

# Perceptions of local people toward pulpwood plantations: Insights from the Q-method in Indonesia

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## SUMMARY

Industrial timber plantations are controversial in many parts of the world, including in Indonesia. Knowledge of their perceived impacts among local populations is important for better management and integration of plantations in the rural landscape. To advance knowledge on this topic, we used the Q-method in a case study in East Kalimantan province, Indonesia, where a large-scale acacia plantation is established. Three groups emerge from the analysis, with contrasting viewpoints: a first group exhibits enthusiasm over the development of the plantation, including recognition of environmental services provided; the two other groups express dissatisfaction, either generally on all aspects or with a focus on the plantation as an obstacle to local development. Research has shown that the Q-method needs to be complemented by other tools such as household surveys to compensate for its limitations (e.g. lack of representativeness in all groups and lack of information on the determinants of inclusion in a given group).

Keywords: timber plantation, pulpwood, perceptions, environmental impacts, landscape

## Perceptions des populations locales envers les plantations industrielles papetières: Une application de la méthode Q en Indonésie

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Les plantations forestières industrielles restent controversées dans de nombreux pays, tout particulièrement les plantations monoculturelles destinées à produire du bois de pâte pour l'industrie papetière. L'Indonésie est un cas intéressant à cet égard, puisque de nombreux conflits y sont documentés alors que le gouvernement a des objectifs ambitieux d'expansion des surfaces plantées. La compréhension des impacts tels que perçus par les populations est donc particulièrement utile afin d'aider à l'élaboration de plans de gestion pour faciliter leur intégration dans les zones rurales. Pourtant, la diversité des opinions locales reste mal connue, ne serait-ce que parce que les cas d'étude publiés concernent généralement des zones de conflits, ce qui constitue un biais évident. Afin d'améliorer notre connaissance de la question, nous avons donc appliqué la méthode Q à un cas d'étude situé dans la province de Kalimantan Est, en Indonésie, où une plantation d'Acacia à croissance rapide et à grande échelle est environnée de villages et petites villes. Cette recherche nous a permis de conduire une analyse nuancée des perceptions par les populations locales à l'égard d'une plantation industrielle. En effet, il s'avère que trois groupes bien distincts émergent: un premier groupe est enthousiaste et favorable à la plantation, y compris concernant les services environnementaux qu'il associe à son développement; les deux autres groupes expriment une insatisfaction, qu'elle soit générale à l'encontre de la plantation ou bien qu'elle se focalise sur l'obstacle au développement local qu'elle représente. Notre recherche indique que la méthode Q gagnerait à être complétée par d'autres outils de type enquête auprès des ménages afin de remédier à ses limites. Ceci permettrait notamment d'évaluer la représentativité de chaque groupe au sein de la population, et d'identifier les déterminants de l'inclusion des individus dans chacun des groupes.

## Las percepciones de la población local hacia las plantaciones para pulpa: ideas procedentes de la metodología Q en Indonesia

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Las plantaciones forestales de carácter industrial son controvertidas en muchas partes del mundo, como por ejemplo Indonesia. El conocimiento de las percepciones sobre sus impactos es importante para una mejor gestión e integración en el paisaje rural. Para progresar en el conocimiento sobre este tema, se aplicó la metodología Q a un estudio de caso en la provincia de Kalimantan Oriental (Indonesia), donde se ha establecido una plantación de gran escala de acacias. Del análisis surgieron tres grupos con puntos de vista diferentes: un primer grupo mostró entusiasmo por el desarrollo de la plantación, incluido el reconocimiento de los servicios ambientales que presta; los otros dos grupos expresaron su insatisfacción, bien de tipo general en todos los aspectos o bien dirigida hacia la plantación como un obstáculo para el desarrollo local. El estudio ha mostrado que la metodología Q requiere ser complementada por otras herramientas, como las encuestas de hogares, a fin de suplir sus carencias, como p. ej. en la evaluación de la representatividad de cada grupo y los factores determinantes de la inclusión en un grupo dado.

## INTRODUCTION

Planted forests are progressively being substituted for natural forests for timber production globally, accounting for one third of global industrial roundwood production in 2012 (Jurgensen *et al.* 2014). According to recent estimates, planted forests (including semi-natural forests) account for 278 million ha worldwide (Payn *et al.* 2015), with more than 100 million ha of productive plantations (Del Lungo *et al.* 2006), and 54 million ha of industrial fast-growing plantations (Indufor 2012), the remaining plantation estates being dedicated to protective functions such as reduced land erosion or carbon sequestration. Of the 278 million ha of planted forests in 2015 only 29% are in tropics and sub-tropics and 70% are in the temperate and boreal zone (Payn *et al.* 2015).

Depending on the scenarios used, planted forests are predicted to cover 303–345 million ha 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 ha of plantations established for commercial carbon sequestration worldwide by September 2011 (Diaz *et al.* 2011), and a growing area of plantations established for biofuel production (Arevalo *et al.* 2014).

Rapid expansion of planted forests remains controversial in many parts of the world, including Indonesia (see Gerber 2011 for example). Such expansions are praised by some for their capacity to efficiently produce large amounts of wood products that alleviate pressure on natural forests (Sedjo 1999, Walters 2004), to create jobs that support rural development (Paul *et al.* 2013, Schirmer 2008), 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.* 2014). However, many others point to their negative social impacts, such as the many conflicts related to land tenure (Gerber 2015 based on a comprehensive literature review), the limited value distributed and reinvested locally hence poor records in terms of poverty alleviation (Anderson *et al.* 2015 for the case of Chile), and to their negative environmental impacts when a single species is planted on large estates (Ahrends *et al.* 2015 for the case of rubber in South-East Asia), sometimes on previously forested areas.

These controversies are characterized by a wide range of different meanings and beliefs (Greider and Garkovich 1994) and are important to substantiate because of the increasing role that industrial plantations are going to play in meeting global demand for fiber and fuel. Indonesia stands as a good example of this issue for several reasons. First, a considerable number of licenses have been issued for industrial timber plantations (*Hutan Tanaman Industri*, HTI) with 254 concessions as of 2013, covering 10.1 million ha (Unpublished statistics from the Indonesian Ministry of Forestry), which represents a spectacular increase from a mere nine concessions in 1995. In 2010–2014 alone, the planted area within these concessions increased from 0.9 million ha to 2.25 million ha (unpublished statistics from the Indonesian Ministry

of Environment and Forestry) 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. This also means that there is a lot of room for further expansion of the planted area, especially as the government of Indonesia shows renewed interest in promoting this sector of the economy.

Second, these developments have been marked by numerous conflicts, as tenure insecurity has been a constant and still largely unsettled problem in the country. These conflicts have been widely documented (Sakai 2002, Dhialulhaq *et al.* 2014, Purnomo *et al.* 2014), and seem to be complex because they are triggered by a variety of causes and escalate through up to eight stages according to Yasmi *et al.* (2006). However, the research has been biased because case studies have targeted conflict areas, thus providing little, if any, knowledge about general perceptions of the public (and more specifically those most directly affected as living in the plantation landscapes) toward these industrial plantations. With research centered on conflict areas, we argue that perceptions toward these plantations, as a specific land use, tend to be concealed behind local reactions triggered by competition over access to land. In other words, conflicts and hence negative perceptions might be caused by the appropriation of the land by an outsider entity, rather than by timber plantations a specific land use; thus, mining or other agricultural crops could have probably generated the same reactions.

Third, there is very little or no empirical research on rural populations' perceptions toward industrial timber plantations in Indonesia and other less developed countries. Those studies that have been conducted have taken place in developed countries such as Australia (Williams 2009, Anderson *et al.* 2013), the United Kingdom (Urquhart *et al.* 2012), Finland (Kangas *et al.* 2010), Ireland (Visser *et al.* 2007) and the Netherlands (Cuppen *et al.* 2010). Rural populations' views toward industrial plantations can be assumed to be usually location- and context-specific as conditions can greatly differ from site to site (e.g. land value, access to labor market, land claims, etc.) and it is important to understand such perceptions in the regions where plantations are rapidly expanding.

Why do perceptions matter for the future of industrial timber plantations? Because perceptions about impacts are complementary to objective assessments, such as evaluations of environmental services that might miss key elements for the integration of these new yet important elements in the rural landscapes. Companies might argue that new jobs are provided or that carbon is sequestered, but as long as these are not felt or understood by the people living in the landscape, one can expect tensions and conflicts to arise. Perceptions thus matter to make plantations acceptable and secure a "social license to operate". They are also supportive of conflict prevention approaches such as social-oriented community forest management

In order to fill the lack of knowledge about general perceptions of rural populations toward industrial plantation development in Indonesia, we decided to undertake a case study with the application of the Q-method in a site with neither recorded violent conflict nor model partnership with

local populations. This allows us to identify significantly different groups of villagers (assuming there is heterogeneity within the population) with respect to their opinions about the industrial timber plantation. We will attempt to answer the following research question in this article: What are the main distinctive perceptions and viewpoints by villagers toward an industrial timber plantation in Indonesia?

## CONTEXT OF THE STUDY

The study was conducted in a large village located on the border of an industrial plantation in East Kalimantan Province in Indonesia, namely Tanjung Redeb Hutani (TRH) (Figure 1). Background information about the study site is provided in this section and relies mostly on interviews with key local informants.

### **Suaran: a large village with rapid population growth from in-migration**

The village is located in Berau District, Sambaliung Subdistrict (see Figure 1). It comprises about 700 households in 2015 but the situation has been evolving dramatically over the last two decades. When the surrounding timber plantation was established in 1992, the village hosted a mere two dozen families – entirely local Dayak people, known for practicing subsistence shifting agriculture. In subsequent years migrants have come in large numbers from other parts of the archipelago, either spontaneously, such as the Bugis from Sulawesi, or as trans-migrants from Java, supported by a government program aimed at populating 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, which are critical factors in understanding the interactions with the plantation company.

This new situation led to greater scarcity of natural resources, and resulted in land occupation by migrants within and outside the TRH plantation concession. Migrants and locals have very low levels of education and lack marketable skills, so that farming is de facto their priority economic activity. The concession company and local authorities previously allowed cultivation of land within 200 m of both sides of the road that crosses the plantation concession, where Suaran is located. However, the growing density of population and pressure by migrants to farm land have led the company and local authorities to consider a request to extend this to 500 m. While we did not specifically investigate the local dynamics of land allocation and use, the situation seems to share commonalities with other parts of the country where boundaries are not entirely clear and accepted. As a result, local trade of land seems to take place with the acknowledgment of local authorities, sometimes within the boundaries of the concession, with a questionable degree of legality. An increasing

area of concession land is being cultivated by locals, whether this is the company's intention or not. This is exacerbated by the low intensity of the company's operations with many plots left idle.

In terms of agricultural production, the main crops cultivated include oil palm, cacao, rubber, rice and chili. A number of Bugis people from Sulawesi have also invested in sizeable shrimp farms in the nearby river. Tree cultivation is not appreciated as valuable and competitive compared to these other crops, and past experience with the company has left bitter memories of manipulated prices, with little if any real profit for the villagers. Regarding intercropping (*tumpang sari*), it has not been successful so far, even though the company has allowed villagers to experiment with it. This is in part due to the characteristics of the plantation crop, acacia, which is a fast-growing tree species with a rapidly closing canopy.

### **Tanjung Redeb Hutani (TRH): a well-established industrial pulpwood plantation with fluctuating intensity of operations**

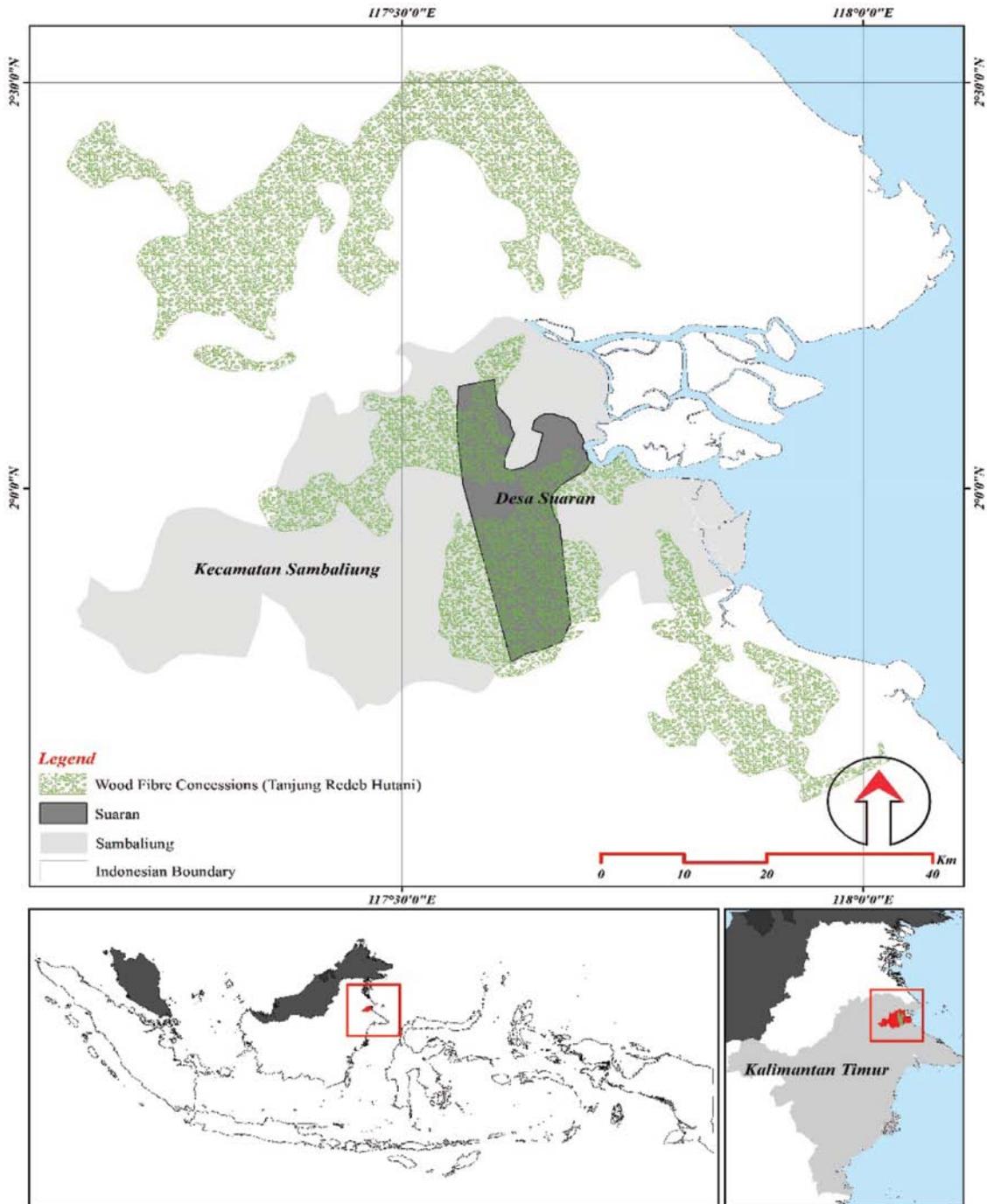
Incorporated in 1992<sup>1</sup>, the company, Tanjung Redeb Hutani (TRH) has changed ownership over time, in part as a result of the Asian financial crisis of the late 1990s and also because of the wrongdoings of the former Indonesian forestry tycoon Bob Hasan (Pirard and Cossalter 2006). The majority shareholder is still a private Indonesian investor, but 40% of the shares belong to the parastatal forestry company Inhutani. It is important to note that the private majority shareholder also owns the nearby pulp and paper mill, Kertas Nusantara (formerly Kiani Kertas) that was supposed to be fully supplied by TRH according to the initial plans (*ibid*). Yet, recurrent technical problems at the mill have resulted in uncertain market availability for pulpwood, with significant impacts on the interactions with the surrounding populations, as will be analyzed further in this article.

TRH controls a concession area of 187 920 ha with 95 555 ha of net plantable area, the rest being made up of protected areas (about 35,000 ha), plantations for local livelihoods (about 20,000 ha), riparian forests (about 15,000 ha), infrastructure and others (data communicated by the company). Its latitude is 1°30'–2°30' N, longitude 117°05'–118°00' E and altitude 200–800 m above sea level. About 60 000 ha were planted over time, almost exclusively with *Acacia mangium*, and production reached 260 000 m<sup>3</sup> in 2012 and 110 000 m<sup>3</sup> in 2013. Production stopped in 2014, but at the time of our visit in March 2015 the management was optimistic about renewal of investments in the near-future. It was obvious during our interviews that these fluctuations in the level of activity, caused mainly by unstable demand by the mill, had negative consequences on the level of trust by the villagers.

There have also been attempts by the company to undertake partnerships with villagers in order to plant acacia on

<sup>1</sup> Unless specified otherwise, all information about TRH comes from the company's official forest management plans validated by the Ministry of Environment and Forestry.

FIGURE 1 Study area



their land for sale to the pulp and paper mill. About 10 years ago a few villagers established small-scale acacia plantations but were never in a position to negotiate a fair price with the mill. There were also accusations of manipulating the terms of the contract, so that in the end villagers seem to have learned the lesson and decided to never again consider pulpwood as a business opportunity (the case was not brought to court though).

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 by the 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. They are also influenced by the local competitor on the labor market, a coal mine that tends to be favored by villagers because of alleged better working conditions, and more importantly because of more regular job opportunities. A few villagers have also been successful in becoming subcontractors for some of the plantation operations, and were able to capture more profits by doing so. Overall, in 2014 the company employed 26 permanent staff

and 7 contractual workers in Suaran area. The majority of employment is nevertheless with daily laborers whose numbers remain unknown but represent many times more workers than those with either temporary or permanent contracts, based on labor practices in this sector.

## METHODS

### Site selection

This plantation site was chosen because it had been established for a long time, and is located in the province with the largest area of HTI concessions, covering about 2 million ha. While protests and land claims have been reported in the area, no violent disputes have ever happened. It is also a region of in-migration, as population densities have traditionally been relatively low, which allows us to capture various opinions from indigenous people and migrants. In addition, the operations at the plantation have not gone without interruptions. This is representative of the situation in Indonesia as a whole, where HTI have faced problems for decades with logistics and road infrastructure, erratic distribution of subsidies from the Reforestation Fund, and technical problems at the mills, as exemplified in this particular case (Pirard and Cossalter 2006).

### Justification for applying the 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 developed by Stephenson (1935) and taken to the next stages by Brown (1980) with a distinctive set of psychometric and operational principles that aims at combining the strengths of both qualitative and quantitative analysis (Dennis and Goldberg 1996). Rather than finding the average opinion in a group, Q-method aims at identifying different patterns or shared ways of thinking on a topic that is relatively independent of the researcher. Therefore the Q-method is especially suitable for studying highly debated phenomena (Barry and Proops 1999), such as stakeholders' perceptions about 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). As a matter of illustration and in relation to our own study, the Q-method has been applied to stakeholders' views on carbon forestry projects (Lansing 2013), to stakeholders' perspectives about regional forestry programs (Kangas *et al.* 2010), to the perspectives of farmers and conservationists about the management of marginal farmland (Visser *et al.* 2007), to stakeholder opinions on energy options from biomass in the Netherlands (Cuppen *et al.* 2010), and to community perceptions toward plantation forestry in Australia (Anderson *et al.* 2013).

This method was valuable and informative for this study because it helped researchers identify the potential diversity

of views about industrial timber 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).

### How it works: the theory

The overall procedure of Q-methodology comprises six key stages. The first stage is the identification of the discourse of interest and relevant population, referred to as the "course". The second stage is to interview a sample of relevant populations in order to obtain a series of statements (Barry and Proops 1999). The third stage is about screening the statements and selecting a manageable number of statements, which is typically less than 60 (Cuppen *et al.* 2010).

The fourth stage is Q-sorting and the general procedure is as follows. The respondents (P-set) are presented with statements (or alternative ways to communicate ideas or concepts, for example, pictures) 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 3). 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). Rates are provided to columns, for instance from -3 to +3 if there are seven columns. Critical to the method, there are as many statements as cells on the board, hence all cells must be filled.

It is usually advised that the respondent reads all statements to begin with, in order to make a preliminary rough classification into three groups – with positive, negative or neutral aspects. The Q-sort should be supervised by the people in charge of the study, who should be available to answer questions of clarification that might arise. Once the Q-sort has been completed, a very last exchange of information should take place in order to make sure that the Q-sort properly reflects the opinions of the respondent.

The fifth stage is the data analysis, which is conducted using principal component analysis in order to reveal how the variety of individual Q-sorts completed by respondents can be grouped together and in how many groups of significant difference. These groups are named "factors" or "discourses" as they reflect the main orientations that can be statistically identified through the process of reducing the number of dimensions from statements to factors. Ultimately, a representative Q-sort for each factor is generally computed and serves as a basis to understand the nature of each group and to undertake its description and analysis. The final stage is to interpret the Q-sorts verbally to obtain the social discourses uncovered by the statistical analysis (Barry and Proops 1999).

One could think that the Q-method is quite similar to the Likert scale approach, since respondents also rank statements based on their level of agreement. However, the Likert scale

approach treats all statements independently and is therefore prone to indecisiveness – with a tendency for respondents to pick middle ranks rather than extremes. The Q-method avoids this problem as respondents have to address all statements at the same time and relative to one another, which implies that they are forced to make critical choices (Nicholas 2011). This is all the more useful, and key for a successful survey in an Indonesian rural context, where respondents are commonly reluctant to express strong feelings about a particular issue.

**How it was applied: the practice**

The first step was to collect basic information about the context through interviews with key informants from company management and village authorities in March 2015, and to undertake literature reviews about plantation development and their impacts in Indonesia. This provided a basic understanding of the various issues at stake, also relying on the experience of the first author in the field of industrial plantations in Indonesia.

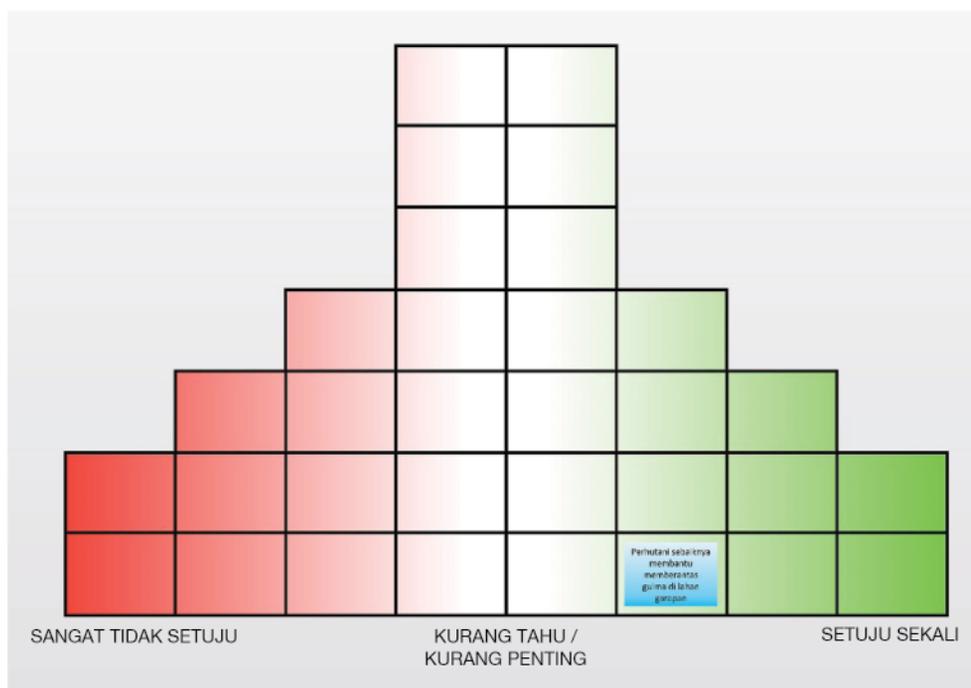
We then organized a focus group discussion with 10 participants, comprising 3 women, 3 subvillage heads, the village secretary and a number of farmers. The discussion took place over 2 hours and resulted in the collection of many issues, both positive and negative, associated with the plantation.

Based on this wealth of information and using our best judgment, we compiled 30 key statements (see Table 1) 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 by the participants. Redundancy also

had to be avoided, yet the same topic could be addressed in several statements but from different angles 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 disproportional (due to a lack of information concerning the parent population) stratified random sample in order to have a good representation of women, of people who had interactions or not with the company, and of villagers who migrated only after the establishment of the plantation or villagers who experienced this radical change in their own landscape. The sample of 31 participants is summarized in Table 2. 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 on the meaning of the statements. Three people would participate simultaneously but 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.

FIGURE 2 The board used for the experiment, with one statement in blue as example



Note: The red area represents disagreement with the statement, the green area is the opposite.

TABLE 1 *List of statements used for Q-sort and their respective factor scores*

N°	Statements	Factor (group) 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

TRH = Tanjung Redeb Hutani, plantation concession company

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

TABLE 2 *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	Has worked at the plantation <sup>a</sup>	4	2
Has never worked at the plantation	1	0	Has never worked at the plantation	12	6

<sup>a</sup> This information is considered at the household level, not at the individual level. Besides, 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.

## RESULTS

## Data analysis

Technical data analysis was conducted with the widely used open-access software PQMethod2.35 developed by Peter Schmolck.<sup>2</sup> Once the correlation matrix has revealed information about the degree of similarity between the Q-sorts, and the principal component analysis has been 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 – based on which we made the final decision.

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. Scientists should not make a decision based on statistical rules only, but also use qualitative knowledge of the context. The final results were compared (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 the analysis because (i) it splits one group of respondents who were generally unsupportive of the plantation into two groups with different motivations for being unsupportive, and (ii) a fourth factor would not bring much additional valuable information.

Once this choice was made the factor rotation was done, which is a critical step as it 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 done by the scientist 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, a score was computed for each statement on each factor using the weighted average of the scores given to a specific statement by the Q-sorts related to a specific factor (Dasgupta, 2005). The need to give a different weight to the score composing the factor score is explained by the fact that “some are closer approximations of the factor than others”, meaning their initial loadings are different (Brown 1993). A model Q-sort could then be created for each factor, interpreted as the Q-sort of a fictional respondent with a 100% loading on the factor (the three factors are shown in table 1). The three representative Q-sorts are presented below in figures 4, 5 and 6.

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
Screeplot	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	One should 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	One should 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

<sup>2</sup> [www.schmolck.org/qmethod/](http://www.schmolck.org/qmethod/)

### 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 environmental 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 strongly criticized 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 the fact 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; 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.

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, and in Java the intermediary institution is even mandatory in order to manage the distribution of benefits and deal with employment for the parastatal plantation company, Perum Perhutani, in charge of the teak and pine estates.

### 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 an 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 the overall plantation management, as not only do people want to be able to undertake inter-cropping activities for any species of their choice (statement 20), but they also would like to get rid of acacia (statement 26), which has a bad reputation because of

FIGURE 3 Group 1: The enthusiasts

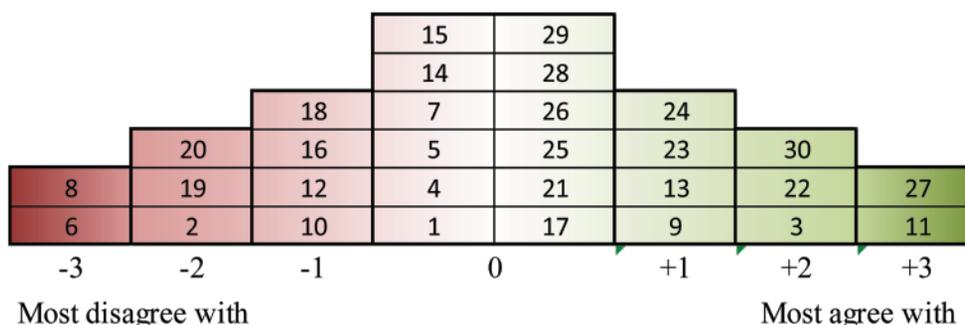
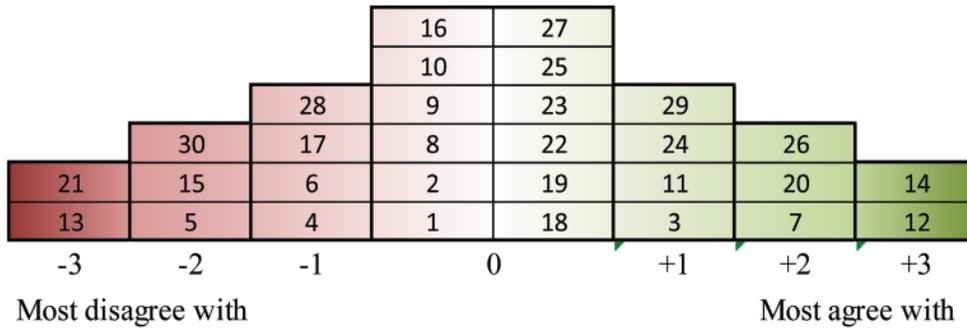


FIGURE 4 Group 2: Plantation impedes local development



its low value and past experience with unfruitful partnerships for acacia plantations on private land.

**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).

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

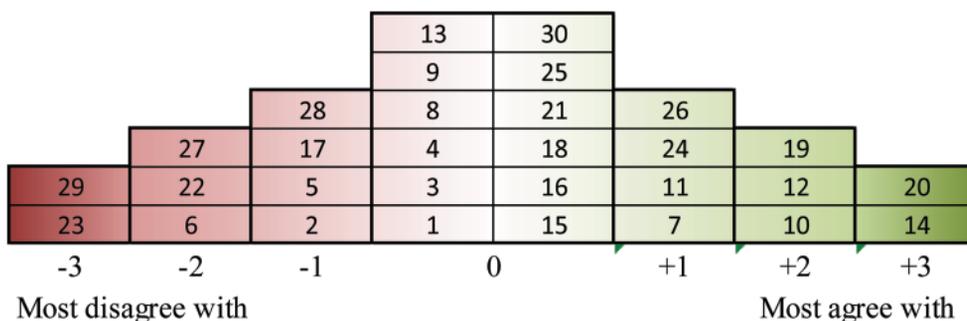
fact that all aspects are emphasized by the group shows a strong belief that the plantation should not be in their landscape.

**Discussion and concluding remarks**

The aim of this research was to conduct an analysis that provides a nuanced view of local people’s perceptions of the impact of large-scale industrial timber plantations in Indonesia. This sector faces a number of problems due to its scale and past practices, in a country where abuses have been perpetrated in the name of economic development, and where rights to land are notoriously ill-defined. Yet the situation is expected to keep improving as a number of initiatives have been launched (e.g. One Map or government plans to allocate part of the forest estate to communities) and important milestones took place (e.g. Supreme Court ruling in 2013).

However, it must be noted that most studies published on this subject have been undertaken in areas of conflict. Although this can be justified by the need to document these abuses by private companies and to provide a balance to the tradition of opacity and reluctance by the state to recognize local aspirations and rights, we believe that it is time to examine the diversity of views in a neutral scientific way. This objective of neutrality implies the avoidance of biases, and in turn the need to document a case where violent conflicts have not been recorded yet, but also where the company operations are not perfect and pressure on land exists in competition with the concessionaire. Our research site arguably

FIGURE 5 Group 3: General dissatisfaction



meets these requirements. The method itself encourages the illumination of a variety of views, as it leads to the identification of significantly distinct groups of participants with respect to their views of the plantation, rather than providing statistics about the respective shares of these groups. As such, it is a good complement to the case studies in the literature.

The data analysis identifies three such groups, one with positive views and two with negative views. In turn, it enables us to identify precisely the motives of dissatisfaction among the community: one group is concerned specifically with the perceived lack of capacity of the plantation to contribute to local economic development, while the other group seems to oppose the plantation in a systematic manner. This is interesting as it 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 points to other negative impacts related to the environment. In addition, the need (not fully satisfied) for enforcement of concession rules to prevent negative impacts, as well as local social dynamics between indigenous people and migrants, are also identified as drivers of discontent and potentially of open conflict at later stages, if nothing is done to deal with these perceptions.

We must stress that the presence of two groups with negative opinions and one group with positive ones should not be interpreted as demonstrating that a majority of the population disagrees with the plantation. The Q-method does not give any indication with respect to the distribution of the respondents into the various groups (their respective shares of the sample), and only addresses the homogeneity versus heterogeneity of the sample. This also implies that groups cannot be traced back to individuals and their characteristics so that it is not known what factors affect responses, e.g. whether specific socio-economic groups or experiences trigger specific viewpoints. But with three distinct groups, we are confident to say that it should not be assumed that the local population holds only positive or negative views. Arguably, policy recommendations should be backed by statistical information in order to determine where the majority lies, and whether there are contrasting weights of opinion among groups. Indeed, if the company or the authorities were willing to take action in order to improve the situation on the ground, then such actions would gain legitimacy from this complementary information. Typically, a household survey would provide additional information about respondents' characteristics and distribution of viewpoints among the population. But the Q method provides useful preliminary information and is relatively affordable.

Another area for improvement would be the replication of the study in other plantation types, such as pine or teak estates that are also managed at scale in Indonesia. Equally important would be to replicate the study in other pulpwood plantation sites, either in Kalimantan or in Sumatra (where huge estates are planted), in order to test the robustness of our results and to find out whether local and idiosyncratic conditions play a more important role than plantation types in the shaping of local perceptions. This can be done with household surveys

that will be informed by our own results, i.e. with questions related to those topics that discriminate among groups of respondents: contribution to local development, environmental services, and rules for access to land.

In practical terms and from the company perspective, the Q method represents one tool among others that does not require a lot of investment and can yield results about communities' perceptions relatively quickly. By picking a limited number of respondents with differing characteristics on critical aspects (e.g. working experience at the plantation in our case), it gives preliminary indications about contrasting viewpoints. It also has a comparative advantage to assess perceptions due to its very nature, notably by forcing respondents to take position. The process itself, even when the study is not done in such a rigorous way that it is publishable in a scientific journal, is informative: Focus Group Discussions and Q-sorting are ideal opportunities for fruitful interactions with people to record their reactions and gather information on company-people interactions. It also forces the company staff to face some inconvenient truths during the process and to discuss ways to address them. Once again, it can be completed by additional studies if needed and resources are available.

Even with the above-mentioned limitations in mind, 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 experience in this field in Indonesia. This is due to intense demographic dynamics, which in our case study are the result of 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 itself because of unstable markets, which is unfortunately not an exceptional case in the country – and is therefore a critical factor that the authorities should address. Unutilized plots might be redistributed in order to meet local expectations but also to force concessionaires to engage in an optimal use of the public resources that have been made available to them.

Second, it was interesting to note the attention paid to law enforcement among respondents and the alleged improvement of impacts that the application of concession rules would produce. A classic example is the logging of riparian forests, which many respondents consider to be detrimental. More generally, respondents show little faith in the willingness of the government to enforce the rules, with decades of malpractice leading to the perception that private companies operate with impunity in the forestry sector. Yet some respondents are still optimistic about the possibility of generating some 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 rules of the game (including concessions rules) and the obligations of the company in terms of land and resource management, as well as silvicultural practices. Furthermore, the attention paid to environmental services versus negative environmental impacts among respondents, depending on the group, calls for

more engagement of local people in order to either mitigate negative impacts or advertise positive ones. The design of innovative solutions, such as establishing multispecies plantations, could meet the aspirations for more diverse landscapes that reflect local values and facilitate the integration of these large-scale plantations. Indeed, an important strength of our study was to show a diversity of views, which go beyond simplistic monolithic positions, thus encouraging companies to be open to consultation in their choice of practices, as sustainable outcomes are more likely to materialize under these conditions.

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