Bulgarian Journal of Agricultural Science, 24 (No 6) 2018, 949–958

Constraints of farm size enlargement in the rice sector of Central Java: A case study

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Abstract

Antriyandarti, E. (2018). Constraints of farm size enlargement in the rice sector of Central Java: A case study. *Bulgarian Journal of Agricultural Science*, *24*(6), 949–958

Rice sector in East Java and Central Java which are the main rice producing areas do not have a comparative and competitive advantage due to the small farm size. Therefore, we need to explore whether both the scale economies related condition and the other conditions are satisfied in Central and East Java. However, in this study we only conducted the field survey in Central Java due to some limitations. This study examines whether the necessary conditions for enlargement of farm sizes are satisfied or not and investigates the constraints of enlargement of farm sizes. The results show that there are some evidences on the existence of scale economies in the study that benefit the enlargement of farm size. The economic condition of farmland lease is satisfied since the large-scale farmer's surplus is greater than that of the small-scale farmer. However, farmland enlargement has not been progressed due to some constraints: 1) there is a surplus labor in the rural Central Java, therefore, they do not lease out the farmland; 2) the existence of 'tanah bengkok' or village; 3) the land market is not competitive, the land tenancy occur between neighborhood and close relationship between owner and tenant, thus large scale farmers do not get incentives to enlarge farm size; 4) fragmentation of land of large-scale farmers; 5) expectation for conversion of agricultural land to non-agricultural land.

Keywords: constraints; farm size enlargement; rice sector; scale economies

Introduction

Rice is the most important food crops commodity in Indonesia. However, the Indonesian rice sector seems to lose global competitiveness, and the government intervenes in the market to achieve food self-sufficiency.

Particularly, in the main rice producing areas of Central and East Java, the rice sector does not have a comparative and competitive advantage (Antriyandarti, 2015). Furthermore, Antriyandarti (2015) as well as Antriyandarti and Fukui (2016) found (based on PATANAS data) that small farm size is one of the important determinants of cost inefficiency in Central and East Java, even though scale economies can be achieved.

This leads us to pose the following question: Why have farm sizes not been enlarged, if the necessary conditions for it were met? To answer this question, we first need to explore whether the condition related to economies of scale as well as the other conditions are satisfied in Central and East Java. Then, if we find that those conditions are satisfied, we must investigate the reasons why the farm sizes of rice producers are still small.

In Indonesia, most rice-growing farmers have small farms and rent agricultural machines. Therefore, economies

of scale may not be achieved for technical reasons. According to Collier and Dercon (2014), small farmers who do not have their own fixed capital can achieve economies of scale due to lower transaction costs of finance; continued access to capital; and government interventions into the organization and logistics of trading, marketing, and storage. There is evidence that market imperfections would actually result in scale economies in agriculture.

Economies of scale will create a situation where large-scale farmers are much more cost-efficient than small-scale farmers. This gap may encourage large-scale farmers to increase their farm size (Deininger et al., 2007). In addition, if there is surplus labor in rural areas, farmers would have difficulty finding job opportunities in sectors other than farming. In such a case, they prefer to cultivate rather than sell or lease their land (Huang et al., 2012**)**. Therefore, the absence of surplus labor is another necessary condition for farm size enlargement (Deininger et al., 2007).

However, Japan has already faced a similar problem as an Asian forerunner, and found that farm sizes in the rice sector have not increased significantly, even after the necessary conditions have been satisfied. Arimoto and Nakajima (2010) pointed out six constraints for farm size liquidation by reviewing existing literature. The constraints are: 1) characteristics of agricultural land (agricultural land is family asset not commercial asset, externality and non-removability) which cause difficulties in transaction of land; 2) property right; 3) investment and cost (the condition of "Relation specific investment" and "Hold up problem" make tenants hesitate to lease in and owner hesitate to lease out); 4) transaction cost; 5) expectation of land diversion; 6) fragmentation of land (Arimoto and Nakajima, 2010).

Takahashi (2012) interpreted the slow progress in farmland liquidation in the agricultural sector of Japan, focusing on the transaction costs related to farmland lease. Kusakari and Nakagawa (2013) also explained the slow liquidation of farm land in Japan from view point of transaction cost and expectation of land diversion.

This study attempts to explore the rice production condition by conducting a field survey in Central Java. Due to some circumstances, we could only conduct the field survey in Central Java. The total harvested area in Central Java and Yogyakarta Province is 1,959,811 ha or 14.2% of the total harvested area in Indonesia; more specifically, 15% of the total production comes from Central Java and Yogyakarta Provinces (BPS, 2014).

In this study, we examine whether or not the necessary conditions for the enlargement of farm sizes are satisfied, and investigate the constraints to enlargement of farm sizes using data from our own field survey in the Sleman and Magelang districts. We hypothesize that the constraints of farm size enlargement are surplus labor in the rural labor market, characteristics of land tenure, fragmentation of land, agricultural land law that discourages land transactions, and an expectation for the conversion of agricultural land to non-agricultural land. We do not examine the "Hold up problem" and "Transaction Cost."

In order to examine whether or not the necessary conditions for enlargement of farm sizes are satisfied, we compare the production cost per weight unit. We also apply the Cobb-Douglas production function to compare the imputed return that belongs to owned land of large-scale farms with those of small- and medium-scale farms. Then, we derive the Marginal Value Product of Land. We examine the first constraint of farm size enlargement by testing the hypothesis of surplus labor through the Cobb-Douglas production function. Furthermore, we investigate the other constraints of farm size enlargement using descriptive analysis.

We also investigate the main restraints on enlargement of farm sizes in rural Central Java. For that purpose, we hypothesize that the factors which restrain enlargement of farm size are surplus labor in the rural labor market, fragmentation of land, relationship-specific investment, agricultural land law that discourages land transactions, and expectations for the conversion of agricultural land to non-agricultural land.

Study Area

We selected two typical rice-growing areas of the Central Java and Yogyakarta Provinces, which account for 15% of the total rice production in Indonesia as our study areas. About 222 rice farm households were selected for interviews through the random sampling method. The two areas belong to the Magelang and Sleman districts of the Central Java and Yogyakarta Provinces.

Geographical conditions

The topographies of Magelang and Sleman are similar because both are basin-shaped plateaus that are surrounded by six mountains (Merapi, Merbabu, Andong, Telomoyo, Sumbing, and Menoreh) so that most of the territory is a water catchment area. The soil was fertile because of the volcanic ash and the abundant water resources. The topography of the Magelang and Sleman districts is lowland with the altitude around 320 m above sea level. The distance from the Mungkid and Godean sub-districts from the central district is 7 km and 10 km, respectively. The total area of the Mungkid sub-district is 3.740 ha, and the total area of the Godean sub-district is 2.684 ha (BPS Magelang Regency, 2014*;* Godean Sub-District in Figure, 2015).

Agriculture conditions

The irrigation conditions are better in Godean than in Mungkid. The farmers in the Godean district enjoy technical irrigation from the Mataram Canal throughout the year, and rice farming as well as triple cropping is possible. On the other hand, in Mungkid, where irrigation is semi-technical from Semaren and Gremeng water resources supply sufficient water, and double cropping during the year or five cropping over a two-year period is common.

The main crop in Godean and Mungkid is paddy. In Sidorejo village, a Godean sub-district, all farmers only plant paddy. However, in Senden village, a Mungkid sub-district, some farmers plant chili, cassava, and papaya. There are three cropping patterns in Sidorejo Village. The first pattern is paddy to paddy to paddy, which means that farmers plant paddy three times in one year (110 plots or 74% of the total plots in Sidorejo). This pattern is dominant in Sidorejo. Some farmers plant paddy five times every two years. Around 23% of total plots in Sidorejo (i.e., 34 plots) apply this pattern. The third pattern is "no crop" to paddy to "no crop" (four plots or 3% of total plots). Farmers cultivate paddy only in the second dry season.

Crop rotation in Senden is more complicated than in Sidorejo; there are four crop rotation patterns in Senden. The first pattern is paddy to paddy to paddy. In this case, the water supply is abundant throughout the year. Therefore, the farmers cultivate paddy all year long. There are 57 plots implementing this pattern. The second crop rotation pattern is the dominant pattern in Senden, which is that a farmer plant paddy five times every two years. 180 plots or around 70% of total plots apply this pattern. The third pattern is to plant paddy only once per year (nine plots). The fourth pattern is cultivating paddy in two seasons of the year and cultivate other crops such as corn, chili, cassava, and bean in the other season. There are 12 plots that practice this pattern.

Table 1. Farm household characteristics

Characteristics	Sidorejo village	Senden village
Number of Households	84	138
Age of household (HH) (year)	56.04	55.82
Education of HH (year)	8.08	7.85
Main occupation of HH (person)		
Farmer (person)	64	116
Non-farm self-employed (person)	12	1
Daily unskilled labor (person)	3	5
Permanent off-farm job (person)	5	16
Subsidiary occupation of HH (person)		
Farmer (person)	19	22
Non-farm self-employed (person)	23	4
Daily unskilled labor (person)	6	8
Permanent off-farm job (person)	4	5
Family member (person)	3.9	3.9
Number of plot	1.77	1.89
Farm size (ha)	0.3919	0.3278
Production (kg/HH)	3259	2424
Self-consumption (kg)	1196.87	719.13
Remittance (thousand IDR)	343.4524	244.7464
Asset for rice farming (million IDR)	219.935	146.386

Source: Farm Household Survey, 2015
Note: Exchange rate in 2015 is USD 1= IDR 13,820

Farm household characteristics

This study uses 222 sample households, comprising 84 households for Sidorejo and 138 households for Senden. Table 1 shows the characteristics of sample households. The overwhelming majority of the sample households are engaged in farming. Some households engage off-farm jobs, such as traders, roof tile makers, craftsmen, public servants, daily unskilled laborers, etc.

Current situation of farmland liquidation in the study area

We divide the farmers by farm size into three groups (Fig. 1). The first group comprises farmers who have farm sizes under 0.5 ha, called small-scale farmers. This type is dominant in the study area, and is represented by about 80.20% of all farmers.

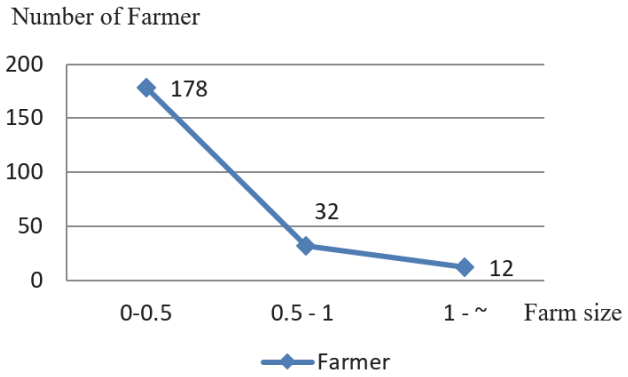

Fig. 1. Distribution of farmers by farm size

The second group comprises farmers with farm sizes between 0.5 and 1 ha, called medium-scale farmers. The number of farmers defined as medium-scale farmers is 14.40%. The last group comprises farmers have farm sizes of more than one ha, and is defined as large-scale farmers. Only 5.40% of total farmers are included in this group.

The majority of rice farmers in Sidorejo and Senden Villages rented paddy field from the owner. Approximately 60 % of total paddy lands is rented, and around 40% is owned. Fig. 2 illustrates the condition of farmland liquidation in study area.

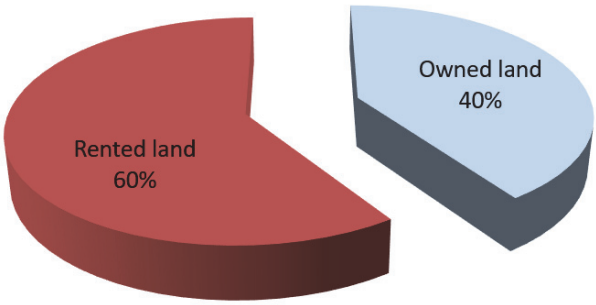

Fig. 2. Farmland liquidation in study area

Material and Methods

The necessary condition for the development of large-scale tenant farming is as follows (Kajii, 1973):

$$Surplus_{\text{large-scale farmer}} \geq Income_{\text{small-scale farmer}} - Utility \text{ of family labor used in small scale farms} \quad (1)$$

If this equation holds, the economic advantage of large farms over small ones is sufficient for large-scale farmers to pay sufficiently high rents to induce small-scale farmers to stop farming and rent out their land.

In order to examine whether or not the necessary conditions for enlargement of farm size are satisfied, we firstly compare the Marginal Productivity of Labor for large-scale farmers with that for small-scale farmers. We also compare the surplus of large-scale farmers with that of small-scale farmers. Finally, we compare the production cost of large-scale farmers with that of small-scale farmers.

We apply the Cobb-Douglas production function to compare the imputed return that belongs to owned lands of large-scale farmers with those of small- and medium-scale farmers. Then, we can get the Marginal Value Product of Land (Allen et al., 2014) through the Cobb-Douglas production function defined as equation (2).

$$lnY_i = \alpha_I lnT_i + \alpha_L lnL_i + \alpha_S lnS_i + \alpha_F lnF_i + \alpha_{Tr} lnTr_i + \varepsilon_i, \quad (2)$$

where

Y = Production per year (kg)
T = Farm size (ha)
L = Total labor (HOK)
S = Amount of seed (kg)
F = Amount of fertilizer (kg)
Tr = Tractor and draft animal (HOT)
ε = Random disturbance

Note: HOK = Workday of labor; HOT = Workday of tractor or draft animal

The marginal value product (MVP) of land is estimated by size class. The economic condition of land liquidation is written as (Kusakari and Nakagawa, 2013):

$$MVP_{\text{large-scale farmer}} > MVP_{\text{small-scale farmer}} \quad (3)$$

Result and Discussion

Scale economy and economic surplus of rice production

Marginal productivity of land

The estimation result of the Cobb-Douglas Production function is shown in Table 2. Variables of farm size, labor, seed, and fertilizer are positively significant to the rice production at the 1% significance level.

Table 2. Estimation result of Cobb-Douglas production function

Variable	Coefficient	Standard Error
Ln Farm size	0.2667***	0.0656
Ln Labor	0.3820***	0.0638
Ln Seed	0.2216***	0.0656
Ln Fertilizer	0.1919***	0.0483
Ln Tractor + draft animal	-0.0210	0.0499
Constant	2.1049***	0.3885
Number of Obs.	222	
R^2	0.7062	
F calculated	103.84***	
Value Marginal Product of land		
0–0.5	771.91	
0.5–1	774.08	
1 – ~	784.46	
Marginal Value Product of labor	45268.59	
H0: VMPL = 50000; t	-2.6254**	

Source: Farm Household Analysis, 2015

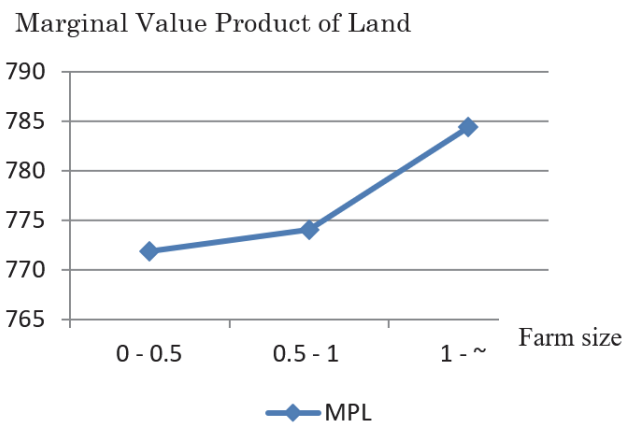

Fig. 3. Marginal value product of land

The marginal value product of land increases as farm size increases. This result supports the existence of the necessary condition for scale economies. Large-scale farmers can expand their farm size by borrowing land from small-scale farmers.

Surplus of rice farmers

The surplus produced by rice farmers to whom land belongs is illustrated by Fig. 4. The surplus produced by large-scale farmers who have farm sizes of more than one ha is more than that of medium- and small-scale farmers. This indicates that the necessary condition of scale economies is satisfied. Large-scale farmers can use the surplus to borrow farmland from small-scale farmers to expand their farm sizes (Kajii's hypothesis).

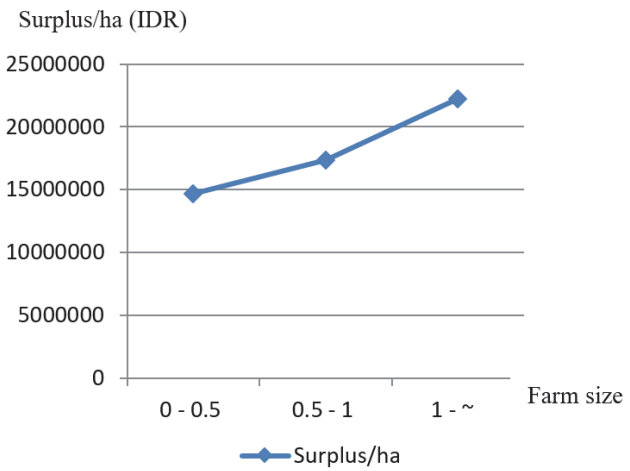

Fig. 4. Surplus per hectare in study area

Production cost/unit

The relationship between farm size and production cost per weight unit is illustrated in Fig. 5. The production cost per unit will decline along with increasing farm size. This means that economies of scale are achieved in the study area. Scale economies are achieved because large-scale farmers have draft animals and/or agricultural machines, such as tractors, hand tractors, threshers, and rice mills.

Seed cost/unit

This paper also compares the costs of inputs of large farmers with those of medium and small farmers to capture the transaction process of each category of farmers. According to Mahipal (1992), large-scale farmers have bargaining power that enables them to buy inputs such as seeds, chemical fertilizers, and so on at cheaper rates, while small-scale

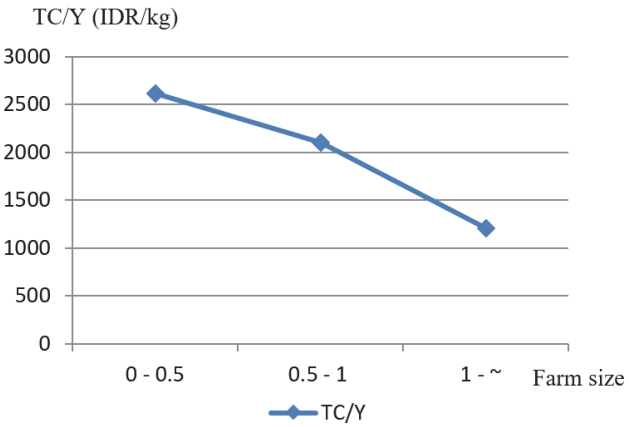

Fig. 5. Production cost/unit

farmers cannot do so. Therefore, we observe this evidence to support the examination of the existence of scale economies in the study areas.

The seed cost per weight unit decreases as farm size increases (Fig. 6). According to Table 3, large-scale farmers more easily get discounts for seed transactions. This suggests that large-scale farmers have stronger bargaining power in seed purchasing than small-scale farmers.

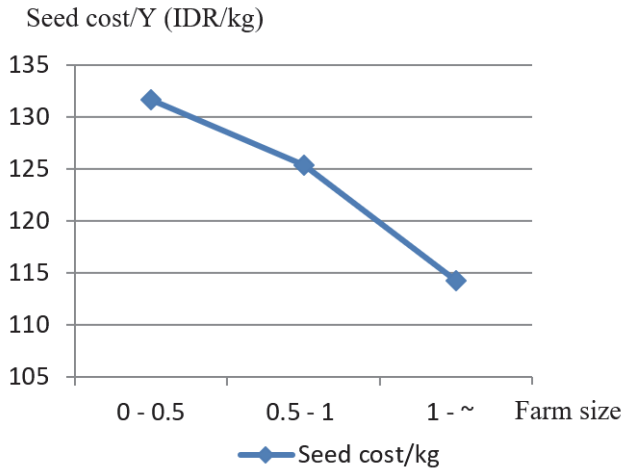

Fig. 6. Seed cost/unit

Fertilizer cost/unit

Similar cases occur in fertilizer input. The fertilizer cost per weight unit also decreases as farm size increases (Fig. 7). Some small-scale farmers prefer to make their own fertilizer (manure) rather than to purchase chemical or organic fertilizers at the shop or farmer group (Table 4).

Table 3. Seed transactions in study area

How to buy seed	0–0.5 ha	0.5–1 ha	1 ha–~
Prepared by himself	30.9%	28%	8.33% The farmer also gets free seed from the government
Agriculture shop	59% 6.7% of farmers get a discount of IDR 600–2,000/kg	69% 13.6% of farmers get a discount of IDR 8,000/10 kg	75% 44.4% of farmers get a discount of IDR 8,000–10,000/10 kg
Farmer group	2.8% 80% of farmers get subsidies 3–10 kg	–	8.33% of farmers get a discount of IDR 10,000/5 kg
Neighbor	5%	3%	–
Agriculture cooperative (KUD)	1.1% All farmers get subsidies of 10 kg	–	8.33% of farmers get a discount of IDR 2,000/kg
Hamlet storage	0.6% of farmers get a subsidy of IDR 2,000/kg	–	–
Seed center	0.6% of farmers get subsidies of 10 kg	–	–

Source: Farm Household Survey, 2015

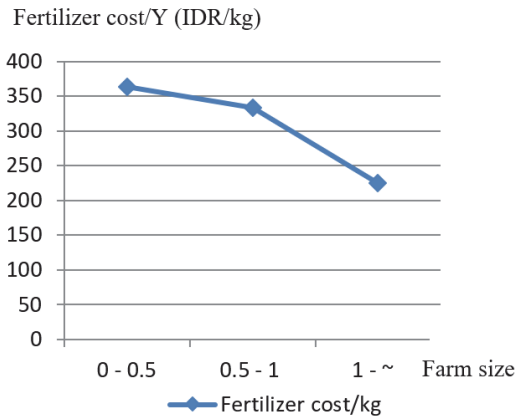

Fig. 7. Fertilizer cost/unit

Although the Ministry of Agriculture manages the fertilizer subsidy, farmers do not access this facility automatically. If the farmer is an active member of a farmer group, the subsidy is easily accessible (which is the main motivation for a farmer to join a farmer group). However, complicated administration systems regulate access to subsidies through farmer groups. Therefore, most farmers buy fertilizers at agriculture shops. Large-scale farmers have stronger bargaining power to access subsidies and discount facilities than small-scale farmers.

Pesticide cost/unit

Similar to seed and fertilizer, the pesticide cost per weight unit also declines along with increasing farm size (Fig. 8).

Table 4. Fertilizer transactions in study area

How to buy fertilizer	0–0.5 ha	0.5–1 ha	1 ha–~
Made by himself	7.3%	–	–
Agriculture shop	85.4% 30.9% of farmers get a subsidy of IDR 5,000–15,000/50 kg	94% 33% of farmers get a subsidy of IDR 5,000–15,000/50 kg	75% 55.5% of farmers get a subsidy of IDR 5000–15000/50 kg
Farmer group	4.5% Farmers get a subsidy of IDR 5,000–30,000/50 kg	6% Farmers get a subsidy of IDR 5,000/50 kg and IDR 30,000/50 kg	8.33% Farmer gets a discount of IDR 30,000/50 kg
Distributor	2.2% 75% of farmers get a subsidy of IDR 100/kg and IDR 3,000/50 kg	–	–
Agriculture cooperative (KUD)			8.33% Farmer gets a discount of IDR 30,000/50 kg
Hamlet head	0.6% Farmer gets subsidy for urea of IDR 50,000/50 kg and for phonska of IDR 30,000/50 kg	–	8.33% Farmer gets subsidy of IDR 40,000/50 kg

Source: Farm Household Survey, 2015

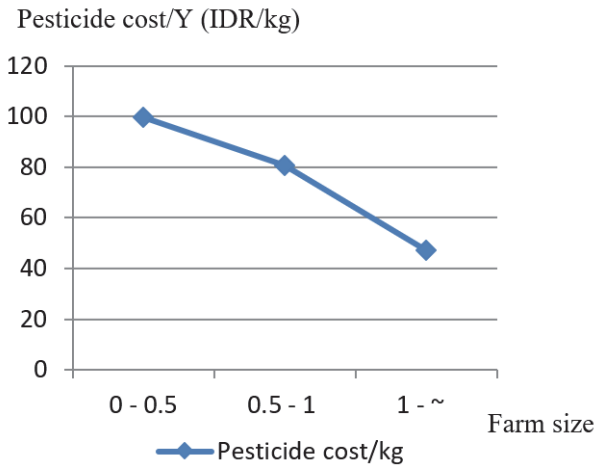

Fig. 8. Pesticide cost/unit

Labor cost

The relationship between farm size and labor cost per weight unit is illustrated in Fig. 9. Large-scale farmers have the bargaining power to determine a hired labor wage that is less than the standard wage (Fig. 10). Thus, the labor cost per weight unit declines as farm size increases.

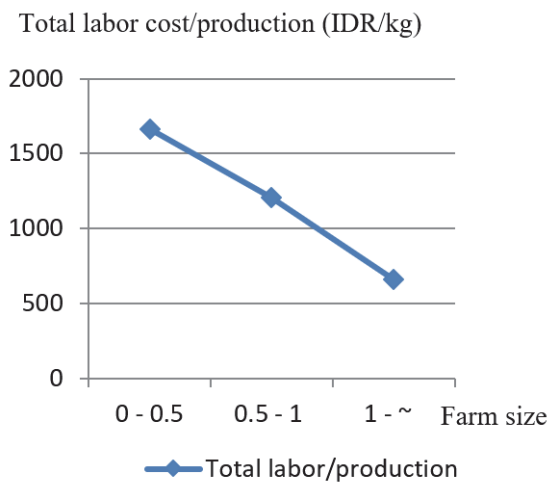

Fig. 9. Labor cost/unit

Tractor cost and draft animal cost

Tractor cost per weight unit decreases as farm size increases. Some medium- and large-scale farmers have hand tractors, big tractors, or draft animals for rice production.

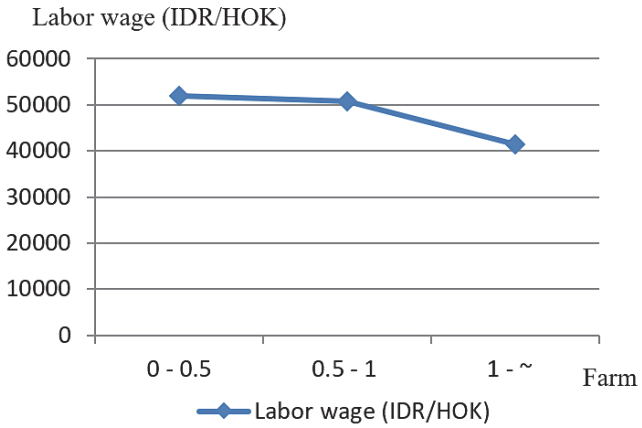

Fig. 10. Labor wage/HOK (HOK = Workday of labor)

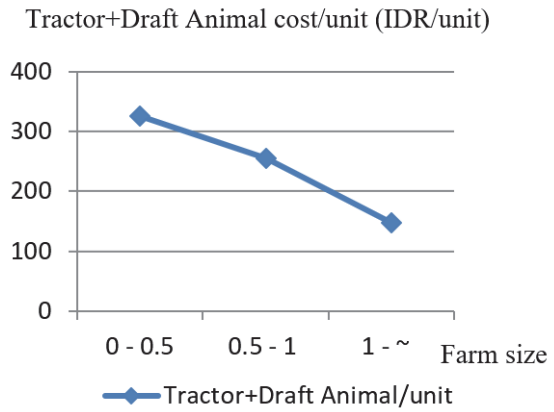

Fig. 11. Tractor and draft animal cost/unit

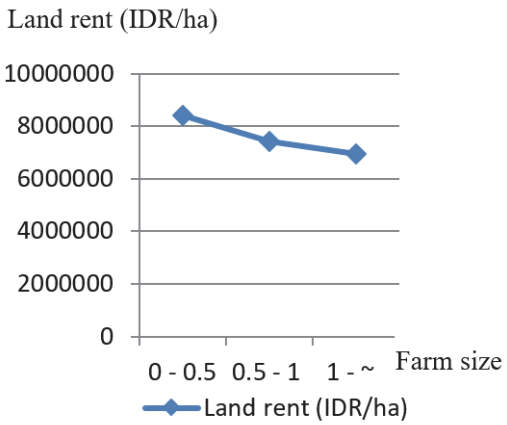

Fig. 12. Land rent/unit

Land rent

According to Fig. 12, the land rent per hectare declines as farm size increases due to the stronger bargaining power of large-scale farmers.

Investigation of constraints on farm size enlargement

Surplus labor

Deininger et al. (2007) concluded that the existence of surplus labor in rural areas restrains farm size enlargement. Therefore, we need to examine the existence of surplus labor in study areas. From the empirical model of the Cobb Douglas production function in equation 2, we test the hypothesis of surplus labor (Ranis, 1997). Surplus labor exists when the Marginal Value Product of Labor is below the market wage rate. In this study, we test the null hypothesis that the Marginal Value Product of Labor equal to the market wage rate amounted to IDR 50,000.

The estimation result in Table 2 shows that the null hypothesis is rejected at the 5% significance level. Thus, the Marginal Value Product of Labor is smaller than the market wage rate. This indicates a surplus of labor in the study area.

Characteristics of land tenure system

Arimoto and Nakajima (2010) stated that the characteristics of agricultural land tenure are a constraint (1) of farm size enlargement. In order to investigate this constraint, we observe the characteristics of land tenure in the study areas. We found that the majority of plots are leased in, amounting to 98 plots in Sidorejo and 104 plots in Senden. Most of the farmers lease the plot from their neighbors. The second choice is to lease the land from their relatives. Farmers tend to lease farmland only from a person with whom they have a close relationship. This behavior is similar when farmland is leased out. Farmers only rent the land to relatives or neighbors. In Sidorejo village, farmers lease out the land only to their relatives. Some farmers lease in the land with the status "tanah bengkok" or village land.

According to Fukui (2009), the personal relationship between landlord and tenant in Central Java influences the tenancy contract decision. In Sidorejo village, three cases are fixed-rent contracts, and 95 cases are "maro" contracts. Meanwhile in Senden village, there are nine fixed-rent contracts, five "moro telu" contracts, and 128 "maro" contracts. "Maro" is a share tenancy contract in which the sharing rate of the tenant is fifty percent of the gross output. "Moro telu" is a share contract in which the sharing rate of the tenant is one third of the gross output. The forms of tenancy are mainly determined by personal relationships, rather than commercial relationships. This indicates that the land market is not competitive.

Table 5. Land tenure in study area

	Sidorejo village	Senden village
Owned Land (plot)	49	109
Lease in (plot)	98	144
Relation to owner:		
Friend	14	1
Neighbor	48	87
Relative	31	53
Tanah Bengkok (village land)	2	2
others	3	1
Lease out (plot)	2	8
Relation to tenant:		
Neighbor	–	5
Relative	2	3
Total (plot)	149	261

Source: Farm Household Survey, 2015

Land fragmentation

Constraint (6) of Arimoto and Nakajima (2010) is fragmentation of land. Thus, we also investigate the fragmentation of land in the study areas. Land fragmentation is not always disadvantageous, though there are more disadvantages than advantages. Land fragmentation creates economic and production problems because of increased time, work, and organization required by the plots' distance (Lusho and Papa, 1998). In the study area, most of the farmers have all their land in only one plot. Table 6 shows the number of farm holdings by level of fragmentation in each village and hamlet.

From the Table 7, we can see that the farmlands of large-scale farmers are fragmented into two to six plots in both villages.

Table 6. Land fragmentation by village and hamlet

Village	Number of holdings by plot fragmentation					
Hamlet	1	2	3	4	5	6
Sidorejo	37	33	7	4	1	–
Kwagon	23	21	4	2	1	–
Pare 2	1	4	–	–	–	–
Pare 3	11	8	1	2	–	–
Pare 4	2	2	2	–	–	–
Senden	67	38	21	7	3	2
Senden	12	3	3	1	1	1
Ngabean	6	5	3	2	–	1
Butuh	7	9	4	1	–	–
Loning	8	7	3	1	–	–
Bangsan	12	5	1	–	1	–
Kempulan	12	4	3	–	–	–
Brogo	10	5	4	2	1	–

Source: Farm Household Survey, 2015

Table 7. Land fragmentation by size and village

Village	Number of holdings by plot fragmentation					
Farm size categories (ha)	1	2	3	4	5	6
Sidorejo						
0–0.5	33	27	3	2	–	–
0.5–1	4	4	2	1	–	–
1–~	–	4	2	1	1	
Senden						
0–0.5	65	32	13	3	–	–
0.5–1	2	5	7	4	2	1
1–~	–	1	1	–	1	1

Source: Farm Household Survey, 2015

Table 8. Average price and earning capitalized value of land in Sidorejo and Senden village 2010–2015

Year	Sidorejo (IDR/1000 m^2)		Senden (IDR/1000 m^2)	
	Price of land	Earning capitalized value of land	Price of land	Earning capitalized value of land
2010	100,000,000		75,000,000	
2011	125,000,000		100,000,000	
2012	150,000,000		125,000,000	
2013	200,000,000		150,000,000	
2014	250,000,000		175,000,000	
2015	300,000,000	160,868	200,000,000	151,050

Source: Sidorejo and Senden villages, 2015

Land law

This constraint relates to constraint (2) of Arimoto and Nakajima (2010). We also need to investigate the current land law in Indonesia. The land policy period of 1945–1960 focused on improving control and ownership of the colonialist system, and transformed it into a national system. In 1960, the Indonesian government set legislation regarding sharing the system to protect small farmers and agricultural laborers. This land reform was implemented until 1965. Then, in 2001, Indonesia implemented the realignment of control, ownership, use, and utilization of land (land reform) to be fair with land ownership. Furthermore, the government established a decentralized form of authority at the national, provincial, district, and village levels to allocate and manage agricultural and natural resources. Policies give autonomy to villages in Indonesia, especially in Java, to regulate land issues in accordance with the situation and local culture (Tjondronegoro and Wiradi, 2008). Since 2009, the Indonesian government has issued a law in protection of farmland to ensure sustainability of agriculture (Masyhuri, 2015).

Under the current land law in Indonesia, in the new era of decentralization, rice farmers are encouraged to expand their farm size. Land law is implemented in a relatively fair manner for both tenant and owner. Thus, land law does not constrain farm size enlargement.

Expectation for conversion of agricultural land to non-agricultural land

When farmland is converted to non-agricultural use, the price of land is 30–140 times higher than its earning capacity under agricultural use. This reflects farmers' expectations of capital gain from farmland conversion, and farmers therefore do not have motivation to lease out the land for farming (Godo, 2007; Arimoto and Nakajima, 2010). Table 8 illustrates the trend of land prices in both villages.

Table 8 shows that the price of land is much higher than the earning capitalized value of land. This leads to farmers not wanting to lease out their farms; they have an economic incentive to keep their land.

Conclusions

The purpose of this paper is to examine whether or not the necessary conditions for farm size enlargement are satisfied, and to investigate the constraints on farm size enlargement using our field survey data. The results show that there is some evidence for the existence of economies of scale in the study that benefits the enlargement of farm size. The economic condition of the lease of farmland is satisfied, since the large-scale farmer's surplus is greater than that of the small-scale farmer. However, rice farmers in Central Java do not choose to enlarge farm size. We observed many cases of land tenancy in the study areas. Farmland liquidation is widely observed in rural Java. The possible reasons why farmland enlargement has not progressed are: 1) there is a surplus of labor in rural Central Java, therefore, they do not lease out the farmland; 2) the existence of "tanah bengkok" or village; 3) the land market is not competitive, the land tenancy occurs between neighbors and where there is a close relationship between owner and tenant; large-scale farmers do not get incentives to enlarge farm size; 4) fragmentation of land of large-scale farmers; 5) expectation for conversion of agricultural land to non-agricultural land. The land law in Indonesia is not a constraint of farmland enlargement.

The main fact findings are in line with the constraints which Deininger et al. (2007) as well as Arimoto and Nakajima (2010) present. Constraints (2) and (3) are related to constraint (1) of Arimoto and Nakajima (2010). Constraints (4) and (5) are also related to constraints (6) and (5) of Arimoto and Nakajima (2010), respectively; constraint (1) is related to Deininger et al. (2007).

The Indonesian government faces the difficult problem of promoting farm size enlargement. It may implement an alternative mixed policy to overcome this difficulty. The Indonesian government needs to facilitate the development of off-farm jobs in rural areas to properly reduce the surplus labor. Therefore, small-scale farmers prefer to lease out their farmland. This is also an imperative from the perspective of

poverty reduction, because small-scale farmers can receive higher income. Moreover, irrigation and land consolidation should be developed to reduce land fragmentation. To control land conversion, which is the main factor of fragmentation of paddy field in sub-urban areas, regulations for agricultural land utilization should be established. Efforts to reduce the rate of conversion of agricultural land for the future are about how to protect agricultural land through spatial planning and control, how to increase optimization, rehabilitation and extension of the land, how to increase productivity and efficiency of farming, as well as how to control population growth.

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Received: December 26, 2017; *Accepted*: March 22, 2018; *Published*: December 31, 2018