PROFITABILITY OF SMALLHOLDER DAIRY FARMS BASED ON THE PERFORMANCE OF LACTATING COWS AND FRESH MILK MARKET PRICES AT LOWLAND AREAS OF YOGYAKARTA

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ABSTRAK

Penelitian ini bertujuan untuk menentukan profitabilitas usaha sapi perah rakyat di daerah dataran rendah Yogyakarta, dikaitkan dengan kinerja induk sapi perah yaitu produksi susu yang harus dicapai pada harga pasar susu segar. Tiga puluh ekor sapi Friesian Holstein laktasi dipilih sebagai sampel secara purposif dari 16 peternak responden yang menjual susu segar kepada konsumen langsung di Yogyakarta. Penentuan profitabilitas menggunakan analisis *enterprise budgeting* dengan *accounting profit, economic profit* dan *break even point* (BEP). Pengambilan data yang terkait dengan masukan dan keluaran usaha sapi perah dilakukan melalui wawancara dengan responden menggunakan kuesioner serta observasi langsung terhadap induk sapi sampel. Hasil penelitian menunjukkan bahwa pada kondisi kinerja induk sapi perah dengan produksi susu rata-rata 9,28 liter/hari pada harga pasar susu Rp 4.700,-/liter menghasilkan *accounting profit* sebesar Rp 7.758.862,-/induk laktasi/tahun. Peternak mampu menghasilkan *economic profit* sebesar Rp 1.839.875,- dengan indeks profit margin 0,12. Jika peternak harus menjual susu ke koperasi dengan harga Rp 2.800,- atau Rp 3.200,-/liter, *economic profit* yang positif akan diperoleh apabila kinerja induk menghasilkan produksi susu masing-masing di atas 13,5 liter dan 12,0 liter/hari.

Kata kunci: Enterprise budgeting, accounting profit, economic profit, BEP, sapi perah, dataran rendah

ABSTRACT

This study was aimed to determine the profitability of smallholder dairy farmers at the lowland areas of Yogyakarta related to dairy cow performance (milk production) to be achieved at various fresh milk market prices. Thirty lactating Holstein cows belonging to the 16 farmers at the lowland areas of Yogyakarta Province selling milk directly to the consumers were drawn as the samples. Profitability was determined by enterprise budgeting (accounting profit and economic profit) and break even point. Input and output data were obtained from interview with the farmer samples along with direct observations on the cows performance. The results indicated that under the observed condition of 9.28 liter/day average milk production at IDR 4,700 market price, the accounting profit was found to be IDR 7,758,862/lactating cow/year. The farmers were able to make an economic profit of IDR 1,839,875 with profit margin index of 0.12. If the farmers have to sell the fresh milk to the Cooperatives at the price of IDR 2.800 or IDR 3.200/liter, in order to gain a positive economic profit, milk production must be at least 13.5 or 12.0 liters/day, respectively.

Keywords: Enterprise budgeting, accounting profit, economic profit, break even point, dairy cow, lowland.

INTRODUCTION

Demand of Indonesian's milk consumption has continued to increase, but the national milk production was still low (Ditjen Peternakan dan Kesehatan Hewan, 2010). More than 70% of

national milk consumption has been met by import. The market chances of an increase in demand for milk could not be fulfilled by an increase in domestic production. According to Arifin (1994), high increase of agriculture production and productivity during the green revolution was caused by changes in the use of biological, chemical and mechanical technologies progressively. Similarly on a dairy farm, improvement of superior cows breed technology such as artificial insemination and import the superior cows which was expected to improve the performance of lactating cow to produces milk has been started since 1974 (Sutarno, 2003). In rice farming, Jatileksono (1994) stated that improvement of varieties could increase the production, productivity and income distribution through changes in the structure of input use, output market and finally impact on farm income. Case in dairy cows is not much different from the rice farming. The problems were almost all small-scale dairy farmers in increasing the national milk production are less efficient, low performance of lactating cows that only produced of milk about 8-12 liters of milk/day/cow and low income (Yusdja, 2005; Widiati *et al.*, 2010), compared to overseas the production per cow was about 20 liters/ d/cow (Webster, 1992). Almost all national production of fresh milk has been supplied by smallholder dairy farms, approximately 92.85% of fresh milk was absorbed into cooperatives and almost all the fresh milk was marketed to the Milk Processing Industry/IPS (Direktorat Jenderal Industri Agro dan Kimia, 2009). It can be stated that the fresh milk market is a monopsony causing the farmers do not have a strong bargaining position, and the profit of farmers are less able to be guaranteed. In order to develop small scale farming industry including dairy farming, farmers and policy makers had to formulate plans or other alternatives which were technically feasible and economically profitable (Kay *et al*., 2008). Technically, a profit in dairy farming would be affected by productivity of input such as dairy cows and feed that showed by performance of lactating cow in milk produce. Economically, a profit would be effected by market price of input and output such as fresh milk price. Studies related to the technique and socio-economic conditions of dairy cows is still a little bit, authors were interested in research the problem.

Ditjenak (2009) stated that approximately 87.38% population of the dairy cows was concentrated in Java, the rest were outside of Java and most of them were looked after in the highlands. However, some farmers were also developing dairy cattle farming in lowland area despite there were obstacles in temperature and humidity for increasing the productivity of cows. Facing these obstacles, researchers have found the way to improve micro-climate and feeding management (Berman, 2005), thus dairy cow farmers in lowland areas could contribute to an increase in national milk production and give employment opportunities for the community. Therefore, the aims of this study were to determine, (1) the profitability of the small hold dairy farmer in lowland, and (2) the performance of dairy cows measured by milk production to be achieved at the price of fresh milk market that were profitable for farmers.

MATERIALS AND METHODS

Sampling and Data Collection

The study was conducted in the lowland areas of Bantul and Kulonprogo district, in Yogyakarta Province. Sixteen dairy farmers were chosen as respondent purposively based on they had the lactating cow at least one cow and sold fresh milk directly to consumers or did not through to milk cooperative. Furthermore, 30 Holstein-Friesian breed lactating cows owned by respondent were chosen as the sample cows, where each respondent was taken minimal one cow. Data that related to economic and technical variables to profitability analysis were collected by using survey method with questionnaires through direct interview to the respondent. Supporting of performance data of dairy cow such as milk production, feed consumption, mortality, and calving interval were taken through the observation of the sample cows.

Data Analysis

Enterprise Budgeting

Enterprise budgeting reflects an estimate of potential revenues, expenses, and profit of farm for one commodity affected certain technology, such as in the small hold dairy farmers. Revenues and expenses are distinguished into cash and non cash (Kay *et al*., 2008, Amir and Knipscheer, 1989). Further analysis as follows:

Total revenues = cash revenues + non cash .... (1)

Total cost = cash cost + non cash..... (2)

Accounting profit = cash revenues - cash costs..... (3)

Economic profit = total revenues - total expenses..... (4)

Accounting profit was the accumulation of a return to family labor, land capital and farm management. Units of analysis in this study were per dairy cow intended to measure their performance. Enterprise budgeting in this study was focused on the dairy business budget that was influenced by the performance of lactating cow in producing fresh milk and market condition of input and output, especially milk price. Further analyses were to calculate the profitability of the smallholder dairy farms as follows:

a) Gross Margin Index

This analysis was used to measure the ability of the business to pay interest and capabilities of farm management, where only variable costs that are calculated in the business and compared to total revenue. The formula was:

$$\text{Gross Margin Index} = \frac{\text{Gross Margin}}{\text{Total Revenues}} \quad \text{..... (5)}$$

Where, Gross Margin (IDR) = Total Revenues - Variable costs

b) Profit Margin Index

This analysis was used to measure the business get a profit when all costs and revenues are calculated and compared to all sales or total revenues. The formula was:

$$\text{Profit Margin Index} = \frac{\text{Net Profit}}{\text{Total Revenues}} \quad \text{..... (6)}$$

Where, Net profit (IDR) = Total Revenues – Total Cost , according to Downey and Erickson (1989).

Break Even Point (BEP) of Product

Break Event Point (BEP) of product is to determine the performance of dairy cows measured by the amount of milk production to be achieved to cover the total cost at certain market prices of fresh milk, or when economic profit equals to zero. Therefore, if the performance of dairy cows can produce more fresh milk production than BEP products, the business is profitable and vice versa. To calculate the BEP of products at every possible price of fresh milk market, it was used the formula:

$$\text{BEP of Milk Product} = \frac{\text{Total Costs}}{\text{Product Price}} \quad \text{..... (7)}$$

RESULTS AND DISCUSSION

Conditions of research location

The climate condition in the research location such as the temperature was 20^{o}C to 34^{o}C and humidity was 41- 97%. Meanwhile the best production performance of lactating cows was achieved in the climate with a temperature of 18.3^{0}C and humidity 55% (Sutarno, 2003; Berman, 2005). This suggested that theoretically the location was less than ideal for lactating cows, dairy productivity was lower. The fresh milk market condition in the research location showed that the dairy farmer could sell fresh milk to direct consumers with the average price IDR 4,700.00/ liter. It was higher than the price in milk cooperatives (IDR 2,800.00 – 3,200.00/liter). The dairy farmers in the research location could get the high price of fresh milk because the location was in suburban area, thus people were more aware to consume the fresh milk.

Characteristics of the Respondents

The result of the study revealed that 12.50% of respondents had formal education of graduated primary school, 43.75% of graduated junior high school, 31.25% of graduated high school and 12.50% of graduated college. Most of respondents had enough experiences to manage a dairy cattle farming, in average 14, 32 years. The average age of respondents was 49 years old, which meant they were in the productive age. A large percentage (75%) of respondents worked as a dairy farmer and the rest were civil servants and entrepreneurs. From these conditions, the dairy farmers in the research location were expected can receive technological innovations to improve performance of lactating cow and can sell fresh milk with the higher price than the price in milk cooperatives.

Performance of Dairy Farm

The result of this research showed that the average input of feed per lactating cow was 6.89 kg of total digestible nutrient (TDN)/cow/day or equal in 11.61 kg of dry matter (DM). It was calculated from the various types of feed given to cattle that were converted based on "Food Composition Table for Indonesia" by Hartadi *et al.* (1986). The average of milk production was 9.28 liters/ lactating cow/day. The result of the research of Kenedy *et al.* (2009) showed that the maintenance of Holstein-Friesian cows in Ireland

with the restricted grazing for 9 hours continuously and 2x3 hours/day could producing milk 22.4 liters/day and 20.9 kg/day, respectively, with the dry matter intake were 13.0 kg and 12.1 kg of DM /day. The DM of feed in the sample cows almost equal to than that research but the milk production smaller. There were some possibility such as quality of raw material and quality of dairy cows genetic were low or the maintenance of lactating cows were not right. The calving interval was 14 month and the average of weaning calve was 0.62 unit/lactating cow/ year. Production of manure was used for planting the grass as fodder input. Performance of dairy cows based on the applicable implementation in the lowlands of Yogyakarta is presented in Table 1.

Enterprise Budgeting of Smallholder Dairy cattle

Components of enterprise budgeting of small hold dairy farmers in this study are presented in Table 2. The average of milk production was 9.28 liters/ lactation cow/ day with price of fresh milk market IDR 4,700.00/liter. In these conditions, the farmers obtained accounting profit IDR 7,758,862.00/ lactating cow/ year. But, it did not mean that increasing number of dairy cows would improve the accounting profit, because dairy farmers were limited by their own resources and skills to manage the business which were not valued as a cost. Another aspect, economic profit analysis showed that all inputs calculated in cash was IDR 1,839,875.00/lactating cow/year which was lower than accounting profit. Based on the results of a positive economic profit, the profit could be improved by increasing the number of lactating cows, assuming there were no change in input prices and fresh milk prices in the market. Furthermore, gross margin index was 0.40, which meant that dairy farmers who sell milk at IDR 4,700.00/liter would have the ability to pay loan interest for 40% of total revenues. Profit margin index at 0.12 showed that farmers would have the ability to generate economic profit at 12% of total revenues. The finding of research about optimal resources allocation in the integrated beef cattle and crop farming system on the slopes of Merapi volcano, Yogyakarta conducted by Widiati (2006)

Table 1. Performance of the Smallholder Dairy Cows (n = 30)

Items	Mean ± SD
Forage (kg TDN / cow/d)	3.92 ± 2.02
Concentrate (kg TDN /cow/d)	3.97 ± 1.27
Forage (kg DM/cow/d)	6.70 ± 2.28
Concentrate (kg DM/cow/d)	4.91 ± 1.72
Use of labor	
- Family labor (man-hours / cow /d)	1.50 ± 1.06
- Hired Labor (man-hours / cow /d)	0.50 ± 0.10
Production of fresh milk (liters /cow/d)	9.28 ± 1.27
(Estimated liters / yr)	2,831.42 ± 304.30
Potential of milk production (liters/cow/d)*	10.34 ± 2.24
(Estimated liters/yr)*	3,154.46 ± 683.20
Calving interval (months)	14 ± 3.14
Average calf production (weaned calves/yr)**	0.62 ± 0.18
Average fresh milk price (IDR/liter)	4,682.00

* Calculation of milk production per year converted to per lactation period according to Yapp (1955 *in* Sutarno, 2003)

**Calculation of calf production per year is based on the average calving interval, age of calves sold and mortality

Table 2. Enterprise Budgeting for Smallholder Dairy Cow (IDR/ lactating cow/yr)

Items	Cash	Non cash	Total
Revenues			
Milk 2,830 l/yr, IDR 4,682/liter)	13,250,060		13,250,060
Calves (0.60 head/yr, IDR 3,900,000/head)	2,340,000		2,340,000
Manure (3 ton/hd/yr, IDR 100,000/ton)	300,000		300,000
A. Total Revenues	15,890,060		15,890,060
Variable costs			
Forage (4,216 kg DM/yr, IDR 766/kg DM)	807,258	2,421,773	3,229,031
Concentrate (1.997 kg DM/yr IDR 3.102/kgDM)	6,207,945		6,207,945
Medic. supplies (IDR/year)	64,000		64,000
Equipment consumables (IDR/year)	30,010		30,010
Water and electricity (IDR/year)	31,447		31,447
B.Total Variable Cost	7,140,659	2,421,772	9,562,431
Fixed Costs			
Stable depreciation (IDR/Year)		283,333	283,333
Equipment depreciation (IDR/Year)		151,945	151,945
Hired labor (204 man-hours/year, IDR 4.300/man-hour)	716,571		716,571
Family labor (504 man-hours/yr, IDR 4.300/man-hour)		2,314,454	2,314,454
Transportation (IDR/yr)	113,339		113,339
C. Total Fixed Cost	829,910	3,657,844	4,487,754
D. Total Cost (B+C)	7,970,569	6,079,616	14,050,185
Accounting profit = cash revenues – cash costs (IDR)			7,758,862
Economic profit = total revenues – total costs (IDR)			1,839,875
Index gross margin = gross margin/total revenues			0.40
Index profit margin = profit/total revenue			0.12

showed that with an average farm land owning of 0. 47 ha, using family labor and its own capital, beef cattle farmers could get maximum profit to the maintenance of accounting at 1.74 Animal Unit (AU) equal of cow. Furthermore, an increasing farm-scale of beef cattle caused the farmers to purchase more input or resources in cash, it would bring a negative economic profit or loss, because of high prices of inputs. The feed benefit in agribusiness, including the dairy farm business would be determined by the input including technology in use, on farm management, product markets, and government policy (Downey and Erickson, 1989. Kay *et al.* 2008). According to Ekowati *et al*. (2011), the implementation of beef cattle agribusiness subsystem had positive influence to the beef cattle agribusiness and its outcome that support to increase production and incomes of farmers. Furthermore, these factors would be appeared in the components and the values were arranged in the implementation of the farming system.

Break Even Point (BEP)

The analysis showed that the BEP product of fresh milk at IDR 4,500.00/ liter was 8.31 liters, which means that dairy farmers got economic profit from the difference in average milk

Table 3. Possibility of Break Even Point (BEP) of Milk Production at Various Prices of Fresh Milk

Fresh milk price (IDR/liter)	Costs per Lactating Cow for Milk Production (IDR)	Milk Production for BEP (liter/yr)	Average Milk Production for BEP (liter/d)
2,800	11,410,185	4,075	13.40
3,200		3,566	11.70
4,000		2,853	9.40
4,500		2,536	8.30
5,000		2,282	7.50

Cost per lactating cow of milk production = total costs – revenue from the calves and manure sales.
The average milk production/d was calculated based on the lactation per year divided by 305 days.

production of lactating cow at 9.28 liters/ cow/day. At the price of fresh milk IDR 4,000,00/ liter, BEP product was equal to milk production of sample cows, so the dairy farmers can not take the profit. When the milk cooperative was an alternative to fresh milk market at a price equal to or lower than IDR 3,200.00/liter, it would not be profitable for farmers, because the BEP of product was greater than milk production of samples. At this price, a positive economic profit will be obtained if the performance of lactating cows can be increased to achieve an average milk production above the 11.7 liters per day and if the price was IDR 2 800.00, milk production of cow should be increased above 13.4 liters/day (Table 3).

CONCLUSION

Performance of samples cow can produce average of 9.28 liters milk/ day with price of milk at IDR 4,700.00/liter has obtained accounting profit IDR 7,758,862.00/year. The dairy farmers were able to produce a positive economic profit IDR 1,639,675.00 with profit margin index 0.12. However, if the farmer had to sell milk to cooperatives at a price IDR 2,800.00 or IDR 3,200.00 / liter, a positive economic profit will be obtained when lactating cow is producing milk more than 13.4 liters or 11.7 liters/day, respectively. The technology development and government policies should be directed to support the increased production as well as economic profit.

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