BIODIVERSITAS
Volume 18, Number 1, January 2017
Pages: 101-108

ISSN: 1412-033X
E-ISSN: 2085-4722
DOI: 10.13057/biodiv/d180115

Factors affecting paddy farm income in East Kalimantan, Indonesia

KARMINI
Department of Agribusiness, Faculty of Agriculture, Universitas Mulawarman. Jl. Pasir Balengkong, Kampus Gunung Kelua, Samarinda 75119, East Kalimantan, Indonesia. Tel: +62-541-749161, Fax: +62-541-738341. ♥email: karmini.kasiman@yahoo.com

Manuscript received: 3 August 2016. Revision accepted: 17 November 2016.

Abstract. *Karmini. 2017. Factors affecting paddy farm income in East Kalimantan, Indonesia. Biodiversitas 18: 101-108.* The development of paddy farming in East Kalimantan Province faces problem and challenge as the low level of paddy farm income. Consequently, efforts are needed to increase paddy farm income. The objective of this study is to determine factors affecting paddy farm income. This study was carried out in East Kalimantan Province, Indonesia (Now, the province was divided into two, East Kalimantan and North Kalimantan). The two-stage cluster sampling was applied to select one cities and three Districts (Bontang City, Kutai Kartanegara District, and Penajam Paser Utara District) and to choose 3 sub-cities and 6 sub-districts (Sub-cities of South Bontang, North Bontang, and West Bontang and Sub-districts of Tenggarong Seberang, Loa Janan, Muara Muntai, Babulu, Penajam, and Waru) as the study areas. The simple random sampling was used to choose the households of paddy farmers as respondents. This study assessed 380 paddy households as respondents. The regression function was used to analyze the data. The result of *F* test shows age of household head, depreciation of tools, experience of household head in paddy farming, labour cost, land cultivation cost, paddy farm size, raw materials cost, and rice requirement of the household, collectively, very significantly affect paddy farm income in East Kalimantan Province, Indonesia. The results of *t* tests show land cultivation cost, paddy farm size, and raw materials cost, individually, significantly affect paddy farm income in East Kalimantan Province, Indonesia. Meanwhile, labour cost, individually, significantly affect paddy farm income. However, the other variables, individually, are not significantly affect paddy farm income.

Keywords: East Kalimantan, farm, income, Indonesia, paddy

INTRODUCTION

The agriculture sector has important role to the national and rural economies of Indonesia. Paddy is one of the most important commodities in the agricultural sector whereby it produces rice as a staple food for most Indonesians. Paddy farming is still the main occupation in the rural areas of Indonesia, especially in East Kalimantan Province (Now, the province was divided into two, East Kalimantan and North Kalimantan, based on Indonesian Law (UU) No. 20 of 2012). Paddy farmers obtain paddy farm income from the marketing of their rice production. Rice production fluctuates from one planting season to the next planting season. Rice production of wetland paddy farming in East Kalimantan Province in 2012 (283,089.30 tons) was higher than that in 2011 (279,228.95 tons) but lower than that it in 2010 (293,469.15 tons) (Statistics of East Kalimantan Province 2013). Meanwhile, rice yield rate of paddy farming in East Kalimantan in 2012 (2.56 tons ha^{-1}) was lower than the average rice yield of paddy farming among provinces in Indonesia (3.34 tons ha^{-1}) (Statistics of East Kalimantan Province 2013; Statistics Indonesia 2014). These problems cause farmers have small opportunity to achieve higher paddy farm income because of small production and its impact on small revenue.

The allocation and price of inputs in paddy farming are vary. They have ability to affect the production cost. Most households of paddy farmers in East Kalimantan Province cultivate paddy in small farm size. The average size of paddy field was 1.26 ha in 2013. The number of farm household as land owner less than 1 ha, between 1 and less than 2 ha, and more than 3 ha in 2013 were 25,024 (13.85%), 106,875 (59.17%), and 48,715 (26.98%) farm households (Statistics of East Kalimantan Province 2014a, b). Paddy farming involves many people (family members and hired/contract labourers) in its activities. The number of tractor is limited in the rural areas. Meanwhile, the quantity, quality, and price of tools that owned every paddy household are vary. The high rice production will be achieved if farmers use high quality seeds in the optimal number. However, most paddy farmers in East Kalimantan in 2009 used local seed (64.86%) and non fertilizer users (59.28%) (Statistics of East Kalimantan Province 2010a).

The explanation above showed that paddy farmers face many problems related to the utilization of production factors in paddy farming. Those problems indicate production cost has ability to affect paddy farm income. Therefore, the main problem in the development of paddy farming in East Kalimantan Province was the low level of paddy farm income. As stated by Penson et al. (2006), two symptoms of the farm problem are (i) output fluctuations from one year to the next and (ii) low net farm incomes.

Several previous studies determined factors affecting farm income such as Mirotchie and Taylor (1993), Mishra et al. (2002), Kamanga et al. (2009), Zou et al. (2009), Ding et al. (2011), and Korir (2011). Each previous study discovered a new different set of factors affecting farm income. The sets of factors had similarities and differences in terms of variables that were used by previous studies. The scope of previous studies focused on farm income that

was obtained by farmers from cultivation not only paddy but also from other commodities. Some previous studies focused and found information on socio-economic factors affecting paddy farm income in East Kalimantan Province, Indonesia. However, many socio-economic factors in farm households have not been explored yet in the prior studies. Therefore, there are many opportunities to construct several new sets of factors affecting paddy farm income.

The objective of this study was to determine socio-economic factors affecting paddy farm income in East Kalimantan Province, Indonesia. The findings of this study provide ways to increase paddy farm income through the management of factors has proven could affect paddy farm income.

MATERIALS AND METHODS

Study area

Study was conducted from October 2012 to October 2013. The location of this study was Province of East Kalimantan, Republic of Indonesia (Now, the province was divided into two, East Kalimantan and North Kalimantan). In terms of geographic position, East Kalimantan Province ($113^0 44'$ - $119^0 00'$ EL and $2^0 33'$ NL - $2^0 25'$ SL) borders with Sulawesi ocean and Makassar strait in the east; Central Kalimantan Province, West Kalimantan Province, and Malaysia in the west; Malaysia in the north, and South Kalimantan Province in the south (Statistics of East Kalimantan Province 2010b) (Figure 1).

Figure 1. Formerly Province of East Kalimantan, Indonesia that now separated into two, East Kalimantan and North Kalimantan

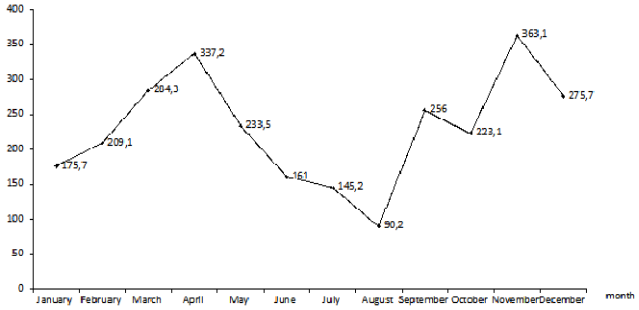

Figure 2. Rainfall (mm) in East Kalimantan in 2009.

There were two reasons for the selection of this study location. First, harvested area of paddy and production of rice in East Kalimantan Province in 2012 were lowest among the other provinces in Kalimantan island, Indonesia. Second, agricultural labour household in Indonesia owned the average of per capita income after taxes was lowest in 2008 among the other household groups both in rural and urban levels (Statistics Indonesia 2014).

East Kalimantan Province, Indonesia, has a tropical climate with two seasons, a dry season that commonly happens from May to October and a rainy season that usually comes from November to April. There is two planting seasons for wetland paddy during a year. The rainfall in East Kalimantan Province in 2009 was recorded (Figure 2) in the range of 90.20 and 363.10 mm month^{-1} or 1,082.4 and 4,357.2 mm year^{-1} (Statistics of East Kalimantan Province 2010b). The rainfall during the paddy growing period should not be lower than 800 mm year^{-1}, with the optimum range of 1,250 and 1,500 mm year^{-1} (Rehm and Espig, 1991).

Paddy farming are done by paddy farmer households that live in all cities/Districts in East Kalimantan Province. This study used the two-stage cluster sampling as the method to choose the study areas. The first stage selection was done as follows. East Kalimantan Province has 4 cities and 9 Districts which were called clusters, it meant East Kalimantan Province had 13 primary sampling units. Then, every city/District was classified into 3 different categories such as the high (2 cities and 3 Districts), medium (4 Districts), and low (2 cities and 2 Districts) of Gross Domestic Product (GDP) of food crops. Then, study selected a random sample of these units. Kutai Kartanegara District was selected to represent location owned high GDP of food crops, Penajam Paser Utara District from medium GDP of food crops level and Bontang City for low GDP of food crops group.

Then, the second stage selection as follows. This study classified all sub-cities/sub-districts from 3 primary sampling units had been chosen in the first stage selection (Kutai Kartanegara District, Penajam Paser Utara District, and Bontang City) into 3 groups such as the high, medium, and low harvested areas of paddy. Every sub-city/sub-district was called as the secondary sampling unit. Kutai Kartanegara District and Penajam Paser Utara District has 18 and 4 sub-districts, respectively. Meanwhile, Bontang City has only 3 sub-cities. This study chose a subset of smaller units within the primary units that randomly selected. The result of this second stage selection was 3 sub-cities and 6 sub-districts as the study areas which were selected from 3 sub-cities and 22 sub-districts available. They were sub-city of South Bontang, North Bontang, and West Bontang and sub-district of Tenggarong Seberang, Loa Janan, Muara Muntai, Babulu, Penajam, and Waru.

The biodiversity in agriculture is reflected in scope of this study. This study focused on wetland paddy farming that is done in different regions of high, medium, and low GDP of food crops. The different regions owned high, medium, and low harvested areas of paddy reflect various diversity. Although all respondents live in 3 sub-cities and 6 sub-districts, however they represent paddy farmers who reside in 4 cities, 9 districts, 3 sub-cities, and 22 sub-districts in East Kalimantan Province.

Procedures

This study collected primary data from households of paddy farmers and the secondary data from Statistics Indonesia and East Kalimantan Province. The primary data were obtained from household heads or household members of paddy farmers who are currently engaged in wetland paddy farming and he or she should have known the characteristics of household members. Wetland paddy farming includes several activities such as seedling, land cultivation, planting, fertilizing, weeding, transplanting, controlling pests and diseases, harvesting, and post harvesting. Wetland paddy farming is done in paddy field where farmers commonly use agrochemical inputs. Land cultivation for wetland paddy farming is done before the planting season by using handtractor. Wetland paddy farmers use some raw materials in paddy farming such as seeds, fertilizers (Urea, TSP, KCl, etc), and other agrochemical inputs (pesticide, herbicide, fungicide, insecticide, etc). Agrochemical inputs are commonly used not only to control or eliminate pests and diseases but also to help farmers in preventing pests and diseases. The respondents used agrochemical inputs with some Indonesian brands such as Antracol, Decis, Score, Matador, etc.

There were 119,714 households of paddy farmers in East Kalimantan in 2009 and 36,970 of them reside in the study areas (Kutai Kertanegara District, Penajam Paser Utara District, and Bontang City) (Statistics of East Kalimantan 2010b). According to Rea and Parker (1997), the minimum sample size for a 20,000 persons population at a 95% level of confidence with $\pm$ 5% confidence intervals is 377 and 382 persons for a population of approximately 50,000 persons. This meant that the total sample was needed for this study was 380 households. The sample size in each study area was calculated proportionally based on harvested area of paddy, where Sub-district of Tenggarong Seberang (128 households), Loa Janan (17 households), Muara Muntai (4 households), Babulu (128 households), Penajam (84 households), Waru (16 households), and Sub-city of South Bontang (2 households), North Bontang (1 household), and West Bontang (0 household). The simple random sampling was

applied to select the households of paddy farmers that could be respondents.

The survey with in-depth interview was applied to gather the primary data. It produced and provided abundant data that was useful in this study. The researcher gave adequate training to the enumerators to ensure uniformity in some understandings such as identifying the target of respondents, selecting the locations of study, filling the questionnaire, and understanding the manner of interview. Respondents were given the choice to decide the place for the interview, either at home or other places which were convenient for them. Their participation in the interview was strongly encouraged. The interviews began with providing information on the purpose of study and assuring that the data would be kept confidential.

A structured questionnaire had been prepared and designed as a tool in the survey. Because of language barrier, it was translated into Indonesian. The researcher developed questions in a simple way, used a few sentences only. However, this might lead to misperception and confusion by the respondents. Therefore, it was assumed that interviews would provide a greater chance for respondents to address questions. Interviews were likely to be effective, particularly for those respondents who cannot read and write but were considered as potential sources of information. Some respondents could not speak the Indonesian language; they commonly used ethnic or local languages. Therefore, the interviews were needed to solve these problems. Agricultural extensions were employed to help the interview process as they have good relationships with respondents. They also have good knowledge about the location and characteristics of respondents, also the local language. They understand local measurements that are commonly used in their agricultural area.

Data analysis

Several previous studies have some important findings related to factors affecting paddy farm income as follows. Age of farmer or age of household head affects revenue, planting income, household income, and the production of agricultural products (Tijani 2006; Kamanga et al. 2009; Ding et al. 2011). According to Debertin (1986) and Mankiw (2009), fixed cost is a part of total cost in the production process besides variable cost. Farming experience affects process of adoption in paddy farming (Adesina and Zinnah 1993; Rusmadi 2005) and value of rice (Tijani 2006). Previous studies were conducted to investigate the effect of family and hired labourers to farm output, farm income, and process of adoption such as Zhao et al. (1991), Rusmadi (2005), Tijani (2006), Larson and Plessmann (2009), and Ding et al. (2011). Larson and Plessmann (2009) reported that tractor usage effects the rice production of households. Several previous studies used farm size as a factor that affects rice production, rice value, and farmer adoption (Adesina and Zinnah 1993; Rusmadi 2005; Tijani 2006; Ekaputri 2008). The study by Zhao et al. (1991), Day et al. (1992), Rusmadi (2005), Tijani (2006), Larson and Plessmann (2009), and Zou et al. (2009) indicated that the use of seeds, fertilizers, and pesticides, could result in beneficial changes in process of adoption, rice production, rice value, and farm income. Abdulai and Egger (1992), Luomala (2007), and Ferng (2009) found that trade prices, income, and food consumption affect the rice demand response or what will be planted on local cultivated land. Therefore, the hypothesis has been formulated that age of household head, depreciation of tools, experience of household head in paddy farming, labour cost, land cultivation cost, paddy farm size, raw materials cost, and rice requirement of the household, collectively and individually, significantly affecting paddy farm income in East Kalimantan Province, Indonesia.

The multiple log-linear regression equation was used and presented below to identify factors affecting paddy farm income in East Kalimantan Province, Indonesia:

$$\ln y_i = \beta_0 + \beta_1 \ln x_{1i} + \beta_2 \ln x_{2i} + \beta_3 \ln x_{3i} + \beta_4 \ln x_{4i} + \beta_5 \ln x_{5i} + \beta_6 \ln x_{6i} + \beta_7 \ln x_{7i} + \beta_8 \ln x_{8i} + \varepsilon_i$$

where:

y_i = paddy farm income (Rp ha^{-1} cs^{-1});
x_{1i} = age of household head (year);
x_{2i} = depreciation of tools (Rp ha^{-1} cs^{-1});
x_{3i} = experience of household head in paddy farming (year);
x_{4i} = labour cost (Rp ha^{-1} cs^{-1});
x_{5i} = land cultivation cost (Rp ha^{-1} cs^{-1});
x_{6i} = paddy farm size (ha);
x_{7i} = raw materials cost (Rp ha^{-1} cs^{-1});
x_{8i} = rice requirement of the household (kg year^{-1});
ln = natural log;
ε_i = error term.

The F test was applied to test the hypothesis on the affect of eight socio-economic factors collectively to paddy farm income. The t test was done to test the hypothesis about the affect of eight socio-economic factors individually to paddy farm income. This study calculated the multiple coefficient of determination. Testing the overall significance of a regression in terms of R^2, according to Gujarati and Porter (2009), could be done through computation $F = (R^2/ (k - 1)/ ((1 - R^2)/ (n - k))$ where R^2 was the coefficient of determination, $(k - 1)$ was numerator df and $(n - k)$ was denominator df. This study also counted the Durbin-Watson d statistic to detect autocorrelation.

RESULTS AND DISCUSSION

Result

Households of wetland paddy farmers in East Kalimantan Province, Indonesia, have some socio characteristics as follows. Most of wetland paddy farmers are Javanese communities (93.16% or 119 respondents). The number of Sundanese, Kutainese, Bugisnese, and Banjarnese respondents are 7, 6, 6, and 2 households, respectively. Household members of wetland paddy farmer are mainly male at 51.92% and the rest are female. Household of wetland paddy farmer are largely dominated

by children at 40.74%, then followed by household head at 380 persons, and his spouse at 361 persons. Other household members are children in law, grand children, family, and non family. This study found that approximately 57.79% the household members of wetland paddy farmer has married and other 40.25% has not married yet. As many as 1.12% the household members of wetland paddy farmer divorced and other 0.84% widowed. Majority of households of wetland paddy farmer (216 respondents) have the members between 3 and 4 persons (Karmini and Isa 2012).

Primary data from all respondents were analyzed by using descriptive statistics. The minimum and maximum data of age of household head, depreciation of tools, experience of household head in paddy farming, labour cost, land cultivation cost, paddy farm size, raw materials cost, and rice requirement of the household could be found in Table 1. The average and standard deviation data of each factors is also presented.

The result of *F* test (Table 2) shows that age of household head, depreciation of tools, experience of household head in paddy farming, labour cost, land cultivation cost, paddy farm size, raw materials cost, and rice requirement of the household, collectively, very significantly affecting paddy farm income in East Kalimantan Province, Indonesia. The *F* test result meant the increasing or decreasing of eight independent variables, together, affects the increasing or decreasing the one dependent variable. Three variables have the *t* values statistically significant at the 1% level. These variables are land cultivation cost, paddy farm size, and raw materials cost. It meant, these variables individually, very significantly affecting paddy farm income in East Kalimantan Province, Indonesia. Meanwhile, labour cost significantly affecting paddy farm income. However, the other variables are not significantly affecting paddy farm income at the 1 and 5% levels.

The coefficient of variable measures the elasticity of dependent variable with respect to independent variable. Three variables have positive signs such as depreciation of tools, paddy farm size, and rice requirement of the household. This positive sign suggests that if the use of an independent variable increases by 1%, on average the dependent variable increases by about 1%. The other five variables have negative signs, namely age of household head, experience of household head, labour cost, land cultivation cost, and raw materials cost. This negative sign suggests that if the use of an independent variable increases by 1%, on average the dependent variable decreases by about 1%.

Table 1. Descriptive statistics on factors affecting paddy farm income in East Kalimantan Province, Indonesia, in 2012

Variable	Minimum	Maximum	Average	Standard deviation
Age of household head (year)	17.00	85.00	47.50	12.78
Depreciation of tools (Rp ha^{-1} cs^{-1})	5,400.00	650,000.00	106,151.68	80,038.47
Experience of household head in paddy farming (year)	1.00	60.00	15.44	10.09
Labour cost (Rp ha^{-1} cs^{-1})	1,480,000.00	11,700,000.00	4,224,083.52	1,748,838.97
Land cultivation cost (Rp ha^{-1} cs^{-1})	350,000.00	1,000,000.00	883,614.04	147,190.17
Paddy farm size (ha)	0.25	5.00	1.27	0.83
Raw materials cost (Rp ha^{-1} cs^{-1})	165,500.00	4,172,000.00	1,190,943.33	692,255.62
Rice requirement of the household (kg $year^{-1}$)	113.00	1,130.00	425.53	152.49

Table 2. The results of regression on factors affecting paddy farm income in East Kalimantan Province, Indonesia

Variable	Coefficient estimate	Standard error	*t* value	*p* value
Intercept	32.532	5.05	6.44	0.00
ln Age of household head (year)	-0.017	0.12	-0.14^{ns}	0.89
ln Depreciation of tools (Rp ha^{-1} cs^{-1})	0.082	0.05	1.54^{ns}	0.12
ln Experience of household head in paddy farming (year)	-0.011	0.04	-0.27^{ns}	0.79
ln Labour cost (Rp ha^{-1} cs^{-1})	-0.337	0.15	-2.22*	0.03
ln Land cultivation cost (Rp ha^{-1} cs^{-1})	-0.778	0.23	-3.39**	0.00
ln Paddy farm size (ha)	0.250	0.08	3.10**	0.00
ln Raw materials cost (Rp ha^{-1} cs^{-1})	-0.173	0.07	-2.59**	0.01
ln Rice requirement of the household (kg $year^{-1}$)	0.003	0.07	0.04^{ns}	0.97

Note: n = 380; *F* value = 10.28**; * significant at 5%, *p* value < 0.05; **significant at level 1%, *p* value < 0.01; ^{ns} non significant.
Source: Primary data (analyzed).

The R^2 value of 0.18 shows that 18.15% the variation or fluctuation in the paddy farm income is caused by the fluctuation in the eight independent variables and 81.85% is caused by other factors. The result of testing the overall significance of a regression in terms of R^2 shows under the null hypothesis that $R^2 = 0$, the preceding F value (9.96) follows the F distribution with 7 numerator df and 372 denominator df, respectively. The F value is very significant at about the 1% level (2.64). Therefore, this study rejected the null hypothesis that eight regressors have no impact on the regreesand, notwithstanding the fact that R^2 is only 0.18. That result indicates that the model is correctly specified, that the regressors have the correct signs as theoretically expected and that the regression coefficients are statistically significant (Gujarati and Porter 2009). Although the R^2 value of this study is lower than the study by Ekaputri (2008) who found the R^2 value of 0.89 for the effect of harvested area to rice production in East Kalimantan Province, Indonesia. However, it is higher than the study by Rusmadi (2005) who found the R^2 value of 0.07 when investigated factors affecting the adoption of chemical method by paddy farmers in South Sulawesi, Indonesia. This study also found that an insignificant d statistic (the d value of 1.50) or lie between 0 and 4, meant the non-presence of autocorrelation. The effect of an increase of one independent variable on its paddy farm income is not expected to affect the independent variable of another respondent.

Discussion

The younger farmers have the same opportunity to obtain the similar paddy farm income as the elder farmers. The younger farmers commonly gave more attention to paddy farming with their hard works and they put more interest in training and others informal education. Therefore, they are considered to have the same knowledge as the elders. It is revealed that the elder farmers are likely to use contract labourers in land cultivation, planting, weeding, and harvesting. Even both younger and elder farmers apply the same method in paddy farming. They are different in the allocation of inputs. They sell the rice to the same buyers such as neighbours, small traders or rice milling located in their villages. Mostly, rice buyers come to the field paddy in harvesting season to buy the harvest yield directly from farmers. In this case, farmers do not need to incur an extra cost for transport because some buyers own and facilitate the transport. Farmers also do not spend other expenditure to buy sacks of gunny for rice packing because buyers provide them such facility. Some farmers prefer to keep some portion of mill dry rice for self-consumption and to sell them at another time.

The technical period of tool is duration tool usage which it is predicted around 12 to 60 months. In this time, farmers could use them for several times. The technical period of tools depends on the utilization, maintenance, and price. The frequency of tools usage will affect on the capability of tools. It is revealed that there is no specific requirement to maintain the tools. In general, the farmers clean and dry the tools directly after using, then store them in their houses. Most farmers stated that tool price determines technical period or quality, so the higher price of a tool, the longer duration of its technical period.

Members of households commonly have knowledge about paddy cultivation since they were children when they helped their parents. Therefore, most farmers are familiar with the methods of paddy cultivation, so it do not require higher experience to manage paddy farming. However, Mulyoutami et al. (2009) noted that local knowledge is dynamic and evolves over the time; a person accepts new knowledge depend on the situation and needs. The result of this study is similar to finding of previous studies by Adesina and Zinnah (1993) and Rusmadi (2005), but it is in contrast to Kamanga et al. (2009). Household heads that have high experience, commonly elder farmers, tend to reduce their involvement in paddy farming. They increase the use of family labourers in many activities in order to share knowledge and to minimize production cost. Zahra et al. (2007) revealed that family involvement in management can either strengthen or weaken a firm's capacity to share knowledge, but knowledge sharing practices in a family can enhance their positive benefits. According to Rusmadi (2005), farming experience significantly negative affects process adoption technology in paddy farming. Farmers who have more farming experience tend to adopt new technology slowly since they are already familiar with conventional practices.

Total labour cost of paddy farming in East Kalimantan Province, Indonesia in 2012 was 84.50% of the production cost. This number was greater if compared to the raw materials cost (12.98%) as well as the depreciation of tools (2.52%). The bigger proportion for labour cost indicates that labour cost plays an important role in paddy farm income. The increase of labour cost is caused by the increase in both the quantity and labour wages to an extent, leads to the increment in production cost. On the other hand, if the production cost increases, the selling price and the production quantity remain constant which later, leads to the decrease in income of paddy farmers. Paddy households can reduce the expenditure for labour cost through the increase of family and woman labourers usage. Gender roles are partly the result of local ecosystems and farming practices which may change over time. For instance in Eastern India, women from the middle and lower castes work not only in their own rice fields but also as hired labourers on other people's farms (Lambrou, 2004). Some respondents sow seeds directly in wetland field without planting seeds in seedbeds. Thus, it increases the seed usage from 50 kg to between 80 and 110 kg ha^{-1}, however they could cut the planting cost. Zaini (2004) and Boa (2008) reported that wage affects household income in Indonesia. Nielsen et al. (2006) mentioned that the use of labourers in wet rice farming becoming more efficient due to the use of agrochemical inputs and heavily subsidized investments in terraces.

Paddy farm size affects land cultivation cost. Farmers who have larger land areas will have a greater expenditure for land cultivation than those who have smaller land areas. The result of this study is in line with Mirotchie and Taylor (1993) and Larson and Plessmann (2009). Land cultivation cost is included in variable cost as part of the production

cost. The amount of land cultivation cost will affect the production cost in which, if the production cost increases and the revenue is constant, the profit will decrease.

The result of regression on variable of paddy farm size is in line with the findings of previous studies that conducted by Tijani (2006) and Ekaputri (2008), but it is in contrast to Adesina and Zinnah (1993) and Rusmadi (2005). Most respondents in this study own a land from transmigration programme that allow them to have 2 ha paddy field per household located besides the house. Some respondents could buy paddy fields; however the number is small (26 households), because the price of land is quite high. Dawe et al. (2008) found there is a relationship between land price and rice marketing in the Philippines and Thailand.

Raw materials cost has an important role in determining how much income could be obtained from paddy farming. Raw materials are the main input in paddy farming. Paddy farming needs raw materials in the production process. The expenditure for buying raw materials determines the amount of production cost and profit. This finding is relevant to the result of previous studies by Elnagheeb and Bromley (1994), Rusmadi (2005), Tijani (2006), and Larson and Plessmann (2009). The increase of raw materials cost leads to greater farmer expenditure which subsequently forces the decrease of paddy farm income. Due to such situation, farmers should optimize the use of their inputs in order to reach optimal output, minimum cost, and maximum profit, or in other words the production process needs to be carried out efficiently and effectively. The expenditure for buying raw materials depends on quantity, quality, buying price, financial ability, buying price of other inputs, etc.

The increase of rice requirement forces paddy farmers to increase paddy productivity. The rice requirement increases because the increase of family size forces the increase of basic food consumption. The increase of family labour means that paddy farming has done more to achieve high productivity. If rice production increases, paddy farm income will increase. Productivity varies due to technological knowledge and natural conditions such as soil conditions, geographical location, and climate (Singer and Donoso, 2008). The increase of population forces the increase of productivity per unit land area (Buhr and Sinclair, 1998). The high productivity means more potential to obtain high income. The high utilization of family labour could reduce labour cost or minimize production cost. These factors have a positive effect on paddy farm income.

The result of this study shows that labour cost, land cultivation cost, paddy farm size, and raw materials cost, individually, significantly affecting paddy farm income in East Kalimantan Province, Indonesia. Based on that result, this study formulated four programmes that have the potential ability to increase paddy farm income in East Kalimantan Province, Indonesia. First programme is the increase of family labourers numbers with the ways (i) leads household members to have skills, work experience, and education and (ii) employes household members in paddy farming. Second programme is the increase of handtractor numbers through the related activities such as (i) saves part of income minimum as much as depreciation cost of handtractor, (ii) sets up business in selling, renting, and maintaining of handtractors, (iii) provides handtractor to agricultural institution at village level, and (iv) studies related to efficiency of handtractor utilization to know the optimal numbers of handtractors in agricultural areas. Third programme is the extensification of farm areas with the actions as follows (i) increases the planted and harvested areas, (ii) rents land to farmers, (iii) developes infrastructure and regular maintenance, and (iv) studies related to the optimal farm size for paddy farming. Fourth programme is the intensification of inputs through supplies inputs to farm areas (Karmini and Isa 2013).

This study constructed a set of variables consists of age of household head, depreciation of tools, experience of household head, labour cost, land cultivation cost, paddy farm size, raw materials cost, and rice requirement of the household, affect paddy farm income in East Kalimantan Province, Indonesia. However, it is only labour cost, land cultivation cost, paddy farm size, and raw materials cost, individually, significantly affect paddy farm income in East Kalimantan Province, Indonesia. Meanwhile, age of household head, depreciation of tools, experience of household head, and rice requirement of the household, individually, do not significantly affect paddy farm income in East Kalimantan Province, Indonesia. Depreciation of tools, paddy farm size, and rice requirement of the household, individually, positively affect paddy farm income in East Kalimantan Province, Indonesia. It meant if those variables increase, on average, paddy farm income increases. This study estimated that age of household head, experience of household head, labour cost, land cultivation cost, and raw materials cost, individually, negatively affect paddy farm income in East Kalimantan Province, Indonesia. This negative effect meant if those variables increase, on average, paddy farm income decreases. It is possible to reach the greatest profit in paddy farming and there are many opportunities to increase the paddy farm income. Four programmes that have the potential ability to increase paddy farm income in East Kalimantan Province, Indonesia are (i) the increase of family labourers numbers, (ii) the increase of handtractor numbers, (iii) the extensification of farm areas, and (iv) the intensification of inputs.

REFERENCES

Abdulai A, Egger U. 1992. Intraregional trade in West Africa. Impacts of Ghana's cocoa exports and economic growth. Food Pol 17: 277-286.

Adesina AA, Zinnah MM. 1993. Technology characteristics, farmers' perceptions, and adoption decisions: A Tobit model application in Sierra Leone. Agric Econ 9 (4): 297-311.

Boa H. 2008. Analysis of rural poverty model in Indonesia. Ekonomi Pertanian dan Pembangunan 5 (1): 16-22. [Indonesian]

Statistics of East Kalimantan Province. 2010a. Farm Census 2009 Province of East Kalimantan. Statistics of East Kalimantan Province, Samarinda. [Indonesian]

Statistics of East Kalimantan Province. 2010b. East Kalimantan in Number 2009. Statistics of East Kalimantan Province, Samarinda. [Indonesian]

Statistics of East Kalimantan Province. 2014a. Agribusiness Potrait of East Kalimantan Province Based on Subsector (Complete Cencus Result of Agriculture Cencus 2013 dan Survey of Agribusiness Household Income 2013). Statistics of East Kalimantan Province, Samarinda. [Indonesian]

Statistics of East Kalimantan Province. 2014b. Agriculture Potency in East Kalimantan Province. Analysis of Complete Cencus Result of Agriculture Cencus 2013. Statistics of East Kalimantan Province, Samarinda. [Indonesian]

Statistics of East Kalimantan Province. 2014c. East Kalimantan in Number 2013. Statistics of East Kalimantan Province, Samarinda. [Indonesian]

Statistics Indonesia. 2014. Indonesia in Number 2013. Statistics Indonesia, Jakarta. [Indonesian]

Buhr KL, Sinclair TR. 1998. Human Population, Plant Production, and Environmental Issues. In Sinclair TR, Gardner FP (eds.), Principles of Ecology in Plant Production. CAB International, New York.

Dawe DC, Moya PF, Casiwan CB, Cabling JM. 2008. Rice marketing systems in the Philippines and Thailand: Do large numbers of competitive traders ensure good performance? Food Pol 33: 455-463.

Day JC, Hughes DW, Butcher WR. 1992. Soil, water, and crop management alternatives in rainfed agriculture in the Sahel: An economic analysis. Agric Econ 7 (3): 267-287.

Debertin DL. 1986. Agricultural Production Economics. Coller Macmillan, New York.

Ding S, Meriluoto L, Reed WR, Tao D, Wu H. 2011. The impact of agricultural technology adoption on income inequality in rural China: Evidence from Southern Yunnan Province. China Econ Rev. DOI:10.1016/j.chieco.2011.04.003.

Ekaputri N. 2008. The influence of harvested area to food plant production in East Kalimantan. Ekonomi Pertanian dan Pembangunan 5 (1): 43-50. [Indonesian]

Elnagheeb AH, Bromley DW. 1994. Extensification of agriculture and deforestation: Empirical evidence from Sudan. Agric Econ 10 (2): 193-200.

Ferng J. 2009. Effects of food consumption patterns on paddy field use in Taiwan. Land Use Pol 26: 772-781.

Gujarati DN, Porter DC. 2009. Basic Econometrics. McGraw-Hill/Irwin, New York.

Indonesian Law (UU) No. 20 of 2012 dated 16 November 2012 on the Establishment of the North Kalimantan Province.

Kamanga P, Vedeld P, Sjaastad E. 2009. Forest incomes and rural livelihoods in Chiradzulu District, Malawi. Ecol Econ 68 (3): 613-624.

Korir LK. 2011. Risk Management Among Agricultural Households and the Role of Off-Farm Investments in Uasin Gishu County, Kenya. Egerton University, Kenya.

Karmini, Isa AHM. 2012. Characteristics of paddy farmers households in East Kalimantan, Indonesia. Proceeding of The 4th Regional Conference on Natural Resources in the Tropics (NTrop4). Universiti Malaysia Sarawak, Malaysia, 19-21 September 2012.

Karmini, Isa AHM. 2013. The integrated planning to increase total household income of paddy farmers in East Kalimantan, Indonesia. Interdisciplinary J Contemp Res Bus 4 (11): 745-755. ijcrb.webs.com.

Lambrou Y. 2004. Gender and Rice. Food and Agriculture Organization of the United Nations, Rome.

Larson DF, Plessmann F. 2009. Do farmers choose to be inefficient? Evidence from Bicol. Dev Econ 90 (1): 24-32.

Luomala HT. 2007. Exploring the role of food origin as a source of meanings for consumers and as a determinant of consumers' actual food choices. Bus Res 60: 122-129.

Mankiw NG. 2009. Principles of Microeconomics. South-Western Cengage Learning, USA.

Mishra A, Sandretto C. 2002. Stability of farm income and the role of nonfarm income in U.S. agriculture. Rev Agric Econ 24: 208-221.

Mirotchie M, Taylor DB. 1993. Resource allocation and productivity of cereal state farms in Ethiopia. Agric Econ 8 (3): 187-197.

Mulyoutami E, Rismawan R, Joshi L. 2009. Local knowledge and management of impukng (forest gardens) among the Dayak people in East Kalimantan, Indonesia. For Ecol Manag 257: 2054-2061.

Nielsen U, Mertz O, Noweg GT. 2006. The rationality of shifting cultivation systems: Labor productivity revised. Human Ecol 34 (2): 201-218.

Penson Jr JB, Capps Jr O, Rosson III CP. 2006. Introduction to Agricultural Economics. Prentice Hall, New Jersey.

Rea LM, Parker RA. 1997. Designing and Conducting Survey Research. A Comprehensive Guide. Jossey-Bass Publishers, San Fransisco.

Rehm S, Espig. 1991. The Cultivated Plants of the Tropics and Subtropics. Cultivation, Economic Value, Utilization. Priese GmbH, Berlin.

Rusmadi. 2005. Factors Affecting Farmers' Pest Management Decisions: The South Sulawesi, Indonesia Case Study. Center for Community Empowerment and Economics, Samarinda.

Singer M, Donoso P. 2008. Upstream or downstream in the value chain? Bus Res 61: 669-677.

Tijani AA. 2006. Analysis of the technical efficiency of rice farms in Ijesha Land of Osun State, Nigeria. Agrekon 45 (2): 126-135.

Zahra SA, Neubaum DO, Larrañeta B. 2007. Knowledge sharing and technological capabilities: The moderating role of family involvement. Bus Res 60: 1070-1079.

Zaini A. 2004. The impact of transfer payment on farmer household income and economic development in Indonesia (Analysis of Social Accounting Matrix: SAM). Ekonomi Pertanian dan Pembangunan 1 (2):19-24. [Indonesian]

Zhao F, Hitzhusen F, Chern WS. 1991. Impact and implications of price policy and land degradation on agricultural growth in developing countries. Agric Econ 5 (4): 311-324.

Zou J, Lu JW, Chen F, Li YS. 2009. Increasing yield and profit of rapeseed under combined fertilization of nitrogen, phosphorus, potassium, and boron in Yangtze River Basin. Acta Agronomica Sinica 35 (1): 87-92.