond jobs and infrastructure. The latter, however, are seen as more intrusive and competing for land, although it is fair to recognize that they fill the gap in investments left by the state and contribute to local development with jobs and other economic benefits.

Still, respondents at pine sites remain eager for support activities as reflected in their responses to the question about 'expected services and benefits from the plantation'. They usually quote cattle (50%), loan facilities (30%), and a variety of extension services (26%). Teak sites have lower unsatisfied expectations, with 54% of respondents not citing any category whatsoever.

There was consensus across villages on the lack of support provided by companies, with 1–18% of respondents per village citing one or more related benefits (hence, 82–99% cite no related benefit at all). This provides a huge margin for action by companies in order to improve their integration into the landscape, to integrate locally and to obtain a "social license to operate".

### 3.2.3 Negative impacts

Negative impacts were surveyed with one broad question, "What negative aspects are associated to the plantation?" It allows us both to test whether few/many positive impacts are correlated to many/few negative impacts, and to point out the main problems related to plantation development and areas of improvement (Table 9).

**Table 9. Perceptions of negative impacts caused by plantations (% of respondents replying spontaneously).**

Negative impacts	Pine			Teak			Acacia						Entire sample
	A	B	Total	C	D	Total	E	F	G	H	I	Total	
<b>Local development</b>	14	45	36	22	22	22	80	70	93	89	85	81	54
Access to land and natural resources	0	14	10	16	1	9	58	61	79	80	75	68	37
Livelihoods	0	10	7	0	0	0	30	18	75	49	25	34	18
<b>Environmental impacts</b>	11	15	14	2	1	2	59	38	61	64	31	49	27
Biodiversity/wildlife	0	4	3	0	0	0	50	35	46	56	25	42	21
<b>Lack of infrastructure and services</b>	6	31	24	14	23	19	20	44	7	5	24	23	22
<b>Various annoyances</b>	9	5	6	24	11	17	26	18	32	36	44	30	21
Plantation does not look good/is too big	0	2	2	4	0	2	24	12	29	27	18	21	11
<b>Others</b>	6	20	16	8	6	7	41	64	32	16	51	43	26
Communication with company	0	19	14	4	3	4	8	57	32	11	42	30	19
<b>None</b>	66	47	52	62	63	62	8	9	7	4	2	6	33

Note: A = Jabung, B = Slahung, C = Nglebur, D = Bangunrejo Lor, E = Suaran, F = Buyung-Buyung, G = Lubuk Jering, H = Pinang Sebatang Barat, I = Rantau Bertuah.

In the case of acacia, the small number of benefits and services mentioned by respondents is indeed accompanied by a high rate of dissatisfaction, with 44% of respondents citing at least four negative impacts and a mere 6% citing no negative impacts at all. The vast majority of respondents point to adverse effects on local development, which is clearly a stronger statement than not mentioning local development as a positive effect from plantation development. A detailed analysis indicates that the negative perception is mostly due to restricted access to land (often translating into land claims), usually associated with reduced sources of livelihoods. There is, therefore, competition over local natural resources, and a majority of people think that this is detrimental to their economic fate.

This trend is verified in environmental terms and also across villages bordering acacia concessions, as respondents are convinced about there being negative impacts on various environmental features. Loss of biodiversity is prominent in this assessment, as it is directly associated with forest loss, which gives way to plantation establishment. Acacia plantations also stand out as not being esthetically pleasing and being established at too

large a scale; they indeed commonly cover areas of tens of thousands of hectares, as illustrated in the sample villages. Other annoyances such as pollution, dust and noise caused by passing logging trucks and other continuous operations with short rotations of 5–7 years, were also flagged for acacia – much more so than for teak or pine – as well as unsatisfactory communication channels with the company. The case of acacia plantations is not surprising, as these pulpwood plantations lag behind teak and pine plantations, which are managed by a parastatal company that initiated early local development programs with the creation of intermediary institutions that provide effective ways to convey grievances and make requests.

In other words, teak and pine seem to do better on all fronts as far as negative impacts are concerned. In general terms, it is meaningful that as much as 52% and 62% of respondents cite no problems for pine and teak, respectively, and 71% and 80% cite one problem at most. This means that negative impacts reflect a minority of opinions that involve specific cases. For instance, 22% of Nglebur (teak) respondents cite truck annoyances and 16% cite lack of employment, and 20% of Slahung villagers (pine) mention bad communication.

One possible interpretation for the lack of association between plantations and potential negative impacts is the long-term establishment of pine and teak and their good integration in the landscape. Villagers may face a number of problems, for instance in terms of water services, but do not attribute the responsibility to the plantation owners, as water services have always been a problem. The same applies to benefits and services; for instance, the local climate may be well regulated because of the presence of the plantation, but people would not see any difference, as the plantation was established before they were born.

### 3.2.4 Evolution of perceptions and changes in the landscape

To try to go beyond a snapshot analysis, we asked how perceptions had evolved over time in the same questionnaire. Here, acacia exhibits a specific pattern with clearly worsening opinions (55%) compared with an anecdotal 4% of improved opinions. In contrast, 76% and 60% of villagers located near pine and teak plantations, respectively, have improved perceptions and very low rates of dissatisfaction (5% and 8%, respectively). This probably reflects efforts by the government to enhance the integration of plantations under public management and their interactions with neighboring populations, as exemplified by the intermediary institutions and advanced local development programs over the last 15 years.

These efforts seem to have paid off, as integration and social acceptance could not be taken for granted; otherwise, the majority of villagers would have declared stable levels of satisfaction.

This pattern is consistent across villages, with between one-third and two-thirds of worsening opinions in acacia sites and with figures significantly higher than for other sites in all cases. This is a remarkable result for two reasons: first, it goes beyond the fact that large-scale pulpwood plantations would have difficulties in obtaining a social license to operate because of inherent characteristics, as indicated by the evolution of perceptions that we captured; second, in recent years, efforts were supposed to have been made by these companies in order to improve the situation; however, this is not yet reflected in the minds of people.

The question on radical changes to the landscape was only asked at sites near acacia plantations for obvious reasons. Indeed, the other plantations have been around for such a long time that villagers cannot remember a time when they did not exist, and hence no comparison can be made to a landscape without their presence. Three-quarters of respondents consider that plantations have generated radical changes to their living environment, and this change is mostly negative (54%), and slightly positive (18%), yet with significant differences between villages.

# 4 Discussion

## 4.1 Lessons from the Q method

With our Q-method experiment we have been able to identify three distinct groups: one satisfied by the plantation but acknowledging that some elements could improve the situation, and two groups unsatisfied, one mainly for economic reasons and the second one in a more general manner. Interestingly, this shows that competition for land use is not the only reason behind local opposition to the development of industrial tree plantations in Indonesia, as part of the population highlights other negative impacts related to the environment. In addition, poor law enforcement resulting in a lack of positive impacts, as well as local social dynamics with migrations, were also identified as drivers of discontent and potentially of open conflicts at later stages.

The issue of migrants is of paramount importance in the study site with rapid population growth during the last two decades due to a large flow of migrants coming from other Indonesian islands in search of land to cultivate. This, together with the plantation has created greater competition for land. This is especially true in a context of under-utilization of the concession land by the plantation, as it creates a feeling of anger towards the plantations by the population who claims that these lands could have been redistributed. On the other hand, economic matters such as income/salary provided by the company, appear to be (quite surprisingly) of relatively low importance for the population compared to the issues previously emphasized (including more general local development) since they remain non-salient for the three groups.

The presence of two groups with negative opinions should not be interpreted to mean that the majority of the population disagrees with the plantation. The Q method does not give any indication of the distribution of the respondents

into the various groups, and only addresses the homogeneity versus heterogeneity (our case) of the sample. Policy recommendations should be backed by statistical information in order to determine where the majority lies, and whether the groups are of similar sizes. Indeed, if the company or the authorities were willing to take action in order to improve the situation on the ground, then these actions would gain relevance and legitimacy from such complementary information.

Yet we argue that our results show the need for policies – both private and public – that deal with the following issues. First, concerns about competition in access to land were stated, unsurprisingly and in line with knowledge in this field in Indonesia. This is due to intense demographic dynamics that are caused, or at least amplified, by in-migrations, and repeated attempts by villagers to appropriate land within the concession boundaries. Another driver behind this phenomenon is the under-utilization of the concession land by the company and low levels of activity because of a very specific situation, namely the erratic production by its sister-company pulp mill that represents its unique market. Yet, such low levels of production are common in the country where main concessionaires have proved to be unable to sustain their plantations, and government plans to increase planted areas have not fully succeeded. Therefore, unused plots might be redistributed in order to meet local needs but also force concessionaires to engage in an optimal use of public resources that are made available to them.

Second, it was interesting to note the attention paid to law enforcement among respondents and the perceived improvement of impacts that the application of concession rules would produce. A classic example is the logging of riparian forests that is considered detrimental: regulations exist that forbid companies to log forests along river



streams, but poor law enforcement had led to many violations of this rule in concessions over the country (we do not refer to the company site with this statement). More generally, with the perceived impunity of private companies operating in the forestry sector over decades of malpractice, people show little faith in the willingness of the government to enforce the rules. Yet some are still optimistic about the possibility of generating positive impacts if the regulations are fully applied.

Third, and related to the previous point, local populations should be engaged in order to clarify the obligations of the company in terms of land and resource management, as well as silvicultural practices. Furthermore, the attention paid to ecosystem services versus negative environmental impacts among respondents, depending on the group, calls for more engagement of local people in order to mitigate negative impacts and promote positive ones. Innovative solutions, such as having multispecies plantations, could be designed in order to create more diverse landscapes that reflect local values and facilitate the integration of these large-scale monoculture plantations. An important strength of our Q study was to show the diversity of views that go beyond simplistic views of monolithic positions. By taking the diversity of local perceptions into account and trying to implement solutions, the company may improve its local reputation creating a mutually beneficial long-term relationship. In addition, implementing local proposals for a multispecies plantation, as well as practicing intercropping in a systematic manner, are likely to reduce the environmental impacts of the plantations.

## 4.2 Lessons from the household survey

We argue that there are two sub-groups with pine/teak plantations converging on many aspects and contrasting with acacia plantations. Common features of pine and teak plantations include their localization on Java Island with a higher level of development, a long history, ownership by a parastatal company, relatively high levels of recognition of the land tenure and legitimacy of the company to operate, and medium to long rotations from 20 to 50 years. In contrast, acacia plantations are located in remote areas of Sumatra and Borneo islands, are managed by a private company, have a shorter history, and see their

tenure rights and legitimacy commonly challenged. These factors might partially explain why pine and teak plantations generate more positive perceptions, although we also report important differences among villages themselves in some variables. These better perceptions relate mostly to the higher number and variety of benefits and services, lower number of negative impacts, and greater opportunities to use the plantation for rural livelihoods.

When looking at the positive impacts perceived by surrounding populations, the pine/teak and acacia plantations have followed contrasting patterns in terms of local development. The localization of old pine and teak plantations in areas that have been opened up for a long time seems to correlate with fewer associations by villagers between infrastructure and the company. Interestingly, this does not mean that local development was not acknowledged: villagers associate the plantations with a diversity of benefits ranging from development to ecosystem services, including the provision of ecosystem goods (e.g. fuelwood).

These results can be combined with the heavy focus of villagers around acacia plantations on economic development and infrastructure, both in terms of acknowledgment of past achievements and expectations for future progress and improvement. This is likely to be related to the fact that the latter acacia plantations are usually established in more remote areas where they can, and are expected to, make a difference. Indeed, 56% of acacia respondents considered that the company should provide these services, and only 23% considered that the state should<sup>2</sup>. One general interpretation of this is that pine/teak plantations operate in a more static environment than acacia plantations, and this is magnified by the heavy presence of migrants as a majority group in most acacia sites (pine and teak sites in Java are more ethnically homogeneous).

This suggests that recently established plantations, especially in under-developed areas, that do not take local inhabitants into account are likely to be assessed critically. This means that the company cannot rely on the positive externalities provided by its first investments (infrastructures, economic activity, etc.) to be socially integrated within the area, and has to go a step further.

<sup>2</sup> We did not ask the question in the other plantation sites because we realized that respondents were confusing between the company and the state, as the company is parastatal.

In-migrations in Indonesia are common and impactful. We only looked at this aspect in Sumatra and Kalimantan sites with acacia, as it is less relevant in the Javanese context. On many variables the views and experiences of migrants and indigenous people were similar. In terms of employment, the moderately higher percentage of work experience among indigenous respondents (55% versus 45%) is probably due to company policies to preferentially hire local people, but this does not seem to lead to major differences. Stated positive and negative impacts were extremely close for both groups of respondents, as well as whether the plantation generated a dramatic change in their environment.

But differences also exist, as illustrated by a much larger proportion of indigenous respondents having suffered from restricted access to natural forests for their own needs. This is not surprising and can be explained by their longer presence and traditional lifestyles with greater dependence than migrants on natural forests to which they might also have rights. Indigenous respondents tend to see their overall appreciation of the plantation worsening over time, while migrants tend to have more stable views, which is probably reinforced by the number of them who have not witnessed the change in the landscape. In the end, migrants put their hopes in the hands of the company much more than indigenous respondents who rely on the state.

Data were disaggregated by gender for further analysis. No significant differences were found between males and females in whether the plantation dramatically changed the living environment and in what ways, and whether the company or the state should be in charge of providing services. More importantly, we found that women and men tend to give similar responses to positive and negative impacts, with only few more benefits cited by women (55% cited at least three benefits) than men (43% cited at least three benefits), and a few more negative impacts cited by men (42% cited at least three negative impacts) than women (27% cited at least three negative impacts), which provides a general indication that plantation development has not impacted women more than men. In fact, the overall appreciation of positive and negative impacts is strongly related to plantation types so that either gender or the origin of the respondents appear to be secondary factors. Yet there is a

greater exception by women in the capacity to access natural forests to satisfy local needs. Two-thirds of the female respondents deplored reduced access to the natural forest caused by the plantation, significantly more than the one-third of male respondents who expressed objections.

Regarding different perceptions and experiences between men and women, work opportunities obviously matter a lot and they differ significantly depending on plantation types. Again, pine and teak contrast with acacia: in the former case women seem to be marginalized (73–77% have never worked at the plantation) while half of them have work experience at the latter. For men the differences are less obvious with 47/37/52% having work experience in pine/teak/acacia plantations respectively. It is difficult to assess the reasons for such results.

In dynamic terms, we find that women tend to have a better assessment of the plantation: to the question “Was the change to the landscape positive or negative?” women had equally distributed positive and negative views, whereas men significantly lean towards the negative side (58% versus 12% with positive assessment). This is supported by the evolution of perceptions over time, as women had 43% increasingly positive and 23% increasingly negative views, whereas men were equally distributed.

### 4.3 Combining results from household survey and Q method

#### 4.3.1 Are Q-method groups representative according to the household survey?

In order to go further into the analysis of the results, we combined the outcomes of both methods. Indeed, the Q method does not give any indication on the respective shares of the group and, hence, their level of representativeness. Both methods are complementary in this respect. We only compared results from the Q study with data on the different acacia sites from the survey since we conducted our Q study in Suaran, a village nearby an acacia plantation.

To do so we looked at the main discriminating characteristics of each group from the Q method and used them to isolate groups of respondents presenting these traits in the data from our survey.

For group 1, respondents are the only ones with positive perceptions towards environmental impacts from the plantation. Group 2 is characterized by a negative perception heavily oriented towards local development but with no focus on the environment, while group 3 has negative perceptions towards both environmental impacts and local development contribution from the plantation.

Therefore, in order to find respondents corresponding to each group, we proceeded as follows: for group 1, we looked at respondents citing at least one positive environmental impact but no economic impact; for group 2, we selected respondents citing no environmental impact from the plantation but stating at least one negative impact on local development; and for group 3 we included individuals giving at least one negative impact on both environment and local development. With this method a respondent belongs to either one group or none, and cannot belong to more than one group.

Results in Table 10 show that only group 2 and 3 are represented in significant numbers with respectively 36% and 43% of the respondents from our sample. Group 1, on the other hand, is practically non-existing with only one respondent meeting our criteria. It could be suggested to have a less restrictive definition of group 1 by taking into account only respondents citing positive environmental impacts (even if it violates the rule to have mutually exclusive groups). We can also use less restrictive conditions for the two other groups while keeping them mutually exclusive, with results indicated in the last column of Table 10.

Group 1 is only composed of one individual and therefore is not useful. However, it is interesting to note that the small fraction of respondents citing positive environmental impact (group 1 in the case of the least restrictive definition) mainly comes from Suaran, the village where we undertook the Q study. Therefore, we conclude that local perceptions of positive environmental impacts are characteristics only applicable to Suaran and cannot be generalized to other sites.

Group 2, focusing mainly on economic related issues, represents 36% of our sample near the acacia plantations. Compared to the related group in Q, respondents with this new group have both positive and negative assessments of local development impacts. Indeed, 77% of them cited at least one economic item as positive, mainly employment (61%) but also income and infrastructures (26% and 29% of respondents, respectively). A total of 80% of respondents cited 'restricted access to land' as a negative aspect. Respondents seem disappointed by the plantations (only 4% have seen their opinion about the plantation improving through time), and do not have great expectations for more positive impacts in the future.

Group 3 represents 43% of our total acacia sample (those who mentioned both environment and economy as negative aspects). This group was mainly concerned with restricted access to land/resources and land conflicts (87%) and reducing sources of livelihood (54%). Interestingly, they express

**Table 10. Relative size of the groups determined with the Q method.**

	Description from Q	Discriminant traits in the survey	Population N (% of the total)
<b>Group 1</b>	<b>The enthusiasts</b> , also pointing to the need for better law enforcement to optimize local impacts	Cite positive environmental impacts but nothing on local development issues	<b>N = 1</b> (0,3%) (Less restrictive: 16 (5,5%))
<b>Group 2</b>	<b>Plantation impedes local economic development</b>	Cite no environmental impacts but find at least one negative economic impact	<b>N = 106</b> (36%) (Less restrictive: 138 (47%))
<b>Group 3</b>	<b>General dissatisfaction</b> with no hope for an integration of plantation in the landscape	Cite both negative environmental and economic impacts	<b>N = 125</b> (43%) (Less restrictive: 143 (49%))

\*Total sample considered here is 291 respondents since we focused only on Acacia plantations

some satisfaction with economic aspects, a point that our Q study did not say explicitly. Indeed, 84% put at least one economic related category within the positive aspects, with a focus mainly on employment (65%) and infrastructure (42%). The focus on negative environmental impacts was primarily on biodiversity issues (88%) and to a lesser degree negative impacts on environment and ecosystem services (40%). This concern about the environment is not reflected by their expectations, which are mostly oriented towards economic topics (62%), but once again no strong consensus emerges. There are significant expectations for provision of goods and land (26%), infrastructures (27%) and employment (25%). Finally, we observe that, just as in the previous group, opinion worsened over time with 61% of the respondents claiming a deterioration. Once again, this group seems disappointed by the plantation, with more varied grievances than those of group 2, but not as much as Q results suggest, with some satisfaction concerning employment opportunities and infrastructures investment. They also rely on the company to keep improving and providing goods, land, infrastructures and employment.

#### 4.3.2 Are groups determined by individuals' characteristics?

We tried to identify characteristics of individuals that could explain why they belong to a particular group. To do so, we looked at the composition of groups 2 and 3 and ran a series of statistical tests to find significant differences for any of the variables addressed in the questionnaire. For instance, would gender determine the group an individual belongs to, or the level of education? The results of these tests are presented in Table 11.

It appears that the two groups do not exhibit any specific pattern in terms of socioeconomic and demographic characteristics. It is worth noting that gender and indigenous/migrant variables do not have any significant influence on the respondents' affiliation to one of these two groups; nor any of the variables related to employment. This is an important result as it runs counter to the assumption that plantations have contrasting impacts depending on gender, region of origin and opportunities to work at the plantation, which in turn leads to differing levels of appreciation of the plantation by villagers. In our case, these variables seem to have limited influence on the social acceptance of the acacia plantation.

**Table 11. Significance of the link between affiliation to group 2 vs. 3 and selected variables.**

Variable	N	Pearson's Chi <sup>2</sup> (degrees of freedom)	Cramer's V	Interpretation (significance/ strength of relationship)
Gender	231	0.09 (1)	0.02	Not significant
Age class	231	3.75 (5)	0.13	Not significant
Members in the HH (number)	231	10.03* (5)	0.21	Low/medium
Indigenous / Migrant	231	2.39 (1)	-0.1	Not significant
Year of arrival in village	229	11.35** (4)	0.22	Medium/medium
Employment (yes/no)	231	0.03 (1)	-0.01	Not significant
Worker status	106	0.09 (1)	0.03	Not significant
Education	231	1.12 (3)	0.07	Not significant
Motorbike (number)	231	7.67* (3)	0.18	Low/low
Fridge (number)	231	11.24*** (2)	0.22	High/medium
Village	231	22.45*** (4)	0.31	High/medium

Note: \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ .

HH = household

The variables 'year in arrival in village', 'worker status', 'motorbike', 'fridge', 'member in the HH' and 'education' were simplified in order to avoid biases related to categories with very low numbers of respondents.

In fact, the two variables that seem most important in discriminating between individuals in the two groups are the number of fridges in the household and the settlement village. The former is an indicator of the wealth and social status of the household (also supported by number of motorbikes, yet with a weaker statistical relationship): the higher the wealth and status the higher the probability of belonging to group 3. This could be interpreted as seeing the plantation as an obstacle to plans for investment on land.

Yet this observation is less meaningful for the analysis than the strong relationship between the village where the household is settled and the group of affiliation. Even within the sample of acacia plantations with similar silviculture practices and markets, there are significant differences in terms of appreciation. This could be seen as encouraging as it suggests that the type of plantation does not fully determine perceived impacts by villagers; in other words, companies producing pulpwood in Indonesia could improve their level of social integration with appropriate management. Yet the two villages with higher rates of affiliation to group 2 (hence better perceptions) are Buyung-Buyung and Rantau Bertuah,

which are located in Kalimantan and Sumatera, respectively. As a consequence, this suggests that the history, composition or other idiosyncratic elements play a greater role than company management in these results; otherwise we would have in the same group villages located around the same plantation.

In conclusion, we can say that the two groups partially or fully hostile to the plantation seem to exist in significant numbers within the population according to the household survey (but not the other group with more positive views), even though looking at survey data forces us to nuance the description of these groups compared to the more clear-cut Q study. Indeed, they seem to dislike the acacia plantation in general terms but they nonetheless seem satisfied with employment and, at a lesser degree, infrastructure. The vast majority of our sample lies in one of these two groups which enables us to conclude that acacia plantations failed to receive wide acceptance by populations in the landscape. This comparison of results from our two methods enabled us as well to infer that group 1 from Q method seems to be quite idiosyncratic to only one village among our sample and therefore cannot lead to any further analysis.

# 5 conclusions and recommendations

Over the last few decades, timber plantations have expanded greatly due to increasing demand for timber products. This trend is expected to continue. However, some controversies remain about the economic, social and environmental consequences of these plantations. In this regard, Indonesia is an interesting study case. Here the expansion of timber plantations faces many criticisms due to issues such as land tenure conflicts, unsatisfactory benefit-sharing mechanisms and negative environmental impacts. Studies have mainly focused on smallholder plantations and in many cases present a strong bias, since they focus on conflict areas to evaluate local perceptions. In order to go beyond this, we conducted our surveys in sites around industrial tree plantations that cover a diversity of situations and reflect various management approaches with different species.

Overall, our results show a strong dichotomy between positive perceptions towards pine/teak plantations and negative opinions towards acacia plantations, even though there are some positive perceptions of acacia (mainly about employment and infrastructure provision). The issues of environmental impact and land competition stand out very clearly in our study, highlighting the complexity of fitting the plantation into the biophysical and economic landscape. Perceptions vary greatly between different types of plantation (acacia rated poorly while pine/teak seems to do well) and even between villages for a particular type of plantation. Plantations that have existed for several years become part of the landscape and are therefore viewed positively by neighboring populations, whereas recent plantations, especially those like acacia that cannot provide much land to locals for intercropping for instance, are still seen as detrimental to the landscape. This comes from a lack of investment in support structures (infrastructure, social investment, intermediaries, etc.) for the nearby populations, their needs and

expectations. Still, new plantations in remote areas tend to be the main investors in local development, as the state is not sufficiently present.

There is little variation in perception according to gender or migrant/indigenous divisions. However female and indigenous respondents seem to be more affected than males and migrants in their access to natural forest. Moreover, female respondents appear to be marginalized in terms of job opportunities at pine and teak plantations, but the companies' efforts, or lack thereof, to practice more inclusive hiring have yet to be assessed.

Our Q study gave us some valuable information in terms of distinct groups of villagers: two of these groups strongly disfavored the plantation, while the third group liked it but also pointed out some desirable improvements. Overall, environmental and land-use related issues dominate, and some economic considerations (largely those related to income/salary) were not considered to be of significant importance compared to others. In addition, the survey enabled us to strengthen and document the analysis of local perceptions. The results suggest that the group with most favorable views is poorly represented, while the two other groups appear to be more representative of the population. Nevertheless, the survey suggests that these two groups may not be as much in disfavor of the plantation as indicated by the Q-study, therefore its conclusions might have to be nuanced.

These conclusions have implications for practices of plantation companies, and even for general policies regulating the timber sector. For a 'social license to operate', companies need to take local populations' situations, expectations and ideas into account. This is especially true for acacia plantations, or more generally for recent plantations. A new plantation is disruptive for people living nearby as it impacts the economic and social relations as well as the natural environment. Therefore it should

not be taken for granted that local populations will have positive attitudes towards plantations that substantially change their landscape if their expectations and perceptions are not seriously considered in plantation management plans. Indeed, these companies are considered to be important actors of local development, and in remote areas villagers will expect significant contributions. Taking local populations' ideas into account and replicating practices implemented in well-integrated plantations would improve local perceptions of the plantation. Implementing multispecies plantations instead of monocultures, as well as practicing intercropping at a larger scale would strongly improve the general perception, but will require much more effort from the company. At the very least, debates and meetings between the different stakeholders should be held.

Regarding forestry policies, a focus on ensuring the enforcement of existing laws is recommended in order to avoid the most serious adverse impacts

by companies. This would also increase trust from the population towards companies, which is a crucial point for them to be integrated in the landscape. Indeed, current interactions between local populations and timber companies are marked by great suspicion due to a number of past malpractices.

In order to test the robustness of our results, these studies should be replicated in different locations, particularly for the Q method since we implemented it only in one site. Looking at other types of plantation such as rubber or oil palm would take the analysis one step further. Moreover, studying plantations that do not currently experience any conflicts, or that have put in place specific policies to mitigate local friction, would generate valuable knowledge for other companies to revise their management plans and practices, and for the state to create the conditions for conducive relations between local populations and plantations.

# 6 References

- Abdi, H. 2003. Factor rotations in factor analyses. *Encyclopedia for Research Methods for the Social Sciences*. Thousand Oaks, CA: Sage. 792–5.
- Anderson NM, Williams KJ and Ford RM. 2013. Community perceptions of plantation forestry: The association between place meanings and social representations of a contentious rural land use. *Journal of Environmental Psychology* 34:121–36.
- Baral H, Keenan RJ, Sharma SK, Stork NE and Kasel S. 2014. Spatial assessment and mapping of biodiversity and conservation priorities in a heavily modified and fragmented production landscape in north-central Victoria, Australia. *Ecological Indicators* 36:552–62.
- Baral H, Keenan RJ, Fox JC, Stork NE and Kasel S. 2013. Spatial assessment of ecosystem goods and services in complex production landscapes: A case study from south-eastern Australia. *Ecological Complexity* 13:35–45.
- Barry J and Proops J. 1999. Seeking sustainability discourses with Q methodology. *Ecological Economics* 28:337–45.
- Bauhus J, Van der Meer P and Kanninen M. 2010. *Ecosystem Goods and Services from Plantation Forests*. London: Routledge.
- Brockerhoff EG, Jactel H, Parrotta JA and Ferraz SFB. et al. 2013. Role of eucalypt and other planted forests in biodiversity conservation and the provision of biodiversity-related ecosystem services. *Forest Ecology and Management* 301:43–50.
- Brockerhoff EG, Jactel H, Parrotta JA, Quine CP and Sayer J. 2008. Plantation forests and biodiversity: oxymoron or opportunity? *Biodiversity and Conservation* 17(5):925–51.
- Brown SR. 1980. *Political Subjectivity: Applications of Q Methodology in Political Science*. New Haven, CT: Yale University Press.
- Brown SR. 1993. A Primer on Q Methodology. *Operant Subjectivity* 16(3/4):91-138.
- Carle J and Holmgren P. 2008. Wood from planted forests. *Forest Products Journal* 58(12):6-18.
- Chapman R, Tonts M and Plummer P. 2015. Exploring perceptions of the impacts of resource development: A Q-methodology study. *Extractive Industries Society* 2:540–51.
- Cuppen E, Breukers S, Hisschemöller M and Bergsma E. 2010. Q methodology to select participants for a stakeholder dialogue on energy options from biomass in the Netherlands. *Ecological Economics* 69: 579–91.
- Dasgupta P and Vira B. 2005. *Q Methodology for Mapping Stakeholder Perceptions in Participatory Forest Management*. Delhi: Institute of Economic Growth.
- Del Lungo A, Ball J and Carle J. 2006. Global planted forests thematic study. Results and analysis. Planted Forests and Trees Working Papers. Rome: FAO.
- Dennis KE and Goldberg AP. 1996. Weight control self-efficacy types and transitions affect weight-loss outcomes in obese women. *Addictive Behaviors* 21(1):103–16.
- [FAO] Food and Agriculture Organization. 2010. Global Forest Resources Assessment 2010. FAO Forestry Paper 163. Rome: FAO.
- Gerber J-F. 2011. Conflicts over industrial tree plantations in the South: Who, how and why? *Global Environmental Change* 21: 165-76.
- Government of Vietnam. 2011. Report on the implementation of the five million hectare new afforestation project and the forest protection and development program in the 2011-2020 period. Hanoi, Vietnam: Government of Vietnam.
- Hedenus F and Azar C. 2009. Bioenergy plantations or long-term carbon sinks? A model based analysis. *Biomass and Bioenergy* 33(12):1693-702.



- Indufor. 2012. *Strategic Review on the Future of Plantations*. Helsinki: Indufor.
- Jurgensen C, Kollert W and Lebedys A. 2014. *Assessment of Industrial Roundwood Production from Planted Forests*. Rome: FAO.
- Kallio MH, Kanninen M and Krisnawati H. 2012. Smallholder teak plantations in two villages in Central Java: Silvicultural activity and stand performance. *Forests, Trees and Livelihoods* 21:158-75.
- Kallio MH, Krisnawati H, Rohadi D and Kanninen M. 2011. Mahogany and kadam planting farmers in South Kalimantan: The link between silvicultural activity and stand quality. *Small-scale Forestry* 10:115-32.
- Kangas A, Saarinen N, Saarikoski H., Leskinen LA, Hujala T and Tikkanen J. 2010. Stakeholder perspectives about proper participation for Regional Forest Programmes in Finland. *Forest Policy and Economics* 12:213-22.
- Lansing DM. 2013. Not all baselines are created equal: A Q methodology analysis of stakeholder perspectives of additionality in a carbon forestry offset project in Costa Rica. *Global Environmental Change* 23:654-63.
- Leclerc G. et al. 2008. L'information objective comme représentation subjective : une analyse expérimentale des besoins pour un système d'information pour le pastoralisme.
- Maryudi A, Nawir AA, Permadi DB, Purwanto RH, Pratiwi D., Syofi'i A and Sumardamto P. 2015. Complex regulatory frameworks governing private smallholder tree plantations in Gunungkidul District, Indonesia. *Forest Policy and Economics* 59:1-6.
- Maturana J, Hosgood N and Suhartanto AA. 2005. Moving towards company-community partnerships: elements to take into account for fast-wood plantation companies in Indonesia. CIFOR Working Paper no. 29. Bogor, Indonesia: CIFOR.
- Nambiar ES, Harwood CE and Kien ND. 2015. Acacia plantations in Vietnam: Research and knowledge application to secure a sustainable future. *Southern Forests: A Journal of Forest Science* 77(1): 1-10.
- Nicholas JB. 2011. Reliability in Q methodology: a case study. In *Eastern Education Research Association Annual Conference*. Akron, OH: The University of Akron.
- Payn T, Carnus J-M, Freer-Smith P, Kimberley M, Kollert W, Liu S, Orazio C, Rodriguez L, Silva LN and Wingfield MJ. 2015. Changes in planted forests and future global implications. *Forest Ecology and Management* 352:57-67.
- Pirard R. and Cossalter C. 2006. *The Revival of Industrial Forest Plantations in Indonesia's Kalimantan Provinces: Will they help eliminate fiber shortfalls at Sumatran pulp mills or feed the China market*, CIFOR, Bogor, Indonesia.
- Pirard R and Mayer J. 2008. Complementary labor opportunities in Indonesian pulp plantations, and implications for land use. *Agroforestry Systems* 76(2):499-511.
- 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. Presentation. Montpellier Conference, 24-26 March 2010, Montpellier. Bogor, Indonesia: CIFOR.
- Schmolck P. 2015. The QMethod page. Accessed 18 December 2015. <http://schmolck.org/qmethod/>
- Stephenson W. 1935. Technique of factor analysis. *Nature* 136:297-7.
- Visser M, Moran J, Regan E, Gormally M, Sheehy Skeffington M 2007. The Irish agri-environment: How turlough users and non-users view converging EU agendas of Natura 2000 and CAP. *Land Use Policy* 24(2): 362-73.
- Walker BB. 2013. *Identifying Participants' Perspective Changes in Mediation Training Using Q Methodology*. Athens, GA: University of Georgia.
- Warman RD. 2014. Global wood production from natural forests has peaked. *Biodiversity and Conservation* 23(5):1063-78.
- Xu J. 2011. China's new forests aren't as green as they seem. *Nature* 477:371.



*CIFOR Occasional Papers* contain research results that are significant to tropical forest issues. This content has been peer reviewed internally and externally.

Industrial timber plantations are controversial in many parts of the world. Indonesia provides an interesting case study, with its history of conflicts over land use and current ambitions for plantation expansion.

This study investigated perceived impacts of plantations on nearby rural populations. A survey was conducted of 606 respondents across three islands (Java, Borneo and Sumatra), three tree species (acacia, teak and pine) and three end uses (pulpwood, timber production and resin production). In addition, a Q-method analysis was conducted at a site with an established pulpwood plantation in order to identify significantly diverse perceptions of the plantation among villagers. The methods were combined to arrive at a representative view of these perceptions and expectations.

Results illustrate a diversity of viewpoints among villagers, with perceptions varying from general dissatisfaction to enthusiasm. Perceptions of pine and teak plantations tend to differ from acacia pulpwood plantations. For pine and teak, respondents reported a higher number and greater variety of benefits and services, higher number of perceived positive impacts in general, a better environmental record, and more opportunities to use plantation land and products for rural livelihoods. These results contrast with the heavy focus around acacia plantations on economic development and infrastructure. Hence, acacia plantations enjoy some level of recognition for opening up remote areas and providing infrastructure and services that are traditionally the responsibility of the state. Data were disaggregated by gender to enable further analysis, and offer a general indication that plantation development has not affected women more negatively than men.

Our analysis leads to several clear directions for the improvement of plantation management. The role of the state must be clarified and potentially reinforced, except if the burden of development, including that of infrastructure, is to remain the responsibility of companies. Lessons can be drawn from the teak and pine cases in Java as to the performance of institutions that act as intermediaries between companies and people. Contributions by communities should be facilitated early in the planning stages, and this should apply in particular to land claims, to the organization of the labor force (including the privileged form of work contract), to the spatial distribution of the plantation in order to leave aside areas of local value, and to options for land sharing, as this is a major vehicle for fruitful coexistence.



RESEARCH  
PROGRAM ON  
Forests, Trees and  
Agroforestry

This research was carried out by CIFOR as part of the CGIAR Research Program on Forests, Trees and Agroforestry (CRP-FTA). This collaborative program aims to enhance the management and use of forests, agroforestry and tree genetic resources across the landscape from forests to farms. CIFOR leads CRP-FTA in partnership with Bioversity International, CATIE, CIRAD, the International Center for Tropical Agriculture and the World Agroforestry Centre.

[cifor.org](http://cifor.org)

[blog.cifor.org](http://blog.cifor.org)



Fund



**Center for International Forestry Research (CIFOR)**

CIFOR advances human well-being, environmental conservation and equity by conducting research to help shape policies and practices that affect forests in developing countries. CIFOR is a member of the CGIAR Consortium. Our headquarters are in Bogor, Indonesia, with offices in Asia, Africa and Latin America.

