OPTIMUM LENGTH OF RAISING TIME AND THE RELATION WITH BUSINESS INCOME OF SIMMENTAL-ONGOLE GRADE CROSSBRED BEEF CATTLE FATTENING FARM IN WONOSOBO REGENCY-CENTRAL JAVA

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ABSTRAK

Optimalisasi lama waktu penggemukan perlu dilakukan untuk meningkatkan pendapatan peternak. Suatu penelitian survei telah dilakukan dengan tujuan untuk menganalisis kurun waktu mencapai optimum dan hubungannya dengan pendapatan pada usaha penggemukan sapi potong persilangan Simmental dan Peranakan Ongole (Simpo). Penelitian ini melibatkan 50 peternak sebagai responden yang dipilih secara *purposive* berdasar beberapa kriteria, yaitu peternak dengan pengalaman minimal 5 tahun, skala usaha 1- 3 ekor dan bobot sapi peliharaan berkisar 250 – 350 kg/ekor. Data diambil secara *cross section* dan *time series* tiap bulan selama 3 bulan, meliputi data identititas responden, keadaan usaha ternak, input usaha, bobot ternak, harga input dan output. Data dianalisis menggunakan model regresi data gabungan. Kurun waktu optimum dihitung menggunakan fungsi profit per waktu dengan input yang dikonversi ke fungsi waktu. Biaya dan penerimaan usaha semua diperhitungkan. Hasil penelitian menunjukkan kurun waktu mencapai optimum usaha penggemukan sapi potong Simpo adalah 1,50 bulan dari sapi umur 16,67 bulan. Besarnya biaya total, penerimaan dan pendapatan usaha pada kurun waktu optimum, berturut-turut adalah Rp 7.161.740,00; Rp 7.797.100,00 dan Rp 635.350,00. Biaya total, penerimaan dan pendapatan per kg bobot hidup pada kurun waktu optimum berturut-turut adalah Rp 23.247,00; Rp 25.157,00; Rp 1.910,00.

Kata kunci : penggemukan sapi potong, pendapatan, kurun waktu optimum

ABSTRACT

Optimizing the length of raising time in cattle fattening business should be applied to increase farmers' income. A survey research was carried out to analyze the optimum raising duration and its relationship with income in the business of Simmental - Ongole Grade crossbred (SOG) beef cattle fattening. This research involved 50 farmers chosen purposively as respondents based on some specific criteria, i.e. the farmers had been experienced at least for 5 years, the business scale was 1 – 3 bulls and the cattle's live weight was around 250 – 350 kg. Data were taken by cross section and time series for 3 months, covering respondents' identity, cattle business condition, business inputs, cattle's weight, input and output prices. The data were analyzed using combined data regression model. The optimum raising duration was calculated using profit function per time, while the inputs were converted into time function. All of the costs and incomes of business were calculated. The results showed that the optimum raising duration of SOG beef cattle fattening was reached at the 1.5 months from the cattle aging 16.67 months old. The amount of the total cost, revenue and income in the optimum raising duration were IDR 7,161,740.00; IDR 7,797,100.00 and IDR 635,350.00, respectively. The amount of the cost, revenue and income in the optimum raising duration per kg of cattle live weight, were IDR 23,247.00; IDR 25,157.00 and IDR 1,910.00, respectively.

Keywords: beef cattle fattening, income, optimum duration

INTRODUCTION

Wonosobo Regency has a great potential for animal farming, especially beef fattening, because this regency has such ideal environmental climate and providing continuous feed supply. Wonosobo Regency has the environmental temperature, rainfall, relative humidity and altitude 14.3°-26.5°C; 1,713-4,255 mm/year; 24-90% and 275-2,250 m above the sea, respectively. In addition, Wonosobo Regency has a carrying capacity over 100,000 animals unit (Badan Pusat Statistik Kabupaten Wonosobo, 2010).

Wonosobo Regency is one of regencies in Central Java Province that produces a lot of Ongole Grade (OG) and Simmental and OG crossbred (SOG) beef cattle raised in small scale fattening farms. The population of OG and SOG cattle in Wonosobo regency in 2010 were 58.19 and 32.11%, respectively, of the total population of beef cattle (Badan Pusat Statistik Jawa Tengah, 2011).

Many beef cattle fattening farmers in Wonosobo Regency did not sell their cattle in the optimum raising period. They did not know the best time to sell their cattle. They just sold their cattle when they needed money. The efforts to optimize this business can be done through production and productivity approaches (Diwyanto and Priyanti, 2006). One of the efforts to optimize the business is by determining the right length of fattening period, which can be determined by using profit function with converted input variables in time function (Dillon, 1968; Soekartawi, 2003). Small-scale farmers in Wonosobo Regency preferred to raise SOG bulls to be fattened because of their faster body weight gain and their big mature body size.

The costs and incomes of beef fattening business depend on the duration of the bull fattening. A study by Basuki (2000) showed Australian Commercial Cross (ACC) bulls achieved optimum growth after being fattened for 2 months, considering the lowest feed cost per gain and the highest net income. Mayulu *et al.* (2009) stated that SOG bulls, aged about 2 years with initial body weight of 372.15 ± 26.64 kg, given complete feed for 56 days of fattening, gained the income between IDR 601,302 and IDR 925,831 per head.

Income of beef fattening business is correlated to the duration of the bull fattening. The longer duration of fattening increases the production cost and reduce the number of bull fattening activities in a year. Income per period of beef cattle fattening can be determined by weighing the live weight of the bulls multiplied by the price of a kilogram of live weight substracted by production costs (Abimanyu, 2004). A study by Basuki (2000) showed that a two month compensation growth in ACC steers fattening resulted in income of IDR 695,942/bull. The income was calculated at the price conditions in 1998, in which the cost of feed per kg live weight gain was IDR 3,169, the live weight price was IDR 7,000/kg and the feed price was IDR 361.89/kgDM. Ngadiyono *et al.* (2008) studied fattening of 1-2 years old Ongole Grade bulls, fed that Napier grass and concentrate, and found that the feed cost per gain was IDR 15,053-16,482 and income over feed cost (the value of daily weight gain subtracted by the cost of daily feed intake) ranging from IDR 3,886 – 4,692/day.

Based on the description above, the aim of this research was to analyze the optimum duration of bull fattening in relation to income in the fattening business of SOG bull fattening in Wonosobo Regency.

MATERIALS AND METHODS

Research Location and Farmers Selection

The research was conducted in Wonosobo Regency, Central Java Province, from March to July 2012. The target population of the research was the small scale farmers of SOG bull fattening. Survey method was used in the research. The number of farmers taken as respondents was 50. Farmers were selected purposively as recommended by Sugiyono (2005) with the criteria that the farmers had more than 5 years experience, the business scale was 1 - 3 bulls, the business would be remaining in operation for the next 3 months and the bulls weighed from 250 to 350 kg.

Data Collection Procedures

The data were collected by interviewing the respondents using questionnaires, weighing of feed allowed to the bulls, weighing the livestock, and abserving the activities of the bull raising. The data were analysed by a cross sectional and time series combined regression model. The parameters of bulls were measured 3 times at the intervals of one month (30 days) so that the total number of observations was 150 times.

Data Analysis

The variables observed were time variable (T) in months, the bulls' production or bull weight (Y) in kg monthly, the price per output live weight (py) in IDR/kg, the variable of the number of forage input (X_1) in kg the feed intake in Total Digestible Nutrient (TDN)/month, forage input prices (p1) in IDR/kg TDN, and fixed costs (F) in IDR/month. The optimum period analysis used profit function per time from Dillon (1968) and Soekartawi (2003) as the following equation model:

$$\Pi^* = (pY - \sum piXi - F)/T \quad \text{..... (1)}$$

Production function is input function converted into the time function, where

$$Xi = fi\,(Ti) \quad \text{..... (2)}$$

In order that the function (1) is maximum $\partial\Pi^*/\partial T$ must be equal to zero, $\partial F/\partial T$ is zero because it is the constant, so that the equation (1) can be written:

$$Py(\partial Y/\partial Ti) - \sum pi(\partial Xi/\partial Ti) = (pyY - \sum piXi - F)/T = \prod^* \quad \text{.. (3)}$$

Maximum Π^* per time:

$$Py(\partial Y/\partial Ti) - \sum pi(\partial Xi/\partial Ti) = 0 \quad \text{.....(4)}$$

The optimum fattening duration was determined using the production function (Y) of Cobb-Douglas model and the input was time function with exponential model, so the production equation was as follows:

$$Y = A \prod aiTi^{tibi} \quad \text{.....(5)}$$

then equation (3) became as follows :

$$py(aitibiY/Ti) - \sum pi(aitiTi^{ti}/Ti) = 0 \quad \text{. ..... (6)}$$

$$\text{so } Ti = \sqrt[ti]{(py.aitibiY)/(\sum pi.aiti)} \quad \text{..... (7)}$$

The data of py, pi were obtained from the field, and bi, ai, ti and Y were obtained from the data resulted from the regression of Y and X_i functions to T, so the value of T_i by the time of Π^*maximum per time could be determined. The regression analysis used SPSS for Windows 16 with the analysis model as described by Griffiths *et al.* (1993).

The business profit of SOG beef cattle fattening was derived from total revenue subtracted from total cost. Total production costs include variable costs and fixed costs. Profit calculation used the formula as proposed by Soekartawi (2003), as follows:

$$\Pi = TR - TC \quad \text{.....(8)}$$

Where Π is the profit which is gained from total revenue (TR) subtracted from total cost (TC). The revenue was derived from the value of live weight and value of manure produced. Fixed costs include depreciation costs of cage, farming equipment, the cost for purchasing feeder beef cattle, and the variable costs include the cost of forage, concentrate, the cost of medicines, vitamins and labor.

RESULTS AND DISCUSSION

Beef Cattle in Wonosobo Regency

The population of beef cattle in Wonosobo Regency in 2011 was 27,687, consisted of 16,111 heads (58.19%) Ongole Grade cattle and 11,576 heads (41.81%) crossbred of Ongole Grade cattle (Badan Pusat Statistik Jawa Tengah, 2011). Simmental-Ongole Grade (SOG) cattle was one of the crossbred cattle existing in Wonosobo. This breed was resulted from the crossbreeding between Simmental bull and Ongole Grade cow. The population of this crossbred was 8.891 heads or 76.80% of the total crossbred cattle. The number of beef cattle fattening in Wonosobo regency were 13,574 heads occupied by 9,222 farmers, so that every farmer had 1.47 heads in average (Badan Pusat Statistik Jawa Tengah, 2011).

Respondents Identity

The age of SOG cattle farmers was, in average, 46.28 years old, 88% graduated from elementary school with 86% work as farmers, 72% of respondents had been experienced in cattle farming for 10-35 years. The lands owned were mostly rice fields (58%) ranged from 0.10 to 0.50 ha and dry lands (70%) ranged from 0.03 to 0.50 ha. The number of respondent's family members was mostly ranged from 4-6 people (66%). Low educational level, according to Chamdi (2004), leads to minimum adoption of technology so that production resulted by farmers is not optimum.

The condition of respondent's SOG beef cattle; the average cattle ownership was 1.16 bulls, feeder's beef cattle age was 11.76 months with the weight of 204.72 kg and body condition score 2.86. Bull's weight at the initial research was 297.34 kg by the age of 16.67 months and would be fattened in 10.84 months. It means that the respondent's business used very young feeders beef cattle with the weight equivalent to 81.89% of the breed standard of male dairy cattles (Abubakar, 2010) with good physical condition.

Table 1. Production Cost, Revenue and Income of SOG Beef Cattle Fattening in Optimum Duration of Raising

Business Finance	Mean	SEM	Significance
	---IDR/bull---		
Variable Cost	677,040	26,983.17	0.000
Fixed Cost	6,484,700	191,604.00	0.000
Total Cost	7,161,740	199,748.00	0.000
Revenue	7,797,100	128,937.00	0.000
Income	635,350	199,345.00	0.003

SEM = Standard Error of Mean

Table 2. Production Costs, Revenue and Income of SOG Beef Cattle Fattening Per kg on Optimum Duration of Raising

Business Finance	Mean	SEM	Significance
	--IDR/kg--	--IDR/kg--	
Variable Cost	2,188.20	80.32	0.000
Fixed Cost	21,059.00	621.18	0.000
Total Cost	23,247.00	640.89	0.000
Revenue	25,157.00	7.67	0.000
Income	1,910.00	640.16	0.004

SEM = Standard Error of Mean

Beef cattle would be sold after the age of 27.51 months or after fattened in 15.75 months. It approached the maturity in European cattle, which is 3 years (Rianto and Purbowati, 2009).

Optimum Duration of Cattle Fattening

Based on research data from the respondents, regression analysis showed that the input functions of forage feed, concentrates, medicines, vitamins and labor to time, in SOG beef cattle fattening were not significant. It happened since the administrations of those inputs were relatively constant in number and not all respondents administered specific input to their cattle.

The approach for the calculation of optimum duration used forage input, by which all respondents gave it excessively and continuously (Dillon, 1968). Forage was then used to count the input function and production function. According to the respondents, forage intake was estimated at around 10%. This estimation in average was equal to 2.43% of cattle's live weight on dry material basis (DM), which met the standards of nutritional needs for growth and fattening of male calf and heifer (Tillman *et al.* 1991). Forage input was then converted into the unit of kg TDN/month with the DM content of samples and TDN content based on the Feed Composition Tables for Indonesia (Hartadi *et al.*, 1997).

Forage input function obtained in this research was as follows :

$\ln Xi = 2.929 + 0.161 \ln T_1$ or

$\text{in} - \text{anti} \ln X_1 = 18.709 T_1^{0.161}$ ..... (9)

The input function had r^2 = 14.8%, which is simultaneously very significant, very significant partial regression coefficients, no autocorrelation and normal spread of data (F = 25.528; DW = 2.116; VIF = 1.000; KS = 0.742). T_1 variable of the input function X_1 mentioned above was then

regressed with bull's weight (Y) in order to obtain the fattening production function of SOG beef cattle to time T.

The fattening production function of SOG beef cattle to time from the results of regression analysis was as follows :

$$\ln Y = 1.214 + 0.602 \ln T_1^* \text{ or } Y = 3.367 T_1^{0.602} \quad .. (10)$$

The production function had r^2 = 44,7%, very significant simultaneously, very significant partial coefficient regression, no autocorrelation and normal spread of data (F = 118.069; DW = 1.843; VIF = 1.000; KS = 0.476).

The data of cattle's live weight price per kg was IDR 25,000, - (py) and the price per kg of average TDN was IDR 1,533.141 (pX_1). The value of Y, T_1 and T_1* was the average of variable Y, T_1 and T_1*, and each value was 5.8792; 1.6606 and 2.5179. The optimum duration of SOG beef cattle fattening was calculated using the equation 4 and 6 as follows:

$$py.bY / T_1^* = pX1.aiti.T_1^{0.161} / T_1$$

$$25{,}000.0.602.5.8792.1.6606 = 1{,}533.141(0.161.18.709T_1^{0.161}).2.5179$$

$$T_1 = 12.6363818515)^{0.161} = 1.50 \text{ month}$$

The optimum duration of SOG beef cattle fattening in Wonosobo Regency achieved on average in 1.50 months. It means that farmers would earn the highest income in SOG beef cattle fattening at 1.50 months starting from 16.67 months old. When compared to the research of Basuki (2000) and Mayulu *et al*. (2009), it means that the farmers of SOG beef cattle fattening in Wonosobo Regency relatively reached the optimum sooner, at the condition of the prices in 2012 and traditionally cultivated. Generally, farmers had conducted beef cattle fattening for 6.1 to 7.3 months (Topcu and Demir, 2005), 4-5 months (Winaryanto *et al*., 2010), 8.18 months (Prasetyo *et al*., 2012) with an emphasis on high final income, without considering the optimum time. It happened because the small scale farmers had a different goal. At this optimum duration, SOG beef cattle fattening on the condition that reached economically efficient point, which means that the inputs were used effectively (Topcu and Demir, 2005).

Business aspects of the optimum duration will be significantly more favorable in the business of SOG beef cattle fattening in a certain time. Beef cattle farmers can afford cattle fattening by about 8 cycles in the duration of one year. If the price of product, inputs, breed conditions and others remain the same, then farmers will potentially earn eight times a year. Business frequency is relatively higher, both upstream and downstream business activities.

In business, the optimum effort in a short time would be beneficial, but viewed from the zootechnical aspect of SOG beef cattle aged 16.67 months, it is still potential to be fattened more intensively than the previous farmers. The purchase of cattle to be fattened and resold happened in Kendari (Hafid, 2010). Thus, in the optimum duration, farmers would sell their livestock for financial benefit. For cattle buyers, they may still fatten again by better feeding such as complete feed or forage and concentrate adequately, as well as other cultivation aspect which is better than the previous farmers. This had been done by the butchers in Wonosobo Regency. If the cows purchased were still expected to be fattened, then bulls will be raised until a certain duration of time.

Fattening Business Income on Optimum Duration

The amount of variable costs, fixed costs, business revenue and income of SOG beef cattle fattening on optimum duration, either per bull or per kg of live weight are presented in Table 1 and Table 2. Table 1 shows the variable costs, fixed costs, total costs, revenue and income per bull. It statistically shows significant figures because the significance value is less than 1%. It mean that the data are not far from the average. Table 1 shows the average variable cost of IDR 677,040.00/bull which is the total value of forage feed costs, concentrate, vitamins and medicines for 1.50 months of business. Furthermore, the proportion of variable costs consists of the cost of 4% forage, concentrate cost, vitamins and medicines 0.45% and the labor cost is 5% of the total cost. This proportion forage cost is lower, almost half of the proportion of forage costs of Hadi and Ilham research (2002).

The amount of fixed costs for 1.50 months of fattening time is IDR 6,484,700.00/bull, consisting of depreciation and the cost of feeder beef cattle purchase. The proportion of depreciation is 1.3% and the cost of feeder beef cattle purchase is 89.25% of the total cost. The proportion of the cost for purchasing feeder beef cattle in the business of SOG beef cattle fattening took the highest ranks. This is in accordance with the results of a research by Ilham and Hadi

(2002) that the biggest cost of Ongole Grade cattle fattening in Grobogan was the purchase of feeder cattle, i.e 73.55-77.02%. A study by Winaryanto *et al.* (2010) in Tasikmalaya Regency also found a similar result, that the purchase of feeder cattle was 79.14% of total production cost. Thus, the feeder beef cattle price determines the amount of farmer's income and feeder beef cattle price is determined by the breed market and farmers just as followers of the market price.

Income over the feed cost (IOFC) per day per bull in this research was IDR 13,112.00. This result was 2.21 times higher than the results of the research of Priyanti *et al*. (2012) that reached IDR 5,936.00. The business income of SOG beef cattle fattening on the optimum duration IDR 635,350.00/bull was 61% higher, compared to the business income of beef cattle from the research of Arfa'i *et al.* (2009) after equalized. The income of this research was very lower than income of beef cattle business in a province in Northern Vietnam, being at amount of IDR 896,281.00 per bull per 1.50 month (Huyen *et al*., 2010) after equalized. The income in this research was also 40.50% higher than the income of beef cattle fattening in the research of Prasetyo *et al.* (2012) after equalized per bull during 1.5 months and the prevailing prices.

To recognize the business efficiency of SOG cattle fattening in small scale farms on optimum duration, the analyses of cost, revenue and income per kg body weight were conducted. The amounts of costs, revenues and incomes per kg body weight were obtained by dividing the cost, revenue and income per bull with beef cattle body weight on optimum duration.

Table 2 shows all the costs, revenues and incomes per kg of cattle's body weight have significant statistical values. It mean that the data are not far from the average. Each kg of SOG beef cattle production needed variable cost IDR 2,188.20, fixed cost IDR 21,059.00, and needed a total cost of IDR 23,247.00. The optimization of length of fattening time resulted the revenue IDR 25,157 or income IDR 1,910.

The revenue and income per kg of cattle body weight in this research is lower than those of the results of Prasetyo *et al.* (2012) after equalized, i.e. respectively IDR 25,385.45 and IDR 4,574.69. When the both income are equalized in 1.50 month, the income per kg of cattle body weight in this research is more higher than the income of the results of Prasetyo *et al.* (2012), i.e. IDR 838.88 per kg of cattle body weight.

CONCLUSION

It is concluded that optimum duration of cattle fattening can be determined using profit function to time, by which the input and output are converted into time function. Optimum duration of SOG beef cattle fattening in Wonosobo Regency is 1.50 months. Farmers should not take time too long to fatten their beef cattle exceeding the optimum duration, in order to earn high income. Business income of beef cattle fattening in optimum raising duration reached IDR 635,350.00 per bull and IDR 1,910.00 per kg live weight.

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