Paddy Farm Income in Relation to Experience and Geographical Regions in East Kalimantan, Indonesia

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ABSTRACT

The low level of paddy farm income is serious problem in the development of paddy farming in East Kalimantan. The results of some previous studies showed experience has ability to influence farmer income, however, limited studies discussed about geographical regions. The objectives of this study were to analyze the paddy farm income, to investigate the paddy farm experience, and to explore the relations among paddy farm income, paddy farm experience, and geographical regions. The study locations were Subcities/Subregencies of North Bontang, South Bontang, Tenggarong Seberang, Muara Muntai, Loa Janan, Waru, Penajam, and Babulu, Province of East Kalimantan, Indonesia. Primary data were collected by conducting the interviews to total 380 respondents. The distribution of paddy farmers differs very significantly among the 4 categories of paddy farm income and paddy farm experience in East Kalimantan, Indonesia. Paddy farm experience and geographical regions, collectively, affect statistically very significantly on paddy farm income in East Kalimantan, Indonesia, ceteris paribus. There are weak relationships among paddy farm income, paddy farm experience and geographical regions.

Keywords: East Kalimantan, Experience, Geographical regions, Income, Indonesia, Paddy farm.

1. INTRODUCTION

Agriculture has various important roles in Indonesia's development, including as a provider of food, a source of livelihood for some of the population, a source of foreign exchange for the country as well as being a back and forward linkage for the growth of other economic sectors. Agricultural Cencus in 2013 showed that the total of food crops farmers in Indonesia was as many as 20.399,14 persons (64.34% of total workers in agricultural sector (31.705,34 persons)) [1]. Meanwhile, the total households in East Kalimantan in 2013 was 820,888 households; of which 180,614 households (22.00%) were farmers and 83,564 households (10.18%) were food crops farmers [2]. Paddy farming was a major farming activity because as many as 84.08% of food crops farmers were paddy farmers (70,262 households) [3].

The development of paddy farming in East Kalimantan faces various problems and challenges such as the low levels of paddy farm income and farmer household income [4]. The contribution of paddy farm income was approximately 49.29% to household income of paddy farmers whereas it was lower than that of non paddy farm income (50.71%) [5]. The most of poor households (48.8%) in Indonesia were agricultural households, this was related to the low income of farmers and farm laborers compared to wages in other sectors [1]. In contrary with the fact if the high income will motivate the population to get involved with agriculture [6].

Several previous studies investigated factors related to farmer experience and farm income [7], [8], [9], however, there were limited studies that discussed about geographical regions. A set of variables consists of age of household head, depreciation of tools, experience of household head, labor cost, tillage cost, paddy farm size, raw materials cost, and rice requirement of the household, affects paddy farm income in East Kalimantan [7]. Farmers adopt and use technologies in farm management to increase yield and farm income such as the use of hybrid seed, organic and non organic fertilizers, integrated pest management, and farm machinery. Other prior study found that the number of handtractor owners differs very significantly among paddy farmers in Regencies of Loa Janan, Tenggarong Seberang, Waru, Penajam, and Babulu and the number of hand tractors renters differs among the eight paddy farm regions in East Kalimantan [10].

The other study found an average age of labors, average experience in non-paddy farm jobs, average working-days in non-paddy farm jobs, land ownership, number of family dependents, number of non-paddy farm jobs, number of non-paddy farm laborers, and paddy farm income become a set of factors affects non-paddy farm income [11]. The results of those previous studies above showed experience has ability to influence farmer income. The availability of management skills, limited capital, and the unreliability or lack of confidence in cash crop markets influence farmers' management plan decisions more than considerations of price and yield variability [12].

The objectives of this study were to analyze the paddy farm income, to investigate the paddy farm experience, and to explore the relations among paddy farm income, paddy farm experience, and geographical regions.

2. METHODS

2.1. Time and Location

This study was conducted from Juli to December 2019 in East Kalimantan Province, Indonesia. Study areas were determined by two stages cluster sampling. Every city/regency in East Kalimantan could be classified into 3 different categories such as the high, medium, and low of Gross Domestic Product (GDP) of food crops. Kutai Kartanegara Regency represented location where owned high GDP of food crops, Penajam Paser Utara Regency from medium GDP of food crops level and Bontang City for low GDP of food crops group [7]. Location of this study represented high, medium, and low of paddy harvested area in Bontang City (North Bontang and South Bontang), Kutai Kartanegara Regency (Tenggarong Seberang, Muara Muntai, and Loa Janan), and Penajam Paser Utara Regency (Waru, Penajam, and Babulu).

2.2. Data Collection dan Sampling

This study collected primary data from survey by in depth interview to respondents. Secondary data were obtained from publications of Statistics East Kalimantan and Statistics Indonesia. Number of paddy farmers was 36,970 households based on Agricultural Cencus in 2013 [13]. The minimum sample sizes for populations of 20,000 and 50,000 people are 377 and 382, respectively [14]. As many as 380 respondents were determined as total samples while the sample size of each region was determined by using proportional sampling method. The total paddy households [13] and the sample sizes were as follows North Bontang (24; 1), South Bontang (120; 2), Tenggarong Seberang (7,388;

128), Muara Muntai (206; 4), Loa Janan (1,002; 17), Penajam (4,829; 84), Babulu (7,343; 128), and Waru (908; 16). Samples were selected by random sampling method.

2.3. Data Analysis

The data were analyzed with the following stages:
1. Paddy farm income. Paddy farm income was calculated from total revenue minus total costs of paddy farming. This study used descriptive statistics to calculate the values of minimum, maximum, range, mean, total, and percentage from data of paddy farm income. The exchange rate of USD1.00 was IDR14,425.5 on 22 June 2021. Chi Square one sample was used to test hypothesis of distribution of farmers differs among the 4 categories of paddy farm income in East Kalimantan, Indonesia.
2. Paddy farm experience. Descriptive statistics and Chi Square one sample were used in data analysis.
3. Relation among paddy farm income, paddy farm experience, and geographical regions. This study used analysis of covariance (ANCOVA) model which contains an admixture of quantitative and qualitative variables. Model was be developed as follows:

$$Y_i = \beta_1 + \beta_2 D_{2i} + \beta_3 D_{3i} + \beta_4 D_{4i} + \beta_5 D_{5i} + \beta_6 D_{6i} + \beta_7 D_{7i} + \beta_8 D_{8i} + \beta_9 X_i + u_i$$

where:
Y_i = paddy farm income (USD hectare (ha)$^{-1}$ cropping season (cs)$^{-1}$);
β_1 = mean of paddy farm income in North Bontang (USD ha^{-1} cs^{-1});
β_2 = mean of paddy farm income in South Bontang (USD ha^{-1} cs^{-1});
β_3 = mean of paddy farm income in Tenggarong Seberang (USD ha^{-1} cs^{-1});
β_4 = mean of paddy farm income in Muara Muntai (USD ha^{-1} cs^{-1});
β_5 = mean of paddy farm income in Loa Janan (USD ha^{-1} cs^{-1});
β_6 = mean of paddy farm income in Waru (USD ha^{-1} cs^{-1});
β_7 = mean of paddy farm income in Penajam (USD ha^{-1} cs^{-1});
β_8 = mean of paddy farm income in Babulu (USD ha^{-1} cs^{-1});
D_{2i} = 1, if paddy farmer settles in South Bontang,
= 0, if paddy farmer settles in other regions.
D_{3i} = 1, if paddy farmer settles in Tenggarong Seberang,
= 0, if paddy farmer settles in other regions.
D_{4i} = 1, if paddy farmer settles in Muara Muntai,
= 0, if paddy farmer settles in other regions.

D_{5i} = 1, if paddy farmer settles in Loa Janan,
= 0, if paddy farmer settles in other regions.
D_{6i} = 1, if paddy farmer settles in Waru,
= 0, if paddy farmer settles in other regions.
D_{7i} = 1, if paddy farmer settles in Penajam,
= 0, if paddy farmer settles in other regions.
D_{8i} = 1, if paddy farmer settles in Babulu,
= 0, if paddy farmer settles in other regions.
X = paddy farm experience (year);
u_i = stochastic disturbance or stochastic error term.

The *F* test and *t* test were applied to test the hypothesis about the effects of paddy farm experience and geographical regions, collectively and individually, to paddy farm income. This study also calculated the multiple coefficient of determination and coefficient correlations.

3. RESULTS AND DISCUSSION

3.1. Paddy Farm Income

The minimum income of paddy farming in study areas was USD24.19 year^{-1}. There was 1 respondent that gained USD6,797.57 year^{-1}, the maximum income of paddy farming in this study. The mean of paddy farm income in East Kalimantan was USD934.95 year^{-1}. The highest mean of paddy farm income was reached by farmers in Babulu. The distribution of farmers differs statistically very significantly among the 4 categories of paddy farm income in East Kalimantan, Indonesia ($\chi^2_{computed}$ = 59.03 > $\chi^2_{statistic\ df = 3;\ \alpha = 0.01}$ =11.341; p-value = 9.46x10^{-13} < α = 0.01). Majority respondents (38.16% or 145 farmers) had paddy farm income less than USD500 year^{-1}. Only 14.47% respondents (55 farmers) had paddy farm income in the range of USD1,000.1 year^{-1} to USD1,500 year^{-1} (Table 1).

Paddy farm income has contribution to household income of paddy farmers. Therefore, the increase of paddy farm income leads the increase of total household income of paddy farmers [5]. Factors, individually, affect significantly paddy farm income such as the labor cost, tillage cost, paddy farm size, and raw materials cost [7]. Paddy farm size reflects land use by paddy farmer whereas land use associates with paddy productivity in term of yield for land use per hectare. This meant the increase of paddy farm size or land use and paddy productivity will cause the increase of yield and it leads the increase of paddy farm income and total household income of paddy farmers. The most important factors for increasing crop productivity are asset endowment and crop management practices, respectively [15].

Table 1. Respondents distribution based on paddy farm income.

No.	City/Regency	Paddy farm income (USD year-1)				Total respondents (farmer)	Mean of paddy farm income (USD year-1)
		< 500	500 – 1,000	1,000.1 – 1,500	> 1,500		
1	North Bontang	1				1	69.14
2	South Bontang	1	1			2	293.28
3	Tenggarong Seberang	59	42	14	13	128	690.54
4	Muara Muntai	3			1	4	692.66
5	Loa Janan	8	4	5		17	675.45
6	Waru	6	5	3	2	16	817.04
7	Penajam	48	24	10	2	84	571.89
8	Babulu	19	41	23	45	128	1,491.18
	Total respondents (farmer)	145	117	55	63	380	934.95
	Percentage (%)	38.16	30.79	14.47	16.58	100	

3.2. Paddy Farm Experience

Farmer has role as farm manager and commonly has farming experience. Farm experience varies among paddy farmers approximately between 1 and 60 years. The average length of paddy farm experience in East Kalimantan was 20.61 years. The highest and lowest means of paddy farm experience were 26.32 years and 17.65 years owned by farmers in Waru and Loa Janan, respectively. The distribution of farmers differs statistically very significantly among the 4 categories of paddy farming experience in East Kalimantan,

Indonesia ($\chi^2_{calculated} = 19.18 > \chi^2_{statistic\ df = 3;\ \alpha = 0.01} = 11.341$; p-value = 0.00025 < α = 0.01). The majority of respondents (32.63% or 124 farmers) had experience in the range of 10 to 20 years. As many as 99 respondents

had experience less than 10 years and 93 respondents had experience between 20 and 30 years. There were 16.84% respondents had experience more than 30 years in paddy farming (Table 2).

Table 2. Respondents distribution based on paddy farm experience.

No.	City/Regency	Paddy farming experience (year)				Total respondents (farmer)	Mean of paddy farm experience (year)
		< 10	10 - 20	20.1 – 30	> 30		
1	North Bontang		1			1	20.00
2	South Bontang		2			2	20.00
3	Tenggarong Seberang	36	46	20	26	128	19.55
4	Muara Muntai	2	1	1		4	15.00
5	Loa Janan	5	9	2	1	17	17.65
6	Waru	2	5	5	4	16	26.32
7	Penajam	20	24	25	15	84	22.17
8	Babulu	34	36	40	18	128	20.50
	Total respondents (farmer)	99	124	93	64	380	20.61
	Percentage (%)	26.05	32.63	24.47	16.84	100	

3.3. Relations among Paddy Farm Income, Paddy Farm Experience, and Geographical Regions

ANCOVA model of paddy farm income in relation to paddy farm experience and geographical regions in East Kalimantan, Indonesia is $\hat{Y}_i = 62.94 + 137.64 D_{2i} + 232.90 D_{3i} + 349.33 D_{4i} + 357.34 D_{5i} + 253.14 D_{6i} + 191.14 D_{7i} + 329.07 D_{8i} + 0.31 X_i$ (Table 3 and Figure 1). The result of F test showed that paddy farm experience and geographical regions, collectively, affect statistically very significantly on paddy farm income in East Kalimantan, Indonesia, ceteris paribus. It meant that the increasing independent variables, together, affect the increasing of dependent variable.

The slope value of South Bontang region was USD137.64 ha^{-1} cs^{-1} showed the average of paddy farm income in South Bontang. Three slope coefficients had the t values statistically significant at the 5% level. These variables were if paddy farmers settles in Muara Muntai, Loa Janan, and Babulu. The means of paddy farm income are significantly different among paddy farmers who live in Muara Muntai, Loa Janan, and Babulu. However, those are not significantly different among paddy farmers who live in North Bontang, South

Bontang, Tenggarong Seberang, Waru, and Penajam. Income of paddy farmer households from paddy farming varies based on size of land holdings [16].

Paddy farm experience affects positively on paddy farm income in East Kalimantan, Indonesia, ceteris paribus. This result suggests, as paddy farm experience goes up by a year, on average, paddy farm income goes up by about USD0.31 ha^{-1} cs^{-1}, ceteris paribus. The standard error was 0.65 for the slope coefficient of paddy farm experience. In contrary with another study [7] that found age of household head, experience of household head, labor cost, tillage cost, and raw materials cost, individually, affect negatively on paddy farm income in East Kalimantan, Indonesia. This negative effect meant if those variables increase, on average, paddy farm income decreases.

Table 3. The results of data analysis paddy farm income, paddy farm experience, and geographical regions.

Variable	Coefficient estimate	Standard error	tcalculated	Asymptotic significance
β_1 (North Bontang)	62.94	147.23	0.43ns	0.67
β_2 (South Bontang)	137.64	179.61	0.77ns	0.44
β_3 (Tenggarong Seberang)	232.90	147.22	1.58ns	0.12
β_4 (Muara Muntai)	349.33	163.99	2.13*	0.03
β_5 (Loa Janan)	357.34	150.91	2.37*	0.02
β_6 (Waru)	253.14	151.22	1.67ns	0.10
β_7 (Penajam)	191.14	147.53	1.30ns	0.20
β_8 (Babulu)	329.07	147.22	2.24*	0.03
X (Paddy farm experience)	0.31	0.65	0.47ns	0.64
N	380.00			
R	0.39			
R2	14.82%			
Fcalculated	8.07**			0.00

Note: Statistical significance at **1% level, *5% level, and ns non significant.
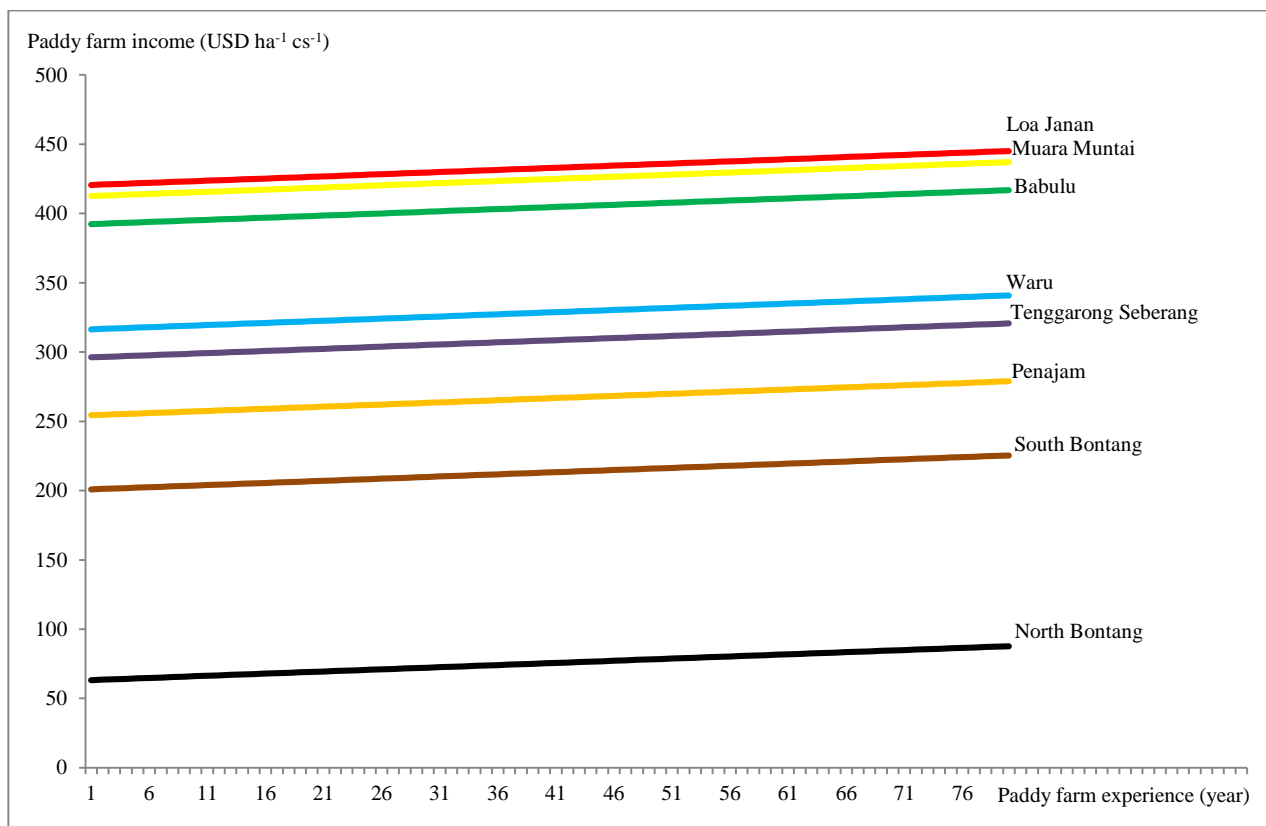

Figure 1. Paddy farm income in relation to paddy farm experience and geographical regions in East Kalimantan, Indonesia.

Other results of this study showed that the computed *t* value of 0.47 while the exact *p*-value of 0.64 does not significant at the 1% and 5% levels. Paddy farm experience does not statistically significantly influence paddy farm income in East Kalimantan, Indonesia, *ceteris paribus*. This is similar to some previous researches [7], [8], [9]. Farming experience supports paddy cultivation however it does not required length experience to manage paddy cultivation. Innovation, adoption of new practices, and farming experience are the major contibuting factors to the productivity of paddy farming [17].

The R^2 value of 14.82 showed that 14.82% of the variation or fluctuation in the paddy farm income are caused by the fluctuation in the eight independent variables and 85.18% are caused by other factors. Meanwhile, *r* of 0.39 showed that there are weak relationships among paddy farm income, paddy farm experience, and geograpical regions. Coefficient correlation values were in the range from -0.027 to 0.990 (Table 4). Another research found that farming experience has an influence to the knowledge sharing behaviour [17]. Farming experience has a positive impact but it does not significantly affect the adoption of the chemical method in paddy farming. However, farming experience has a significantly negative affect on the adoption of integrated pest management in paddy farming [9]. Years of experience in mangrove rice farming do not significantly influence farmer adoption but it has a positive impact [8].

Table 4. Coefficient correlations.

Variable	Babulu	Paddy farm experience	South Bontang	Muara Muntai	Loa Janan	Waru	Penajam	Tenggarong Seberang
Babulu	1.000							
Paddy farm experience	-0.002	1.000						
South Bontang	0.813	0.000	1.000					
Muara Muntai	0,891	0.020	0.730	1.000				
Loa Janan	0.968	0.010	0.793	0.869	1.000			
Waru	0.966	-0.027	0.792	0.867	0.942	1.000		
Penajam	0.990	-0.010	0.812	0.889	0.966	0.964	1.000	
Tenggarong Seberang	0.992	0.002	0.813	0.891	0.968	0.966	0.990	1.000

4. CONCLUSION

The means of paddy farm income and paddy farm experience in East Kalimantan were USD934.95 year^{-1} and 20.61 years, respectively. Paddy farm income and paddy farm experience are different among paddy farmers in eight regions of East Kalimantan, Indonesia. Paddy farm experience and geographical regions, collectively, affect statistically very significantly on paddy farm income in East Kalimantan, Indonesia, ceteris paribus. However, paddy farm experience, individually, does not statistically significantly on paddy farm income in East Kalimantan, Indonesia, ceteris paribus. There are weak relationships among paddy farm income, paddy farm experience, and geograpical regions.

REFERENCES

[1]   Anon, Analisis Rumah Tangga, Lahan, dan Usaha Pertanian di Indonesia: Sensus Pertanian 2013, Kementerian Perencanaan Pembangunan Nasional (PPN)/Badan Perencanaan Pembangunan Nasional (Bappenas), Jakarta, 2014.

[2]   Anon, Agricultural Potency of East Kalimantan Province Analysis of Complete Survey Result 2013, Statistics of East Kalimantan, Samarinda, 2014.

[3]   Anon, Potrait of Agricultural Business in East Kalimantan Province According to Subsector (The Result of Complete Survey of Agricultural Cencus 2013 and Income Survey of Agricultural Business Household), Statistics of East Kalimantan, Samarinda, 2014.

[4] Karmini, A.H.M. Isa, The integrated planning to increase total household income of paddy farmers in East Kalimantan, Indonesia, Interdisciplinary Journal of Contemporary Research in Business, 4(11), 2013, pp. 745-755.

[5] Karmini, Karyati, The various sources of household income of paddy farmers in East Kalimantan, Indonesia, Biodiversitas, 19(2), 2018, pp. 357-363, DOI: 10.13057/biodiv/d190201.

[6] Karmini, The depreciation costs of hand tools in paddy farming in East Kalimantan, Indonesia, Proceedings of Joint Symposium on Tropical Studies (JSTS-19), Atlantis Press Advances in Biological Science Research, 11, 2021, pp. 211-21.

[7] Karmini, Factors affecting paddy farm income in East Kalimantan, Indonesia, Biodiversitas, 18(1), 2017, pp. 101-108, DOI: 10.13057/biodiv/d180115.

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

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

[10] Karmini, Karyati, Comparison of tillage costs among eight paddy farm regions in East Kalimantan, Indonesia, f1000Research, 2021, pp. 1-8, DOI: https://doi.org/10.12688/f1000 research.16991.1.

[11] Karmini, Karyati, Socio-economics factors affecting the non-paddy farm income of paddy households in East Kalimantan, Indonesia, IOP Conference Series: Earth and Environmental Science, 473, 2020, pp. 1-8, DOI: 10.1088/1755-1315/473/1/012002.

[12] P. Abegunawardana, C.A. Pope III, Impacts of price and yield variation on profitability of management plans of subsistence farmers in Sri Lanka Agricultural Administration, 22(1), 1986, pp. 197-204.

[13] Anon, Farm Data Collection 2009 East Kalimantan Province, Statistics East Kalimantan, Samarinda, 2010.

[14] L.M. Rea, R.A. Parker, Designing and Conducting Survey Research a Comprehensive Guide, Jossey-Bass Publishers, San Fransisco, 1997.

[15] S.A. Emran, T.J. Krupnik, S. Aravindakshan, V. Kumar, C.M. Pittelkow, Factors contributing to farm-level productivity and household income generation in coastal Bangladesh's rice-based farming systems, Plos One, 2021, https://doi.org/10.1371/journal.pone.0256694.

[16] S.M.A. Lebbe, Income, consumption pattern and economic status of paddy farming household (With special reference to Sammanthurai Divisional Secretariat Area), Proceedings of Jaffina University International Research Conference Capacity Development in a Post-War Conflict, 2021, pp. 258-260.

[17] A.N. Siriwardana, L.N.A.C. Jayawardena, Socio-demographic factor contributing to the productivity in paddy farming: A case study Tropical Agricultural Research, 25(3), 2014, pp. 437-444.