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ANALYSIS OF EFFICIENCY ON RICE FARMING

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ABSTRACT: The research aims to analyze the efficiency on rice farming business and factors that affect rice production associated with participation in farmer groups. The research was conducted in Senduro Village, Senduro District, Lumajang Regency. Analysis method in this research included revenue, cost and efficiency on rice farming, as well as multiple regression of production function. The results show that there are different performance among farmers who are member and non-member of farmer's group. Productivity to the farmers who are member of farmer group was 8.776 tons per hectare and non-member was 7.275 tons per hectare. Farmers in the group gained higher revenue (IDR 37.74 million per hectare) compared to non-member (IDR 31.28 million per hectare). Production cost to the farmers who are member of farmer group reached IDR 12.69 million per hectare and non-member was IDR 12.55 million per hectare, with efficiency values (R/C) 2.97 and 2.49, respectively. Farmers who become member of the group adhered better farming practices which use more efficient fertilizer, more intensive irrigation and more seeds. Rice production is significantly affected by land size and the group membership. Ten percent increasing in land size would increase production by 2.4 percent. However, for the other factors, i.e, age, education, number of family member, seeds, manpower and fertilizer had no significant effect on rice production.

Keywords: farmer group, farming, rice, production, Lumajang

INTRODUCTION

Development in agricultural sector can accelerate the growth of national economy. Development in agricultural sector is expected to improve farmer's welfare and to mobilize other sectors in order to generate national economic growth. The scope of agricultural development includes institutional, social, environmental, farming and processing technology to marketing. Rice is main commodity, as staple food of Indonesia. In 2015, national rice production reached up to 5,289 tons per hectare, with total production 74.99 million tons of milled rice (CBS, 2016a). The performance of national rice production is affected by many factors, including land use, natural resources, cultivation technology, production factor, land ownership, rice price and input factor price, and institutional aspect. Various effect from these factors determined by regional conditions and farming community. Provinces in Java Island generally have farmer and cultivation characteristic with more advanced technology and productivity reached up to 6.0 tons of milled rice per hectare. Rice production sustainably reflects their farm and give welfare to the farmers.

Study on rice farming has became an important framework to monitor performance of national rice production. So far, farmers prefer to rice cultivation because it is economic and accounted for 25 percent of production value (Table 1). Particularly, rice cultivation conducted intensively using production factors as recommended by local official in charge of farming. Production cost mainly distributed for wages (about 48 to 62 percent), land lease (18 to 30 percent) and fertilizer (7.8 to 10 percent).

Rice farmer position is also somewhat unique. Indonesian farmers are not only functioned as producer, but also they are consumer. This kind of consumer usually farmers who own small farm land. Based on National Agriculture Census in 2013, the average of land tenure for paddy field and dryland rice is 0.20 and 0.66 hectare per household respectively (CBS, 2014). The Ministry of Agriculture (2014) showed that, at national level, main food crops

providing 47 percent income for farmer households, in which 59 percent in Java and 37 percent outside Java. Further, it motivates farmers to create more efficient farming so that it will generate an incentive to maintain rice farming or other food crops.

Table 1. Overview for paddy field and dryland rice

Explanation	Paddy Field		Dryland Rice	
	Value (IDR)	% cost	Value (IDR)	% cost
	thousand per hectare	%	thousand per hectare	%
A.Production Value	17,174.66	–	10,249.76	–
B.Production Cost	12,677.27	100.00	7,821.90	100.00
1. Seeds	406.97	3.21	282.23	3.61
2. Fertilizer	1,318.60	10.40	607.27	7.76
3. Pesticide	233.96	1.85	135.33	1.73
4. Wage and Service Cost	6,114.71	48.23	4,877.45	62.36
5. Land Lease	3,785.42	29.86	1,387.50	17.74
6.Equipment Lease	328.92	2.59	175.30	2.24
7. Fuel	86.48	0.68	70.99	0.91
8. Others	402.22	3.17	285.82	3.65

Source: BPS (2016b)

Efforts to increase rice cultivation can be conducted through farmer group organization. It is more relevant to farming management of small size land. The farmer group is farmer community that created based on mutual interest; similarity in social, economic, environmental and commodity; and familiarity to improve and develop member's agricultural business (Regulation of Agriculture Minister of Republic of Indonesia Number 130 / Permentan / SR.130 / 11/2014 concerning Demand and Retail Price of Subsidized Fertilizer for Agriculture Sector of Fiscal Year 2015). Farmer group is an institution that horizontally brings farmer together and be created in one village, agricultural planting areas and gender (Syahyuti, 2007).

Farmer group has wide functions, started to organize farming activities, improve management scale, share information, do learning and counseling and as a forum for social empowerment. Soedijanto (1999) stated that the farmer group serves as classroom of learning, cooperation and production system. Farmer group also organizes joint activities and friendship in self-help and self-financing to the farming business. In addition, farmer group is a form of consolidated agriculture. In the group, farming technology, provision of means of production, capital and marketing is conducted together, so that it will be more optimum and efficient. Farmer group that shows optimal function can increase productive behavior of its members, promote farming sustainability, create welfare for farmers and their families (Sudaryanto and Rusastra, 2006). Through farmer group, government programmes can be implemented such as fertilizer distribution, agricultural extension services, technology adoption and other programmes. BPS (2016b) showed that only 30 percent farmers who join the farmer group.

Rice cultivation in the Senduro District, Lumajang, has been carried out intensively. The soil develops from volcanic materials. In general, soil characteristic shows high fertility supported by technical irrigation. In Senduro District, some farmers join Sumber Makmur farmer group, while others just operate individually. Both farmer types – member or non-member of farmer group–conduct rice cultivation in small size paddy field. Exploring business performance related to rice farmers in Senduro expected to provide information in order to increase rice productivity and to improve farmer's welfare.

The aim of this research was to study rice farming business analysis and factors that affected rice production with the insight of farmer participation in farmer group membership.

RESEARCH METHOD

Research conducted in Senduro Village, Senduro District, Lumajang Regency. Respondent in this research was rice farmers. Purposive sampling obtained from population of 325 farmers, in which 29 were member of farmer group (Sumber Makmur farmer group). Sample was divided into member and non-member of farmer group – each category was 25 farmers. Primary data obtained through interview that conducted by questionnaire and secondary data taken from various sources.

Analysis method included revenue, expense, and efficiency of farming analysis. It was conducted by using the equation below:

$TR = P. Py$

$\pi = TR - TC$

$TC = FC + VC$

E = TR/TC

Where: TR is total revenue, P is production and Py is selling price; π is income, TC is total cost, FC is fixed cost, VC is variable cost and E is efficiency. Cost in that equation includes fixed costs (such as depreciation expense, land tax, tractor engines) and variable costs (such as fertilizer, labor, and pesticide).

Multiple regression analysis used to determine factors that affect production using the equation below:

$$Y = a + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b5X6 + b7X7 + D + \varepsilon$$

Where: X1 is land area (m^2), X2 is age (years), X3 is education (ungraduated from Elementary School = 0, Elementary School = 1, Secondary School = 2), X4 is number of family members (people), X5 is number of labor (person-days), X6 is fertilizer (kg per ha), X7 is seed (kg per ha), D (dummy variable) is farmer group membership. While a is intercept and b1, b2, ... b7 are coefficient and ε is error. Some variables are transformed to meet production function equation.

RESULT AND DISCUSSION

General description

The geographical position of Senduro District located between 07058`10" to 08009`53" south latitude and 112055`23" to 113009`47" east longitude. Senduro District has boundaries, in the north bordered by Gucialit District and Probolinggo Regency, in the east bordered by Sumbersuko Sukodono District, in the south bordered by Pasrujambe Districts and in the west bordered by Malang Regency.

Senduro District area is about 228.67 square kilometers. In 2014, the land use of Senduro District covers the land field for 62 hectares, residential about 75 hectares, dry land about 189 hectares, orchard about 157 hectares, forest about 87 hectares and yard area about 23 hectares. The landscape includes lowlands in the eastern region and the mountains in western region as part of Tengger Semeru. Rainfall is about 1,500 mm per year and located at altitude of 500 to 700 above sea level. Soil fertility level consists of 208 hectare of high fertile soil, 480 hectares of fertile soil and 5 hectare of degraded soils (Senduro Village Office, 2015).

Until the end of August 2014, population in Senduro was 6817 people or 1,806 families, consists of 3,551 male and 3,266 female. The number of productive population (15 to 64 years old) amounted to 5,064 persons or 74.3 percent. Farmer types in this District consist of farmer and land owner was 16 percent and 20.5 percent of farm workers (labor). Education level of the population mostly was Elementary School (34.5 per cent) and secondary (32 percent) (Senduro Village Office, 2015).

Farming Systems Analysis

The result of rice farming analysis presented in Table 2 and 3, while efficiency presented in Table 4. Respondents who join with Sumber Makmur Farmer Group had total land area of 11,900 square meters or 1.19 hectares (ha), average ownership was 476 sq m and the average productivity was 8,776 tons per ha. Meanwhile, 25 farmers who are non-member had total land area of 1.40 ha, an average ownership of 559 sq m and the average productivity of 7275 tons per hectare.

Table 2. Production and Revenue of Rice Farming

No	Explanation	Member of Farmer Group	Non Member
1	Production (Kg/ hectare)	8,776	7,275
2	Price (IDR/kilogram)	4,300	4,300
3	Revenue (IDR) (thousand/ hectare)	37,737	31,280

Source: Data from research result

Rice productivity in this research, in general, was quite high with an average of 7.965 tons per hectare. It was above the average of national rice production for 5.289 tons per hectare, or above the average of East Java rice production for 6.109 tons per hectare (CBS, 2016a). It was due to the high technology of intensive rice cultivation had been mastered by farmers and supporting factors of soil fertility and climate. Senduro Village is also capital district of Senduro region, which has a municipal facility which provides information, market, infrastructure and institutions to support the farmer's life and agriculture development, especially rice farming. Various needs of rice farming are basically available in the district.

Rice productivity of farmers who are member of farmer group was higher than non members of farmer group. This phenomenon showed that the real function of a group provides farming instructional media, changing attitude and behavior to be more productive. As a result, they obtained benefit from the higher revenue (IDR 37.74 million per ha) compared to non-member farmers (IDR 31.28 million per ha). Phenomena of farmers who join the farmer group and obtained higher revenue than non-member farmers found in rice commodity (Ikbal, 2014) and Citrus Nobilis (Ridjal, 2008)

According to BPS (2014), an increase of higher income motivated farmers in the involvement of farmer group, despite increasing access to information and means of production. It might provide an incentive for farmers to participate more actively in the group and maintaining benefits that acquired from the farmer group. Actual condition indicated that Sumber Makmur Farmer Group was established not more than 10 years ago. Farmer participation not only conducted by regular weekly meetings (every Monday) which discusses about farming activities, but also social gathering for friendship and togetherness. Farmer group management need to be improved in order to obtain more optimal benefits.

Table 3. Cost of Rice Farming

No	Type of Cost	Member of Farmer Group		Non Member	
		Value (IDR)	Proportion	Value (IDR)	Proportion
		Thousand	%	Thousand	%
1	Labor	4,951	39.0	4,552	36.3
2	Fertilizer				
	Urea	1,698	13.4	2,118	16.9
	Za	931	7.3	1,655	13.2
	Phonska	1,797	14.2	1,451	11.6
3	Seeds	446	3.5	345	2.7
4	Pesticide	446	3.5	437	3.5
5	Irrigation	1,698	13.4	1,408	11.2
6	Depreciation	137	1.1	101	0.8
7	Tax	588	4.6	481	3.8
	Total	12.691	100.0	12,548	100.0

Source: Data from research result

In farmer group member, the cost of rice farming reached IDR 12.69 million per ha, while for non-member was IDR 12.55 million per hectare (Table 3). Proportion of expenditure in farmer group member included labor cost (39 percent), fertilizer (Urea 13.4 percent, ZA 7.3 percent and Phonska 14.2 percent) and irrigation (13.4 percent). The same proportion of expenditure in non-member farmer group consisted of labor cost (36.3 percent), fertilizer (Urea 16.2 percent, ZA 13.2 percent and Phonska 11.6 percent) and irrigation (11.2 percent). In general, value to the cost of rice farming did not vary much between member and non-member of farmer group. However, from cost details, it appeared that member of farmer group performed better cultivation practices, applied more efficient and balanced fertilizer (Phonska is important as nutrients and phosphorus source), used more intensive irrigation and more seeds.

This result did not differ much from the average cost of national level for IDR 12.68 million per hectare (CBS, 2014). The expenditure distributed mainly for labor (minimum 36 percent), fertilizer (minimum 34 per cent) and irrigation (minimum 11 percent) that reached about 80 percent from total cost. Nationally, (CBS, 2014), labor cost is 48 percent, 10 percent fertilizer, seed and pesticide 3.2 percent and 1.9 percent. The high proportion of fertilizer cost in this study compared to national cost showed relatively high level of intensification.

It was interesting to see the proportion of fertilizer cost. Member of farmer group used fertilizer more efficiently and impartial which applied Phonska (P) as nutrients and phosphorus source. However, non-member farmers still concerned about Urea and ZA as nitrogen (N) source. This phenomenon showed that there was learning about fertilization in Sumber Makmur farmer group including fertilizer needs, fertilizer efficiency and balanced fertilizer.

Table 4. Efficiency of Rice Farming

Cost and Revenue	Member	Non Member
Revenue (IDR of thousand/ha)	37,737	31,280
Total Cost (IDR of thousand/ha)	12,691	12,548
R/C Ratio	2.97	2.49
Description	Profit	Profit

Source: Data from research result

The efficiency of rice farming in member of farmer group was higher (2.97) compared to non members (2.49). It proved that the farmer group worked to realize prosperity for its members. They learn from each other and apply more efficient cultivation technology (Nuryanti and Swastika, 2011). Although the cost of rice farming almost had no different between member and non-member of farmer group (12.69 versus 12.55 million per ha), however, rice productivity and the revenue in member of farmer group exceeded non-member of farmer groups.

Factors that Affected Rice Production

Factors that affected rice production presented in Table 5. The result of multiple regression analysis showed that there was no significant effect on income variable, with F value 1.349; p-value 0.248 and R square 0.208. Regression equation could be written as follows:

$$Y = 6.42 + 0.24X1 - 0.00X2 - 0.03X3 - 0.01X4 + 0.05X5 - 0.03X6 + 0.230X7 + 0.29X8$$

However, seen from value of $t_{statistics}$, there seemed to be significant variable to the level of 0:10 for land area (X1) and farmer group membership (X8). While for the other factors, i.e., age, education, number of family members, seeds, fertilizer and labor had no significant effect on rice production.

Table 5. Estimation of farmer's rice production

Estimation	Coefficient	$t_{statistics}$	p-value
Constant	6.417	2.951	0.005
Land Area (Ln X1)	0.240	1.783	0.082
Age (X2)	-0.003	-0.393	0.696
Education (X3)	-0.027	-0.229	0.820
Number of Family Members (X4)	-0.014	-0.192	0.849
Seeds (Ln X5)	0.055	0.222	0.826
Fertilizer (Ln X6)	-0.033	-1.070	0.291
Labors (Ln X7)	0.230	1.143	0.260
Farmer Group Membership (X8)	0.287	2.733	0.009

F = 1.349, p-value=0.248; R Square = 0.208
Source: Data from research result

Land area factor is a variable in production function (Soekartawi, 2001), so that it is reasonable to give an effect on production. The larger land area (economic scale), the higher opportunity to apply greater farming technology which led to the production increase.

Ten percent increase in land area will increase production by 2.4 percent. Labor factor showed significant effect at p-value 0.260. Employment in the farmer group generally was more efficient – about 118 people per hectare – compared to non-member of farmer group that was about 131 people per hectare (Table 6). This efficiency might be caused by the learning in the farmer group. In the farmer group, they taught about how to practice efficient cultivation technology, for example, applying Legowo planting system (Balitbangtan, 2013), thus it results in better access to seeds, fertilizer and harvest maintenance.

Table 6. The use of labor on rice farming business

No	Explanation	Member	Non Member
		HOK/Ha	
1	Minimum	63	53
2	Maksimum	240	244
3	Average	118	131

Source: Data from research result

In addition, member of farmer group also taught about seeds and fertilizer efficiency. Although it had no significant effect, however, more qualified seeds could increase rice production. Actual condition showed that there were many farmers that still used unhealthy rice seeds so that it yielded low rice production. The use of seeds to the member of farmer group had an average of 48 kg per hectare, with minimum use of 31 kg per hectare and maximum use of 80 kg per hectare (Table 7). Meanwhile, non-member of farmer group used more seeds, minimum of 30 kg per hectare and maximum of 104 kg per ha, with an average of 46 kg per ha. Member of farmer group appeared to be more coordinated, efficient and adhere to cultivation practices. While non-member of farmer group tended to use seeds wastefully.

Table 7. The use of seeds on rice farming

No	Explanation	Member	Non Member
		Kg/Ha	
1	Minimum	31	30
2	Maksimum	80	104
3	Average	48	46

Source: Data from research result

Although the role of fertilizer had no significant effect on rice production, it was due to Senduro tends to have high fertility rate or already quite saturated in nutrients, member of farmer group proved to use more efficient fertilizer. Actual condition showed the same trend as the use of seeds. In fact, member of farmer group obtained better understanding and information about fertilization. It was in contrast with non-member of farmer group which tended to be unprofitable. Non-member had less guidance in term of cultivation and fertilizer use (on average 615 kg and 379 kg Urea and ZA) compared with member of farmer group (414 kg and 177 kg Urea and ZA) (Table 8).

Table 8. The Use of Fertilizer on Rice Farming

Explanation	Member			Non Member		
	Urea	Za	Ponska	Urea	Za	Ponska
Minimum	100	100	100	222	214	200
Maksimum	800	500	800	1200	800	800
Average	404	177	342	615	379	333

Source: Data from research result

As in the discussion of farming analysis, the role of farmer group was able to identify benefit of phosphorus fertilizer (Phonska) as an important element in rice growth and production. Member of farmer group had implemented balanced fertilization practice by using source of Nitrogen and Phosphorus element, as the Demand of Ministry of Agriculture and the highest retail price (HET) of Subsidized Fertilizer determined every year.

CONCLUSION AND SUGGESTION

Rice farming in Senduro Village showed different performance between member and non-member of farmer group. The average productivity in member of farmer group was 8.776 tons per hectare and non-member was 7.275 tons per ha. Member of farmer group obtained higher revenue (IDR 37.74 million per ha) compared to non-member (IDR 31.28 million per ha).

In the member of farmer group, cost of rice farming reached IDR 12.69 million per hectare, slightly higher than cost of rice farming to the non-member for IDR 12.55 million per hectare. The efficiency on rice farming in member of farmer group was higher (2.97) compared to non-member (2.49). Member of farmer group adhere better cultivation practices, more efficient and balanced fertilizer (Phonska as an important source of nutrients and phosphorus), more intensive irrigation and more seeds.

Rice production was significantly affected by land area and farmer group membership. The increase of land area by 10 percent will increase production by 2.4 percent. Factors such as age, education, household size, seeds, labor and fertilizer had no significant effect on rice production.

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