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Local impacts of industrial tree plantations: An empirical analysis in Indonesia across plantation types

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ABSTRACT

The values ascribed to industrial tree plantations are often controversial. Hence knowledge of their perceived impacts is important for improving their integration in rural landscapes. In 2016 we conducted household surveys with 606 respondents living in villages adjacent to acacia, teak and pine plantations across three islands in Indonesia (Java, Borneo, Sumatra). Results show that perceptions toward pine and teak plantations tend to differ from those toward acacia pulpwood plantations in several ways. Pine and teak plantations are perceived to have a higher number and variety of benefits and services, a higher number of positive impacts, a better environmental record, and to present more opportunities to local people for use of plantation land and products for improving rural livelihoods. In addition, we find that villagers around acacia pulpwood plantations tend to seek economic development and infrastructure to open up remote areas, yet their expectations were often only partially met. Recommendations from our analysis include: the role of the State in plantations must be clarified and potentially reinforced; the role of institutions as intermediaries is fundamental; and contributions by communities to design of management plans should be accommodated.

1. Introduction

With the decline in wood production from natural forests since the late 1980s (Warman, 2014), planted forests have become increasingly important for the global supply of timber and contributed about one-third of global industrial roundwood production in 2012 (Jürgensen et al., 2014). According to recent estimates, planted forests (including seminatural forests) account for 290 million ha globally (FAO, 2015), including more than 100 million ha of productive plantations (Del Lungo et al., 2006), out of which 54 million ha are corporate fast-growing plantations (Indufor, 2012).

The overall trend is for expansion of planted forests into the future. Depending on the scenario, planted forests – which cover a larger spectrum than productive tree plantations and include protective plantations as well as some semi-natural forests – are predicted to cover from 303 to 345 million ha by 2030, with most of the absolute increase taking place in Asia, and likely to be dominated by forest established for industrial roundwood (Carle and Holmgren, 2008). Some authors present a more nuanced view, highlighting differences between regions and risks that may hamper this expansion, if the right policies are not applied (Payn et al., 2015).

Against this backdrop, many controversies remain around expansion of planted forests and their negative social impacts, such as the many conflicts related to land tenure (e.g. Gerber (2011) provides a comprehensive review of case studies). Their contribution to local development has also been challenged (Andersson et al., 2015), yet there is a general lack of studies with robust methods to allow firm conclusions to be drawn. Negative environmental impacts are also an issue when a single species is planted on large estates, and especially when plantations are established on previously forested areas (Stephens and Wagner, 2007). Some are confident that the capacity of planted forests to produce large amounts of wood products will eventually alleviate pressure on natural forests (Jürgensen et al., 2014), although a recent review underlines the complexity of this assumption and outlines the limited conditions under which it can materialize (Pirard et al., 2016a). Other reviewers claim that planted forests can create jobs (Ying et al., 2010), support local livelihoods and rural development, especially when managed by smallholders (Nambiar et al., 2015), or provide a range of ecosystem services, especially when established on degraded lands that require restoration (Bauhus et al., 2010; Baral et al., 2013, 2014, 2016).

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These controversies are important to examine, because of the increasing role that industrial timber plantations are expected to play in meeting global demand for fiber and fuel. Indonesia is a good example for several reasons. First, many licenses exist for industrial timber plantations (HTI), with 254 concessions in 2013 covering 10.1 million ha (personal communication from Ministry of Environment and Forestry, 2015), which represents a very substantial increase from 98 concessions in 1998 (Kartodihardjo and Supriono, 2000). Over the period 2010–2014, the planted area within these concessions increased from 0.9 million ha to 2.25 million ha (personal communication from Ministry of Environment and Forestry), most of it dedicated to pulpwood from acacia and increasingly eucalyptus. And there is room for further expansion of the planted area, considering the total concession area that is already allocated.

Second, these developments have been marked by numerous problems. Kartodihardjo and Supriono, 2000 observe that about two decades ago expansion was accompanied by environmental damage and took place at the expense of the rights and livelihoods of forest-dwelling people. While conflicts are now largely documented (e.g. Sakai, 2002; Dhiaulhaq et al., 2014; Purnomo et al., 2014), there has been relatively little research outside conflict areas, and there is only limited knowledge about the perceptions of rural communities towards these industrial plantations in general.

Industrial timber plantations in the tropics tend to be associated with pulpwood production, which is often misleading. This is exemplified by the situation in Indonesia, where teak and pine plantations have been established for a long time, cover very large areas, and are managed for high-value timber production and non-timber forest products (NTFPs), e.g. resin. Their area in Java, under the management of the State-owned company Perum Perhutani, amounts to 1.8 million ha (out of 2.4 million ha under the management of the company, including 0.6 million ha for conservation purposes, Perum Perhutani, 2014), and is thus of the same magnitude as the area planted with acacia or eucalyptus for pulpwood nationally. Yet, industrial scale teak and pine plantations in Indonesia seem to have reached a limit (mainly located in Java), while pulpwood plantations are still expanding in the outer islands such as Sumatra and Kalimantan

Previous studies have examined various 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 those studies do not deal with industrial plantations, which is the focus of our research. For example, Kallio et al. (2011) analyzed small-scale farmers' socioeconomic characteristics and silvicultural practices. They found that farmers who practised more active silvicultural enterprises either controlled larger areas or had more household members than other farmers. Rohadi et al. (2010) examined the socioeconomic value and challenges of smallholder tree plantations in Central Java and South Kalimantan. Their results indicated that the smallholders generally understood the benefits of timber plantations but their investment in plantations depended on production outputs and existing market opportunities. Others have focused on company-community partnerships designed to mitigate land claims (Maturana et al., 2005) or for benefit-sharing and local livelihoods (Nawir and Santoso, 2005), and underline challenges to their successful implementation.

From a methodological perspective, in recent years there has been growing interest in understanding stakeholders' perceptions within the forestry and natural resources management sector. Williams (2014) investigated public expectations for rural land use and the acceptability of different kinds of plantations in the Australian context. She found that preference was given to public benefit outcomes, e.g. to ecosystem services rather than to private goods. Vihervaara et al. (2012) explored local people's perceptions of the effect of rapid expansion of industrial plantations in Uruguay and their impacts on various ecosystem services. They found that ecosystem services were valued differently by local people than by experts, in the case of certain regulating and provisioning services. Other important research topics associated with perceptions include: different beliefs about large-scale plantation forestry in Australia (Anderson et al., 2013); stakeholders' perspectives about participation process in a regional forestry program in Finland (Kangas et al., 2010); and subjectivity of stakeholders' perceptions of land-use changes in Costa Rica (Lansing, 2013).

Taking stock of the growing interest in studying the impacts of plantations through the perceptions of local populations for policy recommendations, this paper reports on a study in Indonesia designed to answer the following research questions: What are the perceptions held by local people of the impacts (positive and negative) of plantations? How do perceived impacts relate to plantation type, local conditions or household characteristics?

2. Methods

2.1. Analytical framework

Our empirical research adopts the framework of peoples' perceptions in order to assess the impacts of industrial plantations, an approach which is fundamentally different from measuring actual impacts on the ground. The existing literature on the topic, as summarized in the introduction, reveals two main approaches, either based on the application of the Q-method (e.g. Anderson et al., 2013 for Australia; Pirard et al., 2016b for Indonesia) or extensive surveys (e.g. Vihervaara et al., 2012 for Chile). In this article we present findings of the application of a survey questionnaire (in 2014 Nov–2015 July).

We designed a questionnaire to provide information on several aspects to allow comparison between sites, as summarized in Table 1. We believe that this diversity of questions provides a variety of information that would describe the overall effects of the plantation in the surrounding landscape. The analysis follows the same order as the results section.

2.2. Study site selection

The study covered sites with differences in terms of products, forest management, local conditions, tree species and location (three islands: Java, Sumatra, and Kalimantan) (Fig. 1). To increase the representativeness and reduce effects of local conditions and history, we undertook the survey in at least two villages or small towns (referred to here as "villages") for each plantation type. The information on nine villages in our sample is presented in Table 2.

We need to acknowledge that tree plantations differ in a multitude of ways, such as intensity of management, length of rotation, type of product, domestic versus export markets and year of establishment. We used species as proxies for many of these variables, as their products, markets and histories differ substantially and in key respects, as will be shown in the presentation of the Results and Discussion.

Plantations in the sample were chosen based on their main geographical areas in the country, with attention paid to representativeness. For instance, Kalimantan has low population density inland and retains large areas of natural forests mostly inland and in the mountainous areas, although rates of deforestation are significant (Gaveau et al., 2014), whereas Sumatra (especially Riau province) has faced among the highest rates of deforestation in the country for many years, hosts the bulk of pulp and paper processing capacities, and recent investment and internal migration is incessant (Gaveau et al., In press). Conflicts of various degrees are thus more frequent in Riau, as land available for development