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Partnership for Sustainable Coffee Certification: Linking Up Smallholder Farmers to Global Coffee Market

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ABSTRACT

This study examines the impacts of partnerships for sustainability certifications in coffee value chains on farm income in Lampung Province, Sumatra-Indonesia. We conducted farm-household surveys, interviewing 171 samples in West Lampung and Tanggamus Districts, consisting of 98 farmers joining partnership and 73 farmers not joining. A probit model is used to determine decisions to join the partnership; ordinary least square (OLS) is used to analyze the determinants of farm income; and Heckman selection-correction model is used to reduce the selection bias in partnership participation. We find some selection in partnerships for sustainability certifications, driven by the age and education of household head, land holding size of coffee farm and the proximity to rural cooperatives-KUBE. The partnership farmers earn higher farm income than those not joining, due to a higher proportion of productive family members. After employing the treatment-effect model, we find that the partnership for sustainability certifications raises farm income, mostly due to higher coffee yield and farm-gate prices. These results reveal the need for policies to support the establishment and encouragement of partnerships for sustainability certifications. The internal control system (ICS) initiated by coffee corporations in implementing the sustainability certifications have improved the trust level between smallholders and global corporations.

Keywords: Partnership, contract farming, Indonesia, coffee farmers, global corporations

JEL Classification: Q17, Q15

INTRODUCTION

Sustainable certification schemes in coffee value chains have promoted more sustainable sourcing of coffee beans while simultaneously serving business and development interests. Changes in the global commodity chains significantly affect the institutional mechanisms of coffee trade, particularly in coffee producing countries, including improving the welfare of smallholder farmers. For suppliers in developing countries, global standards are a *de facto* market requirement, so that the economic actors in the coffee value chain, farmers, businesses, civil society and government, need to adjust and reposition themselves from traditional, non-sustainable coffee farming practices to more responsible practices, better processing and post-harvest handling, and closer adherence to the growing changes of global environmental governance.

Sustainability certification schemes have emerged in conjunction with growing concerns of environmental governance, especially among consumers in the coffee-buying countries (Glasbergen and Schouten, 2015, Mithofer *et al.*, 2017, Glasbergen, 2018, Leimona *et al.*, 2018). On one hand, efforts to democratize markets by increasing the role of civil society in regulating production and trade-related activities have grown rapidly. On the other hand, these sustainability certifications and standards could serve as new vehicles of corporate control over global food production, trade and consumption (Glasbergen, 2018). Efforts to improve community-cooperative governance structures in the producing regions also help with integration, as standards generally require establishment of farmers' organizations and locally adopted codes of conduct. Global buyers are interested in improving the control mechanisms that ensure product quality to meet both technical and non-economic requirements of coffee beans for the global market. In this case, smallholder coffee farmers need to establish partnerships with global coffee corporations, not only to ensure market access and product quality to meet global requirements, but also to increase access for information, technical assistance, empowerment and other capacity building programs.

Sustainability certifications in coffee value chains have brought about structural changes for smallholder farmers (Neilson, 2008, Arifin, 2010). The demands of such better certifications and standards have increased significantly in the last decades, especially regarding better traceability, documentation, and audits. However, these demands create increased costs. Sustainability standards favor producers' cooperatives over individual smallholders, lead to more specific partnerships or contract farming, and encourage exporter consolidation to ensure product quality and specifications. At the other end, such sustainability certifications could serve as powerful instruments of product differentiation. Hence, they play an important role in capturing market share (Daviron and Vagneron, 2011). Smallholder coffee farmers are sometimes quite dependent on the traders operating in the region, which might also dependent on the global affiliated corporations. Most coffee farmers have incomplete understanding of market pricing and price-setting mechanisms, and smallholder farmers remain in a weak bargaining position with limited access to markets (Arifin, 2010). Although most farmers are well-aware of the need to improve coffee quality, increase market access, and increase price transparency and fairness, any efforts to empower farmers through partnerships or contract farming must be handled with extra care.

This study examines the impacts of partnerships for sustainability certifications in coffee value chains on household income in Lampung Province, Sumatra-Indonesia. The issue is relevant to the literature on sustainability certifications and to agricultural policy decisions because if the partnership improves the welfare of smallholder farmers, then

policies and programs to support sustainability certifications in coffee value chains could be justified both on efficiency and equity grounds. If not, policy makers could allocate resources to other agricultural development strategies. This study has implications for the debate over whether smallholder famers can adapt to the buyer-driven value chains in the context of global market trade, which increases the need for vertical coordination, including partnerships for sustainability certifications. The study also contributes to the theory of change in promoting the sustainability certifications in coffee value chains, which require specific interventions in farmers' empowerment to achieve the objective of sustainable livelihood of smallholder farmers.

More specifically, this paper addresses three related questions. First, to what degree do smallholder farmers participate in partnerships for sustainability certifications in global value chains? Second, do partnerships for sustainability certifications raise the income of participating farmers? Third, if these partnerships for sustainability certifications raise income, how does this happen through better farm-gate prices, higher yields, more multiple purpose tree species (MPTS) or crop diversifications, improved value chains, or some other mechanisms?

In Section 2, we review previous research that evaluates both the impacts of sustainability regulations on the farmers' welfare and the efficiency and distributional effects of partnerships for sustainability certifications in coffee value chains. Section 3 presents the field survey and interviews with farm households, traders and other stakeholders, and the detailed econometric methods used in the study. Section 4 examines the results in three parts: the description of partnerships in sustainability certifications of coffee value chains, a comparison between partnership and non-partnership farmers, and econometric analysis of partnerships and income. Section 5 provides concluding remarks and policy implications.

2. BACKGROUND

(a) Previous studies of partnerships for sustainability certifications in coffee value chains

The literature on partnerships for sustainability certifications in coffee value chains is quite scant compared to the literature on farmers' partnership in the context of contract farming with the private sector and the literature on the sustainability certifications within the context of theory of change (TOC) in development discourse. Existing literature on contract farming between smallholders with the private sector suggests that contract farming schemes have contributed to increased incomes for farmers who participate in the partnership schemes (Simmons *et al.*, 2005; Miyata *et al.*, 2009; Bellamare, 2012; Narayan, 2014; Minot and Sawyer, 2016; Ton *et al.*, 2018). However, this increased income varies by commodity, region, and sophistication of the social system. In some cases, even when the farmers' income has increased, there are still problems with imbalanced power between farmers and companies, the level of understandings on the terms of agreement, environmental sustainability, etc.

Contract farming has contributed to the improvement of farmers' income by introducing new crops and production methods both in developing countries and developed countries (Otsuka *et al.*, 2018). Nevertheless, there is room for strengthening contract farming or partnerships with the private sector for poverty reduction through proper policy or government intervention. In terms of specific interventions for the smallholder farmers, improving the quality of infrastructure in rural areas, facilitating access to credit and agricultural finance, and appropriate institutional intervention to reduce the risk-averse attitude among smallholders. The smallholder farmers prefer input market uncertainty over

output market uncertainty in participating in partnership or contract farming with the private sector (Abebe *at al.*, 2013). In the input market, farmers consider contract farming as a mechanism for risk-sharing to reduce input supply and seed quality uncertainty. In the output market, farmers are more worried about the risk of underpayment by the firm once they are locked into a fixed price contract.

In addition to increasing income, the literature also suggests that partnerships between smallholder farmers and the private sector could also improve the quality of food security for participating households (Barrett *et al.*, 2012; Bellamare and Novak, 2016). From a behavioral perspective, smallholder farmers save additional income they receive from participating in partnerships in order to spend on necessary foods that improve their nutritional status. Improvement in food security that results from partnerships with the private sector could be a result of participants growing staple foods or other food crops for their subsistence or survival. Efforts to lower barriers to entering partnership agreements for farm households with children, particularly girls, might lead to better food security (Bellamare and Novak, 2016).

The existing literature on sustainability certifications in coffee value chains usually deals with global environmental governance (Giovannucci and Ponte, 2005; Reynolds *et al.*, 2007; Neilson, 2008; Arifin, 2010). Sustainability certifications are part of a buyer-driven value chain, where global companies and affiliated traders in coffee producing countries have power to influence the performance of those early in the value chains (Gereffi *et al.*, 2005). The impacts of sustainability certifications on the welfare of smallholder farmers show small positive or neutral effects (Ruben and Zuniga, 2011; Beuchelt and Zeller, 2011; DeFires *et al.*, 2017). Sustainability certifications provide better coffee prices, yield and quality, although there are differences in magnitude among standards. The farm-gate prices of certified coffee ae generally higher than conventional coffee, although the profitability of certified coffee production and its subsequent effect on poverty is not clear.

Case studies of coffee certification from developing countries suggest positive effects across the board, albeit in different ways such as income, demand-side market creation, supply-side production efficiency and quality improvement (Kolk, 2012). The sustainability certification scheme that guarantees a minimum support price increases the average price received by farmers and reduces downside risk. Studies to analyze farmers' preference on attributes of specific certification schemes have concluded that there were some positive effects (Ibnu *et al*. 2015). Within major coffee certification schemes, the economic returns are generally higher, but one scheme was more effective in coffee processing, while another scheme was better for productivity. Ambivalent results were also found as a response to stagnating coffee prices. One scheme increased the tendency for coffee specialization, while the other scheme reduced coffee areas but increased their yield (Van Rijsbergen *et al.*, 2016).

In short, studies that combined the roles of partnerships in the form of contract farming and sustainability certification as a scheme in coffee value chains are rare. Across coffee producing regions in Indonesia, a range of sustainability certification schemes currently interact with this complex and diverse reality. There has been substantial debate on the impacts of such certification schemes, mostly with a focus on whether participating farmers are better off than non-participating ones. A challenge to such studies is that certification is not randomly applied, and certification schemes may (initially) select farmers who met the standards anyway. Earlier works have been conducted to analyze the impacts of sustainability certifications on poverty alleviation through cooperative mechanisms in the farmers' organization. In such schemes the coffee farmers are encouraged to organize as a group so that the monitoring system and traceability principles are ensured. The studies

suggest that sustainability certifications have a small direct impact on farmers' welfare, although the certifications schemes have the potential to strengthen social capital and improve community cooperative governance (Neilson, 2008; Astuti *et al.*, 2015; Arifin, 2019). By examining the roles of different formats for farmers' organizations in different certification schemes, Ibnu *et al.*, (2018) find that certified farmers perceive higher benefits than non-certified farmers, and that organized farmers perceive higher benefits than non-organized farmers. Smallholder farmers who hold dual membership (in a farmers' group and a rural cooperatives-KUBE) perceive greater benefits than farmers who participate in one group. Integrating such different organizational forms of sustainability certifications in coffee value chains might improve the benefits perceived by smallholder farmers.

(b) Coffee agroforestry systems in Lampung Province

Coffee production in the provinces of Lampung and Southern Sumatra account for the largest share of Indonesia's total (49 percent combined, mostly marketed through the port in Lampung), followed by North Sumatra, Aceh and West Sumatra (21 percent combined, mostly marketed through Medan). Coffee production in Java contributes 14 percent, with the port of Surabaya also connecting produce from Bali, Sulawesi and adjacent islands to global markets (BPS, 2018). Coffee production centers in Lampung are concentrated in the district of West Lampung and Tanggamus, which are adjacent to the Bukit Barisan Selatan (BBS) National Park. A policy on community-based forestry management (HKm=*Hutan Kemasyarakatan*) started in 2001 after the fall of President Soeharto. These systems allow local people to grow coffee inside protected forests if they do not own land in the forest. Another important requirement to join the HKm program as a farmer organization is to maintain at least 400 MPTS trees per hectare so that the conservation function of coffee agroforestry system is ensured.

Coffee plantation area in the district of West Lampung and Tanggamus in 2017 was 53,611 and 43,276 hectares, respectively, or more than 60 percent of the total area of coffee plantations in Lampung Province. Similarly, coffee production from West Lampung and Tanggamus in 2017 was 57,664 and 42,667 tons, respectively, or more than 86 percent of the total coffee production in Lampung. However, the coffee yield in Lampung Province is quite low, averaging 690 tons per hectare, similar to the national average but far below the coffee yield in Vietnam, which is 2.3 tons per hectare, the highest in the world (BPS, 2018). The application of good agricultural practices (GAPs) among smallholder coffee farmers is quite low (the use of certified seedlings, fertilizer applications, leaf pruning, red-cherry picking, post-harvest, processing etc).

A coffee agroforestry system is a favorable pre-condition for the development and expansion of sustainability certification in coffee value chains. Coffee agroforestry systems in Lampung Province have long developed in the forest margins where local people grow coffee and multi-purpose tree species (MPTS) for timber and fruit. The tree crops in such complex agroforestry systems have served as conservation mechanisms, especially in the catchment areas of watersheds, and they serve as additional sources of income for smallholder farmers. When sustainable certifications in coffee value chains developed in Indonesia in the 1990s, the long history of agroforestry systems by smallholder farmers accelerated their spread in Lampung Province and other coffee producing regions in Indonesia.

The first sustainability certification scheme to operate in Indonesia was the Rainforest Alliance (RFA) in 1993 in Aceh, followed by Fair Trade Labeling Organization (FLO) in 1997, also in Aceh. Utz certification started in 2002 in Aceh and Lampung,

followed by CAFÉ certification in Arabica coffee production regions of Aceh, North Sumatra and South Sulawesi. Finally, 4C Association (4C) certification started in 2006 in Lampung and South Sumatra. Despite differing details, these certification schemes aim to support smallholder coffee farmers in creating more sustainable livelihoods and improving the coffee yield through application of GAPs, guaranteed prices for the products, fair trade, community development, and environmental stewardship. A more detailed explanation about these sustainability certification schemes is found in Arifin *et al.*, (2019). One should note, however, that more traditional organic standards under the International Federation of Organic Agriculture Movement (IFOAM) and Sustainable Agriculture Network (SAN) started in Indonesia in the 1970s, although in a limited scale for coffee production aimed at specific niche markets. These sustainability certifications have advantages due to long-time adoption of coffee agroforestry systems among smallholder farmers in Lampung Province. Farmers in the District of West Lampung and Tanggamus have grown shade trees and other MPTS to provide favorable environments during dry seasons, and they also supply nitrogen using the natural fixation process of leguminous shade trees.

3. METHODS AND FRAMEWORKS

We conducted a farm-household survey by employing face-to-face interviews with a sample of 78 farm households in West Lampung District; 35 farmers were in a partnership and 43 were not; and of 93 farm households in Tanggamus District; 63 farmers were in a partnership and 30 were not. These households were selected using a cluster sampling method. The Nestle corporation's 4C certification scheme is dominant in Tanggamus and Ecom corporation's Rainforest Alliance (RFA) certification scheme is dominant in West Lampung. By the time of data collection, Nestle also started buying coffee from farmers in West Lampung. The partnership farmers were selected randomly within the cluster, using the lists provided by the agents of the internal control system (ICS) of these two companies. Non-partnership farmers were selected randomly using lists provided by the head of villages and the extension and ICS agents.

The field surveys were conducted in July and August of 2018. The semi-structured interviews for coffee traders, local leaders, and government officials were conducted in August and September of 2018. Additional interviews and verifications with some of the traders were conducted in September and October, especially for specific questions on local government policies in coffee trade and sustainability principles in general. The 6-page questionnaire for farmers includes household characteristics, such as household members, age, and education of household head and the wife; farm characteristics, such as total farm size, distance to rural cooperatives (KUBE), and distance to collector traders; and coffee production details, such as size of coffee farm, production, farm gate price, use of inputs, supply of family labor and hired labor, farm income from non-coffee, and non-farm income. The questionnaires for collector traders and large-scale traders were mostly semi-structured, recording their company profiles, employees, sources of coffee, coffee shipments to domestic and global markets, and open questions on the implementation of the partnership.

We focus our analysis on the impact of the partnerships for sustainability certifications in coffee value chains on farm income. This contributes to the knowledge on the transmission of how sustainability certifications could improve market access for coffee, farm income for smallholder coffee growers and better crop diversification through the

integration of MPTS. We performed the following three components in the econometric analysis:

(a) Probit model to estimate factors determining partnership participation

The probit model is used to estimate the probability that a given household will participate in a partnership for sustainability certification. The regressors include household size, age and education of household head, dependency ratio, size of coffee farm, crop diversification or MPTS, size of total farm, ownership of motorcycle, car, and coffee processing unit, distance to rural cooperatives (KUBE) and distance to collector traders. This analysis addresses the question of whether participant farmers tend to have different demographic and farm-economic characteristics than non-partnership farmers.

$$z_j^* = w_j\gamma + u_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where:

$$z_j = \begin{cases} 1, & \text{if } z_j^* > 0 \\ 0, & \text{others} \end{cases}$$

z_j = participation in partnership (y = 1 partner farmer; y = 0 non-partnership farmer)

w_j = variables or regressors that affect farm household's decision to join the partnership

(b) OLS model to estimate factors determining farm income

The ordinary least squares (OLS) model is used to estimate farm income as a function of household and farm characteristics, and a dummy variable representing participation in a partnership. The regressors are the same as in the probit model above plus a dummy variable that distinguishes partnership and non-partnership farmers. By including household characteristics in the model, we control for observable differences between partnership and non-partnership farmers, such as differences in farm size, education, and the availability of family labor.

The OLS model for farm income is written as follows:

$$y_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \delta z_j + \cdots + \beta_k x_k + e_j \quad \ldots\ldots\ldots\ldots\ldots \quad (2)$$

where

y = farm income (Rp)

x = variables or regressors that affect a farm household's decision to join the partnership

z = partnership (dummy, where 1 = partnership, 0 = non-partnership)

$\beta_1, \beta_2 \beta_3, .. \beta_k$ = estimated parameter

e = error term

One should note that this model does not account for possible selection bias in contract participation. In fact, parameter estimates in equation (2) using OLS will lead to an over-estimation due to selection bias. If the partnership farmers tend have more entrepreneurial skills and better access to information and technology than the non-partnership farmers, they would have higher incomes regardless of whether they participated in the contract farming scheme. In this case, the coefficient on the participation dummy

variable would include the effect of these unobservable characteristics in addition to the effect of partnership; thus, over-estimating the effect of partnership. If unobservable characteristics is correlated with both the dependent variable (farm income) and a regressor (partnership participation), then the coefficient on that regressor will be biased and inconsistent (see Miyata *et al*., 2009).

(c) Treatment-effects model to correct the possible selection bias

The treatment effects model uses the participation probit model, calculates the inverse Mills ratio, and includes the ratio as a regressor in the income model. This is also called the Heckman selection–correction model, where the Heckman procedures are used to produce unbiased and consistent estimates in the income model. This analysis is a maximum likelihood estimation in which all parameters for both models are estimated simultaneously, rather than as a two-step procedure.

The error term of the outcome equation (2) is ε and the error term for the selection equation (1) is u, which is a normal bivariate with zero mean. Estimates γ are used to estimate the inverse Mills ratio IMRs (λi):

$$\lambda \equiv \frac{\phi(x\delta_1)}{\Phi(x\delta_1)} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

The simultaneous Heckman selection-correction model can be used to estimate equation (2) by inserting the λ_i variable into the equation as follows:

$$y_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_n x_n + \delta z_j + \beta\lambda i + v_j \ldots\ldots\ldots\ldots\ldots \quad (4)$$

where

y = farm income (Rp)

x = variables or regressors that affect farm household's decision to join the partnership

z = partnership dummy (where 1 = partnership, 0 = non-partnership)

λ = inverse Mills ratio

$\beta_1, \beta_2 \beta_3, .. \beta_k$ = estimated parameter

v = error term

1. RESULTS AND DISCUSSION

This section provides the description of sustainability certification systems in the coffee value chains based on the farm-household survey and in-depth interviews with collector traders, KUBE or rural cooperative officials, large coffee traders/exporters and coffee corporations. We describe the differences between partnership and non-partnership farmers using a simple mean, variance and t-test. Finally, we present econometric results on the determinants of participation in the partnership schemes and their impact on farm income.

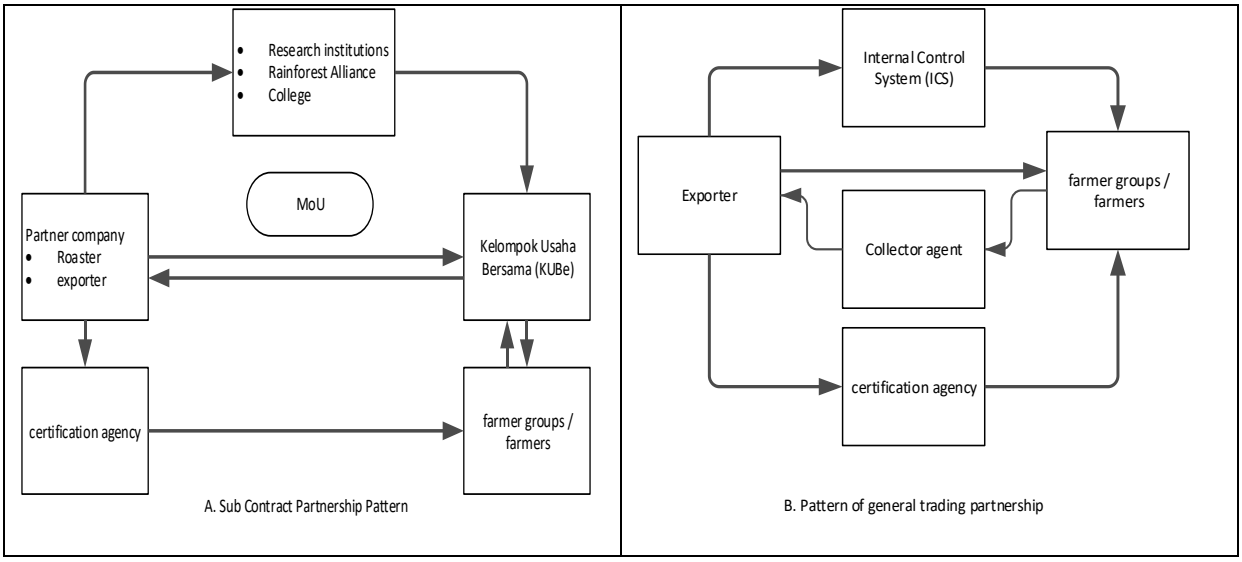
(a) Two forms of partnership for sustainability certifications in the study sites

Based on our farm-household survey, there are at least two forms of partnership for sustainability certifications found in the study sites in Lampung Province, namely: (1) sub-contract partnership and (ii) general trading partnership. The sub-contract partnership between smallholder coffee farmers and Nestle Corporations is bound with a memorandum of understanding (MoU) and involves the third-party rural cooperatives (KUBE=*Kelompok Usaha Bersama*). The general-trading partnership is quite loose, involving smallholder farmers and Ecom Corporations, and occasionally collector traders.

Under a sub-contract partnership, Nestle must to follow the principles of sustainability certifications as a part of global environmental governance, primarily the 4C-Assocations under the Global Coffee Partnership (GCP) Groups and Rainforest Alliance (RFA). In implementing the sustainability certifications, Nestle has been benefited with prior conditions that the smallholder farmers have long adopted coffee agroforestry system. Farmers have been growing shade trees and MPTS to secure additional household income and to contribute to conservation practices of local concern. At least some of the components of sustainability principles have been well-practiced by smallholder farmers.

Coffee farms within or adjacent to protected forests generally have more MPTS than coffee farms in private or communal lands, as the Government has been closely monitoring the progress of sustainability principles in forest-resource management areas, especially in the degrading-prone regions such as in the catchment areas of Way Besay watershed (West Lampung) and Sekampung watershed (Tanggamus District). As many as 95.3 percent of coffee farmers grow MPTS in the form of timber trees, such as African wood, *Sengon* (*Paraserianthes sp* and *Albizia sp*), *Dadap* (*Eryhtrina sp*), etc. Coffee farmers also grow fruit trees such as Durian, Jackfruit, Avocado, Mangosteen, *Duku* (*Lansium*), *Petai* (*Parkia sp*), *Jengkol* (*Archidendron sp*), etc, in addition to pepper, banana, and other secondary crops.

However, the agricultural land holding size in the study sites are quite small, and not all farmers can afford to grow 400 MPTS per hectare in their parcel. Most coffee farmers in West Lampung (48.6 percent) only control 0.25 to 1.0 hectare, while most coffee farmers in Tanggamus (54 percent) control 1.1 to 2.0 hectares. The average land-holding size in West Lampung is 1.71 hectares for partnership farmers and 1.48 hectares for non-partnership farmers. In Tanggamus, the average land-holding size is larger, 2.22 hectares for partnership farmers and 2.15 hectares for non-partnership farmers. Overall, the average farm-holding size is 2.18 hectares for partnership farmers and 2.07 hectares for non-partnership farmers in the study sites. The land is mostly privately owned within communal land and on user rights under community-based forestry management (HKm=*Hutan Kemasyarakatan*) within the state-owned protected forest land.



Source: Based on Farm Survey and Field Work

Figure 1. Two Forms of Partnerships for Sustainability Certifications in Lampung Province

One should note that the global coffee corporations, as coffee buyers, are interested in securing the coffee supply from the smallholder farmers in Lampung both for meeting not only the demand for coffee beans from domestic industries, but also for the export market. However, as the partnership agreement or MoU clearly outlines, the company is obliged to provide empowerment programs for smallholder farmers regarding sustainable coffee farming practices, providing market and price information, and offering market access, hence a selling mechanism for coffee beans. Under such a partnership, KUBE shall supply coffee beans to the company according to the standards set by the company and certification agency, primarily 4C and RFA. In this case, KUBE takes the responsibility for improving the capacity of coffee farmers through the internal control system (ICS), in order to improve not only the quality of coffee bean, but also to comply with the responsible sourcing of the coffee. Basically, global coffee corporations do not want to be associated with environmental degradation or buying the coffee from the national parks, which might harm the wildlife habitat and the sustainability principles in general.

In this case, KUBE and the ICS formed by the company provide training sessions during the September to February period, technical assistance and extension services. The curricula include, but is not limited to, good agricultural practices (GAP), work safety, fertilizing, pruning, pesticide spraying and integrated pest management. The resource people for the training sessions are generally from ICS, and sometimes qualified resource persons from research agencies, faculty members and researchers from universities, and others. Companies usually convene the training for trainers (ToT) at the end of harvest year every August for the ICS workers and extension agents, heads of farmers' groups, etc. The materials of the ToT include some intermediate and advanced principles of GAP, sustainability certifications, coffee trading, business management etc. The resource persons for the TOT include researchers from universities and research organizations, business practitioners in coffee and other agricultural commodities, and non-government organizations.

Farmers are willing to participate in the partnership in the expectation of obtaining a price premium of US$ 40/ton (Rp 550/kg), although they receive only 70 percent of the price premium, while the remaining 30 percent is retained by the KUBE. Farmers adopting the partnership for sustainability certifications also expect higher productivity from their coffee farming through intensive trainings and better market access in the global trade; hence receiving higher farm-gate prices. The adopter farmers generally have a more positive attitude towards risk-taking activities and rural cooperatives KUBE at the field level compared to non-certified farmers. The interviews with farmers and traders also reveal that the partnership for sustainability certifications in coffee value chains is also seen as a mechanism to improve the trust-level or social capital of farmers, traders, cooperatives and coffee corporations and exporters. The empowerment process through KUBE and/or ICS somehow has improved the community-cooperative governance structures in the field to a certain level. Nevertheless, there is no guarantee that the smallholder farmers completely understand about the farm-gate pricing mechanism and price-setting at the regional or global coffee market.

The second form of partnership for stainability certifications in the study sites is a general trading partnership involving coffee farmers and Ecom corporation, which is not as rigid as the sub-contract partnership. As a global buyer, this company is also interested in securing the supply of coffee bean from the smallholder farmers by implementing sustainability certification schemes, where RFA plays an important role. The company also organizes a field-level training and extension to coffee farmers using their ICS agent in order to improve the quality of coffee beans. The company provides plastic covers for farmers joining the certification schemes to control the temperature and humidity for coffee beans before drying and processing. As one among many important requirements in the sustainability certifications, this farmer empowerment is conducted generally before the verification from third party certification agencies.

As in the sub-contracting patterns, smallholder farmers who join the partnership for sustainability certifications expect higher farm-gate price and technical and economic assistance. At the time of data collection, the company had not bought coffee beans from farmers in the study sites due to a specific policy from the headquarters. Since then, coffee farmers have not obtained the premium, although some farmers claim they have obtained benefits from joining the sustainability certifications in the form of new knowledge and drying facilities. This seems to confirm the studies by Glasbergen (2018), where smallholder farmers do not understand the philosophy behind joining the sustainability certifications in coffee value chains. Even though farmers' knowledge about certification schemes was limited, they have general knowledge on recommended activities, such as harvesting the red cherries and not using banned pesticides. Farmers are simply not aware of differences between the certification schemes and therefore cannot think of the detailed requirements of different certification schemes. Farmers do not have complete information about the difference in emphasis and priority between the global-level certification schemes of 4C, RFA, and local organic certifications (see Ibnu *et al.*, 2015).

(b) Comparison of partnership and non-partnership farmers

The comparison between farmers with the partnership and non-partnership is conducted for all 171 observations, 98 partnership farmers and 73 non-partnership farmers. Table 1 shows the characteristics of partnership and non-partnership coffee farmers in the study sites. Most variables are significantly different at the 5 percent level between partnership and non-partnership farmers, although some characteristics do not differ significantly. After combining the samples in West Lampung and Tanggamus, household

characteristics differ significantly at the 5 percent level, where partnership farmers have fewer household members, were younger (household head), more educated (both household head and the wife), and the dependency ratio was lower (the ratio of productive members to non-productive members of the family).

Table 1. Characteristics of Partnership and Non-Partner Coffee Farmers in Lampung

Variables	Partnership	Non-partnership	All farmers	T-test	
				t-stat	Prob.> |t|
Household Characteristics					
Household member (persons)	3.54	3.96	3.72	-2.45	0.02**
Age of household head (years)	41.6	46.34	43.63	-2.93	0.00***
Education of household head (years)	9.28	8.34	8.88	2.1	0.04**
Education of the wife (years)	9.24	7.94	8.69	2.63	0.01***
Household member 15-65 years (persons)	2.24	2.34	2.29	-0.73	0.47
Household member >65 years (persons)	0.04	0.17	0.09	-2.25	0.03**
Household member <5 years (persons)	0.33	0.37	0.35	-0.55	0.59
Farm Characteristics					
Farm-holding size (ha)	2.18	2.07	2.13	0.34	0.74
Family labor (WPD-work-person-days)	288.53	313.1	299.02	-0.93	0.35
Distance to KUBE-Cooperatives (km)	20.31	26.21	22.83	-2.52	0.01***
Distance to collector traders (km)	0.83	1.08	0.94	-0.85	0.4
Coffee Production					
Farm-gate price (Rp/kg)	23,304	22,172	22,820	2.29	0.02**
Production (kg/year)	744.04	620.31	691.22	1.63	0.11
Farm-holding size (ha)	2.04	1.76	1.92	1.41	0.16
Family labor (WPD-work-person-days)	58.78	104.46	78.28	-3.67	0.00***
Hired labor (WPD-work-person-days)	34.89	37.7	36.09	-0.34	0.73
Total cost (Rp/year)	8,173,049	10,600,000	9,194,151	-2.74	0.01***
Cash cost (Rp/year)	5,287,291	4,992,153	5,161,297	0.44	0.66
Farm Income					
Farm-income from coffee (Rp/year)	12,100,000	9,054,410	10,800,000	2.08	0.04**
Farm-income non-coffee (Rp/year)	22,900,000	13,800,000	19,000,000	2.93	0.00***
Non-farm income (Rp/year)	9,639,363	13,600,000	11,300,000	-0.94	0.35
Total household income (Rp/year)	15,400,000	20,400,000	17,500,000	-1.07	0.29
Income per capita (Rp/year)	56,100,000	65,400,000	60,000,000	-0.84	0.4
Number of Observation	98	73	171		

Note: Exchange rate was US$ 1.00 = Rp 14,400 at the time of survey in July-August of 2018

** Significant at 10% level, ** Significant at 5% level,*

Land-holding size does not differ significantly between farmers with partnerships and those without, for both total farm size and coffee farm size. The distance to the rural cooperatives or KUBE differs significantly among the two groups, where farmers who do not join partnerships live about 6 kilometers further away than those with partnerships. This could suggest an opportunity to form new KUBEs in the villages in order to expand certifications between smallholder farmers and global coffee corporations. Table 1 clearly shows that average coffee production differs significantly, where farmers with partnerships produce 744 kilogram per hectare, far higher than those not joining partnerships (620 kilogram per hectare). The coffee yield of partnership farmers is also higher than the national average, whereas the coffee yield of non-partnership farmers is lower than the national average. Partnership coffee farmers generate significantly higher farm income than those who do not join. Farm costs are significantly higher for non-partnership farmers and their farm income from both coffee and other agricultural products are lower. These results confirm other previous studies that a higher farm-gate price and the additional premium price for contracts between smallholders and global coffee corporations remain important determinants in the implementation of sustainability certifications (Ibnu *et al.*, 2015; Astuti *et al.*, 2015, Glasbergen, 2018; Arifin *et al.*, 2019).

(c) Econometric analysis of partnership participation and its effect on farm income

The econometric analysis is performed with pooled data from West Lampung and Tanggamus in order to increase the degrees of freedom in the analysis. We assume that the effect of each explanatory variable is the same between coffee farmers in West Lampung and in Tanggamus. The econometric analysis consists of three parts: (i) a probit model to estimate partnership participation in sustainability certifications, (ii) an ordinary least square (OLS) regression of farm income as a function of various household characteristics and a dummy variable representing partnership participation, and (iii) an estimation of farm income using the treatment effects model, instead of OLS.

The result of the probit model for partnership participation is presented in Table 2. The results show that the model correctly predicts which coffee farms have a contract in 74.9% of the cases. Age and education of the household head, the land holding size of the coffee farm and distance to rural cooperatives-KUBE are significantly higher for partnership farmers, reflecting a more mature character in coffee production for partnership farmers. They have a higher level of education of the household head, larger family size and a larger coffee farm compared to that of non-partnership farmers. Finally, the distance to rural cooperatives-KUBE is a strong predictor of participation in the partnership for sustainability certifications. Overall, these results suggest there is some selection in becoming a partnership coffee farmer or joining contract farming for sustainability certifications, but it is in terms of the household head's age, family size, size of coffee holdings and proximity to rural cooperatives-KUBE, rather than the degree of crop diversification or the number of MPTS in the coffee farms. Ownership of a motorbike, car, or coffee processing unit are not significant predictors of participation in the partnerships in coffee value chains.

Table 2. Probit Model of Participation in Partnership in Coffee Production

Variable	Coefficients	SE	P[|Z|>z]
Dependent variable: Partnership participation (dummy)			
Age of household head (years)	-0.025008	0.012660	0.048**
Education of household head (years)	0.080230	0.041486	0.053**
Family size (persons)	-0.280184	0.119672	0.019**
Share of family member 15-65 years (%)	-0.000520	0.007016	0.94
Share of family member >65 years (%)	-0.017399	0.017335	0.32
Holding size of coffee farm (ha)	0.570411	0.249812	0.022**
Holding size of total agriculture land (ha)	-0.237247	0.167195	0.16
Ownership of motorcycle (units)	0.171121	0.118368	0.15
Ownership of car (units)	-0.353176	0.333668	0.29
Ownership of coffee processing equipment (units)	-0.125318	0.231967	0.59
Distance of KUBE-cooperatives (km)	-0.023985	0.007529	0.001***
Distance of collector traders (km)	-0.030655	0.051160	0.55
Income share from coffee farm (%)	0.021093	0.004936	0.00***
Crop diversification-MPTS (dummy)	-0.149881	0.528044	0.78
Constant	0.800947	1.156478	0.49
LR test of Independent equation			
Chi-Squared (14)	60.41		
Probability>Chi-squared	0.00		
% correct predictions	74.85%		

** Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level,*

The result of OLS regression estimates of farm income as a function of various household characteristics and a dummy variable of partnership is presented in Table 3. Only 13 percent of the variance in farm income is explained by the variance of household characteristics and the partnership of sustainability certifications. The income of coffee farmers is positively affected by the proportion of productive family members and being a partnership farmer. Moreover, other regressors show no statistically significance in affecting the farm income of coffee farmers. The coefficient for the partnership variable, 3,754,036, means that being a partnership farmer increases farm income by Rp 3.75 million or $ 269.70, which is a large premium.

Table 3. Regression Analysis (OLS) of Factors Affecting Farm Income

Variable	Coefficients	SE	P[|Z|>z]
Dependent variable: Farm income (Rp/ha)			
Age of household head (years)	-33580.1	85066.5	0.69
Education of household head (years)	-439143.9	272840.5	0.11
Family size (persons)	805457.4	817298.0	0.33
Share of family member 15-65 years (%)	126918.4	48095.3	0.009***
Share of family member >65 years (%)	23569.7	88074.3	0.79
Holding size of coffee farm (ha)	-1918605.0	1651669.0	0.25
Holding size of total agriculture land (ha)	928234.3	1063969.0	0.38
Ownership of motorcycle (units)	-1116510.0	783349.4	0.16
Ownership of car (units)	-1340044.0	2350390.0	0.57
Ownership of coffee processing equipment (units)	-782902.5	1591261.0	0.62
Distance of KUBE-cooperatives (km)	20007.6	51373.0	0.70
Distance of collector traders (km)	-16396.7	405295.4	0.97
Crop diversification-MPTS (dummy)	-2281956.0	3674556.0	0.54
Partnership (dummy)	3754036.0	1712930.0	0.03**
Constant	9031288.0	7931364.0	0.26
R-squared		0.132	
Probability> F		0.063	
Number of Observation		171	

** Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level,*

The result of the treatment effects regression on farm income is presented in Table 4. As mentioned earlier, the model involves two equations: the selection equation estimates the probability of participating in a partnership and the outcome equation estimates farm income as a function of various household characteristics, the contract dummy variable, and the inverse mills ratio (IMR). The IMR is calculated from the selection equation and adjusts the outcome equation for selection bias associated with the fact that partnership farmers and non-partnership farmers may differ in unobservable characteristics not included in the model. This could involve factors such as the understanding of sustainability certifications, farmer skills or intelligence, or environmental conservation concerns. The analysis is conducted with maximum likelihood estimation where all parameters are estimated simultaneously rather than in a two-step process.

Table 4. Treatment Effects Model on Partnership on Income of Coffee Farmers

	Variable	Coefficients	SE	P[|Z|>z]
Selection equation				
Dependent variable: Partnership participation (dummy)				
	Age of household head (years)	-0.020985	0.012299	0.088*
	Education of household head (years)	0.077915	0.041638	0.061*
	Family size (persons)	-0.231552	0.115938	0.046**
	Share of family member 15-65 years (%)	0.000327	0.006896	0.96
	Share of family member >65 years (%)	-0.018034	0.018168	0.32
	Holding size of coffee farm (ha)	0.420692	0.235189	0.074*
	Holding size of total agriculture land (ha)	-0.137818	0.160064	0.39
	Ownership of motorcycle (unit)	0.206351	0.115278	0.073*
	Ownership of car (unit)	-0.381678	0.319896	0.23
	Ownership of coffee processing equipment (unit)	-0.135244	0.239427	0.57
	Distance of KUBE-cooperatives (km)	-0.022388	0.007814	0.004***
	Distance of collector traders (km)	-0.043071	0.049634	0.39
	Income share from coffee farm (%)	0.033179	0.004370	0.00***
	Crop diversification-MPTS (dummy)	-0.079179	0.502074	0.88
	Constant	-0.102708	1.141050	0.93
Outcome equation				
Dependent variable: Farm income (Rp/ha)				
	Age of household head (years)	54086.2	89785.2	0.55
	Education of household head (years)	-584681.6	287461.8	0.042**
	Family size (person)	1746764.0	863156.3	0.043**
	Share of family member 15-65 years (%)	113814.2	50648.2	0.025**
	Share of family member >65 years (%)	54488.1	92759.7	0.56
	Holding size of coffee farm (ha)	-3989568.0	1745324.0	0.022**
	Holding size of total agriculture land (ha)	1880220.0	1122315.0	0.094*
	Ownership of motorcycle (unit)	-1338905.0	824941.5	0.11
	Ownership of car (unit)	-359873.1	2475715.0	0.88
	Ownership of coffee processing equipment (unit)	-312660.5	1675775.0	0.85
	Distance of KUBE-cooperatives (km)	92453.0	54337.6	0.089*
	Distance of collector traders (km)	118913.1	426844.9	0.78
	Crop diversification-MPTS (dummy)	-2040590.0	3868977.0	0.60
	Partnership (dummy)	13700000.0	1937901.0	0.00***
	Constant	-1794142.0	8386664.0	0.83
	ath(ρ)	-0.9314663	0.1367332	0.00***
LR test of Independent equation				
	Wald chi2(15)		66.80	
	Probability>Chi-squared		0.00	
	Number of Observation		171	
	Selected Observation		98	

* p < 0.10; ** p < 0.05; *** p < 0.01

The treatment-effects equation gives results quite similar to those of the probit model presented in Table 2. The results of the outcome equation, which predicts farm income, are very similar to those of the OLS model in Table 3. In Table 4, the simultaneous estimates show that the value of the Likelihood Chi-square ratio (LR chi2) is equal to 66.80 and the prob> chi2 = 0.000 ($p < 0.05$). So at least one independent variable significantly influences the probability that a farmer will join a partnership for sustainability certifications. Partial parameter testing is carried out with the Wald chi2 test. The variables that significantly affect income level are education of household head, family size, the proportion of productive family members, land holding size for coffee and agricultural land, and distance from the house to rural cooperatives- KUBE. The ownership of a motorbike had a significant coefficient in the treatment-effects model, but not in the probit model.

The parameter *mils lambda* represents the correlation between the error terms in the selection and outcome equations. Table 4 shows that the mils lambda is -0.93 and it is highly significant, implying that there is selection bias in the model. So, it is necessary to estimate farm income using the treatment effects regression model. Nevertheless, it is reassuring to know that both versions of the model yield similar results: that the effect of a partnership on farm income is positive and statistically significant. The coefficient on the partnership variable in this model (Rp 13.7 million) is higher than the contract coefficient in the OLS model (Rp 3.75 million), suggesting that farm income of partnership farmers is about Rp 13.7 million (or US$ 985.24) higher than for non-partnership farmers. The results of the qualitative questions from the farmer survey provide more confirmation that the effect of partnership on household income is quite positive. When the farmers in our sample were asked how their income had changed since they began the partnership, the majority reported that their income has increased.

2. CONCLUSION AND POLICY RELEVANCE

The conclusion of the study covers the answers of three specific questions posed in the Introduction section. First, to what degree do smallholder farmers participate in the partnership for sustainability certifications in coffee value chains? The probit analysis of our farm household surveys in Lampung Province suggest that there is some selection or self-selection of partnership farmers for sustainability certifications based on the following important factors: the age and education of the household head, land holding size of the coffee farm and the proximity or the distance from house to rural cooperatives-KUBE. The selection seems to be a bias towards a more mature character in coffee production and towards relatively larger farmers, although the land-holding size by “large coffee farmers” is relatively small, less than 4 hectares. Partnership farmers tend to have more crop diversifications andr more MPTS trees, but the partnership participation is not determined by the ownership of a motorbike, car, or coffee processing units.

Second, does the partnership for sustainability certifications raise the income of the participating farmers? Our results suggest that partnership farmers earn higher farm income than their neighbors who do not join a partnership, particularly due to the high number of productive family members aged 15-65. Furthermore, the treatment-effects regression model suggests that there is a selection bias caused by unobserved differences between partnership and non-partnership farmers, such as entrepreneurial skills, risk tolerance, or intelligence. Farmers joining the partnership expect to receive higher income and access to technical assistance and capacity building.

Third, if the partnership for sustainability certifications raises income, how does it do so, through better farm-gate prices, higher yields, more crop diversifications or MPTS, better value chains, or some other mechanisms? Higher income from coffee among partnership farmers is mostly brought about by higher coffee yields and farm-gate prices. The farm cost components are higher among non-partnership farmers, mostly because of higher imputed expenses for family labor. Total income from coffee farming among partnership farmers is significantly higher than that of non-partnership farmers.

The policy relevance of these results includes that public policy should encourage and support the establishment of partnerships for sustainability certifications. This would include establishing a clear legal framework with written codes of conduct and other necessary consensus provisions that benefit both smallholders and global coffee corporations. Moreover, the roles of ICSs initiated by global coffee corporations in implementing sustainability certification schemes have somehow positively affected the trust level between smallholders and corporations. The ICS and rural cooperatives-KUBE provide an incentive system for smallholders to perform well in meeting the GAPs in coffee production so that coffee corporations can secure the quantity and quality of coffee beans they need. These practices also improve coffee production processes.

The study also calls for further research on the transaction costs of joining a partnership for sustainability certifications in coffee value chains. This will provide more information on the effectiveness of partnerships or contract farming in increasing the farm income and the welfare of smallholder farmers. Such a comprehensive analysis on the institutional arrangement for such partnerships will reveal the efficiency level of coffee value chains; hence the likelihood that the welfare of smallholder coffee farmers will improve. Nevertheless, one should note that the sophistication of partnership rules, contracts and regulations might be quite specific by crop, geographic characteristics and value systems among the smallholders and global corporations.

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