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Effect of Farmers Socio-economic Toward Adoption Level of Agricultural Technology in Sigi Regency Indonesia

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ABSTRACT

The objectives of this study were to (1) Know the adoption level of agricultural technology on Field School Program of Integrated Plant Management in Sigi Regency Indonesia and (2) Analyze the effect of farmers socio-economic toward agricultural technology adoption on Field School Program of Integrated Plant Management. The study was conducted in Sigi Regency Indonesia. The number of respondents in this study were 67 household heads. Sampling was done by simple random. Descriptive statistic was used to answer the first objective and multiple regression analysis was used to answer the second objective. The result showed that, technology adoption on Field School Program of Integrated Plant Management was still low in Sigi Regency Indonesia, it was because the resource of farmers was still low. The household income, age of household heads, land area of rice farming, frequency of following agricultural extension, frequency of visiting demonstration plot and education of household heads affected technology adoption on Field School Program of Integrated Plant Management in Sigi Regency Indonesia. The increasing of farmers resource was very needed so that farmers could adopt the better agricultural technology.

Key words: Agricultural technology, demonstration plot, field schools, adoption

INTRODUCTION

The change of global climate pattern caused plant suffered from drought or flooded, pests attack and diseases which inflicted losses to farmers. The constraints and problems could be solved through technology innovation. Agency for Agricultural Research would produce oriented technology innovation on technology development in several agro-ecosystem, especially that had wide impact toward the increasing of production, income and food security (BB2TP., 2006).

One of the program that considered could solve those problems was Field Schools Program of Integrated Plant Management (FSPIPM). FSPIPM was an instrument of Agriculture Department program, generally consisted of food security program, competitiveness increasing and social welfare increasing.

FSPIPM was a new model or concept of technology dissemination that considered could accelerate the information delivery and base material of technology innovation. FSPIPM was not stand alone but it was one of the implementation and operational to introduce and promote innovation of Agricultural Research result to the public in the form of agribusiness laboratory in a location that was seen easily and known by farmers. FSPIPM was an extension method in deployment of new technology that considered to be the most effective nowadays, so that the activity needed to be conducted as well as possible by considering the local agro-climatic condition and the location specific technology.

Adoption of technology was very dependent on social system, economic and local culture. Social views which were entrenched in a public should be explored carefully so that the program intent to disseminate and apply technology innovation into the public system in question could be achieved (Rogers, 1983).

Extension had an important role to disseminate a technology to farmers (Rogers and Shoemaker, 1971). Agricultural extension was done to increase the ability of farmers in their attempt to obtain the higher production. The objective of agricultural extension was to change the behavior

of targeted farmers families, so that they could improve the way of farming, farming was more profitable and a better life. Related to that thing, then that considered important and interesting to be researched was farmers socio-economic and technology adoption on FSPIPM program in Sigi Regency Indonesia. The empirical analysis was about adoption of agricultural technology for rice had been done by Bello *et al*. (2012), for other commodities had been researched by Nyanga (2012), Singha *et al*. (2012), Jamsari *et al*. (2012), Raut *et al*. (2011), Paxton *et al*. (2011), Moga *et al*. (2012), Xu and Wang (2012) and Lestrelin *et al*. (2012).

The objectives of this research were to (1) Know the adoption level of agricultural technology on FSPIPM program in Sigi Regency Indonesia and (2) Analyze the effect of farmers socio-economic toward agricultural technology adoption on FSPIPM program.

MATERIALS AND METHODS

The study was conducted in Ranteleda Village Palolo Sub-regency Sigi Regency Indonesia during January until March 2012. The location was selected purposively (intentionally) with consideration of: (1) Location included program development target of FSPIPM program, (2) Generally, public worked in agriculture, especially lowland rice plant and (3) Most of the farmers involved on FSPIPM program.

The study population included all farmers who cultivated lowland rice plant that involved on FSPIPM program that amounted 253 household heads (HH). The number of respondents that were determined by the formula Parel *et al*. (1973):

$$n = \frac{NZ^2\sigma^2}{Nd^2 + Z^2\sigma^2} \quad (1)$$

Where:
- n = Number of sample
- N = Number of population
- Z = Normal variable on the level of desired confidence (90%)
- σ^2 = Variance of population
- d^2 = Standard error (10%)

Based on the Eq. 1 was obtained the number of samples amounted 67 HH. Sampling was done by simple random. Descriptive statistic was used to answer the first objective and multiple regression analysis was used to answer the second objective with the model:

$$Y = \beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+\beta_7D_1+\beta_8D_2+\mu \quad (2)$$

Where:
- Y = Technology adoption level of FSPIPM (%)
- β_0 = Intercept
- β_1-β_8 = Regression coefficient
- X_1 = Household income (IDR)
- X_2 = Age of farmer (years)
- X_3 = Number of family responsibility (soul)
- X_4 = Land area of rice farming (ha)
- X_5 = Frequency of following agricultural extension (times)
- X_6 = Frequency of visiting demonstration plot (times)
- D_1 = Dummy education (D = 0 For farmers that had education under elementary school, D = 1 for farmers that had another education)
- D_2 = Dummy land ownership D = 0 for sharecroppers, D = 1 for owner farmers
- μ = Error term

RESULTS

The level of technology adoption on FSPIPM program: The level of technology adoption on FSPIPM program in Sigi Regency Indonesia was assessed based on the ability of farmers in applied a technology that packaged in form of percentage. Technology adoption on FSPIPM program in Sigi Regency Indonesia were very varies, ranged from 5.56-79.63%, for the details were shown on Fig. 1.

Figure 1 showed the technology adoption on FSPIPM program that were the biggest ranged from 5.56-30.25% as many as 27 people (40.30%) and technology adoption on FSPIPM program that were smallest ranged from 54.96-79.65% as many as 15 people (22.39%).

Farmers socio-economic and technology adoption on FSPIPM program: Analysis of farmers socio-economic effect toward the level of technology adoption on FSPIPM program in Sigi Regency Indonesia used multiple regression, where the dependent variable Y was technology adoption on FSPIPM program that expressed as a percentage and the independent variables X were household income (X_1), age of household (X_2), number of family responsibility (X_3), land area of rice farming (X_4), frequency of following agricultural extension (X_5), frequency of visiting demonstration plot (X_6), education of household (D_1) and land ownership (D_2).

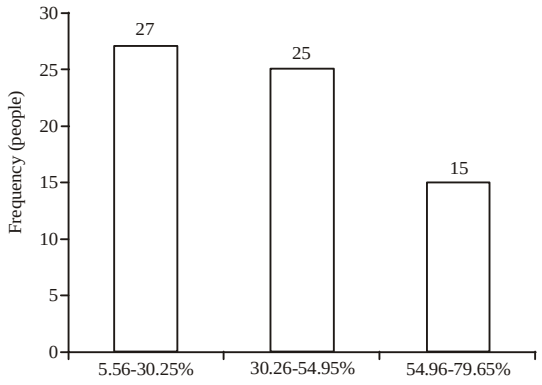

Fig. 1: Classification of technology adoption on FSPIPM program

Table 1: Estimated of regression coefficients

Variable	Coefficient	Standard error	t-test	Pr>|t|	Elasticity coefficient
Constant	8.297				
X_1	0.0000031	0.000	4.383**	0.000	0.217
X_2	-0.174	0.087	-2.010*	0.049	-0.182
X_3	1.277	0.872	1.464	0.149	0.119
X_4	3.237	0.951	3.406**	0.001	0.146
X_5	4.437	0.877	5.060**	0.000	0.271
X_6	3.881	1.712	2.267*	0.027	0.143
D_1	7.559	2.525	2.994**	0.004	
D_2	0.262	2.200	0.119	0.906	

Determinant coefficient (R^2) 0.837, *Significant at α 5% , **Significant at α 1%

The results of statistic analysis showed probability r = 0.000<0.05 (α = 5%) declared to reject the null hypothesis, that meant the independent variables of household income, age of household, number of family responsibility, land area of rice farming, frequency of following agricultural extension, frequency of visiting demonstration plot, education of household and land ownership, simultaneously affected toward the technology adoption on FSPIPM program.

The effect of each independent variables X toward dependent variable Y was used the t-test and the results were shown on Table 1.

Determinant coefficient (adjusted R^2) amounted 0.837 meant that the variation of technology adoption on FSPIPM Program could be explained by the independent variables of household income, age of household, number of family responsibility, land area of rice farming, frequency of following agricultural extension, frequency of visiting demonstration plot, education of household and land ownership amounted 83.70%, while 16.30% were explained by other factors that not included in the model.

DISCUSSION

Adoption of technology was very dependent on social system, economic and local culture. Social views which were entrenched in a public should be explored carefully so that program intent to disseminate and apply technology innovation into the public system in question could be achieved. Introducing or promoting a particular technology in agriculture, then the extension had an important role to disseminate a technology to farmers (Effendy *et al*., 2013; Ayoola, 2012; Bello *et al*., 2012).

The basic principles that were used on FSPIPM program in Sigi Regency Indonesia: (1) Establishing a pilot model (field laboratory) as a technology application that oriented agribusiness to introduce and apply the agricultural technology to farmers in rural areas, (2) Establishing and coaching of farmer groups through the Field School (FS) which was learning while doing by practicing directly the introduction of technology by farmers in lowland field as well as increasing knowledge and insight for farmers and (3) Socialization of agricultural technology innovation through dissemination activity and technology transfer through agricultural information media, namely brochures, leaflets, posters, liptans and assessment results from Assessment Center of Agricultural Technology in Central Sulawesi Indonesia. Technology adoption on FSPIPM Program was still low in Sigi Regency Indonesia. It was because the resource of farmers was still low where the sample farmer was average educated elementary school.

Household income affected positive significant toward the level of technology adoption on FSPIPM Program, at confidence interval 95% two-tail test. Elasticity amounted 0.217 could be meant that for each increasing of household income amounted 1% would increase the level of technology adoption on FSPIPM Program amounted 0.217% by assuming other factors were considered constant. It was because household income related with education level. Household who had higher income tended had the ability in increasing its human resources (education). Household income that was higher would be able to prepare all the necessary inputs in a technology. This study was supported by previous study of (Bello *et al*., 2012; Jamsari *et al*., 2012) that showed income of farming affected toward the application of agricultural technology by farmers.

Age affected negative significant toward the level of technology adoption on FSPIPM Program, at confidence interval 95% two-tail test. Elasticity amounted -0.182 could be meant that for each increasing of farmers age amounted 1% would decrease the level of technology adoption on FSPIPM Program amounted 0.182%, by assuming other factors were considered constant. Farmers that had older age were reluctant to accept new things, they were more maintaining the customs that had exist. Farmers that had young age were faster to adopt new technology. Paxton *et al*. (2011) and Moga *et al*. (2012), showed age was correlated negatively with the application of agricultural technology, which producer that had young age was higher to apply agricultural technology.

Number of family responsibility did not affect toward the level of technology adoption on FSPIPM Program, at confidence interval 95% two-tail test. The number of family members in this research were mostly unproductive so they were unable to do agricultural activity. This research was contrary with research of Bello *et al*. (2012), where household size affected toward the application of rice technology by farmers.

Land area of rice farming affected positive significant toward the level of technology adoption on FSPIPM Program, at confidence interval 95% two-tail test. Elasticity amounted 0.146 could be meant that for each increasing of land area amounted 1% would increase the level of technology adoption on FSPIPM Program amounted 0.146% by assuming other factors were considered constant. Land area of rice farming that was owned by farmer would affected rice production, the higher of production, the income of farmer tended increasing, so farmer would more interested to adopt new technology. This study was supported by previous study (Ayoola, 2012; Nyanga, 2012; Bello *et al*., 2012) that showed the land area affected positive and significant toward the application of technology.

Frequency of following agricultural extension affected positive significant toward the level of technology adoption on FSPIPM Program, at confidence interval 95% two-tail test. Elasticity amounted 0.271 could be meant that for each increasing of frequency of following agricultural extension amounted 1% would increase the level of technology adoption on FSPIPM Program amounted 0.271% by assuming other factors were considered constant. Agricultural extension was one of non-formal education that could increase knowledge of farmers, so they were more open with new technology. Ayoola (2012), Nyanga (2012) and Bello *et al.* (2012) that showed the increasing of attendance number in an extension affected positive and significant toward the application of agricultural technology.

Frequency of visiting demonstration plot affected positive significant toward the level of technology adoption on FSPIPM Program, at confidence interval 95% two-tail test. Elasticity amounted 0.143 could be meant that for each increasing of frequency of visiting demonstration plot amounted 1% would increase the level of technology adoption on FSPIPM Program amounted 0.143%, by assuming other factors were considered constant. Demonstration plot was a pilot laboratory that prepared for farmers as a sample of technology application on FSPIPM Program. Demonstration plot would increase confidence of farmers toward technology that was offered, so farmers would adopt that technology.

Education (D_1) affected positive significant toward the level of technology adoption on FSPIPM Program, at confidence interval 95% two-tail test. Education (D_1) was interpreted by comparing with the basic category, namely the group of farmers who graduated from Elementary School that coded 0. The constant of 8.297 meant if the variables X_1, X_2, X_3, X_4, X_5, X_6 and D_2 were zero and all of rice farmers of group who graduated from Elementary School (numbered 0) then the value of technology adoption level on FSPIPM program was 8.297%. Regression coefficients amounted 7.559 meant on average, farmers that educated beside Elementary School could increase the level of technology adoption on FSPIPM Program amounted 7.559% were higher if compared with farmers who graduated from Elementary School. It was because the higher level of farmers education would be higher the technical ability and its management in absorbing technology information, so farmers would be easier to accept technology that was recommended on FSPIPM Program. Xu and Wang (2012), Singha *et al.* (2012) and Abdullah and Samah (2013) showed education affected toward the decision of technology application by farmers. Land ownership (D_2) did not affect toward the level of technology adoption on FSPIPM Program, at confidence interval 95% two-tail test.

CONCLUSION

Technology adoption on FSPIPM program was still low in Sigi Regency Indonesia. It was because the resource of farmers was still low. Household income, age of household, land area of rice farming, frequency of following agricultural extension, frequency of visiting demonstration plot and education of household affected toward technology adoption on FSPIPM program in Sigi Regency Indonesia. Number of family responsibility and land ownership did not affect.

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