WORKING PAPER 210

Towards more sustainable and productive independent oil palm smallholders in Indonesia

Insights from the development of a smallholder typology

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CIFOR

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1 Introduction

With oil palm smallholders becoming an increasingly dominant producer group in Indonesia, enhancing the sustainability and productivity of their production practices has begun to feature more prominently in Indonesian policy discourse. Since most smallholders operate independently – often without technical and input support from corporate producers and outside the purview of the state – the activities of many smallholders have been poorly regulated and supported. As a result, independent smallholders are not only the least productive oil palm producers in Indonesia, but also likely to operate without proper permits and on lands that, legally speaking, cannot be cultivated. Raising the productivity of independent smallholders in particular is increasingly regarded as an important pathway for enhancing sector productivity and smallholders' incomes and, in combination with other measures, for reducing pressure on ecologically significant peat and forest landscapes. Furthermore, addressing smallholder legality issues that threaten widespread incompliance with the Indonesian Sustainable Palm Oil (ISPO) standard is of critical importance[1]. This would reduce the risk of smallholder disarticulation from formal markets, which increasingly demand supplier compliance with public standards such as ISPO, as well as private sustainability standards such as the Roundtable for Sustainable Palm Oil (RSPO) and zero-deforestation commitments.

In developing appropriate interventions, the Indonesian government and the myriad smallholder technical assistance programs have begun to acknowledge that since independent oil palm smallholders are a highly heterogeneous population, a more tailored approach to addressing productivity, sustainability and legality issues is needed. However, the absence of a comprehensive knowledge base on smallholder characteristics and associated challenges has frustrated efforts to formulate and scale appropriate approaches. To support these efforts, this working paper presents preliminary results from farm and farmer surveys conducted in the Sumatran province of Riau. Through a hierarchical cluster analysis (HCA) it develops a smallholder typology that deconstructs smallholder oil palm farmers into six more homogenous sub-groups. It identifies a number of unique policy challenges and priorities per sub-group and shows that the types of smallholders found in frontier areas differ fundamentally from smallholders in more established agricultural areas. These results contribute to the development of more targeted interventions that account for both group- and geography-specific challenges.

1 Under the Ministry of Agriculture's Regulation 11/Permentan/OT.140/3/2015 passed in 2015, all independent smallholders are mandated to comply with a range of smallholder-specific ISPO principles and criteria (Annex VI). This includes requirements related to legality (e.g. proof of land ownership, not being located in land classified as state- or forestland), land preparation (e.g. no use of fire, establishing terraces on sloping land, canaling in peatlands), planting (e.g. use of officially certified planting material), and plantation management (e.g. associated with water table management, pest control and fertilizer use).

2 The emergence of independent oil palm smallholders in Indonesia

Smallholder oil palm cultivation was first promoted in the 1980s by the New Order regime to develop and politically integrate the outer islands of Indonesia. Early initiatives sought to link smallholder farmers to state-owned plantation companies through so-called Nucleus Estate Smallholder (PIR/NES) schemes. Over the course of the 1990s, the expansion of variations of these types of schemes were increasingly spearheaded by private companies. By the 2010s, PIR/NES smallholders accounted for between 700,000 and 900,000 ha of planted oil palm in Indonesia (Badrun, 2011, Zen, Barlow et al. 2016). With many PIR/NES smallholders prospering and oil palm markets and infrastructure maturing, cultivating oil palm independently became increasingly attractive to and viable for smallholders in many provinces. In 2016, the area of oil palm cultivated by oil palm smallholders is estimated to reach 4.7 million ha (or 41%) of land under oil palm (Direktorat Jenderal Perkebunan 2015) (Figure 1), with independent smallholders accounting for the largest share. With the state neither promoting nor regulating this expansion, most smallholders are dependent on informal input and offtake markets, and their production systems are characterized by low yields and poor practices.

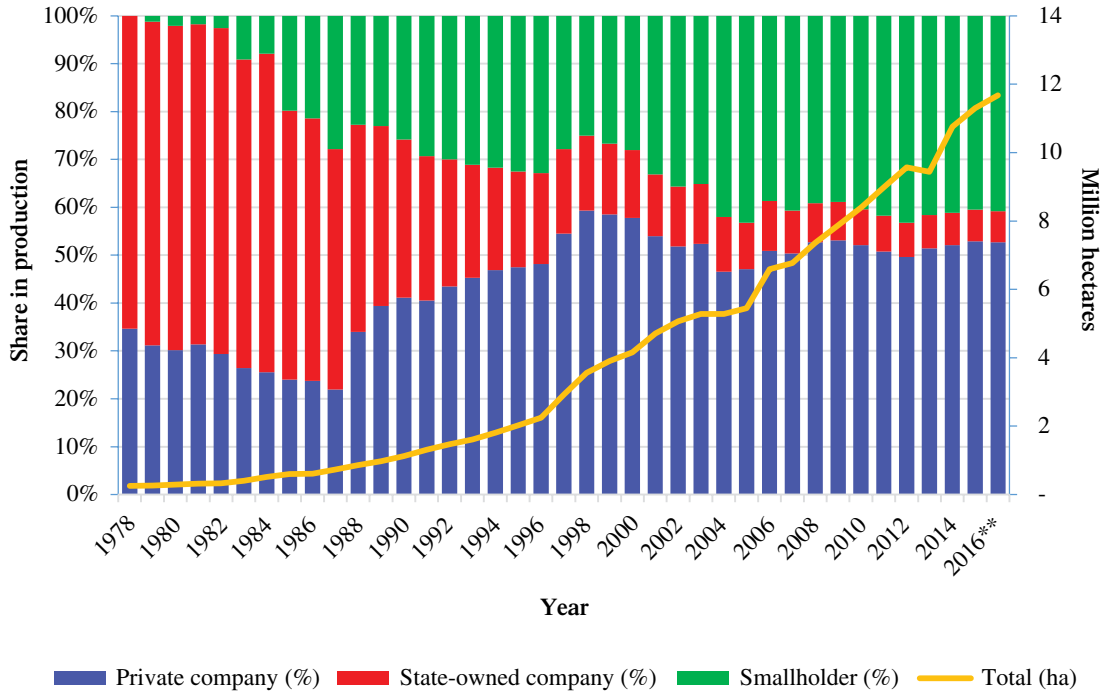

Figure 1. Proportion of area planted with oil palm, by actor type 1978–2016.

** 2016 is estimated data

Source: Direktorat Jenderal Perkebunan (2015)

Company yields, on average, exceed those of smallholders by 25% (calculated from Direktorat Jenderal Perkebunan 2015). Among smallholders, those tied to companies through, for example, PIR/NES schemes, and therefore receive technical and input support, tend to be more productive than independent smallholders; with estimates ranging from a yield difference of 10–15% (Molenaar, Persch-Orth et al. 2013) to 11–48% (Zen, Barlow et al. 2016). These differences are considered to be attributable to insufficient use of and inadequate access to fertilizers and pesticides, use of low quality

planting material and adoption of poor production practices (Donough, Witt et al. 2010, Zen, Barlow et al. 2016). Molenaar et al. (2013) also noted that independent smallholders are less inclined than PIR/NES smallholders to adopt sustainable production practices, which in turn adversely impacts their productivity. Conversely, low productivity also tends to be associated with a greater likelihood of extensifying production, which exacerbates pressure on ecologically significant landscapes. This highlights the intimate connection between sustainability and productivity.

3 Study context

Riau has the largest area under oil palm cultivation in Indonesia, covering an estimated 23% of Indonesia's total mature oil palm acreage and comprising an estimated 30% of Indonesian oil palm smallholders. Of the 2.46 million ha of land under oil palm in Riau, 58.6% is classified as being under smallholder oil palm cultivation, with 3.6% and 37.8% cultivated by state-owned and private companies, respectively (Direktorat Jenderal Perkebunan 2015). Mills without plantations, also referred to as independent mills, account for 33% of Riau's palm oil processing capacity (Table 1). These mills source primarily from independent smallholders, highlighting the maturity of the independent oil palm sub-sector in Riau.

Table 1. Oil palm processing capacity in Riau.

District	Mills with plantation	Capacity (MT/ hour)	Mills without plantation	Capacity (MT/ hour)	Total mills	Total capacity (MT/ hour)	% capacity mills without plantation
Rokan Hulu	22	1065	17	540	39	1605	34%
Kampar	26	1260	9	290	35	1550	19%
Rokan Hilir	14	645	14	545	28	1190	46%
Siak	13	615	12	490	25	1105	44%
Indragiri Hulu	14	570	10	435	24	1005	43%
Pelalawan	14	700	9	370	23	1070	35%
Kuantan Singingi	14	570	4	150	18	720	21%
Indragiri Hilir	14	650	4	180	18	830	22%
Bengkalis	8	365	6	190	14	555	34%
Dumai	2	120	0	0	2	120	0%
Pekanbaru	1	30	0	0	1	30	0%
Total Riau	142	6590	85	3190	227	9780	33%

Source: Dinas Perkebunan Riau (2015)

As can be observed from Table 1, the district Rokan Hulu where research activities took place has the largest processing capacity and number of mills in Riau. Independent mills account for more than one-third of Rokan Hulu's processing capacity. Approximately half of Rokan Hulu's 8513.7 km^2 land area is under oil palm cultivation, with smallholders, consisting primarily of independent operations, accounting for almost 56% of total acreage in 2014 (Direktorat Jenderal Perkebunan 2015).

Within Rokan Hulu, seven sub-districts (*kecamatan*) were selected for research activities across two similarly sized, but ecologically and demographically distinct, areas. One area is the sub-district of Bonai Darussalam in the northeast, which consists largely of peat soils. It has experienced high rates of deforestation in recent years, and is comparative sparsely populated, with a population density of only 29.5 persons/km^2 (see Figures 2, 3 and 4). The other study area is Central Rokan Hulu, which is comprised of six sub-district, where most of the land consists of mineral soils. Deforestation in that area was prevalent before the 1990s. Compared to Bonai Darussalam, Central Rokan Hulu is more populated, with a population density of 151 persons/km^2 (Badan Pusat Statistik Kabupaten Rokan Hulu 2015).

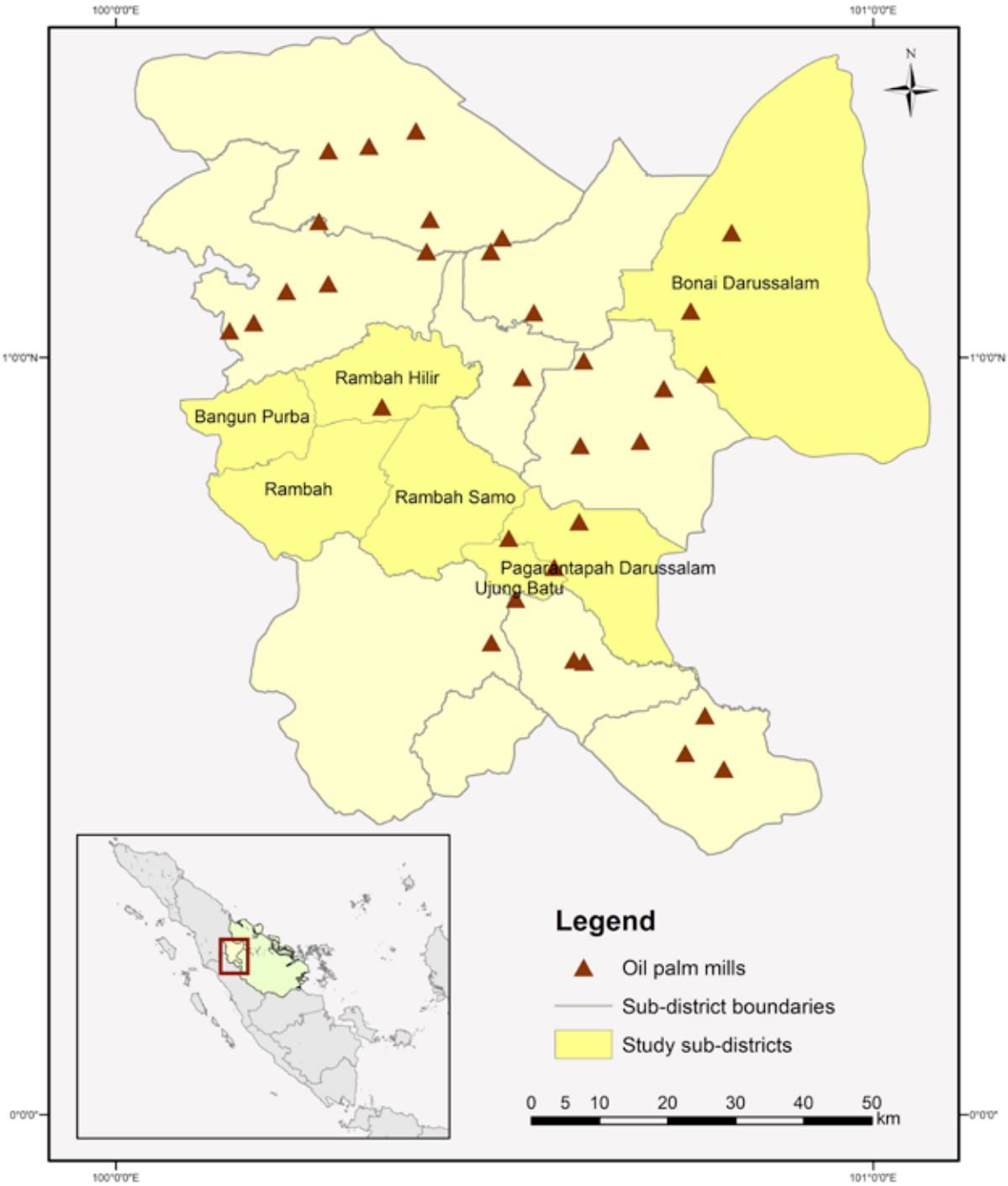

Figure 2. Location of Rokan Hulu regency and mills in the Rokan Hulu area.

Sources: CIFOR (2014); BAPPEDA Rokan Hulu (undated)

Recent oil palm expansion in Rokan Hulu has taken place primarily in Bonai Darussalam, often on lands legally classified as state forestlands and where peat fires associated with oil palm expansion are common. Legally, smallholder oil palm production can only take place on land classified as non-forest estate land (referred to as Areal Penggunaan Lain, APL). Reflecting the environmentally detrimental implications of under-regulated independent smallholder oil palm expansion, unpacking dynamics in such locations provides valuable insights into frontier incorporation processes in Indonesia (Bonai Darussalam), especially when juxtaposed against processes in more established oil palm areas (Central Rokan Hulu).

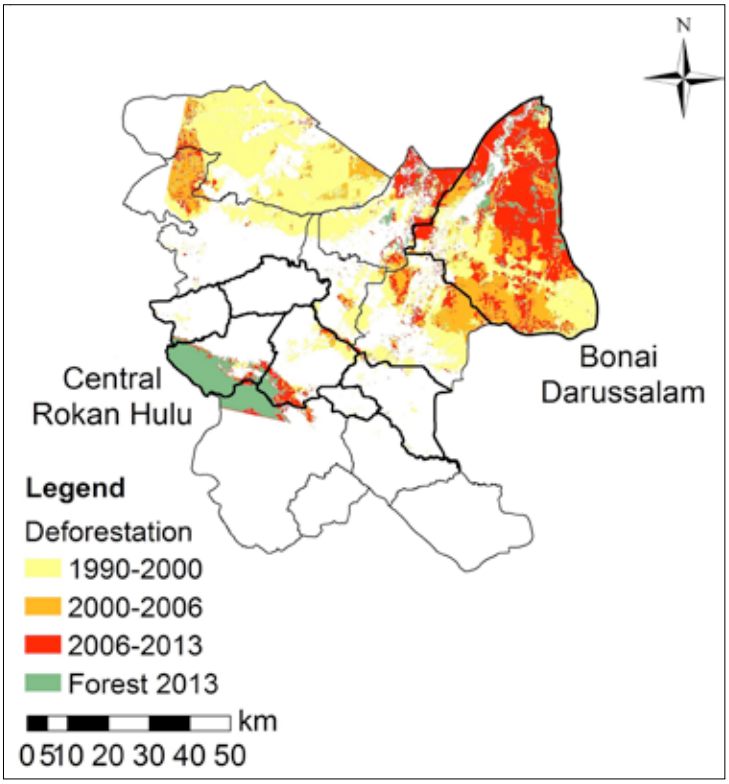

Figure 3. Deforestation in Rokan Hulu.

Source: Authors' depiction, based on CIFOR (2014) and BAPPEDA Rokan Hulu (undated)

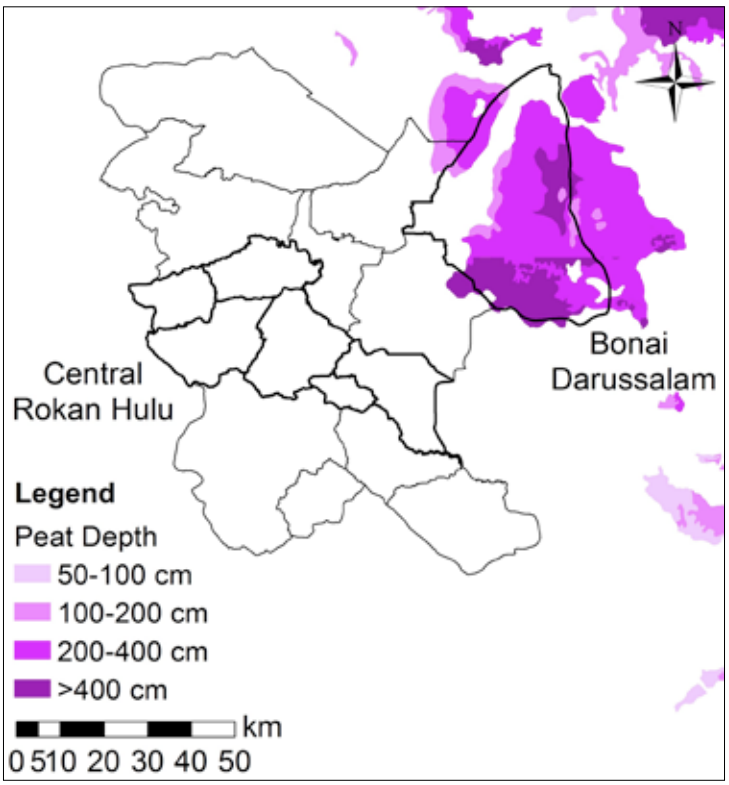

Figure 4. Peat depth in Rokan Hulu.

Source: Authors' depiction, based on Kementerian Pertanian (2011) and BAPPEDA Rokan Hulu (undated)

4 Methods

In the absence of official lists of smallholders from which a random sample could be drawn, research was required to sample smallholders spatially through visual interpretation of recent high-resolution satellite imagery available through Google Earth. In the research areas, a total of 152,099 ha of oil palm was mapped and classified as being either corporate or smallholder oil palm (Figure 5; Table 2). Areas where distinctions between these two types of actors could not be made were visited for validation.

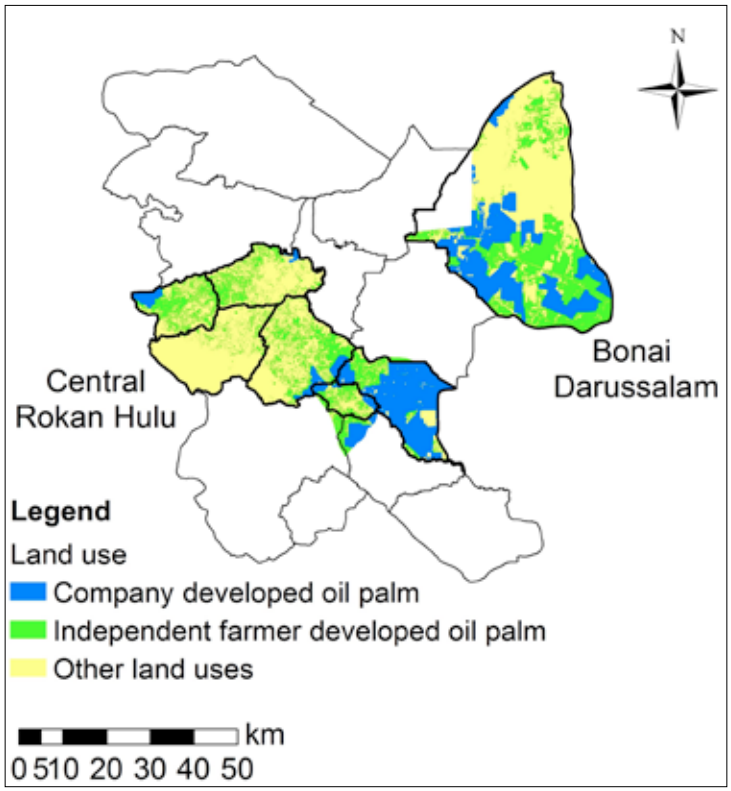

Figure 5. Distribution of oil palm in sampled area.

Source: Authors' depiction and research.

The area identified as being cultivated with oil palm by independent smallholders was subsequently partitioned into 500 m by 500 m cells (25 ha). A total of 287 cells, comprising 5.2% of the total mapped smallholder oil palm acreage, was then randomly selected for research (Table 2). Every smallholder oil palm plot contained within the selected cells was visited. In Bonai Darussalam, the sampled cells comprised a total of 507 different plot owners, while in Central Rokan Hulu sampled cells comprised 1337 different plot owners. For each identified plot, data was collected on the age of planted oil palm, plot area, owner's ethnicity, origin and location of residence, and total size of oil palm holding.

Table 2. Overview of remote-sensing analysis results.

	Bonai Darussalam		Central Rokan Hulu		Total	
	Area (in ha)	% area	Area (in ha)	% area	Area (in ha)	% area
Independent farmer-developed oil palm (IFDOP)	39,568	28%	43,493	26%	83,062	27%
Company-developed oil palm (CDOP)	35,684	26%	33,353	20%	69,038	23%
Total oil palm	75,252	54%	76,846	46%	152,099	50%
Total land area	138,938	100%	165,417	100%	304,355	100%
Mean area of independent farmer oil palm per 25 ha cell	18.0		13.0		15.1	
APL area	51,400	37%	101,050	61%	152,450	50%
State forest land	87,538	63%	64,367	39%	151,905	50%
Sampled IFDOP area*	2,141 (119)	5.4%	2,190 (168)	5.0%	4,331 (287)	5.2%

* The number of cells surveyed is indicated in brackets.

Following the initial identification of all plot owners, in-depth surveys were conducted with 230 plot owners who were ideally located at the center of each of the sampled cells[2]. The in-depth survey addressed various topics, ranging from former and current livelihood activities to articulation to input and offtake markets, sources of finance, and issues related to compliance with ISPO legal requirements (e.g. proof of land ownership, use of certified planting material and production practices). For each of the plots that were subject to an in-depth survey, detailed information on plot condition was also collected. This includes information on, among others, nutritional deficiencies, planting material, quality of pruning, weeding and upkeep, use of erosion control measures and canaling.

In order to identify sub-groups that exhibit similar characteristics within the sampled population, an HCA was performed. HCA maximizes between-cluster variances and minimizes within-cluster variances. This analysis used the data collected from 1840 plots, namely (1) *total size of plot owned* (codified as small (0–3 ha), medium (3.1–15 ha) or large (15+ ha)); (2) *origin of plot owner* (codified as either originating from the sub-district or outside the district); (3) *residence of plot owner* (codified as either residing in the sub-district or outside the district); (4) *ethnicity*; and (5) *soil type* (e.g. codified as being either primarily located on peat or mineral soils). These indicators are proxies for wealth, origin and absenteeism, and the geographies in which they are encountered, which exploratory research identified as being especially important variables for differentiating between sub-groups.

2 Several large owners were located across multiple cells but interviewed only once. Not all farmers could be interviewed; therefore, the number of interviews is less than the number of cells visited.

5 Results

Table 3 provides results from the HCA. A total of six clusters were identified, with each cluster comprising between 1% and 37% of farmers and between 8% and 30% of the area. Values that differed considerably from the population mean are highlighted in yellow. The HCA produced clusters around total size of plot owned by dividing each of the three size categories into two sub-groups.

Table 3. HCA results.

Cluster	1	2	3	4	5	6	Average
1) Owner type (size)	Small farmers (0–3 ha)		Medium farmers (3.1–15 ha)		Large farmers (> 15 ha)		
2) Origin: from within sub-district	0%	92%	8%	87%	2%	28%	31%
2) Origin: from outside district	92%	0%	88%	1%	81%	63%	60%
3) Residence within sub-district	92%	91%	74%	89%	2%	79%	79%
3) Residence outside district	3%	1%	16%	3%	92%	0%	12%
4) Ethnicity: Melayu	2%	65%	0%	65%	6%	20%	22%
4) Ethnicity: Batak	17%	17%	31%	34%	49%	46%	27%
4) Ethnicity: Javanese	78%	15%	66%	0%	9%	32%	46%
4) Ethnicity: Minang	2%	0%	2%	0%	5%	1%	2%
4) Ethnicity: Chinese	0%	0%	0%	0%	25%	0%	2%
4) Ethnicity: other	0%	1%	0%	0%	1%	1%	1%
5) Soil type: peat	14%	3%	29%	1%	75%	13%	19%
Land status: APL	80%	73%	60%	46%	24%	61%	64%
Located in Central Rokan Hulu	76%	93%	62%	89%	10%	74%	72%
Located in Bonai Darussalam	24%	7%	38%	11%	90%	26%	28%
Number of sampled farmers	506	343	507	190	106	136	1788
Proportion total sampled farmers (%)	28%	19%	28%	11%	6%	8%	100%
Proportion farmers calculated in research area (%)*	37%	29%	24%	8%	1%	1%	100%
Sampled area planted (ha)	545	364	1112	386	1296	626	4329
Proportion total sampled area (%)	13%	8%	26%	9%	30%	14%	100%

* Calculated as the average plot size per farmer type over the total sampled area. This corrects for sampling biases associated with the number and proportion of farmers sampled. Large farmers are for example more likely to be sampled than smaller farmers.

Note: A size categorization could not be obtained for 32 farmers and 20 farmers were statistical outliers, this reduced the typology population from 1840 to 1788 farmers and the area from 4453 to 4329 ha.

Table 4 provides an overview of selected results from analysis of the survey of the sub-sample of 230 plot owners. It uses the assigned clusters to further unpack smallholder characteristics. Results on, among others, plantation management, socioeconomic characteristics, market articulation and legality issues will be treated in greater detail in forthcoming publications.

Table 4. Excerpt of results from the in-depth survey sub-sample.

Cluster	1	2	3	4	5	6	Total	F-value
Mean oil palm area (ha)	2.1	1.8	6.6	6.9	217.8	91.3	49	18.883***
N	36	34	58	35	37	25	226	
Std. dev.	0.7	0.6	2.6	3.0	259.4	115.8	136	
Mean yields (MT/ha/year)	15.5	15.6	15.7	15.4	12.9	18.6	15.5	2.56**
N	36	35	57	34	39	26	228	
Std. dev.	5.7	5.6	6.6	5.4	6.6	5.0	6.1	
Mean stand age (years)	8.2	8.4	8.4	6.8	8.7	11.0	8.5	2.259**
N	36	35	58	35	39	27	231	
Std. dev.	4.2	5.4	4.3	3.6	4.4	5.2	4.6	
Mean % of *tenera* palms[a]	24%	21%	29%	32%	46%	34%	31%	3.050**
N	29	32	49	31	36	22	200	
Std. dev.	0.2	0.2	0.2	0.3	0.4	0.3	0.3	
% plantation activities involving household	69%	86%	39%	45%	1%	20%	43%	

a *Tenera* palms are a hybrid of the *dura* and *pisifera* (DxP) varieties with a significantly higher oil content than non-hybrids.

Note: F-values denoted with * significant at the 0.1 level, ** at the 0.05 level and *** at the 0.01 level

6 Typology of smallholders

The results presented above highlight the diversity of independent smallholders in Riau. The typology of smallholder we developed identifies some of the defining characteristics of each of the groups and group-specific policy challenges and priorities.

6.1 Type 1: Small migrant farmers

6.1.1 Social characteristics

This group is comprised primarily of comparatively poor migrants of Javanese and, to a lesser extent, Batak ethnicity. While most Javanese in this group migrated from Java to Riau in the 1980s through government transmigration programs, some migrated to Riau independently from North Sumatra in pursuit of cheaper land or from Aceh due to conflict. Batak migrants typically migrated from their ancestral homelands of North Sumatra, like some of the small Javanese farmers in search of cheaper land. Because North Sumatra has the most established plantation economy in Indonesia and a comparatively high population density, expansion options are more limited there than in neighboring Riau. Farmers in this group tend to reside permanently within the sub-district where they produce oil palm; often close to their plantations.

6.1.2 Plot location

This group is concentrated in the more established agricultural areas of Central Rokan Hulu where land, often under transmigration schemes, has long been formally reclassified as APL allowing oil palm to be grown. Lack of financial and political capital tends to deter such smallholders from exploring frontier areas. These farmers tend to be disinclined to expand beyond Central Rokan Hulu, where, compared to Bonai Darussalam, oil palm production infrastructure and social services are well developed and other employment opportunities more readily available. The average farm size is 2.1 ha.

6.1.3 Prevalence

Although this is one of the largest groups in terms of number of farmers (37%), due to their small average farm size, they account for only a small proportion of the total area under production (13%).

6.1.4 Economic profile

Almost all farmers in this group were involved primarily in agriculture such as rubber and rice prior to adopting oil palm. Now, the majority of farmers are additionally employed as menial oil palm plantation laborers and involved in more commercially oriented agricultural activities, such as rubber. On average, 60% of this group's income is derived from oil palm.

6.1.5 Production practices

Yields are on par with other smallholders, though well below those of many large-scale plantations. On average, 69% of labor activities in their plantations involve household members. Planting materials of these farmers are often of sub-standard quality, with the *tenera* variety comprising on average only 24% of palms. These farmers were most likely to obtain seedlings from unregistered sources.

6.1.6 Policy challenges and priorities

From a rural development and poverty alleviation perspective, interventions should prioritize this group. Although a high proportion of farmers in this group lack formal tenure rights – in part because the land certification process is perceived to be cumbersome and expensive – they are more likely than any other group to own land in legally designated areas. Therefore, many members of this group have the potential to comply with ISPO criteria (which requires formal land documentation) once land certification programs are in place. Moreover, considering the high yield gap, value-chain support (particularly those that promote increased availability of and access to certified planting material and production inputs) and improved extension services could contribute to enhancing both the productivity and incomes of this large, more vulnerable, producer group. Since many farmers in this group manage and work on their own plantations themselves, the effectiveness of extension services could be high. However, because government support programs have historically prioritized transmigrants, interventions to this effect should not disadvantage other marginalized producer groups (e.g. Type 2 farmers).

6.2 Type 2: Small indigenous farmers

6.2.1 Social characteristics

Almost all farmers in this group originate from the sub-district in which they produce oil palm and are of Melayu ethnicity (the indigenous ethnic group of Riau). Although some Javanese and Batak farmers are also represented here, in contrast to Type 1 farmers, these originate from the area. Often, this involves second (or more)-generation settlers whose parents migrated to the area, typically for reasons unrelated to oil palm. Like Type 1 farmers, most farmers from this group reside in close proximity to their plantations.

6.2.2 Location of farms

Even more so than the small migrant farmers, this type is rarely encountered in Bonai Darussalam and on peatlands. This is attributable to both lack of capital and, since they also originate from the area, strong social ties to the areas in which they produce. However, this group is least likely to have formal land documentation due to the perceived legitimacy of informal historical claims and high costs associated with titling. Like Type 1 farmers, the vast majority are located on APL land. These farmers tend to own land on more fertile mineral soils. With a per capita farm size of just 1.8 ha, this group has the smallest average oil palm farm size.

6.2.3 Prevalence

This group comprises a sizable 29% of smallholders, but accounts for only 8% of the area.

6.2.4 Economic profile

The majority of Type 2 farmers are also engaged in the cultivation of other commercial crops, notably rubber. A considerable proportion of farmers also work as a menial agricultural laborers, mostly as rubber-tappers or on other oil palm plots. About 10% are civil servants, though these are often part-time positions at a neighborhood level. On average, farmers derived 48% of their income from their oil palm activities.

6.2.5 Production practices

Yields are on par with other smallholders, though well below those of many large-scale plantations. This group has the highest participation rates of households in plantation labor (86%). Planting materials

used by these farmers are often of sub-standard quality and obtained from either local agents without certificates or from loose fruits. Legally, farmers cannot purchase certified planting material without land documentation. The proportion of palms of the *tenera* variety is the lowest of all groups (21%).

6.2.6 Policy challenges and priorities

Like Type 1 farmers, this group should be prioritized for intervention from a rural development and poverty alleviation perspective. This group faces the most significant ISPO incompliance issues because a comparatively high proportion of farmers lack formal land documentation. This calls for a targeted land certification program. This would also enhance access to certified planting material. Moreover, given that this is a more politically integrated and established population where the household is intimately involved in plantation management, the effectiveness of extension programs is likely to be high.

6.3 Type 3: Medium-sized migrant farmers

6.3.1 Social characteristics

Ethnically, this group largely consists of people of Javanese or Batak ethnicity. Closely resembling Type 1 farmers – at least demographically – while this group tends to originate from outside the area, they often reside in close proximity to their oil palm farms.

6.3.2 Location of farms

Since 38% of this group is active in Bonai Darussalam, these farmers are significantly more likely to operate in frontier areas dominated by peatlands than the smaller Type 1 and 2 farmers. As a middle-class group, this group tends to be better capitalized and less risk averse. While larger areas of land can be acquired in frontier areas, the comparatively high cost of land preparation, lower productivity, less-developed production infrastructure (e.g. road networks and availability of input suppliers) and higher susceptibility to hazards such as fire tends to deter poorer farmers from exploiting peatlands. Approximately 60% of Type 3 farmers are located on APL. The average farm size is 6.6 ha.

6.3.3 Prevalence

Representing about 24% of the farmers and occupying 26% of the researched area, in terms of numbers and the area they occupy, this is clearly an important group.

6.3.4 Economic profile

About two-thirds of farmers in this category are also involved in the farming of other commercial crops, notably rubber. Compared to Type 1 farmers, fewer Type 3 farmers were engaged in agriculture prior to planting oil palm and more likely to have accumulated capital from off-farm activities to establish their oil palm plantations. This highlights differences in *ex ante* economic status. Approximately 20% are currently also engaged in menial plantation labor activities, 20% as white-collar employees and 17% as civil servants. Although this group has comparatively diversified livelihood portfolios, the majority of income still originates from oil palm activities.

6.3.5 Production practices

Yields are on par with other smallholders, though well below those of many large-scale plantations. On average, less than 40% of total plot labor involved the household. *Tenera* comprised only 29% of fruits, indicating widespread use of poor planting material. The most common source of planting material was local agents without certificates.

6.3.6 Policy challenges and priorities

This group should be targeted if priorities are to support a more entrepreneurial middle class and enhance both sector productivity and sustainability. The comparatively high rate of (illegal) farming on peatlands by this group is a serious environmental challenge, as expansion is frequently associated with fire and deforestation. Prior to initiating any land certification or regularization programs, inventorying landholdings in non-APL land, especially in Bonai Darussalam, would be prudent to determine the potential to excise (degraded) state forestland and to develop criteria for plots eligible for regularization. Additionally, low yields and use of poor planting material suggests that formalizing input markets and improving extension support could contribute to increased productivity. Since most reside in close proximity to their plantations and thus could be directly involved in day-to-day plantation management, extension support has the potential to translate into improved production practices, albeit to a lesser extent than Type 1 and 2 farmers. However, many are engaged in other full-time occupations and, partly as a result, rely more on hired labor than household labor.

6.4 Type 4: Medium-sized indigenous farmers

6.4.1 Social characteristics

Farmers in this category are largely medium-scale indigenous Melayu farmers. Almost all originate from and reside within the same sub-district as their plantations. Demographically, these farmers closely resemble Type 2 farmers.

6.4.2 Location of farms

Type 4 farmers are rarely encountered in the peatland frontiers of Bonai Darussalam. Even though the vast majority are located on mineral soils in Central Rokan Hulu, this group is significantly more likely to own plots on state forestland than Type 2 farmers. As a well-established ethnic group, this is partly attributable to political leverage that reduces the perception of risk associated with operating on areas not designated for oil palm production and/or without formal land documentation. The average oil palm farm size is very similar to Type 3 farmers (6.9 ha).

6.4.3 Prevalence

This group is comparatively small both in number of farmers (8%) and in area (9%).

6.4.4 Economic profile

Like Type 2 farmers, about two-thirds of these farmers are also engaged in other agricultural activities. Although only 6% work as plantation laborers, a comparatively large proportion are employed as civil servants. The share of oil palm in total income is, on average, almost 60%.

6.4.5 Production practices

Yields are on par with other smallholders, though well below those of many large-scale plantations. On average, household members are involved in approximately 45% of plantation management activities. With 49% of farmers indicating that they bought planting material from local agents without certificates, an average of only 32% of palms were found to be producing *tenera* fruits.

6.4.6 Policy challenges and priorities

This group should be targeted if priorities are to support a more entrepreneurial middle class. However, this group is comparatively small in both number and area. Since the majority of farmers in this group

are located outside APL, this group will face ISPO noncompliance issues without proper support. However, since few Type 4 farmers are located in environmentally sensitive frontier areas, but rather on mineral soils in state forestlands that have long been converted to oil palm, reclassifying these lands as APL would avoid disarticulation of this group without significantly impacting sector sustainability. Like most other groups, regulating and modernizing input markets and targeted extension support could help reduce the yield gap. Extension support has the potential to yield positive results as this is a well-established group of farmers who rely primarily on agriculture and are likely to be able to oversee labor activities on their plantations because they live nearby.

6.5 Type 5: Large frontier pioneers

6.5.1 Social characteristics

Farmers in this group originate largely from outside the district and often also reside outside the district. Owners often originate from and reside in large cities such as Medan, Pekanbaru and Jakarta. Although some do live in neighboring districts, because many own several houses, they often tend to reside in several places. The majority are wealthy Bataks (49%) or Sino-Indonesians (25%); an ethnicity that is almost exclusively represented in this group.

6.5.2 Location of farms

The majority of farms in this group are located in the peatlands of Bonai Darussalam (75%), where large contiguous areas of land could be obtained comparatively cheaply. Only 24% of farms are (partially) located on APL. This group is most likely to possess some sort of land documentation. Many farmers have, for example, managed to obtain documentation for land located on state forestland from sub-district government. This tends to be enabled through complex networks that control frontier land markets, often referred to as *mafia tanah*. From a legal perspective, the National Land Registration Agency (BPN) cannot formalize these land titles at this point. The average size of oil palm plantations owned by these farmers is 217.8 ha.

6.5.3 Prevalence

Although this group only represents about 1% of farmers, they account for almost one-third of independent oil palm farmer land area. They are, therefore, the smallest group in terms of number of farmers, but the largest in terms of area.

6.5.4 Economic profile

About 20% of Type 5 farmers used to be civil servants and more than half entrepreneurs. While the Sino-Indonesian farmers often own many other (non-agricultural) businesses, most large Batak farmers specialize in oil palm and land trading. Considering the high costs of establishing plantations of this size in such a difficult and risky environment, farmers in this group are clearly the most affluent ‘smallholders’.

6.5.5 Production practices

This farmer group experiences the lowest yields of all groups. This can partially be explained by their focus on peat soils, which are less suitable for oil palm cultivation than mineral soils. However, poor water table management and production practices appear to be prevalent among producers in this group. Nevertheless, planting material is more frequently bought at official dealers or local agents with formal certificates than the other types of farmers. Accordingly, the proportion of palm of *tenera* variety was the highest in this group (46%). This group relies almost entirely on hired labor for plantation management and is least likely to be directly involved in day-to-day management.

This group is also most likely to sell to mills directly, with most other groups relying mostly on local intermediaries.

6.5.6 Policy challenges and priorities

This group should be prioritized from a sector sustainability perspective. Since this group is located on peatlands within the state forest estate, Type 5 farmers are one of the primary drivers of expansion in environmentally significant frontier areas in Rokan Hulu. If ISPO legality stipulations were to be strictly enforced, most farmers in this group would not comply. Besides land documentation issues, all farmers in this group should have a plantation business license (IUP), as this is a legal requirement when developing more than 25 ha of land. Technically, this implies that this group should no longer be classified as 'smallholders' and, therefore, should adhere to the more stringent ISPO criteria for private companies. Thus, considering the large land area and widespread noncompliance with various Indonesian regulations, the government should investigate and address illicit land trading practices in frontier areas such as Bonai Darussalam and establish criteria for regularization. Productivity issues are prevalent within this group, since most plantations primarily serve as business investments that are often not directly overseen by plantation owners. Providing extension support to this group is unlikely to yield significant results, since owners clearly have access to sufficient capital to invest in the acquisition of knowledge needed to improve productivity. Moreover, there is little political justification for devoting public resources to land users that have already benefited extensively from the exploitation of public land resources. However, close monitoring and enforcement of sustainability standards to improve practices while also providing better access to information could improve the sustainability performance of this group. An advantage of targeting this group is that through a small number of farmers, production practices could be improved across a large area.

6.6 Type 6: Large consolidated producers

6.6.1 Social characteristics

Type 6 farmers are large farmers who, contrary to the large frontier pioneers of Type 5, mostly reside within the sub-district in which they operate, despite originating from outside the district. Although Batak farmers comprise almost half of this group, it is comparatively diverse and also includes Javanese and Melayu.

6.6.2 Location of farms

This group is mostly active on the mineral soils of Central Rokan Hulu and 61% of farms are (partially) located on APL; considerably more than Type 4 and 5 farmers. With an average stand age of 11 years, this entrepreneurial group appears to have pioneered independent smallholder farming in Rokan Hulu, owning an average of 91.3 ha.

6.6.3 Prevalence

This group comprises about 1% of the independent oil palm farmers and 14% of the area.

6.6.4 Economic profile

Many Type 6 farmers are involved in multiple economic activities, with 47% involved in other agricultural activities, 41% owning a non-agricultural business and 6% employed as civil servants. Nevertheless, 74% of income is, on average, derived from oil palm, suggesting that this group is comparatively specialized.

6.6.5 Production practices

Yields in this group are the highest of the six groups, though this is partly attributable to more mature palms. While most claim that planting material is sourced primarily from official dealers or local agents with certificates, only 34% of palms were found to produce *tenera* fruits. While this group relies primarily on hired labor, almost 20% involved some household labor in plantation labor activities. With most owners residing in close proximity to their plantations, farmers in this group are, unlike Type 5 farmers, considerably more able to be directly involved in day-to-day management.

6.6.6 Policy challenges and priorities

This group is not a clear priority from a productivity or sustainability perspective. Nevertheless, since a large proportion of farmers are located on state forestland and should have an IUP because of their land size, legality issues that could undermine ISPO compliance do need to be addressed to prevent disarticulation. Since few are located in environmentally sensitive frontier areas, reclassifying many of these areas as APL would help to formally integrate this group into the sector without significantly compromising sector sustainability. Similarly, this group has the potential to become a legitimate commercial farmer class when provided with legal support and technical assistance to enable compliance with more stringent ISPO private company criteria. This important entrepreneurial and socially and politically embedded group for whom oil palm is more than a mere investment could also potentially be leveraged to support other small and medium-scale farmers in Central Rokan Hulu in upgrading their production practices. For example, as has been done with success in other sectors, they could play a direct role in mobilizing external support, local input provision and technical support. Like Type 5 farmers, production practices across a comparatively large area could be improved by targeting only a small number of farmers.

7 Conclusions and recommendations

Although many of Riau's independent oil palm smallholders fit the legal and popular definition of 'smallholders', most of the area classified as being under independent smallholder oil palm cultivation does not. The groups that cultivate fewer than 3 ha and rely primarily on household labor, as is often used in popular definitions of smallholders, represents 66% of the population but only represents one-fifth of the smallholder area. The results show that one of the most dominant producer groups, especially in frontier landscapes, is incorrectly classified as smallholders, since they operate like businesses and are often characterized by absenteeism. The vast differences between these groups that arguably occupy two ends of the smallholder spectrum suggest that employing one-size-fits-all interventions is unlikely to achieve policy objectives effectively. Moreover, results show that different groups should be targeted for different policy priorities.

The typology we developed shows that different types of interventions are needed to achieve policy objectives. Some interventions pertain to structural productivity, legality and sustainability issues, while others are more group specific. In summary, we recommend the following:

1. **Introduction of land certification programs**, especially for small and medium size farmers (Type 1 to 4). The smaller farmers, in particular, are most likely to occupy APL land, but due to the perceived legitimacy of informal claims and high cost and difficulty of obtaining land certificates, they have been discouraged from formalizing their ownership rights. If this is not properly addressed, it not only threatens to alienate more marginalized producer groups from formal markets as a result of ISPO noncompliance, but also reduces the effectiveness of interventions to improve access to input markets (especially planting material). The larger farmers cultivating in excess of 25 ha should, however, be supported in applying for other relevant licenses (e.g. IUP).
2. **Regularization of some landholdings in state forestland** by converting the land status to APL should be seriously considered. In established agricultural areas where deforestation occurred long ago (such as Central Rokan Hulu), this would prevent disarticulation through ISPO noncompliance of an important indigenous medium to large entrepreneurial class that plays an important role in sector productivity (e.g. Type 4 and 6), without significantly compromising sustainability. In environmentally significant areas, such as Bonai Darussalam, dominated by very large smallholders (e.g. Type 5), a thorough investigation of illicit land trading practices and fraudulent formalization is clearly needed to prevent further expansion. Eligibility criteria would need to be established to determine what non-APL lands could be regularized without further exacerbating negative environmental impacts.
3. **Value-chain support programs targeting input markets** are essential for enhancing productivity across all producer groups. Although smaller producers are least likely to source planting material from official suppliers (in part due to lack of land documentation), larger plantations also often use planting material that is not high-yielding hybrid seedlings and which suffers considerable *dura* infestations. This highlights that the widespread practice of selling fake seedlings effects all smallholder types. Though not explicitly addressed in this working paper, similar issues were observed with fertilizer markets. This suggests that improved (enforcement of) input quality standards, combined with initiatives to enhance accessibility and availability and to demonstrate the benefits of improved input use could significantly enhance the productivity of the sub-sector.
4. **Investing in improving extension services** is critical to enhancing smallholder productivity and formality. Extension services should target small- and medium-sized groups (e.g. Types 1 to 4), especially in established agricultural areas such as Central Rokan Hulu. Promoting improved production practices among these groups would both contribute to reducing the high yield gap, enhancing the incomes of smallholders and facilitating ISPO compliance. Since smaller

farmers, in particular, rely primarily on household labor and are intimately involved in day-to-day plantation management, uptake of improved practices is likely to be comparatively high. Large farmers that manage to formalize their land claims and obtain IUPs in the context of the above programs would likely benefit from both bureaucratic and technical assistance in complying with more rigid ISPO private company standards. Since many of the large indigenous farmers are strongly embedded in the local oil palm economy and wield ample social and political influence, they have the potential to play an important role in representing smallholder interests and facilitating upgrading. Therefore, particular care should be taken to avoid disarticulation of this important group as a result of ISPO incompliance.

5. **A holistic approach to addressing productivity, legality, and sustainability issues** is required to protect against unintended trade-offs and enhance intervention effectiveness. For example, interventions that succeed in increasing smallholders yields and incomes may further incentivize production expansion in frontier areas should this not be accompanied by measures to more strictly enforce relevant regulations and ISPO requirements. Similarly, improved extension services without enhancing smallholder access to higher quality inputs will reduce smallholder capacity to attain their productivity potential. This, on the one hand, points to the importance of resolving structural institutional issues that undermine the capacity and willingness of relevant public authorities to enforce regulations and effectively deliver on intervention priorities. On the other hand, it also points to the need for more integrated planning and inter-organizational collaboration, which should also involve the private sector.

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The rapid expansion of Indonesia's independent smallholder oil palm sector is posing important productivity, sustainability and legality challenges. As a result, the need to better regulate independent oil palm smallholders is increasingly being acknowledged by Indonesian polity. Because the sub-sector is comprised of highly diverse stakeholder groups that face and pose distinct challenges, a targeted and stakeholder-disaggregated approach to sector regulation is required. Efforts to that effect have, however, been frustrated by an inadequate understanding of independent oil palm smallholder characteristics and associated challenges. This paper aims to contribute to this knowledge gap by developing a typology of independent oil palm smallholders. Through a hierarchical cluster analysis employing field data collected on 1840 smallholders in one of Sumatra's largest oil palm producing districts, Rokan Hulu, six sub-groups are identified, which are differentiated here on the basis social, economic, and geographic characteristics. Drawing on these results, the paper identifies a number of specific intervention priorities for each of the sub-groups.

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