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**Do Smallholders Gain from Contract with an Oil Palm Company?
Lessons Learned from Jambi, Indonesia**

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Introduction

The rapid expansion of oil palm area in Indonesia particularly under contractual arrangement has led to concern over the impact on socio economic benefits of communities in surrounding areas (Sheil, et al, 2009; Rist et. al, 2010; Marti et al, 2008). Contractual arrangements between oil palm corporations and smallholders have been enforced by the Indonesian government in order to promote oil palm as a major tool of rural socio economic improvement and poverty reduction (Zen, et al, 2005). However, there are some debates in literature on the pro and cons of contract farming. Some authors have found positive effects of contract in the oil palm industry such as more secure income (e.g. Sheil et al, 2009) and oil palm companies' social responsibility related investments in health and education for local communities (e.g. Zen, 2005). Other studies pointed to the inequality in bargaining power between smallholders, local communities and companies (Glover, 1984; Warning and Key, 2002) and unfavorable contractual schemes offered by companies and lack of contractual compliance by the them in the oil palm industry (Marti, et al, 2008).

This paper aims to improve our understanding of the impact of oil palm contractual arrangements on smallholder well-being and its implication for poverty reduction. The specific objectives of this paper are (i) to understand differences in characteristics between contract smallholders and non-contract smallholders and to identify the specific elements of the contractual arrangements that is responsible for the differences, (ii) to identify the factors that can explain the participation of smallholders in contract scheme with a private oil palm corporation, (iii) to assess the impact of contractual schemes on household income of smallholders, and (iv) to examine whether contract farming in the oil palm industry is poverty sensitive.

Methods

This study relies on data collected randomly from 245 smallholders consisting of 126 contract and 119 non-contract smallholders in three villages of the District of Merangin, Province of Jambi, one of major oil palm producers in Indonesia. A Multistage sampling procedure was employed in this study. Firstly, an oil palm company covering totally 15,441 hectares in District of Merangin was selected purposively as our study area considering the coverage of oil palm growth stage. Secondly, three villages were selected purposively representing three ranges of distance from production sites to the location of the oil palm mill. Thirdly, households were sampled randomly with probability proportional to the number of oil palm growers in each of the villages. The samples were drawn from the lists of oil palm households provided by the village heads.

In order to address four specific objectives above, a set of analysis is carried out in the following stages. Firstly, simple mean comparison is employed to explore difference in characteristics between contract participant and non-participant. This also allows us to find specific elements of contractual arrangement that is responsible for the difference. Secondly, a decision of participation is estimated by a probit model in order to identify factors that are able to explain contract participation.

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Thirdly, in order to control other observable variables that are not accounted by simple mean comparison, OLS is employed. However, the validity of this model depends on the assumption that there is no endogeneity problem, which will arise if participation is driven by unobservable factors (e.g. risk aversion, entrepreneurial ability, etc.) that affect the outcome of the participation decision. If unobservable characteristics are correlated with both household income and contract participation, then the model will produce biased results. In order to correct this bias, treatment effect regression is employed.

Fourthly, in order to examine whether contract farming in the oil palm industry is poverty sensitive, a dummy of poverty based on per capita consumption is incorporated into model. Two critical questions addressed in this analysis are: (i) whether poor smallholders are discriminated by contract term for joining the contract (ii) whether poor smallholders are significantly benefited from the contract. The first question is examined by introducing poverty dummy in participation model (the first stage of treatment effect regression) in which we assign value of 1 for a household with per capita consumption less than \$ 2 international poverty line at 2005 PPP, and zero otherwise. The second question is examined by running two separated model for poor group and non-poor group. We expect that participation has different impact for different groups.

Results and Discussion

The characteristics of contract and non-contract smallholders are shown in Table 1. The results reveal that total household income, total asset and net revenue per ha of contract smallholders are almost double than non-contract smallholder. We also find that contract smallholders receive almost eleven percent higher price and allocate at least twice higher budget for inputs per hectare than non-contract smallholders.

Table 1. Characteristics of oil palm smallholders

Household characteristics	Non-contract	Contract	T stat
Household size	4.20	4.33	-0.70
Age of household head (years)	45.75	52.10	-4.04***
Migrant dummy (1: migrant 0:indigenous/ local)	0.85	0.87	-0.36
Total land size (hectare)	2.88	4.59	-4.70***
Oil palm area (hectare)	1.58	3.51	-9.01***
Total household income (IDR 000)	31,411	62,671	-4.83
Total asset (IDR 000)	229,359	477,129	-9.60***
Net revenue per hectare (IDR 000)	9508	11649	2.15**
Received price (IDR)	981	1087	4.30***
Input per hectare (IDR 000)	1618	3300	6.05***

Remarks: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Source: own calculation

Our probit results reveal that contract participation is significantly associated with the age of household head, migrant status, size of oil palm plot, and time of plantation establishment (see column 2 Table 2). An older household head is more likely to participate in the contract because risk aversion may be growing by age. As a safer option in oil palm investment, contractual arrangement is more likely to be adopted by an indigenous than a migrant that tend to be a risk taker. Considering production efficiency, a smallholder with larger oil palm plot is more likely to join the contract. A smallholder who planted oil palm between 1989 and 1994 is more likely to participate in the contract than a smallholder who planted after this period. The likelihood of participation during period of 1995 to 2000 is lower than that in the previous period but significantly higher than that in after 2000. This suggests that participation is significantly affected by the match in time between planting period and the contract offered by the company.

In the income model, we use natural log of net household income as a dependent variable. The results of OLS and treatment effect regression show that contract farming has a positive impact on household income but there is a considerable difference in the level of significance (see column 3 and 4 Table 2). Because the treatment effect model can control for selection bias, its results may be more reliable.

The results reveal that the coefficient of participation in the treatment effect regression is almost double than the coefficient in OLS. Since the parameter rho in the treatment effect model differs from zero and has a negative sign a hidden bias may exists and can affect income and participation in the opposite direction. The OLS model cannot account for hidden bias which can lead to an underestimation of the magnitude of the coefficient.

Table 2. Econometric results

Variable code	General model			Incorporating poverty variable		
	Treatment effect model		OLS	Including poverty (1 st stage)	Poor group (2 nd stage)	Non-poor group (2 nd stage)
	Participation	Income	Income	Participation	Income	Income
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age of hh	0.0295**	0.0390**	0.0396**	0.0298**	0.0372	0.0233
Age ² of hh		-0.0004**	-0.0004**		-0.0003	-0.0003
Household size	0.0667	0.0670***	-0.068***	0.1089	0.07162	0.0889***
Labor capacity	0.6805	-0.1551	-0.1425	0.6563	-0.2345	-0.1826
Education of hh	0.0099	-0.0097	-0.0081	-0.0016	-0.0421*	-0.0100
Allacated land	-0.2943	-0.0519	-0.0604	-0.2750	-0.2092	0.0270
Social capital	-0.0060	0.0088**	0.0094**	-0.0089	0.0124*	0.0106*
Migration dummy	-1.1095**			-1.2339**		
Size of oil palm	0.2934***	0.1550***	0.1646***	0.2737***	0.2924***	0.1358***
Size of rubber	-0.0340	0.0710***	0.0726***	-0.0293	0.1114**	0.0539*
Size of other crops	-0.0073	0.0687	0.0675	-0.04	-1.0783**	0.0951
Oil palm age		0.0202	0.0233	0.0194	0.03257	-0.0015
Oil palm age ²		-0.0006	-0.0003	-0.0009	0.0012	-0.0004
Off-farm	-0.3346	0.3143***	0.3054***	-0.2867	0.2763	0.3608***
Planting period 1	3.2609***			3.2703***		
Planting period 2	1.6295***			1.6762***		
Participation		0.4682*	0.2773**		-0.8641*	0.6290**
Poor				-0.4212		
Constanta	-3.4408***	8.1905***	8.1027***	-3.2181***	8.0507	8.7449***
Lambda		-0.1197			0.6335**	-0.1927
Rho		-0.2180			1.00	-0.3618
No of observation	245	245	245	245	88	157
Adj R ²			0.4503			
Prob > F			0.0000			
Wald chi ²		241.12			72.22	166.36
Prob > Chi ²		0.0000			0.0000	0.000

Remarks: * p<=0.1, ** p<=0.05, *** p<=0.01

Source: own calculation

Both OLS and the treatment effect regression suggest that household income is positively and significantly affected by growing rubber and engaging in off farm activities. Adding one hectare of rubber and engaging in off farm activities will increase household income by seven percent and 35 percent, respectively. In comparison an additional area unit of oil palm area contributes to a 17 percent increase in household income, while the duration of staying in the village which can be seen as a proxy of social capital raises income by one percent for every additional year of staying in the village.

These results show that while household income can be increased by contract participation other factors are more important. Therefore, the equity effects of participation in the contract among different groups of smallholders are further analyzed.

By introducing dummy variable of poverty status in the first stage of treatment effect regression, we find that poor smallholders are not significantly discriminated for joining the contract (see column 5 Table 2).

This not surprising because to join the contract is easy and does not require high administrative costs initially. All necessary investments are financed by the company which ultimately puts a high debt burden on the small holder. However we find that smallholders with smaller land are less likely to participate in the contract but 58 percent of poor smallholders have at least 2 hectare of land for oil palm.

The results of separate models reveal that there is different effect of participation for different group of smallholders. A significantly positive effect on household income can be shown for non-poor group only (see column 7 Table 2). Conversely, we find negative effect of contract farming for poor smallholders (see column 6 Table 2).

Conclusion

Contract farming can benefit smallholders in several ways. Firstly, the contract provides smallholders with quality seeds and advanced planting techniques in establishing the smallholders' plasma oil palm plot. Secondly, the contract smallholders benefit from the higher price as set in the contract during the survey year. Thirdly, contract farmers have higher net revenue per hectare in spite of higher production costs induced by the improved production technology.

Contract participation is significantly associated with the age of household head, migrant status, size of oil palm plot, and time of plantation establishment.

The results reveal that the overall contract farming in the Indonesian oil palm industry is positive for small holder farmers in terms of household income. However, there are other important factors that influence the income such as the household's engagement in off-farm activities, the size of oil palm and rubber area, social capital, which may be more important than the contribution of contract farming. This suggests that the benefit from contractual arrangements varies considerably depending on household type.

The more interesting question of whether contract farming also benefits the poor has been investigated by incorporating poverty in the model. The results show that although we found no evidence that poor smallholders are discriminated from participating in the contract, the effect of participation on household income was negative. Running separate model for poor and non-poor households shows that that only for the latter group a significantly positive income effect can be shown. One reason for a negative poverty effect could be that while the costs for joining the contract may be attractive, loan conditions and management requirements may often be beyond the financial and technical capacity of the poor. Our results therefore convey a message for policy makers to review the contractual schemes and to induce oil palm companies to make suitable contract term for poor smallholders.

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