A SUPPORTING AID FOR BEEF CATTLE INVESTMENT OF FARM HOUSEHOLD IN CENTRAL JAVA

T. Ekowati[1,3], D.H. Darwanto[1], S. Nurtini[2] and A. Suryantini[1]
[1]Faculty of Agriculture, Gadjah Mada University,
Jl. Flora, Bulaksumur Campus, Yogyakarta - Indonesia
[2]Faculty of Animal Sciences, Gadjah Mada University,
Jl. Fauna, Bulaksumur Campus, Yogyakarta – Indonesia
[3]Permanent Address : Faculty of Animal Agriculture, Diponegoro University,
Tembalang Campus, Semarang 50275 – Indonesia
Corresponding E-mail:tiekowati@yahoo.co.id

Received December 27, 2011; Accepted February 08, 2012

ABSTRAK

Penelitian dilakukan dengan tujuan untuk menganalisis beberapa faktor yang mempengaruhi produksi, pendapatan, konsumsi rumahtangga dan investasi usaha sapi potong. Lokasi penelitian ditentukan secara *purposive sampling* berdasarkan populasi sapi potong dan lokasi terpilih yaitu Kabupaten Rembang, Blora, Grobogan, Boyolali dan Wonogiri. Responden peternak ditentukan dengan metode *quota sampling*, setiap kabupaten diambil 40 responden. Data dianalisis dengan analisis regresi simultan dan diestimasi dengan *Two Stage Least Square* (TSLS). Hasil penelitian menunjukkan bahwa secara simultan variabel independen berpengaruh nyata terhadap variabel dependen (produksi, pendapatan, konsumsi dan investasi sapi potong) dengan probabilitas F hitung 0,0000 dan adjusted R^2 masing-masing adalah 91%; 89%; 96% and 62%. Analisis simulasi penerapan agribisnis yang terdiri atas 1) penurunan *service per conception* 15%; 2) kenaikan harga induk dan jumlah sapi potong masing-masing 15%; 3) kenaikan harga beras dan jumlah anggota keluarga masing-masing 15% dan 4) peningkatan pendapatan dan harga ternak sapi potong masing-masing 10% menyebabkan peningkatan konsumsi rumah tangga 0,446% dan investasi sapi potong 5,14% sedangkan produksi dan pendapatan tidak berubah. Kesimpulan penelitian adalah variabel independent secara simultan berpengaruh terhadap produksi, pendapatan, konsumsi dan investasi sapi potong dan adanya perubahan penggunaan input maupun harga hanya berpengaruh terhadap konsumsi dan investasi.

Kata kunci: regresi simultan, produksi, pendapatan, konsumsi rumahtangga, investasi sapi potong

ABSTRACT

The research was conducted to analyze some factors influencing production, income, farm household consumption and investment of farm household beef cattle in Central Java. Five districts were purposively chosen for research location based on the number of beef cattle population, namely Rembang, Blora, Grobogan, Boyolali and Wonogiri. Forty respondents of each district were chosen randomly using quota sampling. Data were analyzed through Simultaneous Regression and estimated by Two Stage Least Square (TSLS). The results showed that independent variables were simultaneously significant to dependent variables (production, income, farm household consumption and investment) with the Probability F test 0.0000 and adjusted R^2 were 91%; 89%; 96%; 62%, respectively. The simulation's analysis of agribusiness implementation consisted of 1) decreasing 15% of service per conception, 2) increasing of beef cattle breed and number of beef cattle 15% respectively, 3) raising of price of rice and number of household member 15% respectively and 4) increasing of income and price of beef cattle 10% respectively influenced to farm household consumption and investment 0.446% and 5.14%, respectively, meanwhile production and income did not change. The research can be concluded that the independent variables simultaneously significant influenced to production, income, farm household consumption and beef cattle investment. The simulation of changing usage of input factor and price significantly influenced to farm household consumption and beef cattle investment.

Keywords : simultaneous regression analysis; production, income, farm household consumption, beef cattle investment.

INTRODUCTION

The important component of agriculture sector is livestock and an insurance against harvest failures and a source of easily cashable investment capital. Ninety two percent farmer families have opinion that livestock is the only first level sustainable source of livelihood (Herani, 2008). Therefore, beef cattle farming is kept living among those farm households in the village as one of their livelihoods. Livestock farming is a system influenced by physical, biotic, and social economic factors where these also become challenges for an agribusiness management (Amir and Knipscheer, 1989). On farmer level, some efforts to raise productivity can be taken by improving its management (Saragih, 2003). Farming management is related to how to allocate the resources in order to gain profit through production, consumption, and investment. Singh *et al*. (1986) stated that on farming level; subsystem decisions on production, consumption, and labor are simultaneously formulated. However, the condition confirmed that many of these activities are nowadays turned to semi-commercial but decisions on production, consumption and labor are still correlated. Concerned to this matter, a concept of cattle farming was implemented through a comparative profit measurement of production factor or resource. That was in line with Ponzoni and Newman (1989) and Harris and Newman (1994) that the general aim of farm animal improvement is to increase efficiency of production to get profit. The challenge faced by farmer now is how to use production factors efficiently in order to gain profit so that its improvement can be realized by allocating part of investment.

Beef cattle investment decision provides an excellent opportunity to increase the economic efficiency of beef cattle production. The investment problem that face beef cattle producers are of interest to beef cattle producers, educators and financial institutions involved in lending to beef cattle producing firms (Falconer *et al*., 1996).

Based on the beef cattle farmer's problem related to the allocation of production factors and how to increase income to develope beef cattle farm through investment so the farmers need supporting aid. Supports for beef cattle farming among farm-households are simulated through improvement on the usage of input factor, the rise of cattle price and total household income towards production capacity, income, consumption and investment.

Taking into consideration the above-mentioned, this research was conducted to analyze some factors influencing production, income, farm household consumption, beef cattle investment and supporting aid for farm household in Central Java.

MATERIALS AND METHODS

Descriptive research design was used for research method, it involves observing and describing the behavior of a subject and describes data or characteristics about the population being studied (Nasir, 1988). Besides that, survey method was used to collect data by asking questions to people who are thought to have needed information related to beef cattle firm. Five districts were purposively chosen based on the number of beef cattle population (BPS, 2010), namely Blora, Grobogan, Rembang, Boyolali and Wonogiri, respectively. The number of respondents were 200 farmers which were chosen randomly using quota sampling, so that each region consists of 40 respondents. The data were analyzed descriptively and statistically through simultaneous regression analysis.

Econometric model formulated is a combination of mathematic and statistic models which correlating variables as a stochastic element and meets the criteria of economic, statistic and econometric (Koutsoyiannis, 1985; Pyndick and Rubinfeld, 2005; Gujarati, 2004). Identification test of the model according to *order condition* was taken to identify structural equation as a model of simultaneous equation which meet the criteria: $(K-k) \geq (m-1)$, where K = total of exogenous variables in the model, k = total of exogenous variables in the equation, and m = total of endogenous variables in the equation. If $K - k > m - 1$, then the result is *over identified*, which means that the equation can be estimated. The result of order condition test is suggested in Table 1. From the equation in Table 1, pre-determinant variables were found:

LC; NB; OWT; SC; AF; AC; AM; YB, AI, PB; NBC; PF, PC; NHM; PR; PC; PS; PFish; PM; PMilk; PT; PO; PBC; AH; AW; D.

Then, model validation was taken in order to find whether the model used is valid for decision simulation or not. Statistic criteria used for model validation are Mean Square Error (RMSE) and U-Theil's inequality coefficient (U) (Pyndick and Rubinfeld, 2005).

Table 1. Identification of Sufficiency Requirement to 11 Equations

No.	Equations	K-k	m-1	Ident
1.	BCCP = LC+IC	26-1 = 25	2-1=1	Over
2.	IC= CB + CF + CC+ CM + CR + CE	26-6 = 20	1-1=0	Over
3.	$LnPROD = Lna_0 + a_1LnNB + a_2LnOWT + a_3LnSC + a_4LnAF + a_5LnAC + a_6LnAM + a_7LnYB + a_8LnIA + \mu_1$	26-8 = 18	1-1=0	Over
4.	$INC = b_0 + b_1PB + b_2NBC + b_3PF + b_4PC + b_5LC + b_6D + \mu_2$	26-6 = 20	1-1=0	Over
5.	INBC = RBC – BCCP	26-0 = 26	3-1=2	Over
6.	RBC= PROD x PBC	26-1 = 25	2-1=1	Over
7.	HHTI = INCB + INBC	26-1 = 25	2-1=1	Over
8.	$LnFC = Lnc_0 + c_1LnNHM + c_2LnPR + c_3LnPC + c_4LnPS + c_5LnPFish + c_6LnPM + c_7LnPMilk + c_8LnPT + c_9LnPO + c_{10}LnAH + c_{11}LnAW\ c_{12}LnINBC + \mu_3$	26-12 = 14	1-1=0	Over
9.	TC = FC + NFC	26-0 = 26	3-1=2	Over
10.	$LnBCI = Lnd_0 + d_1LnNBC + d_2LnOWT + d_3LnPBC + d_4LnTC + d_5LnAI + \mu_4$	26-5 = 21	3-1=2	Over
11.	NFE = NFC + BCI	26-0 = 26	3-1=2	Over

Notes :

BCCP (Beef cattle cost production); LC (labor cost); IC (input cost); CB (Cost of breed); CF(cost of forages); CC (cost of concentrate); CM (cost of medicine); CE (cost of equipment); CR (cost of reproduction); PROD (production); OWT (outflow of working time); SC (Service per conception); AF (amount of forages); AC (amount of concentatre); AM (amount of medicine); YB (Years of Breed); AI (Agribusiness Implementation); INC (income); PB (price of breed); NBC (number of beef cattle); PF (price of forages); PC (price of concentrate); D: dummy variable (kind of beef cattle); INCBC (income of beef cattle); RBC (revenue of beef cattle); PBC (price of beef cattle); HHTI (Household total income); INBC (income of non beef cattle); FC (food consumption); NHM (number of household member); PR (price of rice); PC (price of corn); PS (Price of sugar); PFish (price of fish); PM (price of meat); PMilk (price of milk); PT (Price of tobacco); PO (price of oil); AH (Age of husband); AW (age of wife); TC (total consumption); NFC (Non food counsumption); BCI (beef cattle investment); NFE (Non Food Expenditure).

Supporting aid for farm household was simulated by 1) improvement of agribusiness subsystem implementation and lowering service per conception of 5%; 2) increasing 15% of price of cattle breed and number of beef cattle; 3) raising 15% of rice price and number of family members; 4) increasing 10% of income and price of beef cattle.

RESULTS AND DISCUSSION

Profile of Beef Cattle Farming in Central Java

Beef cattle is one of big farming commodities which mostly managed by farmers in Central Java, both as people and corporate farming. The population of beef cattle farming in Central Java from 2006-2010 is turned to raise with growth rate of 2.8% and population in 2010 achieved 1,554,458 cattle. The population of beef cattle is spread through all of Central Java with the most populated areas found in 5 regencies, those are Blora, Grobogan, Rembang, Boyolali, and Wonogiri

Characteristics of the Respondents

The result of the study revealed that 89% respondents were in their productive age and 56.5% attended primary school. Moreover, most

Table 2. Analysis Result of Factors Influencing Beef Cattle Production

Variables	Expected Sign	Coeficient	Probability
Intercept	+	10.01947***	0.0000
Ln NC	+	0.809773***	0.0000
Ln OWT	+	0.190888***	0.0092
Ln SC	-	-0.046795*	0.0593
Ln AF	+	0.071804**	0.0235
Ln AC	+	0.008651***	0.0036
Ln AM	+	0.026894	0.1318
Ln YB	+	0.023518*	0.0739
Ln AI	+	0.616217***	0.0000
Probability of F-test			0.0000
R-square			0.915815
Adjusted R-square			0.912289

*Significant at α=10%, **Significant at α=5% and ***Significant at α =1%

of the respondents had experience to manage a beef cattle farming for 19.895 years. Most of the respondent (81%) worked as food crop farmers, only 4% of the respondents had main occupation as beef cattle farmers and it has 8 hours-work day.

The respondents were consisted of 56.50% graduated from Elementary School, 22.00% Junior High School and 11.00% Senior High School. According to the data, 38.50% respondents have worked for their farming more than 20 years. About 67.50% respondents have 3-4 family members with the average of 3.12 people. On average, the cattle ownership raised by the respondents was 5.21 cattle or 4.268 Animal Unit (AU).

The Analysis of Production, Income, Consumption and Investment

Analysis of production, income, consumption and investment discussed matters were related to the allocation of input factor usage in beef cattle farming. From total household income, it was suggested that the allocation of household consumption and improvement of beef cattle farming was directed to the investment. Production cost of beef cattle farming can be estimated by the use of variable cost and fixed cost. The production cost was IDR 8,254,828.287/year consisted of variable cost IDR 7,853,442.525 and fixed cost IDR 401,385.762. In addition, the highest component in this production cost was forage i.e. IDR 3,919,698 (47.483%). This showed that the feed usage was a dominant requirement must be allocated by the farmer for beef cattle farming. The result was in line to Lestari *et al*. (2011) that feed is one of the environmental factors influencing the productivity of livestock.

Income is the difference between revenue and cost production (Debertin, 1986). In this research, the cost component was estimated as a cost i.e. allocation of input usage was valued as cost, thus the approach used here was farmer's profit. The Income of beef cattle farmer was IDR 1,934,861.713/year consisted of revenue IDR 10,189,690 and production cost IDR 8,254,828.287. The beef cattle farmer's income per month was lower than the province of minimum wages namely IDR 161,238,476 and IDR 675,000 respectively. Thus many efforts are needed to improve this activity through improving the attitude of beef cattle farmer to agribusiness implementation (Ekowati *et al*., 2011).

Analysis of factors influencing the beef cattle production is presented in Table 2. The result showed that all independent variables were simultaneously significant correlated with production with probability of F-test of 0.0000 and adjusted R^2 of 91%. The 91% of adjusted R^2

Tabel 3. Analysis Result of Factors Influencing Beff Cattle Farmer's Income

Variables	Expected Sign	Coefficient	Probability
Intercept	+	7445.635***	0.0000
PB	-	-2652.378***	0.0000
NBC	+	2.336677**	0.0426
PF	-	-6275.462***	0.0027
PC	-	-7.626540	0.9662
LC	-	-0.907821***	0.0000
Dummy variable	+	60.25308***	0.0000
Probability of F test			0.0000
R-square			0.897144
Adjusted R-square			0.893946

*Significant at α=10%, **Significant at α=5% and ***Significant at α=1%

means 91% of independent variables were significantly correlated towards dependent variable and 10% was correlated with other factors. Besides that, other variables with significant correlation, in partial, towards production were NB; OWT, AC and AI with 1% of significance. Furthermore, AC has significant correlation of 5% and variables of SC and YB have significant correlation of 10%. Also, regression coefficient of all variables which significantly correlated with production were between 0 – 1 (0 < E < 1), it mean that production function of beef cattle farming was found in area II i.e. input factor used by the farmers was in rational limit.

Factors influencing the income of beef cattle farming were analyzed using profit function measure which was generated from productive equation where input used was normalized by output price. The estimation result suggested that expected sign of variable correlating to endogenous variable of beef cattle farming income was in accordance with the economic criteria. The result of this analysis is presented in Table 3.

The result suggested that all independent variables, simultaneously, were significantly correlated with income with probability of F-test 0.0000 and adjusted R^2 of 89%. That mean 89% of independent variables influenced the income but the other 11% was influenced by other factors. Variables with significant correlation, in partial, to income were PB, PF, CL, and dummy variable (kind of livestock) with significance level of 1%, whereas NBC had significance level of 5%.

Basically, consumption theory is correlated with demand theory. Demand theory is created using the concept of satisfaction as a reflection of utility measure. Utility itself is an index of satisfaction from goods and services consumed and it can be summed and compared among the consumers (Nicholson, 1996). Total consumption of farm household is much related to the number of family members, price of food and income of beef cattle. Total income of farm household was sourced on beef cattle farming and non-beef cattle in average was IDR 14,737,677.1/year or IDR 1,228,139.76/month. From this total income, it was allocated to food consumption and non-food consumption and each was calculated IDR 4,912,500/year and IDR 3,642,960/year respectively.

The estimation result of factor variables which influence consumption was in accordance with the economic criteria, where it was, simultaneously, had significant correlation to household consumption with probability of F-test 0.0000 and adjusted R^2 of 96% (Table 4). The expected sign of variables which influenced farm household consumption was appropriate with the theory approach. In partial, variables that correlated to food consumption were NFM, PR, PFish, PM, PO, INBC and lastly the age of husband and wife.

Investment is an allocation of some budget in order to gain profit in the future. Commonly,

Table 4. Analysis Result of Factors Influencing Beef Cattle Farmer's Household Consumption

Variables	Expected sign	Coefficient	Probability
Intercept	+	61.73794***	0.0000
Ln NHM	+	0.040185**	0.0498
Ln PR	-	-2.556336***	0.0000
Ln PC	-	-0.003049	0.9179
Ln PS	+	0.070743	0.3212
Ln PFish	-	-0.578225***	0.0000
Ln PM	-	-0.043484*	0.0719
Ln PMilk	-	-0.050267	0.2455
Ln PT	-	-0.007221	0.2163
Ln PO	-	-1.810453***	0.0000
Ln AH	-	-0.056728*	0.0124
Ln AW	+	0.105381***	0.0000
LnINBC	-	-0.113579***	0.0000
Probability of F test			0.0000
R-square			0.966664
Adjusted R-square			0.964524

*Significant at α=10%, **Significant at α=5% and ***Significant at α=1%

Table 5. Analysis Result of Factors Influencing of Beef Cattle Investment

Variables	Expected Sign	Coefficient	Probability
Intersep	+	13.63695***	0.0000
Ln NBC	-	-0.086370***	0.0029
Ln OWT	+	0.551563***	0.0000
Ln PBC	-	-0.444818***	0.0000
Ln TC	+	0.338745***	0.0000
Ln AI	+	0.171010	0.2780
Probability of F test			0.0000
R-square			0.636538
Adjusted R-square			0.627171

*Significant at α=10%, **Significant at α=5% and ***Significant at α=1%

investment is divided into *financial assets* and *real assets*. Investment into *financial assets* is taken through currency or capital exchange whereas in the contrary *real assets* is taken through a productive assets such as make some business (Halim, 2003).

The result of regression analysis was based on statistic criteria from the determination of coefficient value (R^2) and t-test. Equation of investment had R^2 63.65% and adjusted R^2 62.72% which was greater than 0.5. It showed that exogenous variable can simultaneously confirm endogenous variable of 62% with probability of F-test 0.0000. Regression analysis on factors influencing investment is shown in Table 5. According to the result of partial analysis

Table 6. The Result of Economic Validation Model of Beef Cattle Farmer's Household

Endogen Variables	RMSE	U'Theil
Beef cattle production	0.121610	0.004750
Beef cattle farm income	17.65410	0.110775
Consumption of farmer's household	0.049828	0.001621
Beef cattle investment	0.096787	0.003291

Tabel 7. The Change of Price and Technical Aspect Implementation of Beef Cattle to Some Economic Criterias of Beff Cattle Farm Household

Endogen Variables	Basic value	Simulation Value	Alteration	
			Unit	%
Beef cattle production	12.79383	12.79383	No change	-
Beef cattle farm income	58.95968	58.95968	No change	-
Consumption of farmer's household	15.37063	15.43901	0.06838	0.443
Beef cattle investment	14.70266	15.50039	0.79773	5.146

on variables with correlation to investment of beef cattle farming, it was consisted of NBC, OWT, PBC and TC.

A Supporting Aid for Beef Cattle Farming

The research on beef cattle farming is formed on simultaneous analysis, thus correlation between endogenous and exogenous variables is simultaneously correlated. Related to this problem, model validation was performed before the simulation analysis is taken. Model validation was analyzed from normality outcome, Root Mean Square Error (RMSE) value, and coefficient of Theil inequality. The result of validation analysis for simulating input or output price changing is presented in Table 6. Based on the validation result, it was found that analysis value of Root Mean Square Error (RMSE) was low. According to Pyndick and Rubinfeld (1995) also Greene (2003) RMSE which has minor value is good for prediction. In another hand, model validation using approach of U'Theil criteria resulted value between 1 and 0, if U'Theil value is closed to 0 (zero) it means that the model had followed the actual data and was a good model. The result of this analysis is suggested in Table 7.

From the simulation towards better improvement both in technical aspect and price changing as a supporting aid for beef catle farming, there were several results:

1. Improving agribusiness implementation and decreasing 15% of service per conception had made no change towards the production. This was because farmers will attain over-capacity level if there was addition of beef cattle raised, remember that level of agribusiness implementation was still in adequate level and number of family members which was in average only 3.14 people. If there is addition on production, there will be an addition on production cost too.
2. Increasing 15% of PB and NBC had no change towards the income. It could be happen, because increasing of NBC will add 15% cost production as well. So, cost addition cannot boost the farmer's income.
3. The changing on number of family members and rice price to 15% caused 0.443% increase on farm household consumption. This was happened due to the addition of total family members and the raise of rice price which finally yields an addition on allocation for consumption. In the other hand, if only the rice price that change (10%) actually it brought no change on farm household

consumption. Based on this condition, it was concluded that number of family members was the key factor causing the change on farm household consumption.

4. Increasing income of 10% tend to raise investment of 5.146%. It showed that the income earned by the farmers was not all allocated for farm household consumption but they were also realistic to allocate it for the improvement of beef cattle agribusiness through investment. The result was in line with Albera *et al*. (2004) finding that simulated profit of the farm is positive gain for farm household.

Based on the result of simulations, it can be concluded that the changes both on input usage and input or output prices were not simultaneously trigger the changes of endogenous variables. This was in accordance with the input factor on the previous discussion that farmer was in rational stage thus improvement of skill or service per conception and price change were not followed by the change of production or income, while the increasing of farmer's income will increase beef cattle investment.

CONCLUSION

The research can be concluded that beef cattle farm gave profit to farmers and the independent variables simultaneously significant influence to production, income, farm household consumption and beef cattle investment variables. The simulation of changing usage of input factor and price significantly influenced farm household consumption and beef cattle investment.

ACKNOWLEDGMENTS

The research was supported by "Beasiswa BPPS" scholarship Doctoral Program from Higher Education General Directorate, Ministry of Education, Republic of Indonesia. The authors wish to thank Agriculture Research and Development Board for providing research funding of KKP3T 2010.

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