

Impacts of industrial tree plantations in Indonesia

Exploring local perceptions

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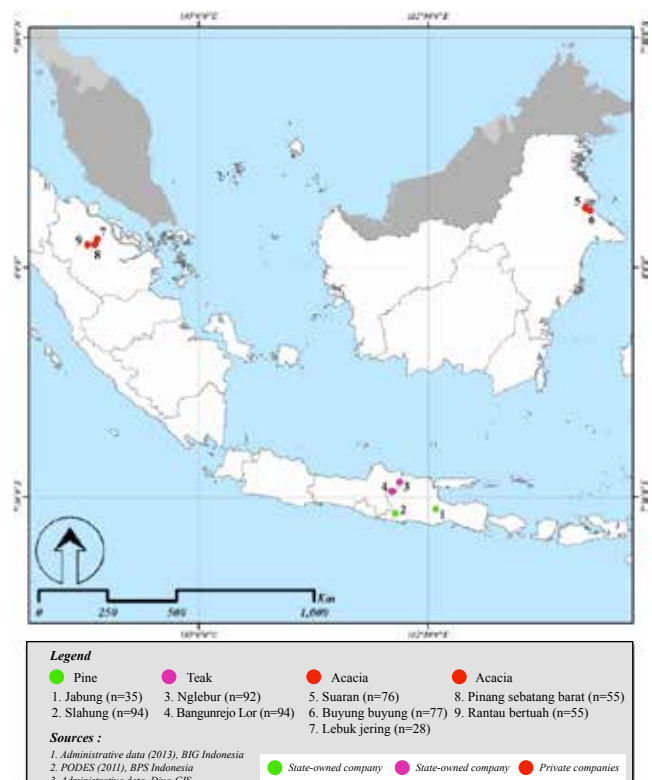
Key messages

- Based on a survey about perceptions of industrial tree plantations of 606 respondents living in the vicinity of such plantations over three Indonesian islands, we find a clear divide, with evidence of more negative perceptions around acacia (pulp and paper) plantations in Sumatra and Kalimantan compared with those around pine (resin and timber) and teak (timber) in Java.
- Acacia pulpwood plantations develop in more remote areas, where they contribute to opening up jobs and infrastructure; these facts are only partly acknowledged by local populations, as expectations have not been fully met. The plantations generate many negative impacts such as deprivation of access to land for locals, environmental damage such as loss of biodiversity, and various annoyances such as dust or noise.
- Pine and teak plantations are usually found in more developed areas and have a much longer presence in the landscape, dating from before Independence in many cases; they are therefore much less associated to negative changes, and their contributions to local development through the provision of jobs or environmental services are acknowledged.
- Intermediary institutions have already proved their effectiveness in the Javanese context with pine and teak plantations, and could be mainstreamed with support from the government.
- We find reasons to hope for better impacts if proper management decisions are made. For instance, companies can adapt rotation periods and involve local people early in the planning process in order to satisfy the most important needs and requests, mitigate risks of conflicts, and eventually improve local impacts.

Introduction

Planted forests are expected to expand dramatically worldwide, as they are progressively taking over natural forests as the main source of timber and other wood products. They cover about 280 million ha already, including 100 million ha of productive plantations and 54 million ha of fast-growing monocultures¹. This expansion is surrounded by controversy, especially in tropical countries. While some praise their capacity to produce efficiently, alleviate damage to natural ecosystems, and contribute to rural development with jobs and infrastructure, others point to their negative social impacts, the associated conflicts and land appropriation, as well as negative environmental impacts with loss of biodiversity and unequal distribution of benefits².

These controversies are particularly acute and relevant in a country such as Indonesia where existing licenses for industrial tree plantations on the public estate (HTI) cover more than 10 million ha, but where less than half of the land is planted; most of this comprises private pulpwood estates established in Sumatra and Kalimantan to supply the mills of the two main pulp



1 See Jürgensen et al. (2014) and FAO (2015) as sources of figures on the expansion of planted forests.

2 See Gerber (2011) and Bauhus et al. (2010) for accounts of positive and negative impacts of planted forests.

Map 1. Location of the nine sites for the study.

Box 1. Methods

We conducted an extensive household survey in 2015 in nine sites on three islands (Sumatra, Kalimantan and Java) having three different kinds of plantations (acacia for pulpwood, teak for sawn wood, and pine for resin tapping and timber) (see Map 1); 606 interviews were performed based on the same questionnaire. Plantations in the sample were chosen based on the main geographical areas of expansion in the country, with attention paid to representativeness. This is, to our knowledge, the first comparative study of different types of plantations, with the application of the same methodology replicated in a systematic manner.

Plantation estates were identified in four contrasted contexts, and based on maps, we went into the field and picked villages randomly among those meeting a number of eligibility criteria. Most importantly, we made sure to avoid villages with documented violent conflicts or model partnerships. This latter double condition was justified by the need to avoid extreme cases in order to ensure that cases and findings were as neutral as possible for the sake of generalization. Yet in a country where conflicts are extremely common due to tenure uncertainty, rapid population growth and migrations, we had to make sure that the sample would also reflect this kind of context. We could verify *ex post* that this condition was met, as about half of the acacia plantation-related respondents have claimed land in the concession at some point in time, which is an indicator of (low-intensity) conflict.

and paper groups. In addition, large-scale pine and teak estates are managed by the state-owned company Perum Perhutani outside of the HTI system, and cover a substantial 2.4 million ha in Java. Land tenure has always been disputed and many conflicts have erupted. In addition, in recent years, fires have spread in plantation concessions, resulting in large emissions of greenhouse gases, with up to one-tenth of plantations going up in smoke.

In this context, we aim to provide knowledge about the impacts of these various industrial tree plantations through the exploration of local perceptions, and collection of extensive primary data (See Box 1).

Differences in perceptions ratings between plantation types

The perceptions of people living near tree plantations are significantly more positive on almost all aspects for both pine (resin and timber) and teak (timber) plantations when compared with those of people living near acacia (pulpwood) plantations. This suggests that generalizations about the impacts of industrial tree plantations may be misleading.

Table 1 shows that people mention many more kinds of benefits and services provided by pine and teak plantations than is the case for acacia plantations. These benefits translate to not only a much greater variety of tangible goods, but also to access to land especially for farming, positive environmental impacts with regard to water

regulation or even local climate regulation, availability of training and others. Conversely, acacia estates are much more associated to negative impacts, and are commonly seen as being responsible for a variety of both socioeconomic and environmental problems. Yet their contribution to local development is acknowledged to some extent, and they indeed usually operate in remote areas where economic development is lower than the national average.

Employment and access to plantation land

Access to land depends largely on the type of plantation. Acacia plantations are intensively managed and fast-growing with short rotations of 5–7 years, and offer few opportunities for villagers to use land that is under company management (26% of respondents). In contrast, pine (64%) and even more so teak plantations (87%) enable land-sharing practices, usually for inter-cropping and mostly for vegetables. While these figures vary between villages for a given plantation type, they seem to be related to the diversity of approaches to plantation management as regards intensity and rotation length.

When it comes to employment, opportunities are roughly equivalent for all types of plantations on average (even if significant differences must be noted between villages for idiosyncratic reasons), with 40%, 49% and 52% of respondents having worked at least once in pine, acacia and teak estates, respectively. In other words, about half of the sampled villagers had the opportunity to earn cash incomes, mostly as manual workers on the plantations.

Exploration of contractual relationships is also necessary in order to assess employment benefits, as they are an indicator of the nature of employment and associated conditions. It appears that patterns differ clearly between plantation types. Pine, teak and acacia exhibit three different employment patterns in this respect: pine plantations are mainly based on payments per task for resin tapping, with use rights allocated to households; teak plantations mainly hire seasonal workers with daily wages; and with acacia we find a range of contracts from permanent staff to daily workers to temporary contracts.

Overall, significant numbers of people expressed their interest in either commencing work or working longer hours than was already the case. Those not willing to commence work or to work more than they already do, admitted it was a personal choice, primarily because of a lack of time and because of other livelihood options. Their secondary reasons were that the tasks would be too hard physically, or incomes would be too low. This result is meaningful and seems to support the assumption that plantations could be seen as providers of complementary sources of income rather than being the one and only source of revenue for villagers primarily involved in farming.

Services and benefits

In the case of acacia, very few (if any) positive impacts were cited spontaneously. They are usually related to some kind of local contribution to development through the provision of jobs and infrastructure, which in the end support the local economy. Even so, respondents around acacia plantations expect more in the way of services and benefits, as private companies tend to be seen as agents of development and should take the burden of investments in roads, power generation and other basic means of development.

Table 1. 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
Local development	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
Ecosystem services	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
Support (training, loans, education...)	11	5	7	18	11	15	9	1	7	18	4	8	10
Others	3	1	2	5	0	3	8	5	14	4	18	9	5
None	0	1	1	0	0	0	13	8	11	9	31	14	7

Note: Categories in the table result from *ex post* coding, as questions were open so that qualitative information had to be subsequently processed to make comparisons. A total of 17 categories were created. For instance, responses such as “water is cleaner” or “springs do not dry out any more” would be classified as “Water-related ecosystem services.”

Source: Pirard et al. (2016)

Respondents mentioned more positive impacts around teak and pine estates (more than two-thirds of them citing at least three positive impacts), and the vast majority of them praised contributions to local development (see Table 1). Interestingly, a variety of environmental services were also cited, including improved water services and less land erosion, or even good local weather.

It is noteworthy that infrastructure was not cited around teak and pine estates, which could be explained by the long presence of these plantations in a relatively developed landscape so that they can hardly be associated to the development of infrastructure. Most respondents were born in Java, with plantations already established in the landscape, and the link with roads, schools and other infrastructure makes little sense to them.

In contrast, provision of goods (e.g. fuelwood or medicinal plants) was massively cited around teak and pine estates, which is certainly due to the fact that these plantations have relatively long rotations and hence have the capacity to produce goods such as fuelwood that are at the disposal of surrounding populations in most cases. Overall, these rather positive views are combined with more expectations for teak and pine companies to provide cattle, loans and a variety of extension services and technical assistance. Note that respondents near teak sites exhibited fewer unsatisfied expectations than did those near pine sites.

Negative impacts

The low rate of responses on positive aspects in the case of acacia is reflected in the high rate of responses on negative impacts (Table 2). Almost half of the respondents cited spontaneously at least four negative impacts. The denied access to land is a primary source of concern, followed by environmental disservices (including loss of biodiversity or lack of beauty). Various other annoyances such as pollution (including dust and noise from trucks) also emerged.

The vast majority of respondents pointed out the adverse effects on development, mostly due to restricted access to land (often translating into land claims), which is usually associated with limited 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.

Regarding teak and pine estates, more than half of the respondents cited no problems. Apart from the fact that these plantations have been around for a long time and people can hardly think of connecting a number of local issues to their development (e.g. possible impacts on water are not connected to the plantation in the minds of respondents because they occurred at the time of establishment even before they were born), it is also likely that intermediary institutions created by the companies have helped in managing good relations with local communities.

Trade-offs and room for improvement

The issue of potential trade-offs is worth raising, as one may wonder whether or not the differences in the views of respondents as regards pine/teak and acacia do in fact reflect very different perspectives. These are not necessarily black and white differences in viewpoints, but might only illustrate choices that give priority to some aspects over others. The only pattern that could be identified in terms of trade-offs is about pulpwood plantations opening up remote areas and being acknowledged locally for contributing to infrastructure for local economic development, while scoring badly on almost all other aspects, especially environmental. Although an attractive finding, caution must prevail as some caveats apply. Acacia plantations have been developed only recently, so that respondents can easily observe and report on the investors’ efforts in building new infrastructure; on the contrary, teak and pine plantations were established generations ago in a more developed and densely populated environment so that their potential contributions to road infrastructure and other benefits can hardly be noted by respondents.

Overall, based on our findings, we see reasons to hope that impacts will be perceived in a better light for a number of reasons. For instance, companies can adapt their management to local needs and requests as reflected by pine and teak plantation companies taking ad hoc decisions to shorten or extend their rotation periods in order to provide more opportunities to share land with farmers for inter-cropping or to tap resin during the productive period. Contributions by local people to the forest management planning early in the process would help a great deal and this could be framed and supported by the government for large-scale adoption.

Table 2. 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
Local development	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
Environmental impacts	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
Lack of infrastructure and services	6	31	24	14	23	19	20	44	7	5	24	23	22
Various annoyances	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
Others	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
None	66	47	52	62	63	62	8	9	7	4	2	6	33

Note: Categories in the table result from *ex post* coding, as questions were open so that qualitative information had to be subsequently processed to make comparisons. A total of 17 categories were created. For instance, responses such as "land is not available any more for rice cultivation" or "we cannot collect fuelwood from the natural forest any more" would be classified as "Access to land and natural resources."

Source: Pirard et al. (2016)

In particular, intermediary institutions can also work effectively by channeling claims and requests by local populations in order to mitigate the risks of conflicts and a variety of misunderstandings between both parties. The example of pine and teak plantations, where local perceptions have mainly improved over time is interesting, as the contributions of early local development programs may have played a key role over the last 15 years, with the creation of intermediary institutions for their implementation that also provide effective ways to convey grievances and make requests.

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