http://dx.doi.org/10.22161/ijeab/2.6.34 *ISSN: 2456-1878*

Factors Affecting the Farmer's Response to the Development of Soybean Farming in East Java Indonesia

Bambang Siswadi[1], Anis Rosyidah[2]

[1]Agribusness Department of Faculty Agriculture, Universitas Islam Malang, East Java Indonesia
[2]Agrotechnology Department of Faculty Agriculture, Universitas Islam Malang, East Java Indonesia

***Abstract*—** *The research was conducted to find out (1) factors influencing farmer's decision to cultivate soybean, and (2)the opportunity level of farmer response to soybean farming in Jember and Sampang. Research location was determined through purposive method and sampling conducted through simple random sampling method. Data analysis method used was logit regression model where the dependent variable (Y) was dummy variable with value of 1 (response) and 0 (non-response). Research result found G value of 130.198 (p-value = 0.0001) indicating that logistic regression model, as a whole, could explain farmers' decision in their response to soybean farming. Factors influencing farmers' response to soybean farming were acreage, education, income, and area status.*

***Keywords*— Response, Soybean, Logistic Regression Model, Opportunity, East Java.**

I. INTRODUCTION

Soybean is a strategic food commodity in Indonesia. Therefore, effort for self-sufficiency in soybean should be conducted continuously since it is not only to fulfill food needs but also to support agroindustry and save foreign exchange as well as decrease dependence on imported food (Amaruddin et al., 2002; Supadi, 2008). An excessive dependence on imported food to fulfill the needs could threat social, economic and political stability that in turn have potential to disturb the independence of the nation (Amang and Sawit, 1997; Suryana, 2002; Arifin, 2004; Husodo, 2004).

The government has targeted self-sufficiency in soybean in the future. Currently, the need or national demand for soybean reaches 2.2 ton per year and national production is only able to fulfill 35-40% of the need thus import is the only way to fulfill the shortage. High trend in soybean demand is a big opportunity to increase interest among farmers to cultivate the commodity as well as increase their household income. Currently, national soybean production is decreasing despite the positive but slow growth in soybean productivity (Ariani, 2005; Supadi, 2008). It means that the production level of soybean is decreasing due to the decrease in planting areas. Based on farmer's view, the decrease in soybean planting areas indicates less participation among farmer to cultivate soybean. However, the opportunity in the development of domestic soybean production is still open due to the extent of land availability, agricultural land ecosystem suitability to cultivate soybean and high market demand for soybean cultivation.

Jember and Sampang Regencies are two regencies that give contribution in the supply of soybean production in East Java Province. Soybean production in East Java in 2014 has increased to 355.46 thousand ton of dry grain or an increase of 26 thousand ton (7.89 percent) from those in 2013. The increase in soybean production is occurred due to the increase in harvest area and productivity of 4.26 thousand hectare (2.02 percent) and 0.90 quintal/hectare (5.75 percent), respectively. The increase in soybean production is related to the increase in harvest area in Jember Regency. It is due to the supporting weather, good crop maintenance by farmer and promising soybean price. As well as in Sampang Regency, soybean harvest area is also increasing due to the Program of Expansion of Planting Area (Perluasan Areal Tanam = PAT) in soybean planted in April 2014. The program is partly used land that usually planted with corn thus harvest area of corn is decreasing (Statistik Jawa Timur, 2015).

The increase in soybean production is closely related to farmer's behavior in soybean production process activity and level of farmer participation influences the effort. Therefore, it is interesting to conduct a research on the response of farmer to the development of soybean farming in both regencies as the representative of soybean production center in East Java. The research aimed to: (1) identify factors influencing farmer's decision to cultivate soybean, and (2) find out the opportunity level of farmer response to soybean farming in Jember and Sampang Regencies.

http://dx.doi.org/10.22161/ijeab/2.6.34 *ISSN: 2456-1878*

II. METHODS

The research was conducted in Jember and Sampang Regencies, East Java Province. Location was determined purposively since both areas had an increased trend in soybean harvest area in 2014. Sample for Jember Regency was 65 respondents with 45 farmers who respond and 20 farmers who do not respond to soybean farming. In Sampang Regency, the respondents consisted of 30 farmers who respond and 19 farmers who do not respond. The research used survey method conducted in 2015.

To identify factors influencing farmer response to soybean farming quantitative approach of econometric analysis, which was logistic regression analysis, was conducted. Logistic regression is statistical analysis method used to describe the relationship between independent variable and dependent variable having two or more categories with independent variable having categorical or interval scales (Hosmer and Lemeshow, 1989). Vasisht (2000) stated that logistic regression is a univariate or multivariate analysis used to predict dependent variable, which is a probability of an incident using one or more independent variables. Logistic regression approach was used since it could explain the relationship between dependent and independent variables that otherwise unable to be explained by regular regression.

According to Nawangsih and Bendesa (2013), some studies need to be done with logistic regression model, which is G test to test whether independent variables have significant influence on dependent variable, simultaneously. Wald test, on the other hand, is used to find out whether each independent variable has influence on dependent variable, partially. In addition, Hosmer-Lemeshow test is used to test model feasibility.

Logistic regression consists of two types, binary and multinomial logistic regression. Binary logistic regression has dependent variable that divided into two categories and logistic multinomial has dependent variable that divided into more than two categories. The research used binary logistic and independent variable of X with continue, discrete and categorical scales.

Logit model is a linear regression model where the dependent variable is dummy variable. Generally, the value of 1 is used if an incident "is occurred" and 0 if an incident "is not occurred". Logit model used in the research was as follow:

$$Yi = Zi = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6D1 + \varepsilon$$

Where:

Y = Dummy of Farmer response

Y=1, if farmers conduct soybean farming and

Y=0, if farmers do not conduct soybean farming

X1 = Variable of acreage

X2 = Variable of farmer's age

X3 = Variable of farmer's education level

X4 = Variable of number of family member

X5 = Variable of farmer's income

D1= Dummy of area status; (1=if the area is Jember Regency, 0=if the area is Sampang Regency)

βo-βn = Regression coefficient

ε = error

III. RESULT AND DISCUSSION

3.1. Characteristics of Farmer

The following Table 1 shows result of characteristics of farmers who respond and do not respond to soybean farming.

East Java Province has a considerable contribution in the supply of domestic soybean production in national level, which is 37.22 percent in 2014 (Statistik Jatim, 2015) and the contribution is estimated to increase in 2015. Knowledge of farmer response is important as anticipation by treating it with the influencing factors. Since farmers are the main actor in the program of soybean farming development, their response to soybean farming is very important to be studied as a consideration for local government that conduct program policy related specifically to the characteristics of farmer in their socio-economic aspect.

Based on Table 1, it can be seen that the average of farmer's acreage was varied between farmers who respond and do not respond to soybean farming with farmers who respond had bigger acreage than those farmers who do not respond. Regarding age, farmers who cultivate soybean were older than those who do not respond indicating that younger farmers interested more to non-soybean farming. In addition, there was no difference in level of education for both farmer groups. It means that both farmer groups had similar level of education, which was elementary school. In variable of number of family member, it can be seen that the average number of family member in farmer who respond was 4 people that bigger than those of farmers who do not respond with average family member of 3 people. Regarding income level, the income of farmers who respond was lower than those farmers who do not respond to soybean farming. It means that non-soybean farming gained more income than soybean farming in the same planting season.

3.2. Factors Influencing Farmer Response

Factors influencing farmer response to soybean farming was analyzed using logistic regression (logit model). The analysis aims to see the opportunity of independent

http://dx.doi.org/10.22161/ijeab/2.6.34 *ISSN: 2456-1878*

variables whether or not they have influence on dependent variable, in this case the decision of farmer to respond to cultivate soybean (1) and the decision of farmer for not doing (to not respond to) soybean farming (0).

Based on result of minitab analysis version 16 as indicated in Table 2, it can be seen that G value was 130.198 with p-value of 0.0001 (indicated testing number below 0.05). It means that logistic regression model, as a whole, could explain or predict the decision of farmer to do (respond to) soybean farming. The result was confirmed by the value of G that bigger than the value of Chi-Square of 17.66 (Pearson Method). The feasibility of logistic regression model (goodness of fit) in predicting was analyzed using Chi-square Hosmer and Lemeshow tests. The test result shows Chi-square value of 4.2808 with p-value of 0.831. It means that logistic regression model was fit to be used for next analysis since there was no significant difference between predicted classification and observed classification. Further, Wald test result indicates that, partially, factors influencing (p-value below 0.1) farmer response to soybean farming were X1 (acreage), X3 (education), X5 (income) and D1 (area status).

Acreage

Acreage in the model was a variable with a very significant influence on farmer response to cultivate soybean. The value of Wald test (Z test) for acreage variable was 2.41 and p-value of 0.016. It indicates that farmers with wider acreage would respond more to cultivate soybean than those farmers with narrow acreage. Coefficient of Odds ratio of 4761.89 implies that the opportunity for farmer with wider acreage could reach 4761.89 times than those farmers with narrow acreage. Rationally, the result analysis could be understood since, according to Sumarno and Adie (2010), soybean farming is in the category of high risk and according to Soekartawi (1988) only farmers with wider acreage are willing to take a risk since they would still be able to fulfill their family need when they fail. On the contrary, farmer with narrow acreage tended to avoid the risk. The fact is in line with Rao (1975 in Sabrani, 1988), Hammal (1983), and Dillon and Scandizzo (1978) stated that small farmers tend to avoid risk compare to farmers with wider acreage.

Education

The relationship between farmer response and education had negative sign with coefficient of Z = -2.20 and p-value of 0.028. It means that the lower the level of education of farmers, their response to soybean farming was increasing. Coefficient of Odds ratio was 0.47 meaning that famers with level of education of one year higher had response opportunity to soybean farming of 0.47 times than farmer with lower education. In other words, farmers with higher education had lower opportunity to do (response to) soybean farming. According to Rachmawati and Djuwendah (2015), level of the application of technology in soybean production was dominated more by farmers with elementary school level of education. It is in line with Hadi and Edyanto (2015) stated that the average of formal education level of soybean farmer was elementary school. The condition was in accordance with description data showing that level of education of soybean farmers was elementary school.

Income

Income based on estimation result through logistic regression shows Z coefficient of 2.57 and p-value of 0.010. It implies that income had significant influence on farmer response to soybean farming in significant level of 99 percent. The negative sign means that the bigger the income of farmers the smaller the opportunity of farmers to response to soybean farming. On the contrary, farmers with lower income had bigger opportunity to response to soybean farming. The value of regression coefficient of 0.0000076 indicates that if the difference in farmers' income was Rp. 100,000, Odd ratio would be 2.13. It means that the opportunity of response from famer with income lower than Rp. 100,000 was 2.13 times than those of farmers with income of (Rp. 100,000) bigger than them. Soybean farmers gained income of Rp. 2,023,916; whereas, non-soybean farmers gained income of Rp.4,684,962. It indicates that the income of soybean farmers was lower than those of non-soybean farmers. The amount of income gained by farmers will be taken into consideration when farmer's decision making on type of commodity to be cultivated. It is in line with Bishop and Toussaint (1989) that farmer's income could be influenced by their selection of production yield. The selection of production yield was conducted by farmers based on their expected income and the sales of their produce. Therefore, before selecting or cultivating a commodity, farmers would consider the amount of income gained from the commodity.

Area Status

As in the case of acreage, variable of area status had a very significant influence in confidence level of 95 percent. The coefficient of Z test was 2.05 with p-value of 0.041. Coefficient of Odds ratio of 196.94 implies that farmers in Jember Regency had opportunity to cultivate soybean of 196.94 times compare to those farmers in Sampang Regency. In other words, farmers in Jember

http://dx.doi.org/10.22161/ijeab/2.6.34 *ISSN: 2456-1878*

Regency had higher opportunity to cultivate soybean than those farmers in Sampang Regency.

IV. CONCLUSION

Factors that significantly influenced the decision making of farmers to cultivate soybean were acreage (X1), education (X3), income (X5) and area status (D1). The opportunity of soybean cultivation in Jember Regency was bigger than Sampang Regency.

ACKNOWLEDGEMENTS

The authors would like to thank the Directorate General of Ministry of Research, technology and higher education for the support for Competitive Research Grant.

REFERENCES

[1] Amang, B dan Sawit, 1997. Perdagangan Global Dan Implikasinya Pada Ketahanan Pangan Nasional. Jurnal Agro-Ekonomika. No.2. Tahun XXVII. PERHEPI. Jakarta

[2] Amaruddin, Masyhuri, Sutrilah., 2002. Analisis Keunggulan Komparatif Dan Tingkat Proteksi Efektif Pada Komoditas Kedelai Di Pulau Jawa. Jurnal : Agrosains 2002, XV(2) UGM

[3] Ariani, M. 2005. Penawaran dan permintaan kacang-kacangan dan umbi-umbian di Indonesia. SOCA 5(1): 48−56.

[4] Arifin, B., 2004. Analisis Ekonomi Pertanian Indonesia. Penerbit Buku Kompas Jakarta

[5] Bishop dan Toussaint. 1989. Pengantar Analisis Ekonomi Pertanian. Jakarta: Mutiara

[6] Dillon, J.L. and P.L. Scandizzo. 1978. Risk attitude of subsistance farmers in Northeast Brazil: A sampling approach. *American Journal of Agricultural Economics 60(3):235-425.*

[7] Hadi,S. dan Ediyanto,R. 2015. Responsif Petani Terhadap Usahatani Kedelai Semakin Melemah di Kabupaten Jember. Agritrop Jurnal Ilmu-Ilmu Pertanian

[8] Hammal, K.B. 1983. Risk avertion, risk perception, and credit use. The case of small paddy farmers in Nepal. Research Paper No. 21. Kathmandu.

[9] Hosmer,D.W. dan Lemeshow. 1989. Applied Logistic Regression. New York; John Willey and Sons

[10] Husodo, S Y., 2004. Membangun Kemandirian Pangan: Suatu Kebutuhan Bagi Indonesia, Negara Berpenduduk Banyak dengan Potensi Pangan yang Besar. Yayasan Padamu Negeri. Jakarta

[11] Nawangsih, E. dan Bendesa, IKG. 2013. Perbandingan Ketepatan Model Logit dan Probit Dalam Memprediksi Kecenderungan Tingkat Hunian Kamar Usaha Akomodasi di Bali 2010. Jurnal Ekonomi Kuantitaif Terapan. Vol.6 No.1 Februari 2013. ISSN:2301-8968

[12] Rachmawati,E. dan Djuwendah,E. 2015. Tingkat Penerapan Teknologi Produksi Kedelai (Glysine max (L) Merril) di Kecamatan Conggeang dan Buahdua Kabupaten Sumedang. http://pustaka.unpad.ac.id/wp-content/uploads/2015/01/5-Tingkat-Penerapan-Teknologi-Produksi-Kedelai.pdf

[13] Sabrani, M. 1988. Perilaku petani peternak domba dalam alokasi sumberdaya. Disertasi. Universitas Gadjah Mada. Yogyakarta. (Tidak dipublikasikan).

[14] Statistik Provinsi Jawa Timur, 2015. No. 47/07/35/Th.XIII,1 Juli 2015

[15] Soekartawi. 1988. Prinsip Dasar Komunikasi. pp 46. UI Press. Jakarta.

[16] Sumarno dan Adie, M.M. 2010. Strategi Pengembangan Produksi Menuju Swasembada Kedelai Berkelanjutan. Iptek Tanaman Pangan Vol. 5 No. 1 – 2010

[17] Supadi, 2008. Menggalang Partisipasi Petani untuk Meningkatkan Produksi Kedelai Menuju Swasembada. Jurnal Litbang Pertanian, Vol 27 (3).

[18] Suryana, A., 2002. Benarkah Impor Pangan Kita Mencemaskan, Sekretariat Dewan Ketahanan Pangan. Jakarta

[19] Vasisht,A.K. 2000. Logit and Probit Analysis. New Delhi. Library Avenue.

http://dx.doi.org/10.22161/ijeab/2.6.34 *ISSN: 2456-1878*

Table.1: Characteristics of Farmers who Respond and do Not Respond to Soybean Farming

No	Variable of characteristics	Mean value		T test (P-Value)	Description
		Response (St.Dev)	Non-response (St.Dev)		
1.	Acreage (Ha)	0.4720 (0.2589)	0.3295 (0.1525)	3.69 (0.0001)	Significant
2.	Age (year)	50.21 (13.23)	40.69 (6.35)	5.19 (0.0001)	Significant
3.	Education (year)	8.693 (2.746)	7.923 (2.120)	1.66 (0.101)	Not Significant
4.	Number of family member (people)	4.240 (1.113)	3.564 (0.788)	3.75 (0.0001)	Significant
5.	Income (Rp)	2.023.916 (499.464)	4.684.962 (2.240.665)	7.32 (0.0001)	Significant

Source: Result of data processing

Table.2: Result of Logistic Regression Model Test

Predictor	Coeff.	SE Coeff.	Z	P	Odds Ratio
Constant	6.92618	5.48496	1.26	0.207	
x1 (acreage)	70.638	29.3359	2.41	0.016	4761.89
x2 (age)	0.0206426	0.0956729	0.22	0.829	1.02
x3 (education)	-0.758026	0.345258	-2.20	0.028	0.47
x4 (number of family member)	-0.838059	0.897021	-0,93	0.350	0.43
x5 (income)	-0.0000076	0.0000030	-2,57	0.010	1,00
D1 (area status)	5.28292	2.57923	2,05	0,041	196,94

Log-Likelihood = -8.137

Test that all slopes are zero: G = 130.198, DF = 6, P-Value = 0.0001

Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	17.6646	107	1.000
Deviance	16.2746	107	1.000
Hosmer-Lemeshow	4.2808	8	0.831

Source: Result of Analysis