DOI <https://doi.org/10.18551/rjoas.2017-01.17>

SEVERAL FACTORS THAT INFLUENCE HOUSEHOLD ECONOMIC DECISIONS OF RICE FARMERS IN INDONESIA

Leki Silverius

University of Nusa Cendana, Penfui, Indonesia

E-mail: sil_leki@yahoo.co.id

ABSTRACT

The objective of this study is to point out the factors that influence household economic decisions in the use of labor, production, and consumption. This study was undertaken in Kupang regency, East Nusa Tenggara with 114 samples of agricultural household. A specification of household economic model used a simultaneous equations system. Parameter estimation uses two-stage least squares (2SLS) method. The results showed that the act of using labor in a household for rice farming was significant influenced by agricultural wage rate, rice product price, household income, farming area, and the number of household member. While the use of wage-labor was significant influenced by wage rate, farming area, and the use of household (domestic) labor. The use of urea and SP-36 was affected by ratio of rice price to fertilizer, and farming area. Rice production was influenced by farming area, total number of labor used, and amount of fertilizer used. Rice consumption from farming was positively significant influenced by an amount of rice production produced and the number of household member. Rice consumption from purchase was negatively influenced by the number of rice production but positively influenced by the number of household member.

KEY WORDS

Econometric model, labor, production, consumption, farmer.

Rice is a grass which produces seeds to be used as a staple for most Indonesian. Rice demand in Indonesia tended to be increase from year to year (Nurasa and Purwoto, 2005; Irawan, 2005). During the period of 2008-2012, rice demand increased up to 4.14 percent (Trade Ministry, 2013). The demand increases was caused by population increases and a change in consumption pattern of community that initially have non-rice consumption pattern, then changed to be rice consumption (Leki, 2010). On the other hand, rice plant was also needed as a raw material for food industry and non-food industrial raw materials, such as cosmetics industry and chemical industry (Central Statistics agency/BPS, 2011).

If the supply of local rice could not meet the needs, so that in the future Indonesia will be more depending on importing rice from other countries. Therefore, Indonesia has to make an effort to increase rice production by increasing plants productivity and land extension. According to domestic trade policy center (2013), source of rice growth from productivity was 0.86% and growth of harvest area was 1.99 percent per year.

Rice working in Indonesia is dominated by home-based business. In 2013 there were 14.206.355 agricultural households that attempted to plant rice (BPS, 2013). Agricultural households have a dual role in producing rice for household consumption needs or to meet the needs of the entire population.

Household in producing production unit by combining goods of modal and raw materials along with outpouring of work and time to produce final goods. (Becker, 1965) Agricultural household in maximizing the advantages to face the obstacles of time allocation, production, and income. (Barnum and Square 1979; Singh, et al.1986) According to Barnum and Square (1979) the total of household time were allocated to combine goods production and leisure, as well as good time allocation on farm and/or off-farm (Chang et al, 2012) Ellis (1998) then stated that household has the freedom to work household (domestic) labor and to rent labor from outside household in the applicable wage rate.

The allocation of labor was influenced by several variables, such as wage rate, product cost, income level, and household characteristic. In addition to labor input, household should require other production inputs such as seeds, urea fertilizer, SP-36 fertilizer and so on to carry out production activity. Bokhuseva and Hockman (2004) stated that one of the factors that influence production was technical inefficiency. Furthermore, Kumbakhar (2002) stated that agricultural production related to farmers managerial ability in managing production.

Model of agricultural household economic has attracted the attention of researchers for a long time. Hanani and Yonekure (2009); Fariyanti et al (2007), used model of household economic to analyze the act of household economic decision-making behavior of vegetable farmers. Rochani and Lolollo (2005); Dwiastuti (2008); Setiani (2015); Makki (2014); Leki et al (2016) used household economic model to analyse the decision of agricultural household of crops.

Those results showed that agricultural household has a dual role in decision-making of consumption and production. The production decision directly affects the amount of income that will be accepted and the income level affects the decision of household consumption. While the influence of consumption towards production shows the different behavior. The results of study conducted by Nuhfil and Yonekure found that household consumption expenditure significantly influenced the decision-making of vegetable farmers household. However, the result of study conducted by Leki et al (2016) showed that non-food expenditure to have not significant influence over the use of fertilizer for maize plant.

Based on the analysis above, so that it is important to conduct research aiming to point out factors that influence household economic decisions in using of labor, production, and consumption.

MATERIAL AND METHODS OF RESEARCH

Study Area. This study was undertaken in Kupang Regency, NTT, Indonesia. This location was chosen since it is one of rice production centers in NTT with 21.765 ha in area. Samples of household was randomly chosen, there were 114 households from household population in two sample villages.

Data Analysis Method. In this study was constructed an economic model of agricultural household in the form of simultaneous equations consisting of 7 structural equations and 3 identity equations as follows:

- (1) $LWH = a_{10} + a_{11}W + a_{12}PQR + a_{13}HI + a_{14}FA + a_{15}NHM + \mu_1$
- (2) $LOH = a_{20} + a_{21}W + a_{22}FA + a_{23}LWH + a_{24}SHI + \mu_2$
- (3) $LUT = LWH + LOH$
- (4) $FUR = a_{30} + a_{31}(PQR/PUF) + a_{32}FA + a_{33}ENF + \mu_3$
- (5) $FSP = a_{40} + a_{41}(PQR/PSF) + a_{42}FA + a_{43}ENF + \mu_4$
- (6) $QR = a_{5,0} + a_{5,1}FA + a_{5,2}LUT + a_{5,3}FUR + a_{5,4}FSP + a_{5,5}SR + \mu_6$
- (7) $SHI = HI - EH$
- (8) $EH = EF + ENF$
- (9) $CRF = a_{6,0} + a_{6,1}PPR + a_{6,2}HI + a_{6,3}QR + a_{6,4}NHM + \mu_6$
- (10) $CRP = a_{7,0} + a_{7,1}PPR + a_{7,2}HI + a_{7,3}QR + a_{7,4}NHM + \mu_7$

Names of the variable in the model are presented in detail in Appendix 1.

A built-model has to meet the criteria of economics, statistics, and econometrics. (Koustoyiannis, 1977). Moreover, the model has to be able to be operated, analyzed, and also producing a conclusion related to the phenomenon being studied (Sitepu and Sinaga, 2006).

Identification result of each structural equation in the model is over identified because variable total of the model is 21 ($K=21$) consisted of 10 endogenous variables and predetermined variables that all of them are exogenous variable with 11 variables. In the equation with total of M equal to 2, then it is obtained $(K-M) = 19$ greater than $(G-1) = 9$. Similarly, in the equations with 6 M is obtained $(K-M) = 15$ greater than 9.

Because of all structural equations identified are over identified so that structural equation parameter is analyzed by using Two Stage Least Square (2SLS) methods. It was chosen because having superiority compared to other methods (Gujarati, 2012) the estimation of the model uses a computer application program package named Statistical Analysis System / Econometric Time Series (SAS / ETS) version 9.1 for windows.

RESULTS AND DISCUSSION

Estimation result of household economics model. Structural equation estimation results presented in Appendix 2 showed that all the equations having R²-value were more than 0.5. F test results showed that all of the structural equations constructed statistically were significantly different from zero at the one percent level. In terms of economic criteria all parameter estimators of built-model have signs and magnitude which was accordance with the hypothesized. Based on statistical criteria, econometrics, and economic criterion can be concluded that agricultural household economic model built was well enough to use.

The estimation results of agricultural household economic model are presented in Appendix 3, they were summarized as follows:

- (1) $LWH = -17.0791 + 0.00033 W + 0.00267 PQR - 1.4E-07 HI + 64.6416 FA + 0.6782 NHM$
- (2) $LOH = 15,8768 - 0,00047 W + 60,1199 FA - 0,1952 LWH + 8,38E-08 SHI$
- (3) $LUT = LWH + LOH$
- (4) $FUR = -0,0517 + 9,0739 (PQR/PUR) + 80,4184 FA - 4,8E-07 ENF$
- (5) $FSP = -0,4222 + 15,9295 (PQR/PSF) + 70,9160 FA - 5,3E-07 ENF$
- (6) $OR = 31,7737 + 1792,834 FA + 6,3033 LUT + 10,8821 FUR + 2,1899 FSP + 5,0437 SR$
- (7). $SHI = HI - EH$
- (8) $EH = EF + ENF$
- (9) $CRF = 127,197 - 0,0268 PPR + 3,82E-06 HI + 0,2727 OR + 45,8976 NHM$
- (10) $CRP = 200,9859 - 0,0265 PRP - 1,6E-06 HI - 0,0442 QR + 57,3047 NHM$

The Decision of Labor Use on Rice Farming. In managing rice farming, household not only use labor within the household but also hire wage-labor. Analysis result of labor use was presented in Appendix 3, it showed that agricultural wage variable to have positive significant influence over the use of labor within the households for rice production. Every 1% increase of agricultural wage would increase 0.7% of household labor use for rice production. Agricultural wage to have significant influence over the use of wage-labor. Every 1% increase of agricultural wage caused 2.08% decrease in the use of household (domestic) labor. This was because households faced limited income so that they would reduce the use of wage labor if there is wage increase.

Variable of seed price to have significant influence over the use of household labor. Every 1% increase of seed price would encourage households to increase the use of household labor for rice production.

Total of household income has a significant negative sign parameter estimator at the level of 10 percent, it meant the addition of household income total would reduce the use of household labor for rice production. This happened because households allocated labor to work to earn income and leisure. If the income was considered to have been able to guarantee the household needs, thus the household tended to reduce working time and increase leisure time.

The number of household member to have positive influence over the use of household (domestic) for rice production. The bigger the total of household member, the bigger household (domestic) labor that would be used for rice production activity.

Rice farming area to have positive significant influence over the use of household (domestic) labor or wage-labor for farming rice. The larger rice farming area, the more activities can do, so that it needed many labors. The result was same as reported by Maleha (2008) that farm area cultivated to have positive influence over the use of labor for corps business.

Parameter estimator of household (domestic) labor 1% addition would decrease 0.6% of hired labor used.

Household income surplus to have not real influence but has a positive sign based on hypothesized. It gave an indication that there was a greater tendency that household income surplus would increase the use of hired labor.

The Decision to Use Fertilizer for Rice Production. The analysis result of equation use of urea fertilizer and SP-36 fertilizer presented on appendix 3 showed that ratio variable of seed price to fertilizer to have a significant influence over the use of fertilizer and pesticide. This reflected that farmers were more critical in doing agricultural business because they have considered the price of product and fertilizer although the response was low. It was seen from the elasticity value that less than 1. The rice price getting high would encourage households to add the use of fertilizer, otherwise the increase of fertilizer prices led the decrease of fertilizer use for rice production.

Farming area to have significant influence over the use of fertilizer and pesticide. Every addition of rice farming area led to use of fertilizer become high.

Non-food expenditure showed no significant influence on the use of urea and SP-36 fertilizer, but it has positive parameter estimator that indicated there was a tendency that households would reduce the use of fertilizer along with the increase of non-food expenditure. The results of this study were similar to Leki et al (2016) that non-food expenditures to have not significant influence over the use of fertilizer for maize in Timor. This was one the subsistence household indicators that always gave high priority on the effort to meet food needs from other interests. In addition, households as a member of society could not avoid the traditional events at community which need a lot of costs. To deal with that condition, household was burdened by various demands of tradition/cultural that has to be paid soon. As a result, they would hold household budget reallocation so as to reduce the purchase of fertilizer. For that reason, the use of fertilizer tended to be low.

Several Factors Affecting Rice Production. Analysis results of the rice production behavior presented in Appendix 3 has coefficient of determination of 0.9712 that means 97.92 percent of rice production variation was able to be explained by the explanatory variables included in the model.

Farming rice area to have significant influence over rice production. Every 1% addition of farming area would increase rice production by 0.4%. Parameter estimator of employment is positive and significant at the level of less than 15%, which means the addition of the use of labor will increase production. This occurred because the addition of labor can be used for weeding, pest control and disease until harvest and post-harvest so that it positively affected rice production.

The use of fertilizer to have significant influence over the rice production, but the use of pesticide to have not significant influence. This result supported the findings of Dwiastuti (2008) and Setiana (2015). Rice seeds did not show significant effect on rice production. Nevertheless, positive parameter estimator sign suggested that there was a tendency that use more seeds will increase the production of rice.

Factors Affecting Rice Consumption's Behavior. In this study, rice consumption's behavior was distinguished by rice consumption derived from farming and rice purchase. The results of parameter estimation rice consumption behavior presented in Appendix 3, shows that the production of rice significantly influences the results of the rice consumption from farming. Every 1% addition of rice production caused the rice consumption from farming increased up to 0.62%. This phenomenon was related to the purpose of farming to meet household food needs, thus the bigger production, the larger the result got. On the other hand the number of rice production to have negative influence over the rice consumption from purchase. This condition implied that there was quantitative substitution relationship between rice production and rice consumption from the purchase. The higher rice production, the larger the food availability in a household to consumption, so that households will reduce rice consumption from the purchase.

The number of household to have positive influence over the rice consumption from farming or rice purchase. Thus, the bigger household member, the bigger rice consumption in households.

Total household income to have not significant influence over the rice consumption. Price rice estimator parameter was not statistically different from zero but has a negative value in accordance with the laws of economics. Not real effect of rice price was assumed by the price rice that almost same sold in market. The same result was stated by Taiwon (2006) and Surachman et al. (2009) rice prices did not affect rice demands.

The effect of Policy Simulation. Model validation was first done before simulation by criteria of Theil's Inequality coefficient (U-Theil) and its decomposition (Pindyck and Rubinfeld (1991). Based on the average of actual value and the predictions average value presented in Appendix 4, It was apparent that all endogen variables were identified very close between the average of actual value and its prediction. The analysis result showed that all the U^M value was equal to zero, while the U^S value close to zero, and U^C value approaching one. Thus, it could be concluded that the model was valid and can be used for simulation.

The policy simulation results of farming scale 25% addition presented in appendix 5 showed that farming expansion resulted in the use of production and labor became high, thereby increased production by 19.84%. Production increases led to household income increased up to 14.86% and revenue surplus by 29.19%. Production increases encouraged household to increase rice consumption from farming by 14.51% but decrease rice consumption from purchase by 7.07%.

The policy simulation of subsidy 25% fertilizer price presented in appendix 5 showed fertilizer price subsidy to have influence over the fertilizer demands through changes in the ration of product price to fertilizer. Structurally, fertilizer use increase to have direct influence over the production and production cost. The impact of fertilizer price subsidy policy affected the use of urea and SP-36 fertilizer increased respectively 12.38% and 14.87%. There was 4.24% rice production increase as following effect. Farming production increase caused the availability of food for consumption became high, so that households increased the consumption of rice from farming income but decreased the rice consumption of purchase.

CONCLUSION

The act of household (domestic) labor use for rice farming is affected by agricultural wage rate, seed price, household income, farming area, and the number of household member. While the use of wage-labor is significant influenced by wage rate, farming area, and the use of household (domestic) labor.

The use of urea and SP-36 fertilizer is influenced by the ratio of seed price to fertilizer and farming area. While the non-food expenditure to have not significant influence. Rice production is significant influenced by farming area, total number of labor used, and amount of fertilizer used.

Rice consumption from farming income is positively influenced by an amount of rice production produced and total of household member. Rice consumption from purchase is negatively influenced by an amount of rice production but positively influenced by the number of household member.

Policy simulation of farming scale extension has a significant impact on labor utilization, production increase, and rice consumption from farming results addition.

POLICY IMPLEMENTATION

In order to improve the condition of agricultural household economy, thus it needs a government policy to expand farming scale by utilizing the potential of farm area that has not been utilized for a while. This policy needs to be supported by provision of various agricultural supported facilities or agricultural household empowerment program on an ongoing basis.

APPENDIX 1 – Variable Name

Variable	Description
LWH	The use of labot within household
LOH	The use of labor outside household
LUT	The used of total labor
FUR	The use of urea fertilizer
FSP	The use of SP-36 fertilizer
QR	Rice production
HI	Household income
SIH	Surplus of household income
EH	Household expenditure
EF	Food expenditure
ENF	Non food expenditure
RCF	Rice consumption from farming
RCP	Rice consumption from purchases
PQR	Price of Rice Product
PRR	Purchase price of rice
PUF	Prices of urea fertilizer
PSP	Prices of SP-36 fertilizer
FA	Farming area
SR	The use of seeds
NHM	Number of household member
W	Wage

APPENDIX 2 – Indicator value R2-Statistic, F-value, Probality F, and Durbin Watson from Structural Equation

Endegenous variable	R2	F-value	Pro –F	DW
LWH	0.97483	690.65	<.0001	2.080215
LOH	0.89748	238.54	<.0001	2.229918
FUR	0.89961	328.59	<.0001	1.840937
FSP	0.88994	296.48	<.0001	1.877879
QR	0.97917	1015.27	<.0001	1.757964
CRF	0.69972	63.50	<.0001	1.590924
CRP	0.54212	32.26	<.0001	1.936612

APPENDIX 3 – Estimation Result of Agricultural Household Economic Model

Equation	Variable Description	Parameter estimate	t-value	Elasticity
LWH	Intercept	-17.0791	-3.28***)	
	W	0.000334	2.23**)	0.7031
	PQR	0.002674	8.8***)	0.2774
	HI	-1.4E-07	-1.83*)	-0.0410
	FA	64.64161	36.8***)	0.7385
	NHM	0.678161	2.1**)	0.1888
LOH	Intercept	15.87677	2.51**)	
	W	-0.00047	-2.51**)	-2.0786
	FA	60.11997	8.43***)	1.4430
	LWH	-0.19522	-1.99**)	-0.4102
	SHI	8.38E-08	0.78	0.0689
FUR	Intercept	-0.05173	-0.02	
	PQR/PUR	9.073995	6.61***)	0.3713
	FA	80.41841	19.77***)	0.7048
	ENF	-4.8E-07	-0.72	-0.0739
OB	Intercept	-0.42219	-0.18	
	PQR/PSP	15.92948	7.38***)	0.4461
	FA	70.91602	16.72***)	0.6612
	ENF	-5.3E-07	-0.8	-0.0869
QR	Intercept	31.77372	1.23	
	FA	1792.834	4.19***)	0.4039
	LUT	6.303262	1.54*)	0.1835
	FUR	10.8821	4.83***)	0.2798
	FSP	2.189868	0.99	0.0529
	SR	5.043663	0.86	0.0425
RCF	Intercept	127.197	0.14	
	PPR	-0.02684	-0.3	-0.6790
	HI	3.82E-06	0.9	0.0511
	QR	0.272664	11.4***)	0.6173
	NHM	45.89757	1.92**)	0.5707

Continue of Appendix 3

RCP	Intercept	200.9859	0.67	
	PPR	-0.0265	-0.9	-1.6231
	HI	-1.6E-06	-1.11	-0.0514
	QR	-0.04423	-5.53***)	-0.2425
	NHM	57.3047	7.16***)	1.7252

APPENDIX 4 – Actual Average Value and Prediction. U-Theil Coefficient and its Decomposition in Agricultural Household Economic Model

Variable	Actual Average Value	Prediction Average Value	Deviation	(U ^M)	(U ^S)	(U ^C)	Coefficient U-Theil
LUT	24.7807	24.8837	0.416	0.0000	0.0000	1.0000	0.0655
LWH	16.7895	16.8271	0.224	0.0000	0.0000	1.0000	0.0717
LOH	7.9912	8.0567	0.820	0.0000	0.0300	0.9700	0.1542
FUR	21.886	21.8859	0.000	0.0000	0.0300	0.9700	0.1424
FSP	20.5702	20.5708	0.003	0.0000	0.0300	0.9700	0.1500
QR	851.3	852	0.082	0.0000	0.0100	0.9900	0.0780
SHI	6565501	6466099	-1.514	0.0000	0.0700	0.9300	0.2407
EH	8458351	8376657	-0.966	0.0000	0.0500	0.9500	0.1014
CRF	376	375.5	-0.133	0.0000	0.1000	0.9000	0.2565
CRP	155.3	155.6	0.193	0.0000	0.1400	0.8600	0.2521

Appendix 5 – Policy Simulation Effect of Farming Scale 25% Extension and 25% Subsidy of Fertilizer Price

Variable	SIM BASIC	25% Extension Policy of Farming Scale	25% Subsidy Policy of Fertilizer Price
LUT	24.8837	21.451	-0.013
LWH	16.8271	16.955	-0.137
LOH	8.0567	30.839	0.245
FUR	21.8859	17.623	12.377
FSP	20.5708	16.534	14.868
QR	852	19.836	4.237
HI	14842756	14.865	1.390
SHI	6466099	29.185	2.815
EH	8376657	3.811	0.291
CRF	375.5	14.514	2.850
CRP	155.6	-7.069	-1.285

REFERENCES

1. Barnum H.N., and L. Squire. (1979). A Model of an Agricultural Household. Theory and Evidence, Published for the World Bank, The Johns Hopkins University Press. Baltimore and London.
2. Becker, G. S. (1965). The Economic Approach to Human Behavior. The University of Chicago Press, Chicago.
3. Bokhuseva, R. and H. Hockmann. (2004). Output Volatility in Russian Agriculture: The Significance of Risk and Inefficiency. Working Paper. Institute of Agricultural Development in Central and Eastern Europe (IOMA), Halle.
4. BPS. (2011). Kajian Konsumsi dan Cadangan Beras Nasional 2011. Statistic Center Indonesia, Jakarta
5. BPS. (2013). Hasil Sensus Pertanian 2013 (Pencacahan Lengkap). . Statistic Center Indonesia, Jakarta
6. Chang, Y. M., B. W. Huang and Y. J. Chen. (2012). Labor Supply, Income, and Welfare of the Farm Household. Labor Economics 19 (2012), 427-437.
7. Dwiastuti, R. (2008). Skenario Kebijakan Diversifikasi Konsumsi Pangan Berbasis Perilaku Rumah tangga dan Kelembagaan Lokal. Kerjasama Badan Penelitian dan Pengembangan Departemen Pertanian dengan Lembaga Penelitian dan Pengabdian Masyarakat Universitas Brawijaya. Malang.
8. Ellis F. (1988). Peasant Economics: Farm Husholds and Agrarian Development Analysis. Fifth Edition. Jhon Wiley and Sons Inc., New York.

9. Fariyanti, A., S. Kuntjoro, Hartoyo, and A. Daryanto. (2007). Perilaku Ekonomi Rumahtangga Petani Sayuran Pada Kondisi Resiko Produksi dan Harga Di Kecamatan Pangelanggan Kabupaten Bandung. *Jurnal Agro Ekonomi* 25(2), 178 – 206.
10. Gujarati, D. (2012). *Dasar-dasar Ekonomterika*. Buku 2. Jakarta.
11. Hanani, N. and Yonekura. (2009). Economic Decision Making of Vegetable Peasant Household. <http://nuhfil.lecture.ub.ac.id/.../jepang-jurnal-nuhfil.pdf>.
12. Ilsan, M. (2015). Ketahanan Pangan Rumahtangga Petani pada Tiga Tipe Agroekosistem di Sulawesi Selatan. PhD Thesis. Program of Agriculture, Interest: Agriculture Economy, University of Brawijaya, Malang.
13. Irawam. (2005). National Rice Availability Analysis A Simulation Study of Dynamic System Approach. *Proceeding of Agriculture Multifunction*, 111-130. balittanah.litbang.pertanian.go.id/ind/dokumentasi/.../mflp2005/irawan_dinamis.pdf.
14. Kementerian Perdagangan. (2013). *Kajian Peran Kebijakan Perdagangan Dalam Rangka Percepatan Swasembada Pangan*. Pusat Kebijakan Perdagangan Dalam Negeri. Badan Pengkajian dan Pengembangan Kebijakan Perdagangan. Ministry of Trade Republic of Indonesia, Jakarta.
15. Koutsoyiannis, A. (1987). *Theory of Econometrics. An Introductory Exposition of Econometric Methods*. Second Edition. ELBS. Macmillan Education, Ltd., London.
16. Kumbhakar, C.S. (2002). Specification and Estimation of Production Risk, Preferences and Technical Efficiency. *American Journal Agricultural Economic*. 84(1), 8-22.
17. Leki S., N. Hanani, R. Dwiastuti, B. Setiawan. (2016). Household Economic Decisions of Corn Farmers at West Timor, Indonesia. *Current Agriculture Research Journal*. 4 (1) June 2016: 74-83.
18. Leki, S. (2010). *Kajian Kebijakan Pertanian Dalam Memenuhi Kebutuhan Dasar Penduduk Di Nusa Tenggara Timur*. Perkumpulan Pikul. Kupang. www.perkumpulanpikul.or.id
19. Makki, M. F. (2014). Perilaku Ekonomi Rumahtangga Petani Padi di Lahan Rawa Lebak Kabupaten Hulu Sungai Utara Kalimantan Selatan. PhD Thesis. Faculty of Agriculture, University of Brawijaya, Malang.
20. Maleha. (2008). Perilaku Rumahtangga Petani Dalam Pencapaian Ketahanan Pangan. PhD Thesis. Graduate Program, University of Brawijaya, Malang.
21. Nurasa, T dan A. Purwoto. (2012). Profitability Analysis On Irrigated Rice Farming In Java and The Outer Islands Within The Patanas Rurality. pse.litbang.pertanian.go.id/ind/pdf/Pros_2012_03C_MP_TjetjepADP.pdf.
22. Pindyck R.S., and D.L. Rubinfeld. (1991). *Econometric Models and Economic Forecasts*. McGraw Hill, USA.
23. Rochani, S. and E. M. Lolollo. (2005). Faktor-faktor yang Mempengaruhi Keputusan Ekonomi Rumahtangga Petani Di Kelurahan Setugede Kota Bogor. *Jurnal Agro Ekonomi*, 23(2), 133 – 158.
24. Setiani. (2015). *Produksi Padi Dan Jagung Dalam Ekonomi Rumah Tangga Petani Lahan Sawah: Model Dan Simulasi Kebijakan (Studi Kasus Di Desa Kepuh Kembang Kecamatan Peterongan Kabupaten Jombang)*. Media Trend. 10(2), 104-115.
25. Singh I., I.Square and J. Strauss. (1986). Basic Model. Theory Empirical Result and Policy Conclusions. In Sigh. I., L. Square and J. Strauss (Eds). *Agricuktural Houshold Models Extenssions, Applications dan Policy*, The Johns Hopkins University Press, Baltimore and London, 17-42
26. Sitepu, R. K. and B. M. Sinaga. (2006). *Apliasi Model Ekonometrika. Estimasi, Simulasi dan Peramalan Menggunakan Program SAS*. Program Study of Agriculture Economy, Graduate School of Bogor Agricultural University, Bogor.
27. Surachman H., et al. (2009). *Kajian Pengembangan Model Proyeksi Jangka Pendek Pasar Komoditas Pangan Pokok*, Pusat Penelitian dan Pengembangan Perdagangan dalam Negeri Badan Penelitian dan Pengembangan Perdagangan. Ministry of Trade Republic of Indonesia. Jakarta.
28. Taiwon, H. (2006). Analisis Ketahanan Pangan Utama Indonesia Pada Era Liberalisasi Perdagangan. PhD Thesis. Faculty of Agriculture, University of Brawijaya, Malang.