

THE PERFORMANCE OF MILK PRODUCTION, TOTAL MILK REVENUE AND REPRODUCTION INDICATORS ON DAIRY SMALLHOLDERS IN YOGYAKARTA AND EAST JAVA, INDONESIA*

PRODUKSI SUSU, TOTAL PENERIMAAN SUSU DAN INDIKATOR-INDIKATOR REPRODUKSI PADA PETERNAK SAPI PERAH RAKYAT DI YOGYAKARTA DAN JAWA TIMUR, INDONESIA

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ABSTRACT

The purpose of this study was to analyze the performance of milk production, total milk revenue and reproduction indicators of Friesian Holstein Crossbred cows maintained under smallholder's management system of 122 cows in DIY Province and 345 cows in East Java Province, Indonesia. The study was conducted with survey method and direct observation. A total of 180 Friesian Holstein Crossbred farmers (90 farmers were in DIY and another 90 farmers were from East Java Province) was randomly selected and interviewed used structured questionnaire to assess the milk production, total milk revenue and indicators of reproduction of Friesian Holstein Crossbred cows. The result of the study showed that the average mature equivalent of milk production was 3,810.21±920.10 L/lactation in DIY and 3,717.79±818.44 L/lactation in East Java Province, and the total milk revenue was 12,401,917.87±2.48 IDR per lactation in DIY and 14,647,217.80±3.05 IDR per lactation in East Java Province; day to first mating (postpartum mating), services per conception and days open were 62.34±29.24 days, 2.60±1.32 and 88.58±34.43 days in DIY and 60.62±23.07 days, 2.46±1.26 and 88.67±28.86 days in East Java Province. Based on total milk revenue, the conclusion of this study was Friesian Holstein Crossbred cows maintained under smallholder's management system in East Java Province better than those in Yogyakarta province (DIY). The mature equivalent of milk production and reproduction indicators of dairy cows (postpartum mating, service per conception and days open) from both provinces showed no significant differences and the value of each parameter reproduction indicators is still within the normal range.

(Keywords: Dairy smallholder, Milk production, Reproduction performance, Total milk revenue)

INTISARI

Penelitian ini bertujuan untuk menganalisis produksi susu, total penerimaan susu dan indikator-indikator reproduksi dari sapi-sapi Peranakan Friesian Holstein yang dipelihara oleh peternak sapi perah rakyat sejumlah 122 ekor di propinsi Daerah Istimewa Yogyakarta dan 345 ekor di Propinsi Jawa Timur, Indonesia. Penelitian dilaksanakan dengan metode survei dan pengamatan langsung. Sejumlah 180 peternak sapi perah Peranakan Friesian Holstein (90 peternak dari Propinsi DIY dan 90 peternak dari Propinsi Jawa Timur) dipilih secara random dan diwawancarai dengan menggunakan daftar pertanyaan yang terstruktur untuk mendapatkan data produksi susu, total penerimaan dari susu dan indikator-indikator reproduksi dari sapi perah Peranakan Friesian Holstein. Hasil penelitian menunjukkan bahwa rata-rata produksi susu setara mature equivalent adalah 3.810,21±920,10 L/laktasi di DIY dan 3.717,79±818,44 L/laktasi di Jawa Timur, dan total penerimaan susu adalah Rp12.401.917,87±2,48 per laktasi di DIY dan Rp14.647.217,80±3,05 per laktasi di Jawa Timur; postpartum mating, service per conception dan days open di DIY dan Jawa Timur masing-masing berturut-turut adalah 62,34±29,24 hari, 2,60±1,32 dan 88,58±34,43 hari dan 60,62±23,07 hari, 2,46±1,26 dan 88,67±28,86 hari. Berdasarkan total penerimaan dari susu, dapat disimpulkan bahwa pada penelitian ini sapi perah Peranakan Friesian Holstein yang dipelihara peternak sapi perah rakyat di provinsi Jawa Timur lebih baik daripada di provinsi

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Yogyakarta (DIY). Produksi susu setara mature equivalent dan kinerja reproduksi sapi perah (postpartum mating; service per conception dan days open) dari kedua propinsi tidak menunjukkan perbedaan yang nyata dan nilai dari masing-masing parameter kinerja reproduksi masih dalam kisaran normal.

(Kata kunci: Penampilan reproduksi, Peternak sapi perah rakyat, Produksi susu, Total penerimaan susu)

Introduction

Dairy farming represented as important sources for providing milk requirement in Indonesia. Milk consumption increased from 0.104 L/capita/year fresh milk consumption in 2010 to 0.156 L/capita/year in 2014 (Dirjen Peternakan dan Kesehatan Hewan, 2015). East Java accounted for 48% of the total dairy cow numbers in Indonesia (Animal Husbandry Department, 2011). As the center of dairy cattle development, East Java has about 253,830 heads with 426,557 tons/year of milk production and DIY has about 4,504 heads with 6,626 tons/year of milk production by the year of 2015 (Dirjen Peternakan dan Kesehatan Hewan, 2015).

The main purposes-of maintaining dairy cattle are milk production and calf, savings, cost of school children, and produce organic fertilizer. Dairying is implemented a tradition practice in milk production for a longer time period and mostly operated by smallholder farmers who raise about 2 to 5 cows. Dairy farming as a part of a farming system has become increasingly important as an aspect of labor and income generating activities of farm households. Utami and Seruni (2013) discovered that household labor was allocated more to dairy farming compared to the farm and non-farm work which female participation was most evident in feed preparation and feeding, whereas the predominant male activity was forage collection for the dairy cattle then the children just assisted the activities alone.

The potential for livestock development in Indonesia is very high, with the support of abundant resources. Studies on dairy farming indicated that livestock can provide additional income and employment to households, especially in developing countries (Piroux *et al.*, 1996). Farming of dairy animals not only increases the level of expected income but also reduces the magnitude of income risk (Bhende and Venkataram, 1994). For instance, the dairy cattle in Bangladesh are proposed as a supplementary income source for smallholders (Wimaladharma, 1985). Similarly, dairy farming is found beneficial in

terms of increasing income and generating employment (Ravindra and Veerabhadraiah, 1991). Therefore, dairy farming can increase villager's life standards and growth income in the area where land holding is inadequate and unbalanced (Kocurk, 2009). Mumba *et al.* (2011) found that smallholder's dairy farming in Zambia has an important role in rural development and poverty alleviation. The effect of milk production and milk total revenue will also affect the reproductive performance of dairy farm income, additional income and employment opportunities for family members. The purpose of this study was to analyze the performance of milk production, total milk revenue and reproduction indicators of Friesian Holstein Crossbred cows maintained under smallholder's management system of 122 cows in DIY and 345 cows in East Java Province, Indonesia.

Material and Method

Materials

The respondent was dairy farmers from DIY Province at district Sleman and East Java Province at district Pasuruan, Malang and Batu. The research was conducted by survey method and the technique of triangulation: a questionnaire to farmers, in-depth interviews, and focus group discussion. A total of 180 Friesian Holstein Crossbred farmers (90 farmers were in DIY and another 90 farmers were in East Java Province) were randomly selected and interviewed with a structured questionnaire to assess the milk production, total milk revenue and indicators of reproduction of Friesian Holstein Crossbred cows.

Methods

Two data collection techniques were used, namely: 1) observation, data collected by directly observing and taking samples from the object of research; and 2) interview, namely the collection of data by requesting information from respondents; while secondary data using recording techniques; namely the collection of data by recording data that were already existed in the

department or institution related to this research.

Data analysis

Revenue referred to compute the value of output. The revenue is defined as output multiplied by the price of output (Ibrahim, 2009). The equation of revenue or total milk revenue is presented as:

$$TR = Pq \times Q$$

which:

TR = Total revenue received from selling fresh dairy milk (IDR/year).

Q = Quantity of fresh dairy milk (IDR/year).

Pq = The price of fresh dairy milk (IDR/year).

The data were entered into MS Excel spreadsheet and transferred to analytical software SPSS 17 for t-test analysis.

Result and Discussion

Socio-economic characteristics of respondents

The characteristic of respondents or farmers includes age, education, occupation, and farming purpose, as well as farming objectives influencing the pattern of raising dairy cows. Farmer characteristic data can be seen in Table 1.

The Table 1 shows that the 40 – 59 age group is the group of smallholders that has the largest percentage amount in Yogyakarta and East Java. East Java has other major groups of 30 – 39. East Java has an average age of farmers who are younger than those in DIY, with an average of 41.83 ± 12.48 years and DIY has an average of 49.49 ± 11.31 years. More than 50% of farmers with low education and no schooling. This shows that there is still a lack of human resources in formal education. In general, they were dominated by elementary level. In addition to formal education, it is also supported by non-formal education such as training and counseling on the maintenance of dairy cows, feed, artificial insemination, fertilizer processing, dairy processing, and animal health (>50%). Farmers who no schooling in DIY as much as 16.67% and East Java 10.00%. Working as dairy farmers is the mainstay for farmers in DIY and East Java. While most farmers do not have a second job, in addition to working in a dairy cattle.

The purpose of raising dairy cattle by farmers (Table 1) prioritized on milk

production (priority 1), savings (priority 2) and cost of children education (priority 3) for farmers in DIY and East Java. The purpose other than maintenance is for manure as fertilizer priority 4 in DIY and priority 5 in East Java, as well as companion animals or for pleasure (hobby) priority 5 in DIY and priority 4 in East Java.

Cattle ownership, milk production, and total milk revenue

Cattle ownership and milk production. The ownership of dairy cows varies greatly between the two provinces. In terms of ownership of cattle, farmers in East Java have cattle more than those farmers in DIY. Meanwhile, in terms of milk production mature equivalent (ME), milk production in DIY better than those in East Java. Table 2 shows that the two provinces in an average of cattle ownership are still under economies of scale as suggested Ahmad and Hermiyetti (2008) that is 10 to 12 heads/farmer. Farmers in East Java approaching economies of scale, even exceeding the recommended, Setiani and Prasetyo (2008) reported that dairy farm household level can provide benefits if the amount kept at least 6 heads. The composition of lactating dairy cows ownership still needs to be improved because it has not reached the requirement to provide a business advantage that is $\geq 70\%$ (Nurtini, 2006). Conditions of cattle ownership are low partly caused by lack of capital and difficulty of finding forage due to limited land for fodder crops to supply the quantity and quality of feed is also limited. This situation led to dairy farming has not been efficient (Priyanti *et al.*, 2009).

Lactation cow proportion is still low and yet achieved economic standard shows that the burden of the lactating cows is high enough to bear the cost of production for cows that do not produce. However, this proportion has increased over the study Priyanti *et al.* (2009) in the provinces of West Java, Central Java, DIY and East Java, which on average is only 51.6%. Ownership male calf is relatively small because in general the male calves are sold at the age of 6 to 12 months. Female calf maintained as they are used as a relatively small replacement. Daily milk production should reach at least about 10 L/head/day. The highest milk production mature equivalent (ME) achieved by farmers in DIY, followed by farmers in East Java. This condition is

caused by mostly respondents in DIY have used milking machine, while all of the respondents in East Java used manual for milking.

Total milk revenue. Capital has a potential role in representing the financial structure controlled by the smallholder dairy

farming. It is divided into two types of asset, namely fixed asset and working capital.

Table 2 shows total milk revenue from dairy farming was primarily derived from East Java was marginally higher (14,647,217.80±3.05 IDR/lactation) than those from DIY (12,401,917.87±2.48

Table 1. Characteristics of respondent

Parameters	Province			
	Daerah Istimewa Yogyakarta	East Java		
Age group (year)	< 20	0 (0.00%)	1 (1.11%)	
	20 – 29	1 (1.11%)	14 (15.56%)	
	30 – 39	16 (17.78%)	25 (27.78%)	
	40 – 49	26 (28.89%)	22 (24.44%)	
	50 – 59	27 (30.00%)	19 (21.11%)	
	60 – 69	15 (16.67%)	7 (7.78%)	
	70 – 79	3 (3.33%)	1 (1.11%)	
	80 – 89	2 (2.22%)	1 (1.11%)	
	Total of respondent / farmer	90 (100.00%)	90 (100.00%)	
Average of age (year)	49.49±11.31	41.83±12.48		
Formal education	No schooling	15 (16.67%)	9 (10.00%)	
	Elementary school	43 (47.78%)	57 (63.33%)	
	Junior high school	10 (11.11%)	14 (15.56%)	
	Senior high school	21 (23.33%)	8 (8.89%)	
	College / university	1 (1.11%)	2 (2.22%)	
	Total of respondent / farmer	90 (100.00%)	90 (100.00%)	
Job (occupation)	Main job (occupation):			
	Dairy farmer	72 (80.00%)	81 (90.00%)	
	Rice farmer	14 (15.56%)	5 (5.56%)	
	Retailer	1 (1.11%)	0 (0.00%)	
	Cooperative staff	0 (0.00%)	2 (2.22%)	
	Private company staff	2 (2.22%)	1 (1.11%)	
	Government officer	1 (1.11%)	1 (1.11%)	
	Total of respondent / farmer	90 (100.00%)	90 (100.00%)	
	Second job (occupation):			
	None	46 (51.11%)	48 (53.33%)	
	Dairy farmer	18 (20.00%)	9 (10.00%)	
	Rice farmer	11 (12.22%)	18 (20.00%)	
	Retailer	5 (5.56%)	13 (14.44%)	
	Cooperative staff	1 (1.11%)	1 (1.11%)	
	Private company staff	8 (8.89%)	1 (1.11%)	
	Government officer	0 (0.00%)	0 (0.00%)	
	Total of respondent / farmer	90 (100.00%)	90 (100.00%)	
	Farming purpose	Priority 1	Milk production	Milk production
		Priority 2	Saving	Saving
		Priority 3	Children's education	Children's education
Priority 4		Fertilizer	Companion animal	
Priority 5		Companion animal	Fertilizer	

Table 2. Ownership of cattle, milk production, and total milk revenue in dairy smallholders

Parameters	Province		Significant
	Daerah Istimewa Yogyakarta	East Java	
Number of cattle owned (AU)	3.56±2.12	8.85±7.02	0.000*
Animal status (%):			
Lactation	53.60±27.17	64.95±21.42	0,000*
Non-lactation (dry)	8.88±22.59	10.22±16.18	0.960 ^{ns}
Heifer	22.66±20.87	10.84±13.98	0.000*
Bull	0.00	3.00±8.21	0.001*
Male calf	5.87±13.15	2.91±5.79	0.021*
Female calf	8.99±11.34	8.08±9.10	0.035*
Mature equivalent of milk production (L/lactation)	3,810.21±920.10	3,717.79±818.44	0.300 ^{ns}
Total milk revenue (IDR/lactation)	12,401,917.87±2.48	14,647,217.80±3.05	0.000*

* = Significant (P < 0.05).

IDR/lactation). This can be influenced by the milk production of dairy cows and the price per litre of milk at the level of farmers and cooperatives. It is importance to understand that the price of milk per litre in DIY is lower than in East Java, that is the milk price in DIY is 3,077.28 IDR per litre and in East Java is 4,616.52 IDR per litre.

The profitable farm in East Java is due to the household involvement that can reduce the expenses in operating dairy farming, with the indicated number of farmers in East Java is in the age of 30-39 years and the Main occupation is a dairy farmer with a value of 90.00% (Table 1). This finding was similar to Utami and Seruni (2013) that household labor including women has a higher participation in the dairy farming sector, especially in developing countries. Likewise, the previous study (Piroux *et al.*, 1996) claimed that livestock farming can enhance learning for rural people who have a limited access to land to have a good living standard (Kocuturk, 2009). Therefore, the rural labor empowerment in dairy farming will lift up their income and it can be used as a mean to alleviate poverty among villagers (Mumba *et al.*, 2011).

Efficiency in raising dairy farming should be measured by R/C ratio. Smallholder's dairy farming indicated efficient (R/C ratio > 1) in rearing dairy cattle. But by looking at the total milk revenue, has also shown the economic value to be received by farmers.

Performance reproduction

Success of reproduction performance is mainly determined by days open, the longer days open means the longer calving interval which affects the lowering amount of milk production throughout the cow life (Rochijan *et al.*, 2016). Reproductive performance of dairy cattle at the smallholder

vary greatly, it is possible for a lot of factors that don't support the maintenance management of dairy cattle. The results overall of reproduction performance was presented in Table 3.

Day to first breeding / Postpartum mating (PPM). The result shows that the shortest average PPM found in East Java is 60.62±23.07 days and Daerah Istimewa Yogyakarta is 62.34±29.24 days. Based on the PPM data obtained, the two provinces still in the normal range of the first time cows mating after parturition. It's lower than Pramono (2008) research about in Daerah Istimewa Yogyakarta value 4.21±1.20 month. This range confirms Salisbury and Vandemark (1993) opinion that first mating is the best performed within 60 to 90 days after parturition cows. The lower of PPM value, it will be more efficient the reproduction performance of dairy cows. The difference in PPM on each cow is caused by differences in the occurrence of oestrous as the result of milk production difference which will cause weight loss. Therefore, the time to achieve the normal body weight for reproduction will be varies. These variations are caused by differing negative energy, which triggers reproductive problems such as sub oestrous and silent heat or quiet ovulation, as stated by Peters and Ball (1995), that very low feed quality and quantity are the main causes of anoestrous and the prolonging of the oestrous period after parturition.

Service per conception (S/C). The result shows that the shortest average S/C found in East Java is 2.46±1.26 and Daerah Istimewa Yogyakarta is 2.60±1.32. It's higher than Pramono (2008) research about in Daerah Istimewa Yogyakarta value 1.98±0.91. This long interval or S/C greater is due to silent oestrous caused by negative nutrient imbalance. This is parallel with

Table 3. Average of reproduction performance in dairy cows

Parameters	Province		Significant
	Daerah Istimewa Yogyakarta	East Java	
Day to first mating / Postpartum mating (day)	62.34±29.24	60.62±23.07	0.509 ^{ns}
Service per conception	2.60±1.32	2.46±1.26	0.317 ^{ns}
Days open (day)	88.58±34.43	88.67±28.86	0.977 ^{ns}

ns = Non significant (P>0.05).

Perry (1984) *cit.* Rochijan *et al.* (2016) opinion, who said that lack of energy after giving birth will extend estrous interval and will delay ovulation. Yifat *et al.* (2009) stated that appropriate and in time heat detection and insemination could be attributed to lower or higher number of service of per conception. The findings of the present study on services per conception suggested comparatively better insemination services at the herds during the period of the study, because S/C value is normal and nothing > 2.00. López-Gatius *et al.* (2005) state that the success of the S/C has an important role in efforts to obtain optimum calving interval. It was further reported that the success of the S/C is influenced by several factors such as detection of oestrous, condition of cows, as well as the skill and precision inseminator.

Days open (DO). The result shows that the shortest average PPM found in Daerah Istimewa Yogyakarta is 88.58±34.43 days and East Java is 88.67±28.86 days. The value of DO in East Java has long days open, this not in line with Antiyatmi (2009), that the optimal days open or the safest time to bring a cow into mating again is between 60 to 90 days after parturition, if it is too long, production during the next lactation period will decrease between 75 to 110 days. The long days open period is caused by the decrease of PPM and by the high service per conception. The long days open period will extend calving interval, which will decrease the number of calves produced throughout the cow lifetime. This in line with the opinion of Foley *et al. cit.* Rochijan *et al.* (2016) that the long days open will be lower the cow's productivity during its lifetime. Yaniz *et al.* (2006) stated that the delay in open days will directly cause calving interval length as a result of delayed pregnancy.

Conclusion

Total milk revenue in East Java higher than it is in Yogyakarta (DIY). This is

influenced by the price of milk in liters and milk production of cows by each dairy smallholder (the milk price per litre in East Java is higher than it is in DIY), so the total milk revenue is significantly different that is higher in East Java than in DIY. The mature equivalent of milk production and reproduction indicators at both sides are the same.

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