Analysis of Factors Influencing Plasma Farmer to Adopt Cattle and Palm Oil Integrated System In South Sumatera, Indonesia

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Abstract. The integration system of cattle in oil palm developed in Indonesia because this innovation can increase farmer's income and also increase productivity of palm oil and beef. This innovation is mixed farming where the combinations of the two commodities can be synergized in order to reach optimal utilization at the same piece of land. Many positive effects can take by the farmers if they adopt this innovation, but something else must be think that innovation is too complex to adopt by the farmers. It's because, farmers must be concern to two economic activities at the same time. Its means if we want to apply this innovation to the farmer in big scale, we have to analyze the probability of farmer's decision to adopt or do not which caused by many factors. Result of this research showed that 80,4% variation of farmer's decision to adopt or not to adopt cattle and palm oil integrated system caused by income factor, consumption, number of family members, extension intensity, origin area and level of education factor (R-square= 80,4). Then, result of chi-square value (X^2) = 44,104 or > X^2 table 5% , means all independent variables able to explain decision to adopt or not to adopt cattle and palm oil integrated system. Result of logistic model regression showed that all independent variables having an effect on farmer's decision to adopt or not to adopt cattle and palm oil integrated system. Analysis using SPSS showed that all coefficient value is smaller than specified reality level (p<0,30), so that all variables have positive effect on reality, if we add 1% to each variable will increase farmer's decision probability to adopt cattle and palm oil integrated system.

Keywords: integrated system, cattle and palm oil, adoption, factors influencing.

1. Introduction

The integration of cattle in oil palm plantation is a form of farming innovation which developed in Indonesia especially in South of Sumatera as one of palm oil centre area in Indonesia. This innovation is mixed farming where the combinations of the two commodities can be synergized in order to reach optimal utilization the same piece of land. The two commodities, when properly integrated can contribute towards sustainable food production system. They are 60 to 70 species of undergrowth under oil palm plantation consisting of planted leguminous cover crop, naturally growing grasses, broad leaves and ferns. These are considered as weeds that need to be controlled periodically with either chemical spray or manual slashing. These are potential feeds source as the yields, palatability and nutritive values which are adequate for cattle. Under appropriate conditions and systematic management, cattle can be effectively used for weed control. The use of cattle as a biological weed control mechanism in oil palm plantation allows the establishments of a harmonious relationship between cattle, the undergrowth and palm oil. Reduced herbicides usages are environmentally healthy, and simultaneously help to reduce total weeding cost through lower volume of chemical use and reduced and extra labor. Reduced herbicides usage means reduced maintenance cost and less environmental contamination and pollution. Then, cattle can use for transportation appliance which can take fresh fruit bunch as a product of palm oil, means reduced transportation cost. On the contrary, the various wastes from oil palm plantations as well

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as those from palm oil processing industry is used for feed, and as we know, feed is an important factor in the beef cattle business.

Many positive effects can take by the farmers if they adopt this innovation, but something else must be think is that innovation is too complex to adopt by the farmers. It's because, farmers must be concern to two economic activities at the same time. Its means if we want to apply this innovation for the farmer in big scale, we have to analyze the probability of farmer's decision to adopt or not adopt which caused by many factors. Based on that assumption, this research did. The objectives of this research were analyzing factors that influenced plasma farmer to adopt cattle and palm oil integrated system In South Sumatera.

2. Research Methodology

This study was based on analyze of primary data which collected from interview to the plasma farmers in South Sumatera. The data was collected using questionnaires distributed to all respondents by enumerators appointed. Data analyze using logistic linier equation, and counting value of parameters used logistic binary method. Logistic model was used to solve problem in qualitative variable like this research problem with linier equation:

$$D = [X_i/1-X_i] = \ + \ _1 I + \ _2 C + \ _3 NFM + \ _4 EI + \ _5 D_1 + \ _6 D_2 + u$$

D   = Farmer's decision to adopt or not adoption Cattle and Palm Oil Integrated System
X_i = Farmer's probability to adopt
$1-X_i$ = Farmer's probability not to adopt
            = Intersept
$_{1-6}$ = Variables coefficient
I   = Income (Rp/years)
C   = Consumption (Rp/years)
NFM   = Number of Family Members
IP   = Intensity of extension in a year
D_1 = Area origin
            = 1, Non local resident
            = 0, Local resident
D_2 = Education level
            = 1 if   junior high school
            = 0 if   junior high school
u   = Error

Income factor , consumption, number of family members, intensity of extension , origin area and level of education was hypothesized to be positively.

3. Factors Influencing Plasma Farmer's Decision to Adoption Cattle and Palm Oil Integrated System

Probability of farmer's decision to adopt or not adopt cattle and palm oil integrated system influenced by 6 factors were income factor (I), consumption (C), number of family members (NFM), intensity of extension (IP), origin area (D1) and level of education (D2). Six variables were included in the logit models to capture influences to farmer's decision. Result of Binary Logistic test for those variables presented in Table 1.

Table 1. Influencing of Independent Variables to Farmer's Decision by Binary Logistic test

Independent Variables	coefficient	Wald	Significant
	-45,679	3,701	0,054
Income (I)	0,001	3,517	0,059
Consumption (C)	0,001	2,755	0,097
Number of Family Members (NFM)	6,400	3,257	0,071
Extension Intensity (IP)	1,650	3,464	0,063
Origin Area (D$_1$)	4,452	1,675	0,184
Level of Education (D$_2$)	2,430	2,617	0,106

Result of Binary Logistic Equation:
$D = -45,679 + 0,001 I + 0,001 C + 6,400 NFM + 1,650 IP + 4,452 D_1 + 2,430 D_2$
X^2 (Chi-square)   = 44,104
R^2 (R-Square)   = 80,4%

Result showed that 80,4% variation of farmer's decision to adopt or not to adopt cattle and palm oil integrated system caused of income factor, consumption, number of family members, extension intensity, origin area and level of education factor (R-square= 80,4). Then, result of chi-square value (X^2) = 44,104 or > X^2 table 5% , means all independent variables able to explain decision to adoption or not to adoption cattle and palm oil integrated system.

Result of logistic model regression showed that all independent variables having an effect on farmer's decision to adoption or not to adoption cattle and palm oil integrated system. Result of regression analysis using SPSS showed that coefficient value is smaller than specified reality level (p<0,30), so that all variables have an effect on reality. All of coefficient variables values are positive, means that effect of those variables to farmer's decision is positive either. If we add 1% to each variable will increase farmer's decision probability to adopt cattle and palm oil integrated system.

3.1. Income (I)

Influence of income variable to farmer's decision to adopt or do not cattle and palm oil integrated system shown by parameter value equal to 0,001. Significant value equal to 0,059 smaller than determined reality level and positive sign (+) identifying that earnings have an effect on positive to farmer's decision in taking decision to adopt or do not that system. That value means that addition one percent income will affect increasing probability of farmer's decision to adopt. This result according reality that income will be affect farmer'decision to adopt caused wishing to be adopter will increase farmer's income.

3.2. Consumption (C)

Influence of consumption variable to farmer's decision to adopt or do not cattle and palm oil integrated system shown by parameter value equal to 0,001. Significant value equal to 0,071 smaller than determined reality level indicated and positive sign (+) identifying that consumption have an effect on positive to farmer's decision in taking decision to adopt or do not that system. High domestic consume will push farmer to adopt this system in order they can handle their life requirement.

3.3. Number of Family Member (NFM)

Number of family member variable also influenced farmer's decision to adopt or do not cattle and palm oil integrated system, it is shown by parameter value equal 6,400. That value means that addition one percent income will affect increasing probability of farmer's decision to adopt 6,400 percent. Significant value equal to 0,097 smaller than determined reality level indicated and positive sign (+) identifying that number of domestic member have an effect on positive to farmer's decision in taking decision to adoption or do not that system.

Number of family member in a family, causing more and more also requirement of life which be responsibility by family head. So that responsibility pushes family head to look for another job like join in this system for increasing their income.

3.4. Extension Intensity (IP)

Influence of extension intensity variable to farmer's decision to adoption or do not cattle and palm oil integrated system shown by parameter value equal to 1,650. That value means that addition one percent extension intensity will effect increasing probability farmer's decision to adopt 1,650 percent. Significant value equal to 0,063 smaller than determined reality level indicated and positive sign (+) identifying that extension intensity have an effect on positive to farmer's decision in taking decision to adopt or do not that system. This result is relevant to reality that extension intensity will influence the farmer's decision to adoption or do not. Most of adopter has high extension intensity and most of farmer who do not adopt has lower extension intensity.

3.5. Origin Area (D$_1$)

Result of origin area factor test showed that variable having a positive effect on to farmer's decision. Parameter coefficient equal 4,452 means probability of non local residence adopts this innovation 4,452 higher than local residence. Most of non local residence came from Java Island in Indonesia, and local residents were Musi Banyuasin's residents.

3.6. Level of Education (D$_2$)

Result of education variable test showed that this variable having a positive effect on to farmer decision. Positive sign indicated that probability farmer who has higher education is bigger than lower one. High education influence farmer to accept innovation, on the contrary, lower education influence farmer to late adopt an innovation.

4. Conclusions

The adoption of cattle and palm oil integrated system for Plasma farmers in South Sumatera were influenced by income factor, consumption, number of family members, extension intensity, origin area and level of education factor. Research result showed that 80,4% variation of farmer's decision to adoption or not to adoption cattle and palm oil integrated system caused of income factor, consumption, number of family members, extension intensity, origin area and level of education factor (R-square= 80,4). Then, result of chi-square value (X^2) = 44,104 or > X^2 table 5% , means all independent variables able to explain decision to adopt or not to adopt cattle and palm oil integrated system. All independent variables having an positive effect on farmer's decision to adoption or not to adoption cattle and palm oil integrated system, means that effect of those variables to farmer's decision is positive either. Addition 1% to each variable will increase farmer's decision probability to adoption cattle and palm oil integrated system.

5. Acknowledgments

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