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The Income Distribution and Household Food Security of Beef Cattle Farmers in The Special Region of Yogyakarta, Indonesia

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ABSTRACT

This research aimed to calculate income and its distribution as well as the food security rate and to analyze factors affecting food security rate of independent and profit-sharing farmers of beef cattle fattening in Special Region of Yogyakarta. An explanatory was used as the method for the research in Gunungkidul, Sleman, Bantul, and Kulonprogo Regencies by quota sampling on 120 independent and 120 profit-sharing farmers. Data were analyzed through income formulation, R/C Ratio, Gini Ratio, cross-classification of food expenditure share and energy consumption (Table of Jonsson and Toole), and ordered logistic model. The research results indicate that the incomes of independent and profit-sharing farmers were IDR1,079,033.00 and IDR1,023,324.00, lower than the Minimum Wage of Special Region of Yogyakarta which amounted to IDR1,337,645.25. The business was still accountable because the R/C ratio had a value larger than one. The values of the Gini Ratio of independent and sharing farmers were 0.310 and 0.219 which categorized as the low-scale unequal income distribution. Food security rates of independent and profit-sharing farmers were 22.5% and 13.33% of food secure, 15.83% and 18.33% of food vulnerable, 40.0% and 38.34% of less-secure food, and 21.67% and 30.0% of food insecure. The determining variables were the price of rice ($p<0.01$), price of vegetable ($p<0.05$), price of beef ($p<0.01$), price of cooking oil ($p<0.05$), and the price of instant noodle ($p<0.01$), household income ($p>0.05$), education dummy ($p<0.05$), cattle group dummy ($p>0.05$), the number of family member ($p<0.01$), and the housewife education ($p>0.05$).

Keywords: *Beef Cattle Farmers, Food Security, Income, Independent, Profit-sharing*

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INTRODUCTION

One of the crucial issues faced by Indonesia to fulfill the demand and availability of beef is the self-sufficiency program of beef, which was planned by the government through Ministry of Agriculture of the Republic of Indonesia in 2004 but it has not been implemented yet. The self-sufficiency of beef is expected to be realized to establish the food security to strengthen the national security as livestock production is a highly critical component of the agricultural economy and it has a supportive role in reducing hunger and food insecurity (Mahmood et al., 2014).

The main issues of beef cattle livestock in Indonesia are the low cow population and a very low-scale business which only ranged from 2 to 3 cows per farmer. In 2017, there were approximately 12,329,477 (97.97%) of beef cattle in 5,078,979 livestock household. The rest 2.03% were in incorporated company, merchants, and others. According to the available data, there were only 4.40% of livestock farmers who became a member of cooperation, while most of them (95.60%) are not. The number of community beef cattle farmers who participate in the cattle group is low (18.22%) while the rest 81.78% are yet to participate as a member of the cattle group. The facilitation of agriculture extension only experienced by 15.72% of livestock farmers household, while most of them (84.28%) never had any guidance and facilitation (BPS, 2017).

Smallholder farmers are the most vulnerable person in the beef cattle production system. Smallholder beef cattle farmers often have limited access to the inputs, information, and services they require to have a better future. They need to be continuously empowered by providing input of technologies, financial support, information, and markets (Agus and Widi, 2018). The conditions of community beef cattle livestock with the various aforementioned issues push the farmers to seek for alternative development system through profit-sharing (gaduhan) type of breeding. Sharing concept for the development of beef cattle with herding or intensive system and appropriate profit-shared concept are still preferred by livestock farmers in the rural area. The existing profit-sharing system is in the form of agreement between the capital owners and the breeders, which usually performed individually (Wibowo and Sumanto, 2013).

The system of community beef cattle livestock in Indonesia is regulated through Law No. 18/2009 that amended by Law No. 41/2014 regarding Animal Livestock and Health in Article 31 verse (1) and (2) which mention that “Livestock farmers are allowed to perform business partnership in livestock farming sector based on the profitable agreement between farmers, between farmers and livestock companies, between farmers and the companies in the other sectors, and between the livestock companies and the government or regional government. The partnership includes profit-sharing, lease, contract farming, *sumba kontrak*, *maro bati*, core plasma, or the other forms suitable for the local culture and the custom of the local community".

Simatupang et al (1999) state that the conditions which encourage the occurrence of a profit-sharing system are 1) undeveloped village financial institution, 2) the livestock business in the form of a family business, 3) low income, and 4) the related village has sufficient production potential. Some partnership patterns of beef cattle livestock business that emerge are custom feeding, profit-sharing, stall rental, build operate transfer (BOT), and price contract (Tawaf and Rahayu, 2003), while the most developed pattern in the community/livestock farmers is a profit-sharing pattern. Simatupang et al (1999) also proposed the regulations that underlie the profit-sharing of a cow in Indonesia, such as regarding the profit-sharing in the traditional profit-sharing system of Bali's cow. Besides acquiring a small margin of profit, the community beef cattle farmers also faced problems related to food consumption. The average community livestock farmers in Indonesia is

categorized as the impoverished community in which their nutrition needs have not been sufficiently fulfilled as results of low purchasing power and low food security.

Special Region of Yogyakarta has potential livestock of beef cattle which farmed by independent and profit-sharing farmers that amounted to 311,470 cows at the end of December 2016 with 9,150 ton of beef production. The meat consumption of Yogyakarta people is approximately 3.7 kg/capita/year. Therefore, the total need for households is approximately 13,613 ton. Meanwhile, the non-household need (industry) amounted to 11,821 ton. Thus, the deficit of beef supply in Yogyakarta Special Province reached 16,284 ton in 2017. The government of Yogyakarta Special Province is taking a policy to stock beef from the regions outside Yogyakarta Special Province, especially when approaching the National Religious Days (Eid Al 'Adha) which amounted to 14,287 ton (BKPP, 2017).

The expected novelty of this research was the calculation of values and income distributions of livestock farmers which associated with the calculation of food security rate between the independent and profit-sharing beef cattle farmers. Therefore, this research aimed to analyze the income value, R/C ratio, distribution of income, food security rate, and the determining factors between independent and profit-sharing beef cattle farmers in Special Region of Yogyakarta.

METHOD

Study area and sampling technique

This research was focused on the farmers of community beef cattle fattening which categorized into two ownership systems, namely independent and profit-sharing in Special Region of Yogyakarta (Gunungkidul, Sleman, Bantul, and Kulon Progo Regencies). The locations were determined by the number of beef cattle population.

This explanatory research was conducted in an interview aided by a structured questionnaire with primary data derived from community livestock farmers as the respondent, and secondary data from related institutions. The respondents of this study were 240 livestock farmers from four regencies with each regency consisted of 60 people, 30 independent/self-ownership farmers and 30 partnership/profit-sharing farmers, who were randomly selected through quota sampling method (Widiati, 2003; Ekowati et al., 2012; Prasetyo et al., 2012).

Data analysis

The acquired data were analyzed in descriptive and statistic manners by applying the calculations of income value and Gini Ratio, cross-classification between food expenditure and energy consumption (Table of Jonsson and Toole 1991), and the analysis method of ordered logistic regression.

1. The income and business accountability (R/C Ratio) was calculated using the income formulation (Soekartawi, 2003) as follows:

   π = TR - TC

   R/C Ratio = TR/TC

where:
π = Profit of Beef Cattle Farm (IDR); TR = Total Revenue (IDR) (Quantity [Q] x Price [P]); TC = Total Cost (IDR) (Total Fixed Cost [TFC] + Total Variable Cost [TVC])

2. The income distribution of community beef cattle farmers was calculated using the Gini coefficient value (Gini Ratio) which described with the Lorentz Curve. Todaro and Smith (2004) explain that the income is distributed unequally and at the low scale if 0.2 < Gini Coefficient < 0.35; at medium scale if 0.36 < Gini Coefficient < 0.49; and at high scale of 0.5 < Gini Coefficient < 0.7. The value of the Gini Coefficient was calculated using the following formula (Riemenschneider, 1976):

$$GR = 1 - \sum_{i=1}^{n} (f_{i+1} - f_i)(y_i + y_{i+1})$$

Where: GR = Gini Ratio coefficient; n = number of class; fi = proportion of a cumulative household of beef cattle farmers; and yi = proportion of a cumulative income amount of class of-i of beef cattle farmers.

3. The food security rate of household in this research was calculated using the percentage calculation of energy consumption sufficiency (Purwantini et al., 2005; Arida et al., 2015) and the food expenditure share (Ilham and Sinaga, 2007), is described as follows:

   a. Real Household Energy Consumption:

$$KERt = \frac{BP}{100} x \frac{Bdd}{100} x\, KGij$$

   Where:
   KERt = real household energy consumption of beef cattle farmers (kcal)
   BP = weight of food consumed (cal)
   Bdd = edible part (% or gr of 100 gr food)
   KGij = Nutritional content of energy consumed (cal)

   b. Equivalent Energy Consumption of Adults

$$KED = \frac{KERt}{JUED}$$

   Where:
   KED = Energy consumption and protein per adult equivalent (kcal)
   KERt = Real household energy consumption of beef cattle farmers (kcal)
   JUED = Number of adult equivalent units (number of family members)

   c. Percentage of Energy Adequacy

$$PKE = \frac{KED}{2.150} x\, 100\%$$

   Where:
   PKE = Percentage of energy sufficiency (%)

KED = Energy and protein consumption per adult equivalent (kcal)
The energy determination number is 2,150 kcal/capita/day (Ministry of Health Provision No.75 / 2013).

d. A Share of Food Expenditure (PPP)

$$\omega = \frac{FE}{TE} x\ 100\%$$

Where:
ω (PPP) = Share of food expenditure (%)
FE = Food Expenditure (Rupiah - IDR / year)
TE = Total household expenditure (Rupiah - IDR / year)

Then, the results were cross-classified with the Classification Table of Food Security Level of Household (Jonsson and Toole, 1991), as seen in the Table 1 below:

Table 1: Classification level of household food security of beef cattle farmers

Energy Consumption per Adult Equivalent Unit	A Share of Food Expenditure (PPP)	
	Low (< 60% of expenditure)	**High** (≥ 60% of expenditure)
Sufficient (> 80% of energy requirement)	**(I) Food Secure**	**(II) Food Vulnerable**
Not Sufficient (≤ 80% energy requirement)	**(III) Less-Secure Food**	**(IV) Food Insecure**

Source: Jonsson and Toole (1991) in Maxwell S et al (2000)

4. The factors that determine the food security rate of household (independent and profit-sharing farmers) were calculated using the analysis method of ordered logistic regression, as shown in the following formula:

$$\Pr HFS(y_j = i) = \ln \alpha + \beta_1 lnX_1 + \beta_2 lnX_2 + \beta_3 lnX_3 + \beta_4 lnX_4 + \beta_5 lnX_5 + \beta_6 lnX_6 + \beta_7 lnX_7 + \beta_8 lnX_8 + \beta_9 lnX_9 + \beta_{10} lnX_{10} + \lambda_1 D_1 + \lambda_2 D_2 + \mu$$

Where: HFS = Household food security (1-insecure, 2-less secure, 3-vulnerable, 4-secure); α = intercept; β = regression coefficient; λ = regression coefficient of dummy variable; X_1 = age of housewife (years); X_2 = education level of housewife (years); X_3 = the number of farmer family member (person); X_4 = price of rice (IDR); X_5 = price of instant noodle (IDR); X_6 = price of vegetable (IDR); X_7 = price of beef (IDR); X_8 = price of cooking oil (IDR); X_9 = total household expenditure (IDR/years); X_{10} = food stock (IDR/years); D_1 = dummy of education level (1 = education > 9 years; 0 = < 9 years); D_2 = dummy of cattle group membership (1 = joined; 0 = not joined); and μ = disturbance item.

FINDING AND DISCUSSION

Socio-economic characteristics of the respondents

Most of the independent and profit-sharing beef cattle farmers were male, with 52.5 years old and 53.4 years old of average ages, respectively. The youngest age of

respondent was 23 years old while the oldest was 84 years old. The respective average years of experience of independent/self-ownership and profit-sharing beef cattle business were 18.7 and 20.0 years. Meanwhile, the average family members of the respondents from the independent and profit-sharing beef cattle farmers was 2.5 and 2.6 people, respectively. The respective average educations of beef cattle farmers from the independent and profit-sharing was 7.4 and 7.8 years, with 37.91% of elementary school graduates, 15.83% of middle school graduates, 23.33% of high school graduates, and only 3.75% who graduated from universities, and the rest of 19.18% did not have any education.

All of the respondents were hired from the livestock farmer families (100.0%). Most of the livestock farmers (93.75%) also worked as agricultural farmers. The types of a cow bred by livestock farmers were Simmental/Limousine cows (44.75%), and local cows or Ongole breed (55.25%). The average business scale was breeding which amounted to 1.79 head of cattle per livestock fattening farmer. The normal fattening process took 7.25 months per production cycle with 0.58 kg/head/day of Average Daily Gain (ADG). The business motive for most of livestock farmer was to seek for profit and gain family savings. In Indonesia, smallholder farmers do not only keep cattle to produce meat for the urban market, to support cropping with manure and draught power, but as livelihood assets (Widi, 2004).

The income and the business efficiency of beef cattle farming

As can be seen in Table 2, the calculated total cost of livestock business (variable cost, fixed cost, and the other costs) of independent farmers, which amounted to IDR 29,061,081.00 per fattening period, was slightly higher than profit-sharing livestock farmers, which amounted to IDR 28,882,400.00 per period. The community livestock farmers in the research location did not buy the forage feed. However, they find it by themselves by mowing grass in unused land or moor. Thus, the entire employees are the livestock farmer families. The livestock farmers did not spend the cost for forage feed and the salary of employees/labors.

Table 2: Average of revenue, production cost, and income of the independent and profit-sharing beef cattle farmers in Special Region of Yogyakarta (n =240)

Component	Independent and Profit-Sharing Farmers (Combined) (IDR)	Self-ownership/ Independent Farmers (IDR)	Partnership/ Profit-Sharing Farmers (IDR)
1. **Total Revenue (TR)**	**30,022,919**	**30,140,114**	**29,905,724**
2. **Total Variable Cost (TVC)**			
a. Fattening Cow (Bulls)	17,448,998	17,648,311	17,329,685
b. Forage Feed (calculated)	4,773,064	4,650,508	4,895,619
c. Concentrate Feed	1,771,158	1,730,851	1,811,464
d. Livestock Medicine	14,201	24,912	3,490
e. Supplement Feed	22,505	38,791	6,219
f. Labor Force (calculated)	4,738,999	4,812,160	4,665,838
3. **Total Fixed Cost (TFC)**			
a. Depreciation of Barn (Housing)	111,766	107,898	115,634
b. Depreciation of Barn Equipment	31,263	27,650	34,876
4. **Other Cost (OC)**			
a. Land/ Barn Rent	-	-	-
b. Water	8,912	9,000	8,825
c. Electricity	10,875	11,000	10,750
5. **Total Cost (TC) = (TVC+TFC+OC)**	**28,931,741**	**29,061,081**	**28,882,400**
6. **Income (TR – TC)**	**1,091,178**	**1,079,033**	**1,023,324**
7. **Revenue/ Cost (R/C) Ratio**	**1.03**	**1.03**	**1.03**

Source: Primary Data Analysis, 2023

The average revenue per cattle of independent livestock farmers was higher than the profit-sharing farmers, with the numbers reached IDR 30,140,114.00 and IDR 29,905,724.00, respectively. This condition is a result of the spent production input and the higher output produced by independent farmers than the profit-sharing farmers.

The average revenue per independent farmer was higher than a profit-sharing farmer, which amounted to IDR 1,079,033.00 for independent farmers and IDR 1,023,324.00 for profit-sharing farmers, or approximately IDR 148,832.14 and IDR 141,148.14 per month. The average fattening period was 7.25 months. The profit was lower than the Provincial Minimum Wage in 2017 in Special Region of Yogyakarta which amounted to IDR 1,337,645.25. The low revenue of community beef cattle is parallel with the analysis results of Hartono and Rohaeni (2014) who mention that the livestock business

of beef cattle is not the primary business and only as the savings, which can be sold any time with 15-26% contributions of the revenue of a livestock farmer family.

For the profit-sharing farmers in the research location, the revenue was still divided further in each selling period in accordance with the oral agreement with the capital/investor. Most of them were in 50:50 proportion (91.67% of livestock farmers), and 60:40 (8.33% of livestock farmers). Widi (2004) states that the profit-sharing percentage of beef cattle of profit-sharing farmers include 50:50, 60:40, or 70:30 for livestock farmers capital owners which calculated after the cattle are sold. The profit-sharing agreement on profit-sharing farmers is performed orally with no written contract due to the kindship or friendship based on the sense of dependency, mutual trust, and mutual dependency.

The R/C ratio indicates that for each rupiah incurred by independent and profit-sharing farmers, it generated IDR1.03 revenue or on the other words the business acquired 3% of total costs incurred. This condition indicates that economically, the self-ownership or profit-sharing system of beef cattle business still considered as profitable due to the R/C ratio value that is more than 1 (one) (R/C > 1) (Table 2).

The results are in line with the study of Nono (2011) in Kupang Regency, which mentioned that the business efficiency (R/C) of the profit-sharing system of beef cattle fattening has 1.97 value (without considering the feed and labor). However, it has not been able to improve business productivity. The business development of community beef cattle in Special Region of Yogyakarta is still accountable to be continued, although almost the entire businesses are performed in small scale (1 to 3 cows), having minimum technology application, and prioritizing more on traditional cattle breeding knowledge that is inherited for generations.

The income distribution of beef cattle farmers

The family incomes of beef cattle farmer consist of the incomes derived from livestock and agriculture businesses, as well as the incomes from the other businesses (non-agriculture/livestock). The incomes classification of livestock farmers in the Special Region of Yogyakarta can be observed in Table 3.

Table 3: Cumulative percentage of gini ratio calculation of beef cattle farmers

Groups of Income	Beef Cattle Farmers			
	Independent (%)		Profit-Sharing (%)	
	Cumulative of Farmers	Cumulative of Income	Cumulative of Farmers	Cumulative of Income
I	0.325	0.191	0.225	0.138
II	0.678	0.475	0.535	0.404
III	0.839	0.650	0.746	0.590
IV	0.890	0.727	0.856	0.715
V	0.916	0.782	0.932	0.856
VI	0.941	0.850	0.974	0.928
VII	0.975	0.916	0.991	0.961
VIII	1.008	1.000	1.008	1.00
Gini Ratio (GR)	0.310		0.219	

Source: Primary Data Analysis, 2023

According to the calculation of total incomes (on-farm, off-farm, and non-farm), the Gini Ratio values for independent beef cattle farmers and the profit-sharing farmers were 0.310 and 0.219, respectively. This condition indicates that both ownership systems are categorized as the income with a low scale of unequal distribution (Todaro and Smith, 2004) (Figure 1).

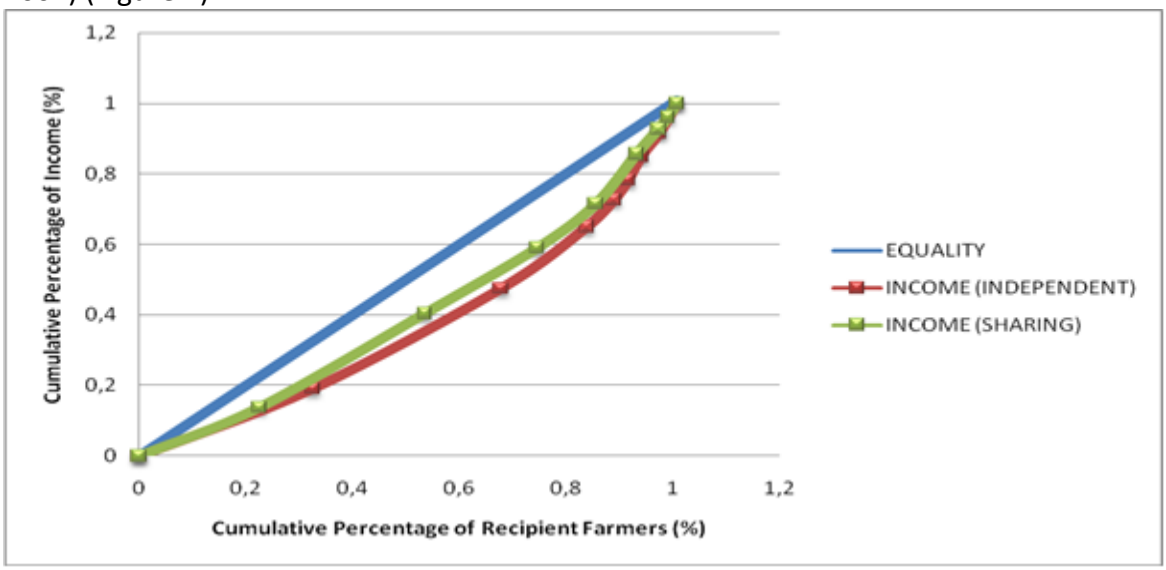

Figure 1. Lorentz curve of household income distribution of the beef cattle farmers

Lorentz Curve can describe the income distribution. Figure 1 displays that the incomes of both types of beef cattle farmers were unequally distributed as the income line deviated from the perfect distribution line (diagonal line). The incomes of profit-sharing farmers were more equally distributed compared to the independent livestock farmer respondents. The distribution of profit-sharing farmers incomes was not obtained from the cattle business unit on an economic scale, although it was still on a small scale. Therefore, the low level of income distribution does not reflect the welfare improvement of livestock farmers lives.

The different income was the results from the various sources of household income other than working as the beef cattle farmers. However, the work is valued as low as the beef cattle fattening business is usually considered as a side business of livestock farmers (Hadi and Ilham, 2002; Suryana, 2009).

The rate of household food security of beef cattle farmers

The results indicate that on both ownership systems of beef cattle (independent and profit-sharing), there were more livestock farmer households that less than 80% energy of the recommended Energy Sufficiency Rate (ESR) that amounted to 2,150 kilocalories (kcal) for energy (the Provision of Ministry of Health No.75/2013) and 57/gram/person/day for protein at the consumption level. There were 74 households (61.67%) of independent farmers and 82 households (68.43%) of profit-sharing farmers that had low energy consumption (≤ 80% of energy sufficiency), while there were 46 households (38.33%) of

independent farmers and 38 households (31.66%) of profit-sharing farmers with sufficient energy consumption (>80% of energy consumption). The variations of household consumption were influenced by the number of family member, price of food, and income from beef cattle livestock business (Ekowati et al., 2012).

The calculation of food expenditure share indicates that the conditions of 75 households (62.5%) of independent farmers and 62 households (51.67%) of profit-sharing farmers in Special Region of Yogyakarta were categorized as low food security since they had a low share of household food expenditure (< 60% of total expenditure). Meanwhile, 45 households (37.5%) of independent farmers and 58 households (48.33%) of profit-sharing farmers were categorized as having a high level of food security (≥ 60% of total expenditure).

According to the cross-classification of food security rate of livestock farmers households, the households of independent farmer could be categorized into four categories of food security; 27 households (22.5%) in the food secure condition, 19 households (15.83%) in the food vulnerable condition, 48 households (40.00%) in the less secure food condition, and 26 households (21.67%) in the food-insecure condition. Meanwhile, the profit-sharing farmers could be classified into 16 households (13.33%) in the food secure condition, 22 households (18.33%) in the food vulnerable condition, 46 households (38.34%) in the less secure food condition, and 36 households (30.00%) in the food-insecure condition, as seen in the Figure 2 below:

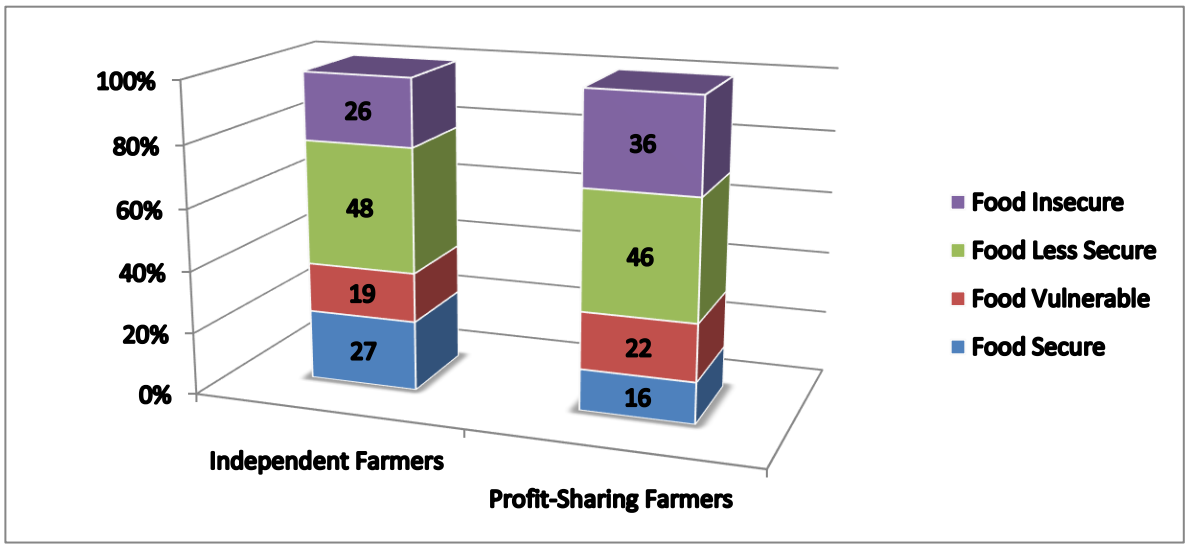

Figure 2. The rate of household food security of beef cattle farmers in Special Region of Yogyakarta

Figure 2 describes the food security rate that was calculated using the indicators of Jonsson and Toole (1991). There were more independent beef cattle farmers households categorized in the food secure condition than the profit-sharing beef cattle farmers. In the lowest category, the number of profit-sharing livestock farmers households with a food-

insecure condition was higher than the independent livestock farmers. These conditions indicate that the food security condition in the households of independent farmers is relatively better than the food security of profit-sharing livestock farmers.

Factors affecting the rate of household food security of beef cattle farmers

The factors that determine the food security rate of a household of independent and profit-sharing beef cattle farmers can be observed in Table 4.

Table 4: The results of ordered logit regression analysis which determine the food security rate of beef cattle farmers households in Special Region of Yogyakarta

Variable	Independent Farmers			Profit-Sharing Farmers		
	Coeff.	Z-stat	Prob.	Coeff.	Z-stat	Prob.
Constant 1	10.079^{ns}	1.617	0.105	19.354***	3.833	0.000
Constant 2	12.798**	2.039	0.041	21.461***	4.186	0.000
Constant 3	13.950**	2.217	0.026	22.901***	4.428	0.000
Age of Housewife (X_1)	0.012^{ns}	0.681	0.495	-0.016^{ns}	-0.912	0.361
Education of Housewife (X_2)	-0.153^{ns}	-1.449	0.147	-0.166*	-1.726	0.084
Number of Family Member (X_3)	-0.620***	-3.817	0.000	-0.216^{ns}	-1.599	0.109
Price of Rice (X_4)	-0.000^{ns}	-0.449	0.653	0.001***	3.824	0.000
Price of Instant Noodle (X_5)	0.002***	3.400	0.000	-0.000^{ns}	-0.420	0.674
Price of Vegetables (X_6)	-1.99E-07^{ns}	-0.007	0.994	0.035**	2.416	0.015
Price of Beef (X_7)	5.50E-05^{ns}	1.134	0.256	0.737***	2.785	0.005
Price of Cooking Oil (X_8)	-5.40E-05^{ns}	-0.909	0.363	0.000**	2.008	0.044
Total Household Income (X_9)	0.700***	4.419	0.000	0.248*	1.659	0.097
Food Stock (X_{10})	-3.59E-08^{ns}	-1.342	0.179	-8.89E-08^{ns}	-1.240	0.214
Dummy of Education (D_1)	1.406**	2.068	0.038	0.651^{ns}	1.179	0.238
Dummy of Cattle Group (D_2)	0.759*	1.665	0.095	0.008^{ns}	0.019	0.984
Pseudo R^2	0.2288			0.1501		
Likelihood Ratio (LR) Stat	72.789			47.142		
Prob. (LR Statistic)	0.00000			0.00000		

***significant at 1% level; **=significant at 5% level; *=significant at 10% level; ^{ns}=non significant

The regression with ordered logit method results show that the Pseudo R2 values were 0.2288 and 0.1501, which means that the independent variable can be used to predict the dependent variable (food security rate) in which the independent variable could explain 22.88% and 15.01% variations of dependent variable in the model while other variables outside the model determined the rest of 77.12% and 84.99%. The pseudo R2 value was considered as small because it was lower than 0.5. If the R2 value is found low on the cross-section data but the result of Z-stat test is significant and the direction follows a theory of economy, then the model can be categorized as statistically accountable (Gujarati, 2003).

The regression analysis results indicate that the independent variables that determined the food security rate of independent beef cattle farmers were price of instant noodle ($p<0.01$), household income ($p<0.01$), dummy of education level ($p<0.05$), dummy of the membership of cattle group ($p>0.05$), and the number of family member ($p<0.01$).

Meanwhile, on the profit-sharing farmers, the significant variables were price of rice ($p<0.01$), price of vegetable ($p<0.05$), price of beef ($p<0.01$), price of cooking oil ($p<0.05$), household income ($p>0.05$), and education of housewife ($p>0.05$).

The variables of the prices of instant noodle, rice, vegetable, beef, and cooking oil were valued positively. This condition indicates that these types of foods are the staple food that is frequently consumed by the family of beef cattle farmers. Therefore, the households of beef cattle farmers still purchase them even though their prices increase. Similar to the variable of household income, the increasing rate of income will increase the food security of a beef cattle farmer household. This condition is explained in previous studies, where they explained that the income influences the food security of households (Susilo, 2010; Abu and Soom, 2016). This condition is also the result of the increasing rate of income. Thus, the purchasing power of the independent and profit-sharing beef cattle farmers to provide foods for their families will be improved. Therefore, they can purchase more varied foods.

Better education and more participation of beef cattle farmers in the cattle group also influence the food security. The negative value of the number of family member indicates that the addition of a family member will decrease the food security rate of a household. The negative value of housewife education on profit-sharing farmers indicates that higher education of housewife will decrease the food security of the household. The average age of respondents' housewife is in old age, with more priority on their health. Higher education of housewives will improve their understanding of nutrition (Asmara and Rahmah, 2010), which tends to decrease food consumption (energy) but increase the protein consumption. This pattern will be inhibited by the issue of the low-income level of beef cattle farmers. Therefore, not all beef cattle farmers can fulfill the protein source with increasing quantity. Having enough food does not secure the access to food, which directly depends on the level of income of an individual or family (Premanandh, 2011).

CONCLUSION

The respective incomes of independent and profit-sharing farmers were IDR 1,079,033.00 and IDR 1,023,324.00, which was lower than the Minimum Wage (IDR 1,337,645.25). R/C Ratio was valued as >1. The values of the Gini Ratio of independent and profit-sharing farmers were 0.310 and 0.219, respectively. It categorized as the income with a low scale of unequal distribution. Food security rates of independent and profit-sharing farmers were 22.5% and 13.33% in the food secure condition, 15.83% and 18.33% in the food vulnerable condition, 40.0% and 38.34% in the less-secure food condition, 21.67% and 30.0% in the food insecure condition. The determining variables of the food security rate were prices of rice ($p<0.01$), price of vegetable ($p<0.05$), price of beef ($p<0.01$), price of cooking oil ($p<0.05$), price of instant noodle ($p<0.01$), household income ($p>0.05$), the dummy of education ($p<0.05$), the dummy of cattle group ($p>0.05$), number of family member ($p<0.01$), and education of housewife ($p>0.05$).

REFERENCES

Abu, G. A. and A. Soom. (2016). *Analysis of factors affecting food security in rural and urban farming households of Benue State, Nigeria*., *International J. of Food and Agricultural Economics*. 4 (1): 55-68. http://www.foodandagriculturejournal.com/vol4.no1.pp55.pdf doi 10.22004/ag.econ.231375

Agency for Food Security and Extension (BKPP). (2017). *Analysis of Availability of the Household and Non-Household Foods*. Agency for Food Security and Extension. DI Yogyakarta Province. (Id).

Agus, A. and T. S. M. Widi (2018). *Current situation and future prospects for beef cattle production in Indonesia – a review*., *Asian-Aust. J. Anim. Sci*. 31 (7): 976-983. https://www.ajas.info/journal/view.php?number=24023 doi: 10.5713/ajas.18.0233

Arida, A., Sofyan and K. Fadhiela. (2015). *Analisis Ketahanan Pangan Rumah Tangga Berdasarkan Proporsi Pengeluaran Pangan dan Konsumsi Energi (Studi kasus pada rumah tangga petani peserta Program Desa Mandiri Pangan di Kecamatan Indrapuri Kabupaten Aceh Besar)*., *J. Agrisep*. 16 (1): 20-34. (Id).

Asmara, R. and B. N. Rahmah (2010). *Analysis of housewife nutrient understanding in food diversification*., *J. AGRISE*. 10 (1): 1-13. (Id).

Central Bureau of Statistics (BPS). (2017). *Results of Cost Structure of Livestock Household Survey 2017*. Statistics of DI Yogyakarta Province. (Id).

Ekowati, T., D. H. Darwanto., S. Nurtini and A. Suryantini. (2012). *A supporting aid for beef cattle investment of farm household in Central Java*., *J. Indonesian Trop. Anim. Agric*. 37 (1):41-49. https://ejournal.undip.ac.id/index.php/jitaa/article/view/7473 https://doi.org/10.14710/jitaa.37.1.

Gujarati, D. (2003). *Basic Econometrics*: Sixth Edition. *Erlangga*, Jakarta.

Hadi, P. U. and N. Ilham. (2002). *Problem dan Prospek Pengembangan Usaha Pembibitan Sapi Potong di Indonesia*., *J. Litbang Pertanian*. 21 (4): 148-157. (Id).

Hartono, B. and E. S. Rohaeni. (2014). *Contribution to income of traditional beef cattle farmer households in Tanah Laut Regency, South Kalimantan, Indonesia*., *J. Livestock Research for Rural Development*. 26 (8): 1-8. https://www.lrrd.cipav.org.co/lrrd26/8/hart26141.htm

Ilham, N. and B. M. Sinaga. (2007). *Penggunaan Pangsa Pengeluaran Pangan Sebagai Indikator Komposit Ketahanan Pangan*. SOCA., *J. Sosial Ekonomi Pertanian dan Agribisnis*. 7 (3): 213-328. (Id). https://ojs.unud.ac.id/index.php/soca/article/view/4217

Jonsson, U and D. Toole. (1991). *Household Food Security and Nutrition: A Conceptual Analysis*. New York: *United Nations Children's Fund*.

Law Republic of Indonesia (UU) No. 41. (2014). Animal Husbandry and Animal Health. (Id).

Mahmood, H. Z., I. Hussain., S. Iftikhar., M. Khan and F. R. Nisa, 2014. *Role of livestock in food security: an ascertainment from Punjab, Pakistan*., *International Journal of*

Academic Research in Business and Social Sciences. 4 (8): 458-470. https://ideas.repec.org/a/hur/ijarbs/v4y2014i8p458-470.html

Maxwell, S., C. Levin., M. A. Klemeseau., M. Rull., S. Morris and C. Aliadeke. (2000). *Urban Livelihoods and Food Nutrition Security in Greater Accra, Ghana*. IFPRI in Collaborative with Noguchi Memorial for Medical Research and World Health Organization, Research Report No. 112. Washington DC.

Minister of Health Provision (Permenkes) No. 75. (2013). *The recommended number of nutritional adequacy for the Indonesian people*. Ministry of Health Republic of Indonesia. Jakarta. (Id).

Nono, O. H. (2011). *The impact of institutional profit sharing on the performance of beef cattle fattening in Kupang Regency*., *J. Sosiohumaniora*. 13 (1): 28-38. (Id). http://jurnal.unpad.ac.id/sosiohumaniora/article/view/5460 **DOI** 10.1088/1755-1315/260/1/012001

Prasetyo, E., Sunarso., P. B. Santosa and E. Rianto. (2012). *The influence of agribusiness subsystem on beef cattle fattening farm's profit in Central Java*., *J. Indonesian Trop. Anim. Agric*. 37 (2): 121-126. https://ejournal.undip.ac.id/index.php/jitaa/article/view/7463 DOI: https://doi.org/10.14710/jitaa.37.2.

Premanandh, J., 2011. *Factors affecting food security and contribution of modern technologies in food sustainability*., *J. Sci. Food Agric*. 91: 2707-2714. https://onlinelibrary.wiley.com/doi/abs/10.1002/jsfa.4666 DOI **https://doi.org/10.1002/jsfa.4666**

Purwantini, T. B., H. P. S. Rachman and Y. Marisa. (2005). *Analysis of Regional and Household Food Security (Case Study in North Sulawesi Province) in Strengthening Household and Regional Food Security as a Base for National Food Security*., *Monograph Series* No. 26. PSEKP. Bogor, pp. 49-69. (Id).

Riemenschneider, C. H. (1976). *The Use of the Gini Ratio in Measuring Distributional Impacts*., *Research Report*. Department of Agricultural Economics. Michigan State University.

Simatupang, P., E. Jamal and M. H. Togatorop. (1999). *Sistem Gaduhan Sapi Tradisional Bali: Faktor Pendorong, Penopang, dan Karakteristiknya*. *Badan Litbang Pertanian*, Bogor, pp. 50-55. (Id).

Soekartawi. (2003). *Principles of Agricultural Economics*. *Rajawali Press*, Jakarta.

Suryana. (2009). *Pengembangan Usaha Ternak Sapi Potong Berorientasi Agribisnis Dengan Pola Kemitraan*., *J. Litbang Pertanian*. 28 (1): 29-37. (Id). http://ejurnal.litbang.pertanian.go.id/index.php/jppp/article/view/7768/6732

Susilo, Y. S. (2010). *Factors affecting food security in rural areas in Yogyakarta Province*., *J. of Indonesian Economy and Business*. 25 (2): 239-250. https://jurnal.ugm.ac.id/jieb/article/view/6298 DOI https://doi.org/10.22146/jieb.6298

Tawaf, R. and S. Rahayu. (2003). *Business Feasibility Analysis of Beef Cattle Partnership, Dairy Cattle, and Chicken*., Faculty of Animal Husbandry. *Padjajaran University*. Bandung. (Id).

Todaro, M. P. and S. C. Smith. (2004). *Economic Development in the Third World*. *Penerbit Erlangga*, Jakarta

Wibowo, B. and Sumanto. (2013). *Pola Budidaya dan Gaduhan Usaha Sapi Potong di Kawasan Perkebunan Sawit Rakyat di Provinsi Lampung*. Proceeding of the National Seminar on Animal Husbandry and Veterinary Technology 2013. *Balitnak Ciawi* – Bogor, pp. 259-267. (Id).

Widi, T. S. M. (2004). *Livestock Sharing Arrangements in the Province of Yogyakarta Special Region; Perspective From Different Stakeholders*. Master Thesis. Wageningen University, Netherlands.

Widiati, R. (2003). *Linear Analysis of Programming of Beef Cattle Business in Farmer Household Systems Based on Regional Typologies in the Special Region of Yogyakarta*. Doctoral Dissertation, Graduate Program Faculty of Agriculture, Gadjah Mada University, Yogyakarta, Indonesia. (Id).