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A case study on the Prafi Plain

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Working Paper 156

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ISBN 978-602-1504-46-8

Kesaulija FF, Sadsoeitoebon BMG, Peday HFZ, Tokede MJ, Komarudin H, Andriani R and Obidzinski K. 2014. *Oil palm estate development and its impact on forests and local communities in West Papua: A case study on the Prafi Plain*. Working Paper 156. Bogor, Indonesia: CIFOR.

Cover photo by Heru Komarudin
Mature oil palm plantation near the provincial capital city of West Papua

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We would like to thank all donors who supported this research through their contributions to the CGIAR Fund. For a list of Fund donors please see: <https://www.cgiarfund.org/FundDonors>

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Acknowledgments

The authors gratefully acknowledge the support received from the Consultative Group on International Agricultural Research (CGIAR) Systemwide Program on Collective Action and Property Rights (CAPRI), the Catholic Organization for Relief and Development Aid (CORDAID) of the Netherlands, and the European Commission. Special thanks go to the Arfak customary communities and transmigrants living around the oil palm plantation in Prafi, Manokwari District, who have provided substantial input to this paper through interviews. Thanks are also due to Anom Indra Adhyaksa, Meliza Worabay and Devi Manuhua — the field

enumerators; Agus Ambraw and Bapak Kerani of Perkebunan Nusantara II and Kukuh Saptoyudo of West Papua Provincial Transmigration Office, who facilitated data collection; and Yos Yambeyandi, Head of the Indonesian Association of Oil Palm Farmers. The authors would like to express their appreciation to Suseno Budidarsono of the World Agroforestry Center (ICRAF); Kresno Dwi Santosa and Petrus Gunarso of Tropenbos Indonesia; and Andrew Wardell, Agus Djoko Ismanto and Agus Andrianto of the Center for International Forestry Research (CIFOR) for comments on earlier drafts of this paper.

Introduction

Indonesia is striving to maintain its position as the world's largest palm oil producer, and is planning to expand production to 40 million tonnes a year by 2020, twice the volume produced in 2010 (PalmOilHQ 2009; Tempo Interactive 2010; World Bank and IFC 2011). To achieve this production target, the area of oil palm plantations is expected to expand from 7.9 million ha in 2010 to 20 million ha by 2020. This will mean the establishment of 300,000 ha of new oil palm estates every year (Greenpeace 2009; Telapak and EIA 2009). The Directorate General of Estate Crops in the Ministry of Agriculture estimated that the area of oil palm estates will grow by 2.55% a year. The Indonesian Government set targets of 8.6 million ha for 2012 and 9 million ha for 2014 (Directorate General of Estate Crops 2010).

Investment in oil palm plantations continues throughout Indonesia. In the provinces of Papua and West Papua, the area of oil palm plantations is low compared to other regions; however, it is growing at a steady rate. The Ministry of Agriculture (2005) estimated that Papua Province had about 5.7 million ha of land suitable for oil palm cultivation. In 2008, the Directorate General of Estate Crops announced that Kalimantan and Sumatra were already too densely developed to accommodate any new oil palm plantations and that land was available in Papua. Oil palm companies seeking to expand their estates soon turned their attention to the last forests in Papua (Radio New Zealand International 2008; Telapak and EIA 2009). Expansion has been further stimulated in Papua by policies allowing oil palm estates to be twice the size of those in other provinces in Indonesia.¹

Opinion is divided on the impacts of oil palm estates. Some believe that they help mitigate climate change by providing an alternative energy source, and contribute to economic development and poverty

eradication (Basiron 2007, 2010; World Growth 2009; Badrun 2011). However, oil palm estate expansion has also been blamed for the loss of wildlife habitat and for greenhouse gas emissions (Cotula et al. 2008; Oxfam 2008; RFA 2010). Oil palm opponents also argue that estate expansion has marginalized local communities, depriving them of their rights and access to land and forest resources (Telapak and EIA 2009, 2011).

There is extensive literature on the economic impact of oil palm expansion on local farmer incomes in Kalimantan and Sumatra (Bunyamin 2008; Feintrenie et al. 2010; Rist et al. 2010). Other studies have looked at the fate of oil palm farmers in the agrarian transition process and increasing corporate and market integration (Colchester 2010; McCarthy 2010). However, little research has been carried out so far on the impacts of oil palm estates in Papua — a new frontier for oil palm development.

This working paper contributes to a broader understanding of the implications of oil palm production on the economy, ecology and society of Indonesia by examining the plantation dynamics in the frontier regions of West Papua. Based on a case study of the Perkebunan Nusantara (PTPN) II Kebun Prafi estate in Manokwari District, West Papua Province. It presents an analysis, based on stakeholder perceptions, of the environmental, socioeconomic and cultural impacts of oil palm expansion. Section 1 presents a brief overview of oil palm estate development in Indonesia in general and Papua and West Papua in particular. Section 2 discusses the methods used to collect and analyze data, and Section 3 describes the study location and its conditions. Section 4 presents findings on environmental, socioeconomic and cultural impacts, and Section 5 offers conclusions and recommendations.

¹ Article 12, paragraph (3) of Minister of Agriculture Decree No. 26/Permentan/OT.140/2/2007 on Guidelines for Permits for Estate Crop Enterprises stipulates that the largest area to be held by one oil palm company is 100,000 ha; in Papua 200,000 ha may be held.

1. Oil palm estate development in Indonesia and Papua

Large-scale development of oil palm estates in Indonesia began in 1977, with the government's Nucleus Estate and Smallholder Scheme. Under the scheme, private developers (known as *inti* or nucleus) prepared plots of land for smallholders located nearby. As these plots matured, usually after 3–4 years, the operations were transferred to the smallholders (known as *plasma*), who developed the plantations under the supervision of the nucleus developers (Casson 1999). In 2010, approximately 3.89 million ha (50%) of oil palm estates were private, 3.31 million ha (42%) were community estates, and only 617,000 ha (8%) were state-owned (Ministry of Agriculture 2010). In terms of area and production, Indonesian oil palm estates have experienced rapid growth since 1990 (see Figure 1). The total area of oil palm estates was only 1.12 million ha in 1990, but it was estimated to have reached 8.99 million ha in 2011 (Ministry of Agriculture 2012).

Most oil palm estates are in Sumatra and Kalimantan. In Sumatra, the largest area is in Riau (21.3%), followed by South Sumatra (20.0%), North Sumatra (12.8%) and Jambi (6.3%). In Kalimantan, the largest area of oil palm estates is in Central Kalimantan (19.4%), followed by West Kalimantan

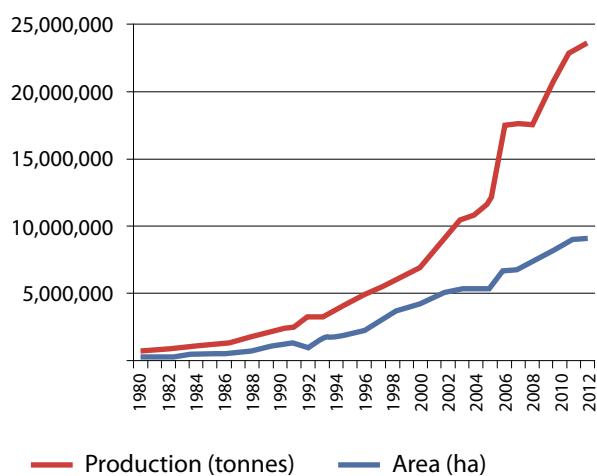


Figure 1. Production and area of Indonesia's oil palm estates, 1980–2012.

Source: Ministry of Agriculture (2012).

(6.9%) and East Kalimantan (6.6%). In Papua, oil palm estates made up only about 0.4% of the country's total oil palm area of about 8 million ha in 2010 (Ministry of Agriculture 2010).

Crude palm oil production rose 16%, from 16.1 million tonnes in 2006 to 18.7 million tonnes in 2008. About 24–27% of this crude palm oil was used to meet domestic demand, and the remaining 73–76% was exported to China, India and the European Union (Sheil et al. 2009).

The first oil palm plantation estates in the provinces of Papua and West Papua were developed in the mid-1980s (Rosariyanto et al. 2008). In 2007, Papua Province had an estate crop area of 29,736 ha spread throughout the districts of Keerom and Merauke (Mampioer 2007). By 2009, around 400,000 ha of land in Papua had been allocated for plantation development (Elson 2009). The area of oil palm estates in West Papua Province increased, from 31,000 ha in 2007 to 70,000 ha in the second half of 2011, controlled by three companies (Mampioer 2007; Dishutbun 2011). Between 2010 and 2011, additional land of about 155,000 ha has been acquired for plantation estates (Dishutbun 2011).²

Among the prime areas for oil palm development in West Papua is the Prafi Plain. In 2005, the Manokwari District Government initiated a community oil palm project adjacent to the PTPN II Kebun Prafi estate with an area of 1,175 ha and individual smallholder estates of 89 ha. Also, Medco Hijau Selaras has been granted a license to establish an oil palm plantation in this district (Amafnini 2010). In 2010, oil palm estates in this area were estimated to cover 15,000 ha in 10 locations (Universitas Negeri Papua 2010).

2. Methods

Stakeholder perceptions of the economic, environmental and cultural impacts of oil palm development were collected through household surveys, focus group discussions and key informant interviews conducted in January–August 2011.

² Interviews with staff of the Forestry and Estate Crops Office of West Papua Province (on February 2011) indicate that by 2010, six companies had submitted applications and secured recommendations from the governor to expand estates on a total of 208,668 ha in West Papua Province, in the districts of Bintuni, Maybrat, Sorong and South Sorong.

Using pre-designed and field-tested questionnaires, household surveys were carried out to interview members of four stakeholder groups: company workers, former landowners and customary land users, investing farmers and affected neighbors.

- *Company workers* are nucleus estate workers or farm workers (company employees) with full-time, part-time or temporary jobs.
- *Former landowners and customary users* include family groups whose customary land has been converted to nucleus estate land, and land-using community members who are not customary landowners but whose land has been converted to nucleus estate land.
- *Investing farmers* include participants in the Nucleus Estate Smallholder Scheme or Perkebunan Inti Rakyat (PIR), either as smallholder out-growers (*plasma*) or members of the Members' Primary Credit Cooperative or Koperasi Kredit Primer Anggota (KKPA), who get direct guidance from the company, PTPN II Kebun Prafi, in managing their estates. This group also includes independent farmers who participate in district government projects and work with the company to manage the harvesting of fresh fruit bunches (FFB).
- *Affected neighbors* are community members — farmers of crops other than oil palm, and non-farmers — who live and work near an estate and are directly affected by it.

Focus group discussions sought to engage as diverse a group of people as possible in order to reflect the existing diversity in wealth, age, ethnicity and gender, and the nature of impacts. We held two focus group

discussions with each group. We set the number of individual and household interviewees at a minimum of 30 for each group of stakeholders, although we were unable to meet this threshold for the affected neighbors group because of the group's limited availability. Details of focus group discussions and household interviews are shown in Table 1.

The number of respondents in each stakeholder group and hamlet is presented in Table 2. While respondents in the former landowners and land users group were distributed across many hamlets, the company workers lived in hamlets close to the nucleus plantations. Investing farmers lived in fewer than half of the hamlets. Affected neighbors lived in hamlets near to economic centers, like markets and shops or kiosks.

Table 3 presents respondents' ethnicity. The highest numbers of respondents were Arfak and non-Papuans. This is understandable, as ethnic Arfak people form the majority living near the estates, and because Prafi is a settlement center for transmigrants from Java and East Nusa Tenggara as well as for non-Arfak Papuan communities.

Table 4 presents the number of respondents by sex. The higher number of men than women is probably due to the patriarchal customs adhered to by most societies in Indonesia, including local communities in Papua. In patriarchal societies, men play a greater role in household decision-making, whilst women carry out decisions made by men. However, for community social issues, which are discussed collectively, women are often more vocal than men in making their opinions known.

Table 1. Focus group discussions and household interviews.

Stakeholder group	Number of focus group discussions	Number of interviewees	Location
Company workers	2	38	Lismau Ngu, Mokwam, Nimbai and Udapi
Former landowners and customary users	2	43	Bogor, Desay, Lismau Ngu, Majemus, Manted, Meiforga, Mimbowi, Mokwam, Muara Prafi, Nimia, Prafi Mulya, Sambab, Sembab II, Subsai, Subsai I and Wasegipop
Investing farmers	2	30	Manted, Meiforga, Mimbowi, Mokwam, Muara Prafi, Sembab and Udapi
Affected neighbors	2	27	Desay, Lismau Ngu, Masni Pantai, Mokwam, Prafi Mulya and Sambab
Total	8	138	

Note: Locations were hamlets in Masni, Prafi and Warmare districts.

Table 2. Distribution of respondents by location and stakeholder group.

Location	Respondents (%)			
	Company workers	Former landowners and customary users	Investing farmers	Affected neighbors
Bogor		4.9		
Desay		2.4		50.0
Lismau Ngu	28.9	7.3		3.6
Majemus		4.9		
Mokwam	34.2	9.8	26.7	14.3
Manted		2.6	13.3	
Masni Pantai				21.4
Meiforga		4.9	16.7	
Mimbowi		2.4	3.3	
Muara Prafi		2.4	6.7	
Nimbai	31.6	2.4		
Prafi Mulya		19.5		3.6
Sambab		14.6	30.0	7.1
Sembab II		2.4		
Subsay		4.9		
Subsay I		2.4		
Udapi	5.3		3.3	
Wasegipop		12.2		
Total	100.0	100.0	100.0	100.0

Note: The number of respondents in each stakeholder group was as follows: company workers, 38; former landowners and customary users, 43; investing farmers, 30; affected neighbors, 27.

Table 3. Ethnicity of respondents.

Stakeholder group	Total	Ethnicity		
		Arfak	Non-Arfak Papuan	Non-Papuan
Company workers	38	3 (8%)	9 (24%)	26 (68%)
Former landowners and customary users	43	33 (77%)	0 (0%)	10 (23%)
Investing farmers	30	16 (53%)	6 (20%)	8 (27%)
Affected neighbors	27	4 (15%)	14 (52%)	9 (33%)
Total respondents	138	56 (41%)	29 (21%)	53 (38%)

In addition to the survey, we collected and analyzed secondary data about oil palm development in the region, including government statistics and reports, donor reports, non-government organization literature and company reports. We also carried out forest-cover and land-use change analysis using a time series of Landsat images.

Table 4. Sex of respondents.

Stakeholder group	Total	Men	Women
Company workers	38	31 (82%)	7 (18%)
Former landowners and customary users	43	39 (91%)	4 (9%)
Investing farmers	30	26 (87%)	4 (13%)
Affected neighbors	27	21 (78%)	6 (22%)
Total respondents	138	117 (85%)	21 (15%)

3. Study location, area and conditions

The study location comprises the PTPN II Kebun Prafi plantation estates, which are located in the three subdistricts of Masni, Prafi and Warmare, Manokwari District, West Papua Province (Figure 2). PTPN II is a state-owned plantation enterprise with the head office in Tanjung Murawa, Medan, North Sumatra; it was the first company to establish a large-scale oil palm estate in West Papua Province.

During 1982–2009, PTPN II Kebun Prafi managed 12,049 ha of oil palm estate, with 99% of its palms producing fruit. In addition to managing the nucleus and *plasma* estates, the company also works with the cooperative KKPA, developed to provide loans for oil palm development, and with community estates operating under a Manokwari District Government project. The number of farmers supervised directly by the company is 5657, of which 3406 are local and 2251 are transmigrants.

PTPN II Kebun Prafi has a crude palm oil processing plant, which has been operating since 1991 with an installed capacity of 60 tonnes of FFB per hour. The plant’s average current production capacity is only around 50% of its installed capacity, at 30 tonnes of FFB per hour. The estate has relatively good access to national roads, which helps the company to transport crude palm oil to its main collection point near Manokwari harbor, and subsequently onto ships to take it out of the province.

The oil palm estate was previously a timber concession managed by Inhutani II, covered in heterogeneous primary forest. Beginning in February 1980, the forest was cleared using chainsaws, while land for transmigration settlements was cleared using heavy machinery (Imbiri 2010). The Prafi Plain has various types of forest, summarized in Table 5.

3.1 Socioeconomic characteristics

Communities in the study area are made up of several Arfak subethnicities: Hatam, Meyakh, Moule

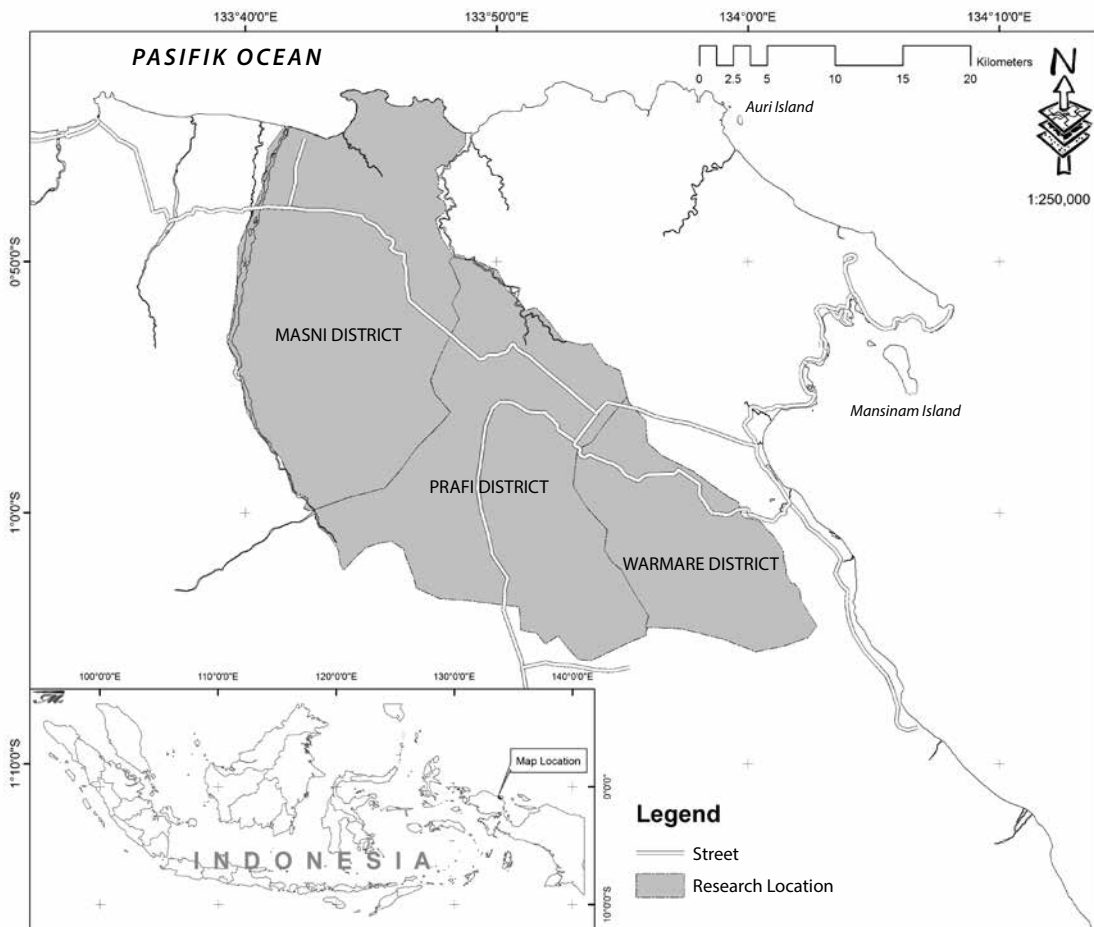


Figure 2. Study location.

Table 5. Forest types on the Prafi Plain.

Forest function	Area (ha)	Percentage
Limited production forest	5,277.9	13.8
Conservation area	884.8	2.3
Conversion production forest	8,363.6	21.9
Other land use area	23,736.9	62.0
Total	38,263.2	100.0

Note: Limited production forests are allocated for low-intensity harvesting of forest products. They are mostly located in mountainous areas with steep slopes. Conservation areas are designated to conserve fauna, flora and ecosystems. Conversion production forests are intended for non-forestry development purposes such as plantations, transmigration and mining.

Source: Ministry of Forestry (1999).

and Sougb. The majority groups among these are the Meyakh and Sougb. These Arfak peoples are the indigenous forest-dwelling inhabitants of Manokwari. Arfak communities consider the forest their mother, who always provides food for her children. They are highly dependent on the forest, which provides for their subsistence needs (Laksono et al. 2001).

The Arfak used to live in villages organized around patrilineal ties, based on the *keret* (family) or tribe (clan). They lived in large clan houses set up near their farmland. This changed with the arrival of Dutch colonists and Christian missionaries. The Dutch colonial government united these family groups into villages with the aim of facilitating population censuses and establishing a village government and education and health services. These days the original Arfak communities have scattered and settled in villages established by the government.

Before PTPN II arrived, ethnic Arfak farmers had no cash income, as they farmed only to meet their household subsistence needs. They practiced traditional swidden farming, hunted and gathered forest products. The main crops were carbohydrate-producing staples such as taro (*Colocasia esculenta*), cassava (*Manihot utilissima*) and sweet potato (*Ipomea batatas*), as well as fruits such as mango (*Mangifera indica*), langsung (*Lansium domesticum*), rambutan (*Nephelium lappaceum*), and jackfruit (*Artocarpus heterophyllus*), and vegetables like spinach (*Sauropus* sp.) and gnetum (*Gnetum gnemon*).

Once the communities became involved as *plasma* farmers in the PIR scheme, they began to earn cash. In addition to working on their oil palms, they also continued to practice swidden farming as well as hunting and gathering from the primary forest at the foot of the mountain and the remaining secondary forest. Since the oil palm estates have been established, land for farming has become limited.

3.2 Customary land control patterns, transmigration and oil palm estates

The land now occupied by transmigration sites and oil palm estates was formerly customary land controlled communally by Arfak clans. These lands once took the clan names and were separated by natural boundaries such as rivers, mountains, valleys, rock formations or large trees.

During the New Order era of the 1970s and 1980s, the Prafi Plain was targeted for large-scale clearance of forestland for the transmigration program and oil palm estates. The transmigration program was intended to create development equality throughout the regions by moving people from densely populated areas. Its aim was to improve the prosperity of transmigrants and the surrounding communities by creating job and business opportunities as well as encouraging expansion and investment. The program, which brought non-Papuan communities into the region, began in 1977 with 40,000 ha set aside by the Directorate General for Transmigration and the Manokwari District Government. In 1981, transmigrants began to settle the area, with each family allocated 2 ha of land — 0.25 ha for a house lot, 1 ha of enterprise I land (intended for producing subsistence food and income for the family, cleared and prepared by the government) and 0.75 ha of enterprise II land (intended for providing income beyond subsistence, cleared and developed by transmigrants).

In 1980, the oil palm company PTPN II obtained a permit to clear 23,000 ha of land close to a transmigration site to create an oil palm estate. In accordance with the rules, in addition to setting up nucleus estates, oil palm companies had to establish a 2-ha *plasma* estate for every indigenous and transmigrant family through the Nucleus Estate and Smallholder Scheme. In order to expand its estates, in 1998 the company established KKPA with funding from Bank Negara Indonesia, to provide financial support for smallholders establishing oil palm

crops. The scheme used enterprise II land, which transmigrants surrendered to the company.

The transmigrants only secured enterprise II land in the form of estates in 1998, 17 years after they had officially been granted it (interview with Pietsau Amafnini, coordinator of JASOIL Tanah Papua, Social and Environmental Advocacy Network in Papua, June 2010). The land and oil palms were not surrendered for free. Transmigrants have to engage in an agreement with the company and the Bank Negara Indonesia and pay off their loans by surrendering 30% of the proceeds of their fruit bunches to the bank. As collateral, they have to surrender their land certificates.

When the transmigration program began, local customary communities submitted a written request for the program to be initiated in their region in the hope that it would open opportunities for them to live more prosperously and build public facilities such as roads and schools. In the written statement, which became an annex to the official government document for the program, they also clearly stated that they did not ask for compensation.³ A government staff member interviewed for this study acknowledged that there was no compensation made during the transfer of lands from customary communities (interview with former staff member of the Manokwari District Transmigration and Manpower Office, 31 March 2011). Based on the regulations, compensation could be made in various ways and was not necessarily financial.⁴

3.3 Local wisdom about natural resource use

Arfak communities have traditional knowledge of natural resources and land use — for housing, farming and traditional medicine (Nauw 2007). For settlement, for example, they divide their customary region into four types: wet areas (*ampiabea*), hot and cold areas (*nubim*), tidal areas (*reshim*), and coastal areas (*mukti*). For farming, communities select moist,

fertile and friable soils with high humus content, usually found in flat areas in valleys or along river banks (Laksono et al. 2001).

The Arfak believe that if an area is cleared for settlement or plantation, then the wildlife will migrate to a more remote place, thus making it harder for communities to hunt game (Nauw 2007). Arfak communities also know which plant and animal species are edible, and which ones they can and cannot hunt. They also are familiar with animals that can help and accompany them when they are farming, hunting and travelling (Nauw 2007).

Arfak communities divide regions between community groups or villages. Boundaries between one clan and another, which are strictly adhered to, are called *hanjob* in the Hatam language (Laksono et al. 2001). For natural resource use, customary forests are divided into the following categories:

- *Bahamti* — primary forest located higher than the settlement area. According to customary rules, such land cannot be used for farming or settlements. It may only be used for gathering wood, tree bark and lianas for house construction.
- *Nimahamti* — very wet forest dominated by mosses. These areas may not be used as plantation land, and forest products may not be gathered there.
- *Susti* — secondary forest and regenerated former farmland. This can be used for farming and is divided into two types: *susgoisi*, which is farmland left for a year with young secondary forest beginning to grow, and *susmahan*, which is former farmland left for more than 5 years where older secondary forest has been established.

3.4 Labor

PTPN II Kebun Prafi employees are either from outside the region (assigned by the central office in Medan) or from local areas such as Manokwari District. Employees from outside the region — usually field assistants, assistant heads and administrative staff — are mostly recruited for skilled jobs, whereas lower-level employees are usually recruited locally. The total number of company employees was 840 in 2009, comprising 645 men and 195 women. Over 80% work on crop maintenance and harvesting (PTPN II 2009).

³ A statement releasing rights over customary communal land is an annex to every district head decree on establishing transmigration sites (Department of Transmigration 1997).

⁴ Article 30 of Government Regulation No. 2/1999 on Transmigration states that recognition or compensation for land release is the responsibility of the minister or business enterprise. Other forms of recognition or compensation include replacement land, resettlement and financial compensation. If a plot of land is subject to communal rights, then it will be compensated with public facilities useful for the community.

3.5 Work relationships

PTPN II Kebun Prafi works with regional government, communities and other parties in the following ways:

- *Nucleus estates* — The company employs villagers as full-time employees, paid monthly salaries, or on a piecework basis. The nucleus estate is on a land-use enterprise concession that is valid for 35 years and may be extended for another 25 years.
- *Plasma estates* — The development of *plasma* estates is basically the responsibility of the nucleus company, and the extent of it would depend on the number of farmers involved in the scheme. The PIR farmers are national and local transmigrants assigned specifically to work on oil palm estate development, commonly referred to as PIR-Trans. At PTPN II Kebun Prafi, there are two types of PIR farmers: PIR-SUS farmers, who receive credit from special national funds, and PIR-ADB farmers, who receive credit from the Asian Development Bank.⁵ Members of the two groups own different sized plots of land. Each PIR-SUS farmer has 2.25 ha of land, comprising 2.00 ha of oil palm and a 0.25 ha house lot. PIR-ADB farmers have 2.50 ha, comprising 2.00 ha of oil palm, a 0.25 ha house lot and a 0.25 ha home garden.
- *KKPA (Members' Primary Credit Cooperative)* — Established in 1996, the KKPA is a collaborative venture involving PTPN II Kebun Prafi, the district government cooperatives office, the Bank Negara Indonesia and transmigrant farmers who own 0.75 ha of enterprise II land allocated for food crops. Enterprise II land not used for food crops can be transferred to oil palm estates through the KKPA program. Backed by government guarantees, the Bank Negara Indonesia provides loans to farmers to establish oil palm estates on their land, which are managed by the company. Once the palms become productive, the estates are returned to the farmers so they can manage them independently to pay back their bank loans.
- *Regional government project* — This is a collaboration for developing oil palm estates between the district government, estate

⁵ The Asian Development Bank's goal is to assist the Government of Indonesia to increase production of palm oil concurrently with balanced rural development and full utilization of the land resource. Projects supported by the bank recruit transmigrants and poor farmers as smallholders, establish new settlements for the smallholders, develop degraded forest land into the smallholder and nucleus estate and process oil palm fruits (ADB 1995).

contractors and owners of communal land rights. The project is based on the following profit sharing scheme: the district government and farmers each get 30%, whilst the contractor, Sawit Thomas,⁶ gets 40%: 30% for operational costs and 10% profit. The project is aimed at increasing communities' standards of living. The estates are spread out, making supervision difficult and transport costs relatively expensive. As the regulator, the government facilitates and funds land clearance and estate development, which the contractor carries out on community land where agreements have been reached.

4. Impacts of oil palm estate development

Oil palm development may have different effects on different stakeholders. This section describes the stakeholder groups that were the focus of this study and then presents findings on the environmental, socioeconomic and sociocultural impacts of oil palm estates on each group.

4.1 Stakeholders

4.1.1 Company workers

Of the respondents interviewed, 3 (8%) were Arfak, 9 (24%) were non-Arfak Papuans, and 26 (68%) were non-Papuan immigrants. Daily workers and pieceworkers on the company nucleus estate mostly come from non-Papuan communities. The low number of Arfak working for the company reflects their lack of interest in wage labor. Most Arfak also lack the skills and experience for intensive oil palm farming, which requires maintenance, eradicating pests and using particular tools for pruning stems and cutting fruit bunches. Arfak farmers are also not used to working full days. Research by Nauw (2007) and Imbiri (2010) shows the difficulties Arfak communities have in accepting oil palm growing innovations, which are contrary to their traditional swidden practices and dependence on nature.

Industrial-scale farming systems that demand individual work are also contrary to Arfak culture,

⁶ Sawit Thomas is a contractor assigned by a local government agency, Manokwari District Agricultural Services, to establish oil palm estates for farmers. The company has carried out this function since 2004 with funding from the regional budget.

where daily activities are always communal. Many Arfak are afraid to do things alone, as they believe in *suanggi*, or enemies who might kill them by using magic.

Of the company employee respondents, 31 (82%) were men and 7 (18%) were women. The small number of women working in oil palm plantations may be related to the fact that maintaining and harvesting oil palm fruits is physically demanding work. Culturally, women are also less used to taking part in male-dominated activities, and to some extent are influenced by the “big man” concept (Mansoeben 1995; Zimmer-Tamakoshi 1997), under which clan members including women are normally not able to speak and act freely.

4.1.2 Former landowners and customary users

There were 43 respondents who were former landowners and land users, 33 (77%) of whom were Arfak and the remaining 10 (23%) were non-Papuan transmigrants whose land had been converted for oil palm under the KKPA scheme. Their oil palm estates are currently unmanaged as their land-use enterprise concession expired in 2004. Most of these respondents were men (91%); only four (9%) were women.

4.1.3 Investing farmers

Of respondents, 30 were investing farmers. Of these, 53% were Arfak, 27% were immigrants, and 20% were non-Arfak Papuans. These more balanced proportions reflect the fact that this group is not directly employed by the company but is made up of farmers who work with the company, participants in the Manokwari District Government project and individual farmers who have bought land independently from customary communities. The Arfak respondents were oil palm farmers receiving guidance from the Manokwari District Agriculture, Estate Crops and Livestock Office. Most investing farmer respondents (87%) were men. Very few women invest in oil palm, and the few that do are generally not Arfak.

4.1.4 Affected neighbors

Of respondents, 27 were affected neighbors: 4 (15%) were Arfak, 9 (33%) were immigrants, and 14 (52%) were non-Arfak Papuans. Most were villagers who were not involved in oil palm estates but sold food or farm products in kiosks, at traditional markets or along the roadside. Most (21 respondents or

78%) were men. These respondents were generally able to take advantage of the economic opportunities that oil palm development brings. However, Imbiri (2010) reported that only around 10.9% of Arfak farmers work as unskilled laborers or pieceworkers on housing developments and road and bridge building projects. Such jobs are short-term and dependent on there being projects to work on.

Respondents reported running the following businesses: motorcycle taxis, kiosks, sale of petrol, transport of FFB, and sale of sand and rock. Most small businesses are run by immigrants; however, some Arfak people do have FFB transporter trucks and mining excavation and transport businesses. These are generally people with high social status in local communities, such as clan heads or their close relatives. Few Arfak people take advantage of the business opportunities resulting from the presence of the oil palm company; most are *plasma* farmers and sell their products at nearby markets. The inability of indigenous communities in general, and Arfak communities in particular, to utilize these opportunities is generally due to the traditional way of hunting and gathering food from the forests, and the perception that natural resources are still abundant, which reduces their motivation to run a business.

4.2 Environmental impacts

According to respondents' perceptions, the conversion of forest land for oil palm estates on the Prafi Plain has resulted in multiple environmental impacts, including the loss of forest cover, increased erosion, flooding, soil instability, decreased water quality and scarcity of clean water in the dry season. The operation of the oil palm plantation is also perceived to have caused an increase in human disease, air pollution and crop pests (see Figure 3). These changes generally have negative socioeconomic and sociocultural effects, with traditional communities experiencing a loss of land for swidden farming and difficulty collecting forest products and harvesting fruit. Once the land has been transferred to the company, a community loses its land rights and has limited ability to carry out subsistence activities on the customary land that they previously controlled.

4.2.1 Changes in forest cover

As shown in Figure 3, the majority of respondents perceive that oil palm development has caused

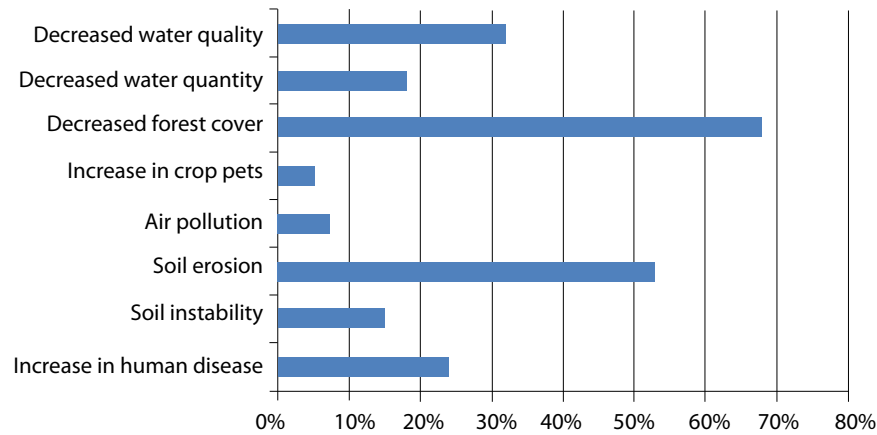


Figure 3. Respondents' perceptions of the negative impacts of oil palm development on the Prafi Plain.

a reduction in forest cover. This perception is supported by satellite imagery. Analysis of Landsat imagery taken in 2001, around 20 years after the establishment of the company's estate, indicates that oil palm covers more than a third of the Prafi Plain. Other parts of the plain are covered with agriculture and scrub. Settlements under the transmigration program, which started in 1982, now cover almost a fifth of the area. Only about a third of the Prafi Plain is still forested, just meeting the legal minimum of 30% (Law No.41/2009 on Forestry and Law No. 26/2007 on Spatial Planning) (Table 6).

Table 6. Land types on the Prafi Plain, 2001.

Land type	Area (ha)	Percentage
Lowland forest	5,764.5	15.07
Highland forest	5,282.5	13.81
Swamp forest	2,049.9	5.36
Unproductive dry land	1,628.6	4.26
Oil palm plantations ^a	14,461.7	37.80
Dry land farms, brush, scrub and open land	2,243.1	5.86
Transmigration settlements and farms	6,818.6	17.82
Bodies of water	14.2	0.04
Total	38,263.1	100.00

Source: Based on Landsat images taken in 2001.

^a The discrepancy between this estimated area and the company's estate concession (12,049 ha) is due to the fact that oil palm plantations covered by the Landsat imagery include small parcels managed by individuals around the company's estate.

An analysis of changes in land cover based on three sets of satellite images — taken before the estates were established (1972 and 1982), after companies had begun operating (1989 and 1991) and more recently (2006) — showed that around 83% of oil palm expansion has occurred at the expense of forests (Obidzinski et al. 2012). Most of the forested area was converted to oil palm estates, and about 48% of the forests, both primary and secondary, became oil palm plantations between 1982 and 1989/1991. As a result, in 2006, only 42% of the company's estate area remained forested. Figure 4 shows the changes in land cover on the oil palm plantation site. There is a strong indication that the company's estate is located not only on conversion production forest or other use areas that have been allocated for non-forestry activities such as oil palm plantations, but also on limited production forest.

Even though the minimum area of forest required by law remains, this should be a warning for central and regional decision-makers that avoiding further forest conversion into plantations is important. In 2011, the local government was found to have a plan to allocate production forests covering 313,215 ha for conversion to oil palm estates (Dishutbun 2011). If oil palm estates continue to be developed in the region, first priority should be given to increasing the productivity of existing estates. Most of the company's estate is already 30 years old, and it is time to regenerate the plantation in order to improve yields. If expansion of area is needed, efforts must be made to direct estates toward non-forested areas and unproductive land. Around 3800 ha of non-forested areas, such as unproductive dry land and scrub, are available for estate expansion (Table 6).

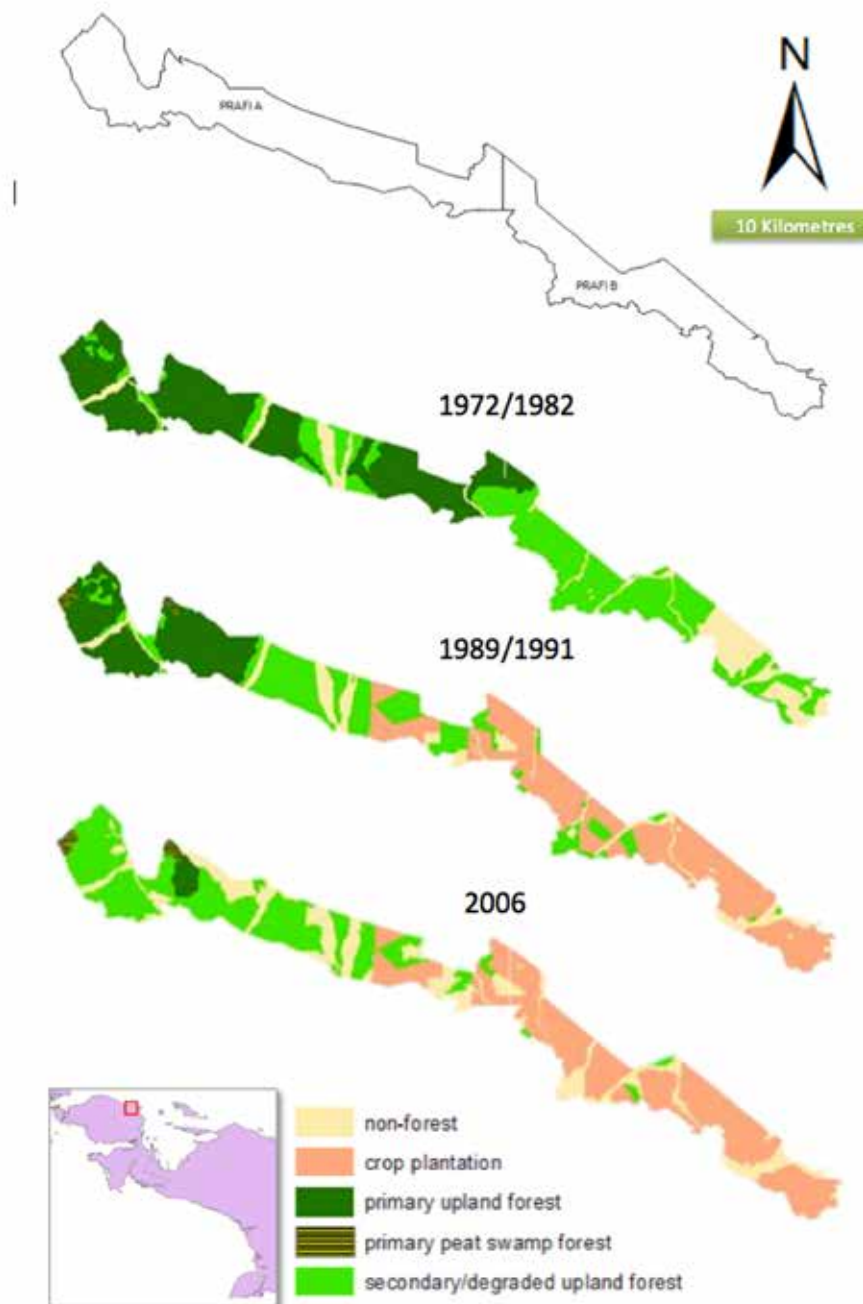


Figure 4. Land cover in the oil palm plantation site at three points in time.

Source: Obidzinski et al. 2012.

Note: The first timeframe is prior to plantation establishment.

4.2.2 Soil erosion

Most respondents perceived that development of an oil palm estate has an effect on soil erosion. Some said that certain areas around the estate lack vegetation cover and, when the rain falls, the soils are easily eroded. Direct observation by the research team also found such areas and abrasions in some

riverbanks where oil palms were planted right to the river's edge and no other plants protect the river banks from floods. While further research, using quantitative techniques and sedimentation measurement, is needed to better understand the precise impacts on soil erosion, survey results and observations provide preliminary signs of the impact.

4.2.3 Changes in water quality and quantity

Some respondents perceive that changes in water quality have been due to oil palm estate development (Figure 3). They complained that, during the dry season when the water in rivers and wells becomes very low, they often have trouble getting clean water. During the rainy season, they use rainwater for their freshwater needs, as river water and well water become cloudy.

Some respondents reported that frequent flooding has changed the direction of the river flow and created new streams. The Prafi Plain, which is the upland part of the watershed, has become highly vulnerable to such changes. Estate buildings and infrastructure such as roads and drainage channels block the flow of some tributaries that had served as natural drainage. The main road to the south of the estate, which forms the boundary with transmigrants' farmland, has also changed the river flow. Estate development has affected the natural flow of water, causing surface runoff to form new drainage channels.

The Smaryam River, which bisects the estate, is the main recipient of drainage from the estate and surface runoff when it rains. In times of heavy rain, the river is unable to contain the volume of water. When the estate was constructed, the Smaryam River was dammed and the water channeled away in order to expand the estate. The impact of the dam is felt in the rainy season when the river overflows and follows its original course, causing some oil palms to collapse due to abrasion. Changing the direction of the river has also led to new drainage channels forming across the estate and flowing into the main roadside drainage channel. This has led to frequent abrasion affecting the main road around the estate.

4.2.4 Air pollution and increase in human disease

Other environmental impacts experienced by company workers are increased air pollution and more frequent instances of disease. The company burns empty fruit bushes to dispose of waste and control oil palm pests. The smoke affects workers' health and increases carbon emissions. Respondents stated that respiratory disorders are the most common illnesses affecting communities. However, the burning site is on the nucleus estate near the plant, and its impact is only felt by those living nearby. Mills produce large amounts of waste, both liquid and solid, and also noxious odors and smoke

(McCarthy and Zen 2010). In Sumatra, the high level of air pollution around the mills has encouraged some oil palm company workers to commute from their village rather than living in the company compound (Feintrenie et al. 2010).

Some respondents reported an increase in rat infestations in farmers' crops near the oil palm estate. Rats, which used to hide in the forest, have lost their habitat and have now moved onto the estate. Some respondents also felt that community health conditions have declined, and the incidence of disease has increased.

4.3 Socioeconomic impacts

4.3.1 Changes in livelihoods

Following oil palm expansion on the Prafi Plain, livelihood patterns have changed for various stakeholder groups. Of investing farmers, 46.6% were originally seasonal farmers, whilst 16.7% had other sources of income and 36.7% did not work for a cash income. Of former landowners and customary users, about 84% were originally seasonal farmers, whilst the rest had other livelihood sources. Of employees, 68.4% were formerly seasonal farmers, and 31.6% worked off-farm as traders and laborers.

Of oil palm estate workers, 74% no longer farm, as most of their time is spent tending and harvesting oil palm fruits. Meanwhile, 26% of farmers who invest continue to work as seasonal farmers as they still have farmland and estates or clear new areas of forest. In addition, some still have free time, since they do not work fulltime on their oil palms but use harvest workers. They reported that since the oil palm estate opened, land available for seasonal crop farming has become limited. Farming is usually for subsistence, with the dominant crops being taro, cassava and other root vegetables.

Changes in livelihood sources have affected family cash earnings. About 32% of respondents of the estate workers group said they had experienced positive changes in livelihood. Respondents indicated that the positive changes were attributed to an increased income (84%) and more reliable income flow (63%). Meanwhile, 15% of respondents reported negative livelihood changes, attributed to declining income as palms become less productive with age. Even though estate workers have fixed incomes of around IDR (Indonesian rupiah) 1,250,000 a month, they have not improved their

livelihoods, as these earnings are barely enough to meet their daily needs. The poor condition of their quarters, limited health services and an obligation to buy work equipment such as bamboo, boots, wheelbarrows and machetes have worsened their conditions. Andrianto et al. (2013) also reported that very few oil palm workers are able to invest in economic activities, despite a significant increase in income during the initial years of estates. Workers also complained about deductions from salary for taxes and union fees.

These findings corroborate other research on income in the Prafi Plain. Despite the fact that the oil palm plantation has been in operation for 25 years, Imbiri (2010) indicated that most Arfak and non-Arfak Papuan farmers still have incomes averaging IDR 1,328,984 a month. These incomes come from three sources: oil palm and cocoa estates, food and fruit crops, and side enterprises. When an oil palm estate is being built, cocoa becomes an important commodity. Local communities have long been familiar with this commodity, and they often ask the company to help them build a cocoa estate when they come to the first negotiation. The company uses this commodity to persuade landowners to transfer their land for the oil palm estate.

From these monthly earnings, the average income from food crops is higher (IDR 514,693 a month, or 38.7%) than income from side enterprises (IDR 418,909 per month, or 31.5%) or oil palm estates (IDR 395,382 per month or 29.8%). Those in positions respected within local communities most often secure income from side enterprises; these include clan heads, hamlet heads, hamlet secretaries, church presbytery heads and teachers. Often, customary communities assign people in those positions to help mediate on behalf of the

communities with external parties such as oil palm companies. People earn a fee for such services. Income also comes from operating motorcycle taxis, buying and selling petrol, running kiosks, transporting FFB, buying and selling rocks and sand, and operating public transport vehicles. FFB transportation, the sale of sand and stone, and public transport businesses are run by people with higher social status such as community leaders or tribal heads and their close family members.

The real income figure for oil palms is very low compared to an analysis by PTPN II (2009), which claimed a net monthly income — after deducting 30% for loan instalments and transport costs — of IDR 1,650,000 for farmers who had yet to pay off their loans, and IDR 2,100,000 for those who had. Although Imbiri (2010) found that most farmers had paid off their loans and had rights of ownership over their land, their monthly income was low.

The low income earned from oil palm enterprises is due to the poor productivity of the palms, lack of maintenance and farmers' high expenditures for tending, harvesting, transporting and marketing FFBs, as well as payments of fees to farmer groups and deductions for hamlet and clan heads. Total monthly expenditure for oil palm enterprises can reach IDR 493,545, whereas total earnings are IDR 888,927 a month. Some respondents said that the low income demotivates them from managing their oil palm estates properly. Farmers' reluctance to participate in company–community partnerships because of their lack of benefits was also reported for a Sumatran oil palm estate (Feintrenie et al. 2010).

The average annual productivity of *plasma* farmers during 2007–2009 was only 7.98 tonnes FFB/ha (Table 7). This figure is far below the 2000

Table 7. Fresh fruit bunch production, 2007–2009.

Source area	Annual production (tonnes)			Average annual production (tonnes)
	2007	2008	2009	
PTPN II Kebun Prafi	67,247.90	72,065.42	81,218.75	73,510.69
Irman Jaya	259.43	238.73	477.53	325.23
District government estates	458.63	900.45	2,522.64	1,293.91
Total production (tonnes)	67,965.96	73,204.60	84,218.92	75,129.83
Productive area (ha)	9,411	9,411	9,411	9,411
Tonnes/ha	7.22	7.78	8.95	7.98

Source: Adapted from Apkasindo (2010).

production level of 14.9 tonnes FFB/ha, or the ideal annual figure of 18 tonnes FFB/ha if an estate is managed properly in a production cycle of up to 25 years (Setiobudi 2000).

Low oil palm productivity is partly a result of the lack of crop maintenance, including fertilizer and pesticide applications, weeding and pruning. Fertilizer and pesticide procurement on credit from the company was stopped in 1995, and they are otherwise difficult to get and very expensive. Field observations showed that in general, *plasma* land is not maintained as it should be, and many weeds grow unchecked around the oil palms.

Interviews with various parties showed that farmers were not fully aware of the extent of harvest yields from their transmigration land and how monthly loan payments were deducted. (This problem is discussed further in the next section.) Even though transmigrant farmers signed contracts and credit agreements with the company and funding bank in November 2004, they did not know how much their land produced, how much the company had deducted, or how much they still owed on their bank loans (interview with transmigration village heads, 29 March 2011).⁷ The company's lack of transparency and unclear profit sharing has contributed to farmers' low incomes from their oil palms. Rist et al. (2010) and Feintrenie et al. (2010), in their studies of relationships between oil palm farmers and companies in Kalimantan and Sumatra, concluded that conflict was created by unclear contracts, weak government management procedures, the failure of companies to meet the obligations laid out in contracts, unclear tenure rights and changes in land value.

4.3.2 Changes in the use of family labor

For this study we categorized labor in three groups: employees, full-time workers and pieceworkers. Employees are office workers, including estate supervisors and plant workers. Full-time workers are those paid monthly for their work, and pieceworkers are workers contracted as and when the company needs them.

⁷ One respondent also said that they were shocked to hear that according to bank records they owed around IDR 1.8 billion, with no explanation of how much they had already paid back. The oil palm farmers believed their debts should already have been paid off, judging by the harvest yields from their fields.

Full-time workers maintain the estate and harvest the FFB. Maintenance includes pruning, weeding, uprooting old palms, applying fertilizer and pesticides and clearing harvest paths. Harvesting work, such as gathering loose fruit, is usually done by men, but their wives sometimes help. Male and female workers both do maintenance.

Most respondents acknowledged that PTPN II's presence has made more jobs available for individual and family labor on the Prafi Plain. This is supported by data showing that 22,598 people — or 71.82% of the population in the three subdistricts of Masni, Prafi and Warmare — work as farmers in the PIR-SUS, PIR-ADB and KKPA schemes (personal communication from RM Wondiwoy, 2010). This figure does not include the 840 company employees and workers; some were recruited from outside the region, but 80% come from local communities.

Workers work from 07:00 to 16:00 Monday–Saturday, meaning they have little time for activities outside work hours. As a result, few workers have side enterprises, except for raising livestock, which they graze on the estate whilst harvesting or tending oil palms.

4.3.3 Local perceptions of socioeconomic change

Of respondents in the former landowner and land-user group, 84% said that changes in living standards and livelihoods are the direct result of handing over land to the oil palm company; 39% said changes were positive, and 61% that changes were mixed.

Perceived positive changes included increased income (reported by 71%), access to foodstuffs (76%), and access to social infrastructure (58%). Communities also perceived negative changes, such as difficulty accessing farmland and increased length of time needed to reach farmland and collect forest products. Increased incomes were the result of compensation for land requisition, oil palm sales and sales of other farm produce. Farmers' average annual income from oil palm in 2010 was IDR 4,744,582. This is fixed income secured by communities directly involved in company activities, particularly as *plasma* farmers. This shows that community involvement in the oil palm company has raised farming households' earnings.

4.3.4 Changes in subsistence and production patterns

Local communities generally subsist from farming, which is also their main source of income. Of local villagers, 84% earned their livelihoods as seasonal crop farmers before becoming oil palm growers. The change to oil palm growing has not completely eradicated their old livelihoods, and according to this study, 37.2% are still seasonal crop farmers.

In addition to productive enterprises, communities also rely on farmland for their everyday needs. They generally produce their own food by farming and sell any surplus at the market. Their links to farmland have meant that villagers generally do not leave their farming habits behind even though they own oil palm land. As a result, most farmers choose not to maintain or harvest the oil palms on their land themselves, but hire workers or rent their land to others. They only receive what is left after costs are deducted, and percentages are shared in accordance with prior agreements. About 90% of local farmers rent their oil palm land to more capable transmigrant farmers from East Nusa Tenggara, Java, Sulawesi and West Nusa Tenggara at prices of IDR 200,000–300,000 a month.⁸

4.4 Sociocultural impacts

4.4.1 Land control, ownership rights and conflict over land

Land and forests in Papua are controlled communally by large clans from each ethnic group. Clan members have customary rights over the land and natural resources within their territories, which are controlled by the clan head. Lands controlled by certain clans take the clan names and are separated by natural boundaries.

Arfak communities have strong cultural ties to the land. They have no terminology for transferring land ownership rights, but the right to use Arfak customary land (and that of most other ethnic groups in Prafi) can be transferred to other parties who need it. Arfak communities believe that customary land cannot be bought and sold; however, they do recognize land lease with compensation, either financial or in the form of jointly agreed social

services, if investors, the government or other parties use their land. The buying and selling of customary land has had consequences for communal rights over land in the local social system, which closely link to how lands are controlled and owned. If the lands are sold, they would be individually owned and the communal ownership would no longer prevail.

The social system of Arfak communities, and in Papua in general, recognizes the lord of land or *Tuan Tanah*, under which a group of clans traditionally have communal control over land within their customary zone. The lord of land is the head of the clan, normally the oldest boy in the family, who controls land that has been governed for generations by the clan. While the head of the clan has the right to make decisions on how the land should be used, collective agreement should be sought from members of the clan if one member intends to sell land. The clan's head and members have collective ownership of the land and authorize the transfer of tenurial rights to it. The tribal head plays a greater role in resolving conflicts over land between clans.

Tenurial rights and control over land may be transferred not only to a company or the government but also to nonlocal communities such as transmigrants. As described earlier, transfer of land in this particular estate occurred, mainly in 1980 and 1981, when PTPN II obtained a permit to clear 23,000 ha of land in conjunction with the government's transmigration program. The company aimed to set up nucleus estates, while establishing 2-ha *plasma* estates for every indigenous and transmigrant family through the Nucleus Estate and Smallholder Scheme. During that time, Arfak communities submitted a request that the transmigration program be developed in their area. They did not ask for any monetary compensation from the government, as they hoped that the government would help them build public facilities such as roads and schools in return for the transferred lands.

However, since the beginning of 2000, the land has become subject to dispute. The customary landowners reclaimed the land and demanded compensation, either for the land or for the resources on that land. Of survey respondents, 92% said they had received no compensation for their customary land that was converted into oil palm estate. Customary landowners have also demanded that the company keep its promise to provide permanent houses with piped water and easy access to health

⁸ As oil palms grow higher, reaching up to 20 m, harvesting becomes more difficult as workers have to use long poles to reach the fruit bunches. Local farmers are generally unused to harvesting this way and tend to contract immigrant farmers to harvest for them.

services. Thus far, the company has only built temporary houses without running water.

The landowners have challenged not only the company's estate but also lands legally transferred by the government to transmigrants. In 2004, landowners started to reclaim the lands controlled by the transmigrants, demanding compensation. Some landowners have claimed and taken over enterprise I land (designated for food crops) belonging to transmigrants from Satuan Pemukiman II and established the hamlet of Lismau Ngu. Further, customary landowners have seized 613.5 ha of enterprise II land belonging to transmigrants from Satuan Pemukiman I (Prafi Mulya hamlet) and Satuan Pemukiman II (Desay hamlet). This land was planted with oil palms through the KKPA program and the customary landowners now enjoy earnings from the harvested FFB.

In reclaiming the lands, the customary landowners argued that not all community members consented to transferring control of customary community land to PTPN II. They recalled that some clan heads from hamlets whose land would become the PTPN II nucleus estate were invited to visit North Sumatra to see the success of oil palm estates there. The aim of the visit was to provide clan heads with an insight into the opportunity to improve their standard of living by changing their swidden farming practices. In addition to the customary community's strong ties to the land, the land reclaiming seemed also to have been driven by desire to meet their subsistence needs, feelings of injustice and unkept promises. Imbiri (2010) has argued that land claims are the result of local community dissatisfaction with the amounts of compensation paid by the company to their predecessors. Two other likely reasons are local villagers' need to fund substantial dowry payments for customary marriages, and envy growing out of economic disparities between local and transmigrant communities.

The transfer of land to nonlocal communities has been made under the agreement that some amount of compensation be paid to the customary landowners. Types of compensation varies depending on the agreements made. Our research shows that, in general, financial compensation was paid when the land was surrendered, but some have continued to pay compensation for the duration of their control of the land. Compensation for communal rights has varied between groups of oil palm farmers. Payments are made from the profits of the monthly

FFB harvest. For the Nur Isba-Muara Prafi farmer group, for instance, compensation for communal rights is IDR 25,000,000 per month, or an average of IDR 81,000 for each lot owner. This amount does not include other incidental costs requested by the oil palm landowner every month. With other farmer groups, in Makwan hamlet for instance, compensation does not need to be paid every month, but other incidental funds are provided, the amounts of which are not determined by communal rights owners. Compensation for communal land is not paid on an individual basis, but through the tribal head.

As the company's land use enterprise concession will soon expire, the unclear status of the lands has raised concern among customary landowners. Interviewees said that customary communities do not want the company to use their land permanently, and they are worried about the status of their land when the company's business use rights expire. They are concerned that the land might become state land rather than being reinstated as customary land. A similar issue came to light with transmigrant communities, who are concerned about their land being reclaimed by customary landowners. The lack of clear land status could become a source of conflict, the symptoms of which are already visible in demands against the company, and transmigrants' demands for restoration of their enterprise II land.

Customary landowners' demands for compensation and attempts to reclaim the land are also driven by uncertainty over the status of land managed by PTPN II. The government's plan is to transfer the management of state-owned PTPN II to the West Papua Provincial Government (Cahaya Papua 2010a,b; Media Papua 2012). The landowners feel they have rights over the estate land, the status of which will become unclear when management is handed over. They consider the company's use of their land for oil palm to be on a leasehold basis, with land rights still belonging to customary communities. FOReTIKA and Tifa (2006) have recommended that local community land not be included as part of the land-use enterprise concession but be treated as leased land.

4.4.2 Changes in health and education

The oil palm estate company plays a minor role in efforts to improve indigenous and other local communities' health. The company has a polyclinic to serve company workers and, to a limited extent, local community members. As also asserted by

Imbiri (2010), who did research in the same region, the company's role in public health is minimal. There have been changes in medical practices, with villagers relying less on traditional medicines and more on modern medicines — it is easier to buy medicines from shops than search for them in the forest. But villagers are more likely to use government community health centers set up near their homes.

Local communities use river water for drinking, bathing and washing. Health became an issue when some community members found that water quality had deteriorated and attributed that to the presence of the plantation. Local communities also collect rainwater, particularly during the rainy season when river water can be muddy.

Education is the responsibility of the district government education office and related institutions; however, the company also plays a part in improving the quality of education in communities around its operations area. Interviewees said that the company provides employees with IDR 50,000 a month to help with their children's education. This assistance is one of the social responsibilities the company promised to take on during land transfer negotiations. However, the company should contribute more to changing family education patterns. Currently, villagers around the estate make use of government education facilities in the hamlets and the nearest towns more than they rely on the company's assistance.

5. Conclusions and recommendations

Oil palm estates on the Prafi Plain have undoubtedly contributed to the region's economic development by creating employment and providing opportunities for various stakeholders to improve their standard of living. Oil palm estates also provide an opportunity for customary communities to interact with government officials, company employees and migrants. The operation of the estate, designed originally through the PIR-Trans scheme, has had positive impacts on various stakeholder groups such as company workers, former landowners and customary users, investing farmers and affected neighbors.

The company's workers, in particular, experienced positive livelihood changes, which were attributed to increased income and more reliable income flow. Affected neighbor groups are positively affected by oil palm development as they are generally able to take advantage of the economic opportunities it brings, such as by operating a business. The change from swidden agriculture to fixed farming of oil palm with intensive cultivation technologies has increased farming households' cash earnings.

However, the expansion of the oil palm estates has also resulted in some adverse environmental and social impacts, which may be important for policy-makers to consider when designing and implementing policies, and for other stakeholders to take into account as well. In terms of the environment, development of oil palm estates has resulted in a significant reduction of forest cover. As a result, forested lands on the Prafi Plain make up only 33.88% of the region's watershed, which is close to the minimum stipulated by law. Various stakeholder groups also consider the following to be negative impacts from converting forest to oil palm estate: changes in water flow patterns, scarcity of clean water in the dry season, reduced water quality, increased erosion and flooding, river abrasion and sedimentation, air pollution, and more numerous instances of disease.

In terms of socioeconomic effects, oil palm estate development under the PIR scheme has not been able to satisfactorily benefit local communities, particularly the Arfak communities who hold customary land rights. PIR schemes that rely on immigrant workers are prone to creating horizontal conflicts, injustice and envy among local communities toward immigrants.

Past processes for allocating and acquiring land for oil palm estate development were marred by lack of transparency and the company's inability to keep its promises. This has resulted in attempts to reclaim land and demands for compensation by customary landowners, and conflict over land ownership between customary landowners and migrants. Of villagers interviewed, 92% said they had received no compensation from the government or the company for their customary land converted to oil palm. Uncertainty regarding the status of the land once the company's business-use rights expire has also raised concern among landowners.

In order to prevent further deforestation, it is recommended that a moratorium be put in place on the conversion of forest to oil palm estates on the Prafi Plain. Efforts to develop oil palm estates should be directed towards regenerating old plantations, taking advantage of high-yielding varieties, and using non-forested, degraded and unproductive land such as scrub or grassland for any new estates. When allocating land for agricultural development, special areas should be set aside for indigenous Arfak communities.

The government also needs to increase the credibility of the environmental impact assessment procedure, take proactive action to monitor and supervise the company's operation, and strictly regulate the operation of oil palm estates. The company's environmental management and monitoring document should be reviewed and tested to ensure that it is in accordance with the law (Minister for Environment 2007). The government should also make serious attempts to seek resolution of conflicts over land ownership and tenure between customary landowners, the company and migrants.

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This paper analyses the environmental, socioeconomic and cultural impacts of oil palm development in the Prafi Plain of Manokwari District in West Papua Province. This analysis is based on interviews and focus group discussions conducted in January–August 2011, a literature survey, and analysis of Landsat images of the region. The research findings indicate that oil palm cultivation brings significant benefits — such as infrastructure development, higher incomes for local stakeholders and broader opportunities for customary communities. However, the large number of immigrant workers brought in to work on the plantation estate are a source of conflict with the local population. Oil palm development has had adverse environmental impacts as it has resulted in the deforestation of about 60% of the Prafi watershed. It has also caused soil erosion, poor water quality and air pollution.

To avoid additional adverse impacts, the development and expansion of oil palm estates should focus on replanting old plantation areas with high-yield varieties and planting on non-forested and degraded land. Special land zones should be set aside for the indigenous Arfak people to use for subsistence farming. Additional efforts should be made to ensure that local communities receive proper compensation for the loss of use of their traditional lands. Increasing transparency in land allocation, stricter supervision of plantation operations and sanctions for non-compliance with sustainability standards are of utmost importance.



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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.

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