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Oil Palm Contract Farming in Brazil: Labour Constraints and Inclusivity Challenges

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ABSTRACT *The Government of Brazil established their Sustainable Palm Oil Production Programme (SPOPP) in 2010, which sought to enhance the sustainability and inclusiveness of oil palm development in the Amazon. This paper evaluates how well oil palm contract farming promoted by SPOPP has delivered on its inclusive development objectives. Drawing on cross-section data collected in Northeast Pará, it analyses two recurrent SPOPP themes, namely (1) equitable participation and (2) labour allocation to plantation management. Our analysis demonstrates that household availability of land and labour resources strongly shapes patterns of inclusion and exclusion. Moreover, findings reveal that labour time allocation is influenced by hiring of external labourers, which increases when households are labour and land poor. These results give reason to question the utility of labour-oriented contract farming eligibility criteria, revealing important inclusive business and value chain development dilemmas.*

1. Introduction

Democratisation in Brazil has since the 1980s enabled rural social movements to more effectively challenge societal inequality. With rural trade unions becoming a particularly powerful electoral support base, the Brazilian government has begun to adopt more inclusive socioeconomic policies over recent decades (Grisa & Schneider, 2014). These policies have led to the formation of a number of important programmes to improve smallholder access to finance, land, technical assistance, insurance, and markets.[1] The National Programme for the Strengthening of Family Farming (PRONAF), a low-interest credit scheme, emerged as one of the cornerstones of smallholder policies in Brazil (Flexor & Grisa, 2016; Medina, Almeida, Novaes, Godar, & Pokorny, 2015; Schneider & Niederle, 2010).

In the mid-2000s, rising international oil prices and the government's renewed commitment to developing its incipient biodiesel industry presented a particularly important opportunity to leverage PRONAF in support of smallholder value chain integration. This was enabled by the 2005 Biodiesel Law, which introduced the Social Fuel Stamp (SFS). Under the SFS initiative, companies sourcing biofuel feedstocks from smallholders would gain priority access to biofuel auctions. Its introduction was partly motivated by political pressures to make Brazil's biofuel sector more socially inclusive. Its well-established sugar and soy sectors, where large-scale producers dominate cultivation, had long been criticised for their poor social performance (Stattman, Hospes, & Mol, 2013). Additionally, biodiesel development became an important new opportunity to enhance the effectiveness of family

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farming programmes, especially since a market for biodiesel feedstocks was guaranteed through federal blending mandates (Andrade & Miccolis, 2011).

In this context, the federal government began to promote non-traditional feedstocks that capitalise on smallholder comparative advantages. Much emphasis was placed on oil palm, particularly in northern states with amenable climatic conditions. In contrast to traditional feedstocks, oil palm is less mechanisable and more land and labour intensive. This led to the introduction of the Sustainable Palm Oil Production Programme (SPOPP) in 2010. Through SPOPP, the federal government sought to ensure development of the oil palm sector would be both inclusive and sustainable. It, amongst others, incentivised development of contract farming arrangements, used PRONAF to address financial barriers to smallholder participation, and restricted oil palm development to degraded lands. Through contract farming, smallholders would be guaranteed market access under fair prices, as well as gain access to technical assistance and better production inputs (Brandão & Schoneveld, 2015; Villela, Jaccoud, Rosa, & Freitas, 2014). Although contract farming is widely viewed as a comparatively a pro-poor form of agribusiness expansion, whether these schemes are genuinely inclusive of and accessible to the poorest and most vulnerable rural groups is debatable (Rehber, 2007; Schoneveld et al., 2021). Vulnerable groups may opt out voluntary due to resource constraints or risk aversion, but may also be ineligible to participate due to corporate discrimination against smaller, less resource endowed, producers (Bellemare, 2012). When contract farming schemes are not fully inclusive, especially of more marginalised groups, they risk exacerbating rural inequalities (Freguin-Gresh, d'Haese, & Anseeuw, 2012). These risks are perceptible under many oil palm contract farming schemes since participation is, due to oil palm's high labour demands, generally restricted to households with adequate labour reserves (Brandão & Schoneveld, 2015). Should more marginalised farmers be systematically excluded from participating in Brazil oil palm sector, SPOPP inclusion objectives risks being undermined.

Based on research conducted in five oil palm expansion hotspots in the Amazonian state of Pará, this article draws on cross-sectional survey data to perform two distinct analyses. First, it assesses the inclusiveness of SPOPP contract farming schemes and identifies factors shaping inclusion and exclusion patterns. Second, it examines whether corporate concerns over labour-scarce households' ability to devote the necessary time to oil palm management is justified. It does this by examining if households with less available household labour actually devote less time to oil palm management. This study thereby contributes to a more evidence-based debate on the role and merit of labour-based participation criteria prevalent in contract farming. Although findings are largely relevant to oil palm and Brazil, they do reveal some of the challenges and trade-offs inherent to inclusive value chain development.

2. Background

2.1. Contract farming and its contributions to rural development

Contract farming is an intermediate form of agricultural organisation whereby exchange conditions between farmers and companies are established through formal or informal agreements. As a form of value chain coordination, it falls between full vertical integration and spot market transactions (Silva, 2005). While contract farming has helped link smallholders to markets for more than a century, from the 1980s, donors and governments began more actively promoting it as a tool for addressing structural market failures that underlie rural poverty and the large agricultural yield gaps in developing countries. A renewed interest in contract farming became apparent over the 2000s, as concerns mounted over the detrimental social impacts of the rapid expansion of large-scale plantation agriculture in many developing economies (Oya, 2012; Vermeulen & Cotula, 2010).

Contract farming is generally considered to be a more inclusive form of agricultural production than plantation agriculture since it productively integrates rather than competes with smallholder farmers. It can also help resolve input and market access issues that have long undermined the

profitability and productivity of smallholder agricultural production in developing countries (Prowse, 2012). Many governments and international institutions have argued that contract farming combines the advantages of plantation agriculture, such as quality control, technical capacity, and market orientation, with those of smallholder agriculture, such as greater individual motivation and access to non-wage labour. They therefore often assert that contract farming could be a powerful instrument of rural development (Prowse, 2012). Yet, critics have argued that contract farming could worsen smallholder exposure to volatile international commodity markets, undermine household food security as households shift from subsistence to cash-crop production, and increase the risks of indebtedness (Córdoba, Selfa, Abrams, & Sombra, 2018; Pegler, 2015; White, 1997).

The impacts of contract farming have been extensively studied and examined from a wide range of disciplinary perspectives (see Glover and Kusterer (1990), Porter and Phillips-Howard (1997) and Minot (2009) for comprehensive reviews). A large empirical evidence base, largely consisting of effectiveness studies employing econometric models has emerged in recent years. Some of these studies show how participation tends to positively impact smallholders' incomes, but confirm the non-random nature of participation (Bellemare, 2012; Bolwig, Gibbon, & Jones, 2009; Briones, 2015; Cahyadi & Waibel, 2016; Herrmann, 2017; Miyata, Minot, & Hu, 2009; Narayanan, 2014; Simmons, Winters, & Patrick, 2005; Warning & Key, 2002). This is partly attributable to self-selection biases influenced by differentiated household risk tolerance and capital bases, but also to eligibility criteria imposed by contract farming companies themselves (Bellemare, 2012). For example, to enhance the economic viability of contract farming and manage transaction costs, contracting companies may be compelled to exclude those households that lack access to land and to human and financial resources (Cahyadi & Waibel, 2013; Tobin, Glenna, & Devaux, 2016). Similarly, governments may seek to limit participation to protect vulnerable populations from indebtedness, market shocks and food security risks (Silva & Rankin, 2013). Although doing so may protect certain smallholders from participation risks, excluding the poorest or most vulnerable smallholders could also exacerbate pre-existing societal inequalities and prevent those groups from accessing services and inputs that facilitate upgrading (McCarthy, 2010).

2.2. The oil palm contract farming model in Brazil

This study was performed in Pará, the largest oil palm producing state in Brazil. Oil palm is predominantly cultivated in the northeast, covering 207,252 hectares of land across 35 municipalities (Lameira, Vieira, & Toledo, 2015). This area represents approximately 88 per cent of the total oil palm acreage in Brazil (Abrapalma, 2017). While commercial palm oil production in Brazil dates back to the 1970s (see Brandão and Schoneveld (2015) for a historical account), it was not since the ratification of the Biodiesel Law in 2005 that the sector began to evolve in earnest, almost tripling in area since 2000 (Brandão, de Castro, & Futemma, 2019). This was largely driven by national biofuel blending mandates and the introduction of SPOPP in 2010, which succeeded in attracting a number of large investors. These include Brazil's state petroleum company, Petrobras, through its subsidiary Belém Bioenergia Brasil (BBB), the United States-based grain company Archer Daniel Midlands (ADM), investment in incumbent Biopalma by Brazil's largest mining company, Vale, as well as a number of medium-sized domestic investors.

Incentives to engage smallholders through the SFS prompted oil palm companies to actively include smallholders into their supply base from the outset. By 2017, six of the nine palm oil companies that control much of the sector were developing nucleus-outgrower models (Table 1). Such models combine company-managed plantations with third-party sourcing involving interlocking agreements with small- and medium-scale farmers. In total, 1,508 smallholders were contracted to cultivate oil palm in Pará by 2018; 95 per cent of which contracted by just four companies. These smallholders account for an estimated 6.8 per cent of the total oil palm acreage in Pará (derived from Abrapalma (2017)).[2]

Table 1. Oil palm planted area in Pará in 2017

		Company-managed plantations		Outgrower plantations			
Company	Total area planted (ha)	Total area (ha)	Year of first planting	Smallholders' total area (ha)	Number of families	Medium and large producers' total area (ha)	Number of medium and large producers
ADM	7,550	5,500	2012	2,050	268	0	0
Agropalma	50,111	39,042	1982	1,746	192	9,323	49
BBB	41,422	38,021	2010	3,055	310	346	1
Biopalma	63,315	56,487	2007	6,543	657	285	2
Denpasa	4,667	1,109	1974	0	0	3,558	57
Dentauá	7,944	3,554	1980	0	0	4,390	15
Marborges	8,935	7,761	1981	770	78	404	16
Mejer	15,595	11,450	1994	0	0	4,145	1
Palmasa	6,480	3,002	1985	30	3	3,448	40
Others	1,234	1,234		0	0	0	0
TOTAL	207,252	167,160		14,194	1,508	25,899	181

Source: Abrapalma (2017) and Brandão and Schoneveld (2015)

The first initiative to promote smallholder inclusion in the Brazilian palm oil sector dates back to 2002, however. Between 2002 and 2006, 192 families were contracted by Agropalma through four separate pilot projects; see César and Batalha (2013) for a detailed analysis of this initiative. The success of these pilots motivated and informed the design SPOPP and its smallholder integration objectives (Santos et al., 2014). Leveraging incentives afforded under SFS, SPOPP defines the requirements and mechanisms through which smallholders participate in the oil palm sector. This includes smallholder input and technical assistance provisioning by processing companies at concessionary rates and fresh fruit bunch off-take agreements at guaranteed minimum prices. Since contracting companies are vested in the productivity of smallholders, it was thought that the quality of services under such arrangements would be higher than under prior government-coordinated or outsourced market development programmes (Brandão & Schoneveld, 2015). Under SPOPP, banks provide smallholders with a loan through a specifically created PRONAF facility of US 2,560 USD per hectare for up to 10 hectares of oil palm.[3] The loan also involves a performance-based quarterly financial contribution for the first three years to compensate for family labour expenses and to encourage farmers to adopt good plantation management practices during the critical early phases of plantation development. The scheme operates on a full cost recovery basis and ensures contracting companies are not exposed to credit default risks. Figure 1 provides a stylised overview of the contract farming model under SPOPP.

The SPOPP scheme falls under the federal PRONAF-Eco framework, which sets the conditions for accessing financial support. In addition to standard PRONAF eligibility criteria, farmers are required to adhere to SPOPP land zoning guidelines, specifically the Agro-Ecological Zoning of Oil Palm in Deforested Areas of the Amazon – ZAE-Palma.[4] They must also have their properties registered in Brazil's Rural Environmental Registry (CAR) and need to obtain a smallholder certificate called a Declaration of Aptitude to PRONAF class V (DAP-V), which proves that a farmer has an annual income of at least US 6,250. USD The minimum income threshold is seen as a proxy of agronomic and financial management capability, but in practice excludes farmers with less income (Annex 1).

Beyond these requirements, companies additionally apply specific criteria based on management and viability concerns or Roundtable on Sustainable Palm Oil (RSPO) certification requirements. While these criteria may differ slightly between companies, they typically relate to land suitability, access to infrastructure, and household labour availability. Companies pursuing RSPO certification also need to address a number of principles and criteria relevant to smallholders; for example, they

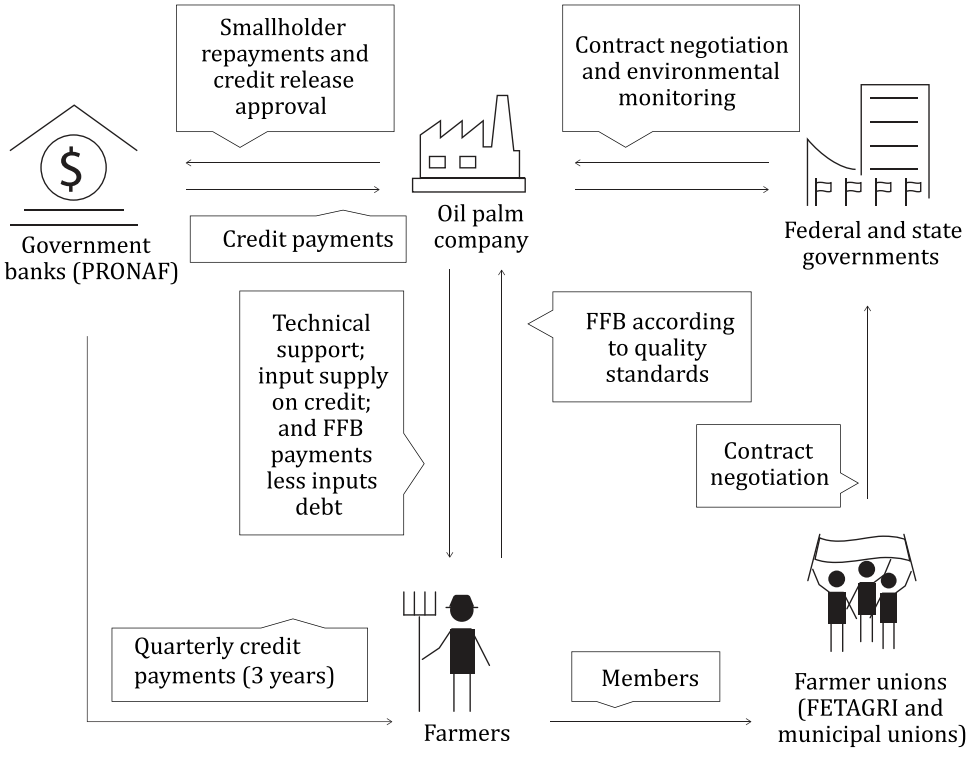

Figure 1. Oil palm contract farming model in Brazil.

Source: Authors' elaboration based on Brandão and Schoneveld (2015)

must ensure that oil palm is not located on land deforested after November 2005 and that workers are hired in accordance with Brazilian labour laws. Since food security risks that could emerge when smallholders specialise in cash crops were frequently raised by social movements during SPOPP's rollout, Brazil's federal government began to recommend that companies work to maintain on-farm diversity.[5] As a result, most companies require farmers to have access to at least 25 hectares of land in order to retain half (12.5 hectares) as forestland, develop 10 hectares of oil palms, and cultivate at least 2.5 hectares with other crops.[6] While many companies neglected to fully adhere to their own participation criteria, labour criteria were usually upheld household labour availability is widely considered integral to productivity.

3. Methods

3.1. Data collection

Data for this study was collected between January and August 2015 in four municipalities of Northeast Pará. We applied a cluster sampling approach in five communities that captures all the major companies operating in these communities. We selected these communities based on density of contracted smallholders. Within each community, structured surveys were conducted randomly with smallholder households belonging to two different clusters, namely (1) SPOPP participant households and (2) a control group of non-participant households. Non-participants are smallholders that live in the same areas, but do not participate in oil palm contract farming. While in theory farmers in this group could be engaged in non-oil palm contract farming schemes, in practice none of them are contract farmers as no such schemes operate in these communities. Pre-SPOPP participant

households contracted under Agropalma's pilots were excluded since they benefitted from more favourable loan conditions and were subject to less stringent eligibility criteria. They are therefore not representative of SPOPP-era contract farming.

In order to obtain comparable sample sizes across the two clusters, we surveyed 30 households per cluster in every community. Lists of SPOPP contract farmers were developed based on information provided by companies, community associations, and municipal farmer unions. 30 households per community were randomly selected from these lists; however, in most cases the entire universe of contract farmers in each community was no larger than 45, so in practice most contract farming households were surveyed. Since the number of non-participant households was significantly higher in each community, control households were selected by surveying every fifth household along a community transect until 30 were surveyed.

In total, 299 surveys were conducted, involving 149 SPOPP and 150 non-participant farmers. This is equivalent to 12 per cent of all SPOPP farmers (see Table 2 for an overview). We used a structured questionnaire to collect detailed information on household socioeconomic characteristics, sources of income, assets, land ownership, distances, crop production, input use, and perceptions of wellbeing. Specific add-ons were developed for non-contract farmers to capture their reasons for not participating and for contract farmers to capture contract characteristics and agronomic practices. Intra-household and gendered dynamics were not considered, since the household was the unit of analysis in this study.

The quantitative data was complemented with open and semi-structured interviews with key informants during fieldwork activities conducted between 2014 and 2017. Our key informants included 22 representatives from four of the five companies operating in the region, 29 representatives from municipal unions, 35 community leaders and oil palm farmers, 18 researchers and representatives from non-governmental organisations, and five representatives from financial institutions. Finally, results were presented to managers of three surveyed contract farming schemes to help validate and interpret findings.

3.2. Descriptive statistics

Besides mainstream socioeconomic variables, three composite indices were also developed (Table 3). Recognising the limitations of using monetary information such as income or consumption

Table 2. Overview of survey clusters and sampling

Community Cluster	Research Cluster	n
1: Arauaí		
BBB	2: SPOPP	30
Non-participants	3: Non-participants	30
2: Calmaria		
Biopalma	2: SPOPP	29
Non-participants	3: Non-participants	30
3: Forquilha		
Biopalma	2: SPOPP	30
Non-participants	3: Non-participants	30
4: São Domingos do Capim		
ADM	2: SPOPP	30
Non-participants	3: Non-participants	30
5: Garrafão do Norte		
Marborges	2: SPOPP	30
Non-participants	3: Non-participants	30
Total		299

Source: Household surveys
Note: The number of survey respondents is denoted by 'n.'

Table 3. Descriptive statistics

Variable	Cluster 1 SPOPP-participants (n = 149) Mean (SD)	Cluster 2 Non-participants (n = 150) Mean (SD)	T Test
Household characteristics			
Household size (n members)	4.490 (2.256)	4.393 (2.030)	−0.3893
Age of household head (years)	45.738 (13.089)	49.000 (13.082)	2.1551**
Gender of household head (male dummy)	0.913 (0.283)	0.893 (0.310)	−0.5657
Highest educational level of household head (from 0 to 5)	1.208 (0.939)	0.860 (0.859)	−3.3433***
Household head migrated (migrant dummy)	0.584 (0.495)	0.660 (0.475)	1.3567
Dependency ratio	0.691 (0.686)	0.924 (0.844)	2.9561***
Household labour (n members)	2.617 (1.298)	2.313 (1.100)	−2.1865**
Economic characteristics			
Area of land (in hectares)	48.857 (31.563)	36.473 (34.716)	−3.2051***
Crop Diversification Index (CDI)	0.284 (0.231)	0.277 (0.204)	−0.2889
Livelihood Diversification Index (LDI)	0.388 (0.112)	0.376 (0.092)	−0.9878
Bolsa Família (dummy)	0.523 (0.501)	0.560 (0.498)	0.6318
Welfare index	1.125 (0.132)	1.067 (0.157)	−3.4452***
Member of community association (dummy)	0.523 (0.501)	0.333 (0.473)	−3.3744***
Prior experience (dummy)	0.168 (0.375)	0.133 (0.341)	−0.8312

Source: Household surveys

expenditure as an indicator of wealth (McKenzie, 2005), we developed a wealth index using information on ownership of 15 different household assets. The index was constructed using Principal Component Analysis, following the approach develop by Filmer and Pritchett (2001). The other two indices relate to crop and livelihood diversification, developed using the method from the Intergovernmental Panel on Climate Change (IPCC) to monitor livelihood vulnerability (Hahn, Riederer, & Foster, 2009). Values for both indices range from 0.0 to 1.0, with lower values denoting increased diversity. Since we sought to assess the effects of Bolsa Família,[7] a conditional cash transfer programme, on households' decision to participate in contract farming, we excluded it from the livelihood diversification index and included it as a standalone variable (Fried, 2012).

The data reveals a number of statistically significant differences between participants and non-participants. Participant households are more educated, have more available household labour, own more land, are wealthier, and have more social capital than non-participants households. Non-participant households are generally older and/or are confronted by higher dependency ratios.

3.3. Empirical approach

The analysis is structured into two components, namely (1) determinants of participation and (2) determinants of labour allocation to oil palm contract farming. Since the majority of participant households are yet to generate an income from oil palm, as most plantations are yet to mature, we did not evaluate the impact of participation on income or other indicators of welfare. Besides, there are ample studies that have attempted to do so (for example, Alwarritzi, Teruaki, & Yosuke, 2015; Bellemare, 2012; Cahyadi & Waibel, 2016; Miyata et al., 2009; Narayanan, 2014; Rao & Qaim, 2011; Simmons et al., 2005). Brandão and Schoneveld (2015) also demonstrate how oil palm is considerably more profitable, both from a land and labour perspective, than alternative crops in Northeast Pará.

To address the first component, we employed a binary response model using a probit link function (Equation (1)):

$$\Pr(CF_h = 1) = \lambda + \beta X_h + e_h \tag{1}$$

Where Pr(*CFh*= 1) is the probability of a household *h* to participate in a contract farming scheme, and *CFh* is a dummy that takes a value of 1 if the household participates in oil palm contract farming and 0 otherwise; *X* is a vector of household characteristics likely to influence participation; λ is a constant of unobserved variables; and *e* is the error term. In addition to standard explanatory variables used in similar studies such as age, gender, education, dependency ratio, household labour, land size, social capital, wealth, and prior experience (Ba, Mey, Thoron, & Demont, 2019; Cahyadi & Waibel, 2016), we included crop and livelihood diversification indices because these were mentioned in interviews as critical variables shaping household labour allocation, and Bolsa Família, Brazil's conditional cash transfer programme, which is perceived by some as a policy constraining household entrepreneurship (Fried, 2012). While poor credit scores (for example, due to past default) is likely to play a role in shaping inclusion and exclusion patterns, we did not incorporate farmer credit histories into our model. Ample research has revealed that households with low credit scores are, due to social stigmas, generally reluctant to disclose information on their credit histories. Access to credit information from banks and companies is also restricted for confidentiality reasons.[8]

Heteroscedasticity tests revealed no functional form misspecification, with all variables exogenous to participation. While arguably endogenous, we do consider wealth to be exogenous to the participation decision since farmers were yet to generate an income from oil palm at the time of research, while the remaining variables are time-invariant and unlikely to result in reverse causality problems. Survey data also showed that crop and livelihood diversification indices did not change as a result of oil palm adoption. This may though change in future as households begin generating income from oil palm.

For the analysis of component two, we assume that hiring labour is endogenous to the total time allocated to oil palm farming because unobserved factors shaping the decision to hire labour will likely correlate with the unobserved factors that shape time allocation, such as entrepreneurialism and motivation. To obviate the endogeneity problem, we estimate a endogenous switching regression model, using the full information maximum likelihood method (FIML) framework (Maddala, 1983). Failure to account for endogeneity could lead to an over- or underestimation of the treatment effect. This model simultaneously estimates both a continuous outcome equation W and a selection equation T (Equation (2)):

$$W_h = \beta Y_h + \delta T_h + e_h$$

$$T_h = \begin{cases} 1, if\ \gamma Z_h + u_h > 0 \\ 0, \text{ otherwise} \end{cases} \tag{2}$$

Where *Y* is a vector of explanatory variables. In addition to household and economic variables, we added two variables specific to contract farming: hired labour and access to trainings. *Z* is the instrumental variable and *u* is the bivariate standard normal density function with mean zero. Our instrumental variable is years of education. Based on extensive research in the study areas, we contend that this instrument satisfies both relevance and exclusion assumptions (Lousdal, 2018). Interviews with smallholders and their representatives showed that more educated household heads are better able to capitalise on local labour markets since they tend to have higher management capacity; therefore, they are better able to estimate the costs and benefits of hiring and engage in contracting, but are not more inclined to allocate more labour to oil palm (for example, lesser educated households do not work less). It also satisfies the monotonicity assumption (for example, the instrumental variable should have a unidirectional effect on hiring), with qualitative research showing that some lesser educated people are not inclined to hire more labourers. We also explored distance to urban centres as alternative instrumental variable because more labour is available in more populous areas. However, as oil palm contract farmers in Pará are generally located in densely

populated areas so mills can reduce transaction costs, external labour availability issues are not apparent in the study areas. They were also never cited as a barrier to hiring in interviews.

4. Results and discussion

4.1. The determinants of participation

The descriptive statistics presented above suggest that participation is non-random. The results from the probit regression confirm this (Table 4). The model was able to accurately 'predict' almost 70 per cent of cases. Specifically, a positive relationship was observed between participation and the level of education of the household head, household labour availability, land size and group membership, while a negative relationship was observed with household dependency ratios. Of scheme non-participants, about 82 per cent claimed that non-participation was a choice rather than a product of involuntary exclusion. While this suggests that non-participation is driven largely by self-selection, farmer awareness of potential ineligibilities certainly influences the household decision to seek out a contract.

Access to human capital strongly shaped participation decisions and scheme eligibility. More educated farmers are more inclined to participate in an oil palm contract farming scheme because they are better equipped to evaluate the implications of participation, are more willing and able to take risks, and more capable of navigating the bureaucratic process of obtaining loans and entering into contracts. At the same time, interviews with company representatives indicated that farmers with demonstrable capacity to adopt their agronomic guidelines were prioritised, suggesting that inclusion patterns cannot solely be attributed to self-selection. Differences in education between scheme participants and non-participants plays a role in this, though interviewees suggested that some companies did not actively consider education levels in their selection process but rather available manpower.

Companies considered the availability of labour within the household to be an important driver of time allocation to plantation management. Households with lower dependency ratios and more household members that contribute to livelihood activities are less burdened by care obligations

Table 4. Probit model

Variable	Coefficient	Robust Standard Errors
Dependent variable: participation dummy		
Age of household head (years)	−0.009	0.007
Gender of household head (male dummy)	0.006	0.288
Highest educational level of household head (from 0 to 5)	0.193**	0.081
Dependency ratio	−0.239*	0.137
Household labour (n members)	0.136*	0.076
Land area (in hectares log)	1.119***	0.199
Crop Diversification Index	0.519	0.379
Livelihood Diversification Index	0.841	0.818
Bolsa Família	−0.180	0.187
Welfare index	1.027	0.687
Member of community association (dummy)	0.382**	0.167
Prior experience (dummy)	0.121	0.232
Constant	−3.606***	1.046
N	293	
Wald chi^2 (12)	65.64***	
R^2 (pseudo)	0.11815	
Percentage correct predictions	69.62%	
*** = signif < 0.01 ** = signif < 0.05 * = signif < 0.1		

Note: Land area was log-transformed, so the interpretation of the coefficient should consider that difference.

and more capable of managing labour (re)allocation between livelihood activities. Companies indicated that labour was an important consideration in their selection process because of the perceived adverse impacts of labour shortages on productivity. Of the sampled non-participants that were deemed ineligible, about 33 per cent claimed that household labour availability was the primary reason for opting out. However, the single most important reason for not wanting to participate in the scheme (64% of households) was oil palm's high labour burden, which underscores that non-participation is to a significant extent motivated by labour considerations on both sides.

Land size is most strongly related to participation, with every additional logged hectare of land owned by the household increasing the probability of participation by about 12 per cent. Because households are required to retain sufficient land after oil palm cultivation for food crop production and Legal Reserves (protected on-farm forests), and can only plant on land deforested before 2008, landholding size is an important participation determinant. This is reflected in the fact that of the households that were not permitted to participate, about 33 per cent claimed their exclusion was primarily attributable to a lack of sufficient suitable land. In addition, about 46 per cent of households that choose not to participate did so because of land constraints. Availability of land resources is therefore an important factor underlying voluntary exclusion from contract farming, at least in the Brazilian context. Finally, membership in community associations also strongly influences participation. Collective organisation reduces the perception of risk by enhancing access to information, facilitating social learning, and improving farmer representation, both politically and vis-à-vis contracting companies.

Results suggest that gender, Bolsa Família, welfare, and degree of diversification do not significantly influence participation. The weak relationship with Bolsa Família demonstrates that conditional cash transfer policies do not necessarily inhibit household entrepreneurship, as some studies suggest (Hall, 2012). Since farmers only begin earning an income from oil palm when they begin to harvest, typically four years after planting, major impacts on household welfare are yet to be observed amongst the SPOPP farmers, with no households owning stands older than four years.

4.2. Labour allocation

The capacity of a household to allocate labour to oil palm management activities strongly shapes processes of inclusion and exclusion, as the preceding section has shown. The results of the second model highlight that while human capital, including age and gender, does influence the time households allocate to plantation management, whether or not a household decides to hire plays a considerably more important role (Table 5). For example, the outcome equation shows that older and male-headed households are more inclined to allocate additional labour to oil palm management. While this relationship is significant, the absolute effect is comparatively small. In contrast, if a household decides to hire labour to support the household in managing their plantation, an additional 14.79 weeks per hectare per year are allocated to plantation management. The importance of hired labour use in ensuring plantations are intensively managed cannot therefore be overstated.

The significance of the Wald test for independent equations shows that the treatment-assignment errors are correlated with the outcome errors, validating our hypothesis that unobservables that increase household time allocation also influence the decision to hire labour. The selection equation shows that a number of household characteristics positively influence the decision to hire, such as more education, higher dependency ratios, less available household labour, more access to formal jobs, greater crop diversification, more social capital, and less land. This suggests that households with labour constraints are more inclined to hire, which has a positive net impact on total labour allocation. This calls into question whether the adoption of labour criteria in appraising household eligibility for scheme inclusion is necessary. A key scheme feature that enables households to hire labour is household entitlement under PRONAF-Eco to quarterly cash advances for the first three years, which improves household ability to cover hired labour expenses.

Table 5. Labour allocation model

Variable	Coefficient	Robust SE
Outcome equation Dependent variable: number of working weeks per ha		
Age of household head (years)	0.121*	0.066
Gender of household head (male dummy)	6.015*	3.290
Dependency ratio	−0.848	1.058
Household labour (n members)	0.368	0.632
Land area (in hectares log)	−2.956	3.316
Crop Diversification Index	−0.651	4.156
Prior experience (dummy)	2.430	1.905
Number of formal jobs	0.359	2.130
Member of community association (dummy)	0.250	1.776
Access to trainings (dummy)	3.458	2.019
Welfare index	−3.879	6.889
Hired labour (dummy)	14.786***	3.066
Constant	−0.359	10.709
Selection equation Dependent variable: hiring labour (dummy)		
Highest educational level of household head (from 0 to 5)	0.415***	0.109
Age of household head (years)	0.007	0.009
Gender of household head (male dummy)	−0.477	0.452
Dependency ratio	0.493***	0.186
Household labour (n members)	−0.397***	0.090
Land area (in hectares log)	−0.337	0.415
Crop Diversification Index	−0.232	0.491
Prior experience (dummy)	−0.090	0.274
Number of formal jobs	1.068***	0.405
Member of community association (dummy)	−0.478**	0.243
Access to trainings (dummy)	0.076	0.259
Welfare index	−1.253	0.911
Constant	2.603*	0.911
Number of observations	133	
Log pseudolikelihood	−524.61484	
Wald $chi^2(12)$	48.10***	
Wald test for independent equations ($chi^2(1)$)	16.07**	

Note: *** = signif < 0.01 ** = signif < 0.05 * = signif < 0.1

Interviews revealed that much of the labour that is hired by oil palm contract farmers is employed informally, and often not full-time. The formalisation of smallholder labour relations has been implemented in pilot schemes in order to facilitate smallholder compliance with RSPO criteria and indicators, with Agropalma relying heavily on RSPO-certified markets (Brandão & Schoneveld, 2015).[9] Such formalisation was met with much resistance from smallholders since it reduces the flexibility of hiring informally. It also increases the cost of hiring, since formalisation involves extending a range of secondary benefits and tax obligations to labourers. Moreover, a lack of farmer familiarity with formal contracting procedures will act as a major deterrent to hiring labour formally. Arguably, such standards and compliance barriers are not in the interest of pro-poor oil palm development since they reduce the capacity of labour-constrained households to meet the demands of oil palm farming, but conversely do improve the labour conditions for farm labourers. This poses a difficult dilemma since formalisation may well also reduce the number of opportunities available to farm labourers (for example, as farmers stop hiring), which may affect more labourers than formalisation benefits. With other companies in Pará recognising the importance of being fully RSPO-certified, the pressure on smallholders to formalise their hiring is steadily increasing.

These results suggest that the focus may need to shift from household labour availability criteria to supporting hiring. Hiring support will generate indirect societal co-benefits and enable labour constrained non-participant households to benefit more meaningfully from sectoral development.

Such a focus might involve extending periodic performance-based payments until plantations reach maturity and helping mediate between smallholders and labour markets, especially for those lacking the capacity to engage these. Piloting collective hiring could be another option, especially in a context where smallholders are increasingly required to comply with the labour formalisation demands of certified global markets.[10] Such market pressures are likely to generate new participation barriers and unintended spillovers, especially for labour-scarce households, as local labour markets become more inaccessible. Collective hiring could help spread formalisation costs and centralise skills development activities to help raise labour efficiency.

5. Conclusions

SPOPP was conceived to enlarge opportunities for smallholders within Brazil's biofuel industry that have long been alienated from the soy and sugar sectors. However, civil society's reservations about food security implications, corporate uncertainties about productivity and profitability, concerns by financial institutions about credit default, and concerns within government about land use change have resulted in complex inclusion and exclusion dynamics. While interviews suggest that during the early implementation of SPOPP, many eligibility criteria were only selectively applied, our analysis demonstrates that household availability of land and labour has strongly shaped inclusion patterns. Consequently, more land and labour poor households, which tend to be marginalised already in the Brazilian rural context, have yet to meaningfully benefit from new market opportunities. This process appears to be both voluntary and involuntary. On the one hand, resource-constrained households voluntarily opt out, and on the other hand, they are also involuntarily excluded as a result of ineligibility.

When managed properly, oil palm generates considerably higher returns to both land and labour than other accessible livelihood options in the region (Brandão & Schoneveld, 2015). As contract farmers begin generating stable incomes from oil palm, differentiation between SPOPP participants and non-participants can be anticipated, as has been observed in other countries (Cahyadi & Waibel, 2016; McCarthy, Gillespie, & Zen, 2012; Tobin et al., 2016). SPOPP is therefore currently not an instrument of inclusion, despite being conceived as such.

Should a programme like SPOPP, however, even endeavour to be(come) fully inclusive? As past PRONAF programmes have shown, long-term indebtedness and resultant exclusion from future opportunities is often a product of indiscriminate credit allocation. Households unable to optimally transform finance into productive opportunities are more likely to enter into debt traps as a result. However, we do not dispute that a programme like SPOPP is not for everyone, but our findings do give reason to question the use of criteria like labour for making inclusion decisions. Our findings convincingly demonstrate that labour allocation is primarily a function of willingness or ability to hire labour, which increases when households are labour- and land-poor. Our results thereby suggest that resource-constrained households possess more than enough agency to overcome household-level limitations. SPOPP, and programmes like it, could consider availability of external rather than internal labour when formulating inclusion strategies.

Poorly designed inclusion strategies can produce a host of unintended effects. They may, for example, contribute to widening rural inequality gaps, rather than protecting marginal households from adverse incorporation. Despite the rising interest in inclusive business and value chain development, issues such as these that are fundamental to designing effective and socially impactful contract farming initiatives have yet to be comprehensively assessed. More emphasis should be placed on scheme mechanics and how these influence cost and benefit distribution patterns (Schoneveld et al., 2021). Too often, structural attributes are not interrogated critically, with emphasis generally placed on measuring impact rather than understanding the causal mechanisms.

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Notes

1. The Family Farming Law (Law 11.326/2006) defines smallholders as farmers who (1) own less than 4 fiscal modes (in Pará a fiscal mode ranges between 5 and 75 hectares), (2) depend largely on agricultural income, and (3) rely primarily on family members to undertake agricultural activities.
2. These figures are considerably higher than official statistics. According to the Instituto Brasileiro de Geografia e Estatistica (IBGE) Agricultural Census (2017) there are 863 properties growing oil palm, totalling 69,431 hectares. According IBGE agricultural statistics, there are 164,441 hectares of oil palm plantations in Pará.
3. Amounts have been converted from Brazilian reais (BRL) at an exchange rate of BRL 3.2 per US dollar (1 June 2015).
4. ZAE-Palma is a zoning plan published by Embrapa (the Brazilian Agricultural Research Corporation), which established the technical foundation for the spatial planning of oil palm cultivation in Brazil. It identified almost 30 million hectares of suitable land in the Brazilian Amazon that is not classified as primary forests, indigenous territories, or conservation units. It was ratified into law through a Presidential Decree (decree 7172, 7 May 2010).
5. The Ministry of Agrarian Development (MDA), created to represent the interests of smallholders within Brazil's federal government and charged with monitoring the SFS, was remarkably active during SPOPP's design and initial implementation stages. As concerns about food security risks were raised, the MDA urged companies to take those concerns into account.
6. The Brazilian Forest Code requires properties in this region to maintain at least 50 per cent as forest reserve known as Legal Reserves. In contrast to non-family farmers, family farmers are exempted from the legal requirement to reforest their properties if deforestation has taken place over more than 50 per cent of the plot before 2008.
7. Bolsa Família is the largest conditional cash transfer programme in the world, with 12 million beneficiaries. The programme offers a monthly stipend to families under a minimum income threshold that meet certain conditions such as school attendance and basic healthcare examinations. See Fried (2012) for more details.
8. Only 3 out of 27 non-participants who declared an interest in planting oil palms conceded that they were excluded as a result of low credit score. This fact either demonstrates that low credit score is not a major factor shaping exclusion, or that the magnitude of false responses is significant.
9. Such formalisation is not necessarily a direct RSPO requirement. Rather, the RSPO stipulates that producers must adhere to national laws. In contrast to Southeast Asian countries, Brazilian labour regulations are notoriously stringent.
10. Agropalma addressed the formalisation issue by establishing a Consortium of oil palm farmers. This Consortium is a legal entity that has the capacity to hire employees. The Consortium hires workers under contract who collectively manage the plots of farmers that wish to use labour from the Consortium.

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