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THE OCCURRENCE OF NUTRITIONAL AND MANAGEMENT-RELATED DISEASES IN DAIRY SMALLHOLDING FARMS IN INDONESIA

(Kejadian Penyakit-Penyakit Nutrisional Dalam Kaitannya Dengan Manajemen Pada Peternakan Sapi Perah Rakyat Di Indonesia)

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ABSTRACT

The aim of the study was to reveal the major facets of animal health status as related to nutrition and farming management upon milk production in smallholding dairy farms. A cross-sectional study was conducted in Boyolali region, Indonesia, involving 50 randomly selected farms consisted of 200 lactating Frisiens Holstein-crossbreed cows. Data related to milk yield, feedstuff composition and clinical evaluation were analyzed with T-test using SPSS for Windows whilst socio-demographic aspect obtained from personal interview were analyzed descriptively based on Chi-square. The result showed that net energy for lactation (NEL) of feedstuff could provide 13 l/day in which mixed roughages and agricultural by-products tend to be preferable when compared with other feedstuffs combination ($P=0.052$). There was imbalance of Ca:P ratio (1:2) which could induce low milk production. Low quality of feedstuff provoked negative energy balance which caused metabolic disturbances. It showed that prevalence for clinical mastitis was 10.85% and nutritional diseases was 34.8% at which bloat was the most lethally disease. Administration of sodium chloride (NaCl) 0.91-3.17% DM/day without compensated by sufficient water consumption affected ($P<0.05$) mastitis occurrence. Skin diseases were detected in 85.92% of selected cows, while 13% of cows were under helminthiasis treatment. In conclusion, over administration of NaCl and imbalance of Ca and P ratio led to the low level of milk production and disease occurrence in the smallholders lactating cows. From this, appropriate method and devices to elevate milk production with respect to zootechnique skill of the farmer is necessary through the intervention of government.

Keywords: smallholder farms, milk production, agricultural-by-products, feeding regime, diseases

ABSTRAK

Tujuan penelitian ini adalah mengkaji aspek-aspek penting status kesehatan ternak dalam kaitannya dengan nutrisi dan manajemen peternakan dalam produksi susu pada peternakan sapi perah rakyat. Penelitian *cross-sectional* ini dilakukan di Kabupaten Boyolali, meliputi 50 peternakan yang dipilih secara acak, dengan 200 sapi peranakan Holstein laktasi. Data yang terkumpul meliputi produksi susu, komposisi pakan dan evaluasi klinis dianalisis dengan T-test menggunakan program SPSS, sedangkan aspek sosio-demografik yang diperoleh melalui wawancara personal dianalisis secara deskriptif berdasarkan *Chi-square*. Hasil penelitian menunjukkan bahwa energi neto laktasi (NEL) bahan pakan dapat menghasilkan 13 l susu per hari. Campuran pakan kasar dan hasil ikutan pertanian cenderung lebih disukai dibandingkan dengan kombinasi bahan pakan lainnya ($P=0,052$). Terdapat ketidakserasian nisbah Ca:P (1:2) yang berdampak pada rendahnya produksi susu. Rendahnya kualitas bahan pakan memunculkan keseimbangan energi negatif yang menyebabkan gangguan metabolik. Ini ditunjukkan dengan prevalensi mastitis klinis sebesar 10,85% serta penyakit-penyakit nutrisi 34,8% dan pada kondisi tersebut bloat merupakan penyakit yang paling mematikan. Pemberian natrium klorida (NaCl) sebanyak 0,91-3,17% dari bahan kering (BK) per hari tanpa diimbangi dengan konsumsi air yang memadai, mempengaruhi kejadian mastitis ($P<0,05$). Penyakit kulit terdeteksi pada 85,92% sapi-api terpilih, sementara 13% sapi-sapi dalam pengobatan helminthiasis. Berdasarkan hasil penelitian ini dapat disimpulkan bahwa kelebihan pemberian NaCl dan ketidakserasian nisbah Ca:P menimbulkan aras produksi susu yang rendah dan terjadinya penyakit pada sapi-sapi induk laktasi di tingkat petani peternak. Berdasarkan hal tersebut di atas, diperlukan metode dan perangkat yang memadai untuk meningkatkan produksi susu, berbasis ketrampilan zooteknis petani peternak. Untuk itu diperlukan campur tangan pemerintah.

Kata kunci: Peternakan rakyat, produksi susu, hasil ikutan pertanian, pakan, penyakit.

INTRODUCTION

Dairy farm has an important role in providing milk product to fulfill the national needs for protein of animal origin. The consumption of milk in Indonesia has achieved 11.9 lt/per capita /year whilst the target was 20 lt/capita/year in 2014. In 2015 national fresh milk production only grew by 0.58% and in Central Java was 1.1% from the previous year (Directorate General of Livestock and Animal Health, 2015). Beside the contribution from modern enterprise, about 90% of national fresh milk production in Indonesia is supported by smallholder farms (Farid and Sukesi, 2011). It has been acknowledged that most of smallholding farmers only have low education level. This condition may indirectly lead to the low capacity of the farmers to accept and implement the new dairy technologies and management. This situation is exacerbated by the limited land ownership that implicates on the lack availability of grass and roughages for the cattle, especially in dry season. The smallholder farmers used to utilize agricultural by-product and crop residues available at the study area although these feedstuffs are obviously insufficient of nutrient especially when they are fed as a single feedstuff (Preston and Leng, 1987). This circumstance will lead to low milk production and high prevalence of nutritional diseases such as bloat, milk fever, ketosis, feed toxication, mastitis and parasitism. Purwaningsih and Sumiarto (2012) found that the prevalence of gastrointestinal helminthiasis in calves in Central Java was 41.3% .Due to the traditional mind set of most of the smallholder farmers in Indonesia, a little is known about the existing dairy production system include health management which may cause substantial losses to the dairy industry. Although some strategies to lift up the animal production and animal health have been developed the comprehensive study on the occurrence of nutrition and management related diseases and predisposing factor related to these diseases have never been conducted. Therefore this study was designed to

determine the major facets of animal health as related to smallholder dairy farms in the study area. Identification of prevailing problems and understanding of the existing dairy production system in such area is essential therefore government intervention is needed to find the appropriate method and devise to elevate animal production.

MATERIAL AND METHODS

Description of the study area

Boyolali is one of the regions in Central Java which was selected purposively as study area considered as the highest density of dairy population and a potential area for milk production. The area is upland with elevations between 200-700 meters above sea level and average rainfall of 2571 mm/year, while temperature of 26-33°C and humidity of 76 - 90% (Central Agency on Statistic of Central Java, 2014). The major cultivated crop grown in the area were, rice, cassava, corn, peanut, sugarcane, however the most frequent of being utilized were rice straw, cassava, while the other crop were utilized occasionally or seasonally.

Sampling procedure

Fifty 50 dairy smallholders in Boyolali region were randomly selected among the smallholders having more than 3 lactating dairy cows in the area. A single visit to the farm was conducted to collect data. Questionnaire data sheet with dichotomous type in term of yes or no answer, multiple choices and open-ended questions was used as a tool to obtain the information from the farmer. The questions covered the aspects of socio-demographic characteristics (age, sex, educational background, household size and income derived from keeping livestock). Data for husbandry practices (number of cattle, breed, feeding management, health management), and diseases incidence were collected directly in the place where the animal were kept. The feedstuffs were collected from each farm. Mastitis indicator (Bovivet®) used to indicate subclinical

mastitis whilst milk production measurement was carried out in the milking times (morning and afternoon). Secondary data was taken from Central Agency on Statistic of Central Java and Livestock Service Agency of Boyolali region.

Data analysis and calculation

Collected data were analyzed using SPSS software. Measurement and analyses on epidemic and socio-demographic aspects were done in Chi-square (Martin *et al*, 1987). Nutrient content of the feedstuffs were analyzed through proximate analyses (Van Soest, 1994). Diseases occurrence were recorded based on the finding of clinical symptoms and medical treatment applied. Evaluation upon clinical symptoms was done combined with Mastitis Indicator paper (Bovivet®) to fix the diagnoses of mastitis.

RESULTS AND DISCUSSION

Smallholder

Smallholder pattern of farming, diseases, and feeding management were interacted among each other in related to quantity and quality of milk production. Socio-demographic analyses showed that the household size was 4.7 representing one household consisted of 4-5 family members. The active group (>15- 55 years old) was 67.2%, the group of < 15 years old was 26.4%, the group of > 55 years old was 6.4%.

Each household had 1 to 5 lactating dairy cows, couples of heifers and several calves. Smallholder has been found to have other cattle beside dairy cows (Data were not presented). For generating income, 66% of the selected farmers intended to keep the cattle for milk production, 8% for fattening and 26% for multiple purposes. This statement was in line with the other result mentioned that milk production was not a single sources of income as typical for smallholder farm (Devendra, 2007).

Nutritional aspect and Milk production

In practice, it found that the purpose of keeping the animal can affect the farmer's attitude to rearing their animals (Payne, 1990; Blowey, 1990). The manner of rearing the animal related to feeding regime and feeding frequency was differ among farmers. The results showed that 38% of farmer gave restricted feeding to the cows, 34% fed the cows ad libitum and 28% fed the cows in conditional scheme. The volume and the kind of feedstuffs given to the animals were varies depend on the available sources, but the daily feed consumption mostly rice straw, field grass, cassava leaves and concentrate. Most of the farmer fed the animal twice per day (82%) whilst the remaining farmer fed the animal 3 times per day. Cassava tuber and papaya were given to the cattle optionally as they were given more on the base of seasonal variation (Widiyanto *et al*, 2011).

Table 1 : Major nutrient composition of feed as ration ingredient

| Item | DM(%) | DP (%) | NEI (Mcal/kg) | Ca (%) | P(%) |
|----------------|-------|--------|---------------|--------|------|
| Rice Straw | 90 | 2.1 | 0.62 | 0.21 | 0.05 |
| Field Grass | 30 | 5.3 | 1.71 | 0.29 | 0.36 |
| Cassava Leaves | 92 | 18.7 | 1.92 | 0.70 | 0.31 |
| Concentrate | 86 | 12.5 | 1.99 | 0.07 | 2 |

Table 2. Consumption of dry matter and nutrient ingredient of the ration.

| Item | DM (kg) | DP (g) | NEI (Mcal/kg) | Ca (g) | P(g) |
|----------------|---------|--------|---------------|--------|------|
| Rice Straw | 0.9 | 118.9 | 0.55 | 1.89 | 0.75 |
| Field Grass | 7.5 | 397 | 12.825 | 21.75 | 27 |
| Cassava Leaves | 0.92 | 172 | 1.766 | 6.44 | 2.85 |
| concentrate | 1.72 | 215 | 3.422 | 1.2 | 34.4 |
| Total | 11.04 | 902.9 | 18.563 | 31.28 | 64.7 |

In general the daily milk production in the study area was <10 l regardless the lactation period and parity whilst some of the cows could reach 16 liters in the peak level of production. On the basis of nutrient composition and consumption of each ingredient Tables 1 and 2 showed that dry matter (DM), protein contain and net energy for lactation (NEL) in the feedstuff consumed could provide approximately 13 liters of milk per day (NRC, 2001), however the reality of milk production in study area only reached < 10 l/day. The tables showed that the ratio of Ca and P supplied and consumed was imbalanced, approximately 1:2. The low efficiency in the utilization of nutrient could also be caused by mineral imbalance. When the Ca/P is imbalance it will reduce the enzyme activity which resulting the low milk production (Underwood and Suttle, 2010). On the other hand to improve the palatability of feedstuff the farmers like to put natrium chloride into it. The amount of NaCl given to the cows were 0.91 – 3.17 % of DM consumed per day which was exceeded than the needs (P=0.0059), whilst water consumption was restricted from 30-60 l/day. The high quantity of NaCl could bring consequence of a higher water consumption for the lactating cows and had an effect on the low milk production (Preston and Leng, 1987) . On the contrary this condition was not supported by water sources availability in the respected area such as wellwater and rainfall. The higher environment temperature from the normal range in the study area especially in dry season gave

the impact on heat increment (HI), and it caused the decrease of net energy (NE). The shortage of energy efficiency could also be caused by toxic compound such as the remaining HCN in the cassava leaves which affected the electron transport system and reduced the ATP formation (Stryer, 1988). Therefore the actual available NEL became lower than it was tagged in the list (Mc.Donald, 2011).

Disease aspects

Drying of the lactating cow varied among the farmers but usually 7 months of pregnancy, or immediately when the milk production was not profitable (Devendra, 2007). However many of the farmers in the study area still milk the cows in dry period for economic reasons. Since approximately 40% of the keratine lining is removed at each milking and it required constant regeneration (O'Rourke, 2009) then the milking at dry period will not give enough time for the teat canal to recover and inhibit penetration of udder pathogens. Based on clinical symptom the prevalence of clinical mastitis was 10.85%, whilst subclinical mastitis assumed to be occurred on the remaining sampels since all the mastitis indicator paper used was indicating the suspicion. There were a tendency of association between mastitis occurrence and various volume of mix-roughage and concentrate given to the animals (P=0.052). The quality of feedstuff in the study area did not meet the requirement that might provoke trace minerals and vitamin deficiencies and negative energy balance

which caused metabolic disturbances such as a higher risk of ketosis. Clinical ketosis associates with a two-fold increase in the risk of clinical mastitis and lead the suppression and impairment of defence system against pathogen and homeostatic failure (Oltenacu and Ekesbo, 1994; O'Rourke, 2009; Wheelock *et al*, 2010). The zootechnique perspective showed that milkers also play important role in inducing mastitis. The different pressures on the teat done by different people will affect the circular and longitudinal muscles resulting the damage of teat cistern and streak canal. This condition will lead the pathogen to enter the mammary gland (Frandsen, 1986) and cause mastitis. In this study 78% percent of cows having mastitis were handled by 2-3 milkers. It should be put into consideration that the occurrence of subclinical and clinical mastitis in the present time was might contributed by the intramammary infections that persisted from the previous lactation during the dry period (Pantoja *et al*, 2008).

The common nutritional disease recognized by the farmer were bloat, indigestion, and poisoning, whilst bloat was the lethally nutritional problem. The frequency of nutritional diseases was significantly different ($P < 0.05$) between the cows fed with concentrate 1-3 kg as compared to the cows having < 1- 0 kg of concentrate in the ration. When the concentrate was not available it will be replaced by large amount of mix-roughage which were in general containing of *Sesbania sp.*, ground nut stems and leaves and maize stem and leaves. These plants contain high levels of rapid degradable protein and carbohydrate in the rumen which contribute to the production of froth and subsequently bloat (Patra, 2007). High amount of rice bran which finely ground was given occasionally to the animal due to the cheap price. The finely ground rice bran without being mixed with long –physical form feeds will sink and escape into the ventral sac of rumen and provoke depressed digestion (Nørgaard, 1989; Cheng *et al*, 1998; Villalba *et al*, 2009).

Gastrointestinal parasites infestation is one of particular importances due to their effects on production in dairy farm in tropical country (Preston and Leng, 1987). In the study area helminthiasis treatment had been applied to 14% of the cows. It was indicated that the respected cows were having problem with endo-parasites. Gastrointestinal parasites could give an effect on protein losses. The impairment of feed digestion, energy and nitrogen utilization in the parasitized animal will contribute to low performance include depressive effect on milk production in cattle (Parkins and Holmes, 1989). About 85.3% of the cows were attacked by skin diseases. It was informed that the skin disease have been appeared for long time in the respected area, and hard to be encountered due to lack of water to clean the animal. The cows under poor nutritional level were more vulnerable to ectoparasite infestation than animals with normal health (Rony *et al*, 2010). On the other hand as in common with other parasitic infections, there is a complex interaction between the host's innate and adaptive defend mechanisms and consequent adaptations by the parasite (Lee *et al*, 2011).

Conclusion and suggestion

Imbalance of mineral status and insufficiency of water supply were important causal factors of the low level of milk production and provoke the occurrence of nutritional diseases. Poor performance of dairy cows in the study area could also reflect other diseases which were in the subclinical state. Contribution from Government is needed to the competence and enthusiasm of the related stakeholders especially government institution to find methods and devise appropriate intervention to elevate milk production with respect to zootechnique skill of the farmers..

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