Smallholder dairy cattle farmer capacity in providing feeds and nutrient in several population densities of villages of Sleman Regency, DIY Province - Indonesia

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Abstract

A study to compare smallholder farmer capacity in providing feeds and nutrients for dairy cattle have been done in 5 different population density villages (Boyong, Tunggalarum, Cemoroharjo, Kemiri and Tambakrejo) of Sleman regency, DIY province. Forty cattle have been observed and 15 farmers have been interviewed. Feeds offered have been identified, weighted, sampled and analyzed for their proximate compositions and minerals. Nutrients requirement and balance of each cow has been calculated. The result showed that type and amount of feed offered related to the village typological area. Farmer in Tunggalarum provided sufficient nutrient and balanced ration with forage to concentrate ratio 55 : 45. The study concluded that the less population densities, the higher dairy farmer capacities in providing feeds and nutrients for their cattle.

Keywords: Nutrient balance, dairy cattle, typological area, requirement, traditional

Background

Smallholders which commonly undertake dairy farming in developing countries, often operated with quite rudimentary facilities (Andrews and Davison 2002). They diversified land as a characteristic of low-input farming systems (Andrieu et al. 2007) to grow grasses and food crops. The grasses and food crops residues were the major feed securities for their cattle. Despal et al (2014ª) reported about 50% of dairy cattle daily ration consisted of forage either cultivated (50 - 66%) or non-cultivated (34 – 50%) such as natural grasses or agricultural by-products (Despal et al. 2014ᵇ). Increasing population pressure on agricultural land resulted high convertion rate of agricultural land into non-agricultural land and limited the farmer capacity to supply nutrients for their cows.

The ability of farmer in providing nutrient depend on land carrying capacity and landuse priority and negatively correlated with population density. Limited land and higher stocking rate reduced milk production if there were no supplement feed to overcome the deficient nutrients (Baudracco et al. 2011).

DIY Province is one of dairy producing area in Indonesia. The Province is under rapid development. Dairy farming in the area had advantage from direct milk marketing but disadvantage from limited land availability and human population pressure. This study was aimed at comparing the capacity of traditional dairy farmer in providing nutrients for their cattle under different population densities.

Methodology

This study was conducted in 5 different population densities villages of Sleman Regency, DIY Province. Population densities per km^2 in each village were 525 (Boyong), 610 (Tunggularum), 833 (Cemoroharjo), 1849 (Kemiri) and 2438 (Tambakrejo). Forty cattle have been observed and 15 farmers have been interviewed. Feeds offered have been weighted, 1 kg each forage type and 100 g each concentrate type have been sampled and analyzed for their proximate compositions and minerals. Proxymate composition consisted of dry matter (DM), ash, crude protein (CP), fat, crude fibre (CF) have analyzed using AOAC (2003) procedures. Ca and P preparation samples used Reitz *et al.* (1987) method. Mineral P quantification has been analyzed using Taussky Shorr (1953) method, while Ca used AOAC (2003) procedure.

Dairy cattle nutrient requirements were interpolated from NRC (1989) nutrient requirement table based on individual cattle spesifications. The amount of nutrients provided were calculated from the amount of feed offered and their nutrient contents. Nutrient sufficiencies were calculated by substracted the amount of nutrient offered from nutrient required by each cattle. The experiment used block randomized design. The data were analyzed using ANOVA (Steel and Torrie) (1991) and continued by Duncan multiple rank test.

Results and Discussion

Feed used by the farmer have been grouped into forage and concentrate, Forage type used by the farmer included napier grass, natural grass, rice straw, albizia leaves and mixed legume. While concentrate type used consisted of different sources of mixed concentrate, tofu waste, pollard, wheat brand, rice polishing. The amount of nutrient provided, nutrient required and balanced are shown in Table 1.

Table 1. Feed and nutrient provided, required and balanced

Parameters	Boyong	Tunggalarum	Cemoroharjo	Kemiri	Tambakrejo
Feeds offered					
Forage (kg FS)	37.49±1.11a	34.17±5.52a	32.08±2.57a	40.00±0.00a	15.42±0.83b
Concentrate (kg FS)	10.88±5.66ab	5.75±2.63bc	8.75±1.54ab	6.80±1.09bc	11.88±1.25a
Forage (kg DM)	7.33±1.69ab	6.21±1.94bc	5.13±0.42c	8.21±0.00a	3.53±0.19d
Concentrate (kg DM)	7.83±2.64a	5.07±2.38b	7.84±1.49a	4.50±0.96b	6.53±a1.07b
Total (kg DM)	15.01±2.93a	11.27±3.14bc	12.97±1.07ab	12.70±0.96b	10.06±0.88c
Forage:concentrate	48.8 : 52.2	55.1 : 44.9	39.6 : 60.4	64.6 : 35.4	35.1 : 64.9
Forage (%BW)	1.86±0.44ab	1.59±0.39bc	1.23±0.16cd	2.00±0.09a	0.98±0.05d
Concentrate (%BW)	1.95±0.54a	1.30±0.53bc	1.87±0.38a	1.10±0.26c	1.81±0.31ab
TDN (kg)	9.57±2.11a	6.61±1.99b	8.01±1.11ab	7.81±0.73ab	6.06±0.69b
PK (g)	1797.20±3.92a	1348.57±b3.11c	1545.31±1.76ab	1499.65±1.23ab	1148.10±1.66c
Ca (g)	46.15±1.16b	73.88±1.74a	35.17±2.59b	38.89±0.97b	39.27±1.77b
P (g)	30.28±5.36ab	39.76±7.33a	22.58±1.47b	24.44±1.24b	23.75±8.35b
Requirement					
DM (kg)	11.63±1.09	11.28±0.80	12.68±1.09	12.08±1.18	11.48±1.06
TDN (kg)	7.32±1.13	5.89±1.46	8.02±1.13	7.06±1.46	7.76±1.06
PK (g)	1435.23±3.15	1024.12±3.78	1567.37±3.15	1329.27±4.41	1624.98±2.94
Ca (g)	56.09±1.16	41.26±1.44	61.82±1.16	53.05±1.46	61.75±1.04
P (g)	36.52±7.18	27.39±8.99	40.28±7.18	34.74±8.96	39.76±6.42
Balance					
DM (kg)	3.39±2.67a	0.01±2.53b	0.28±1.48b	0.62±0.94b	-1.41±1.25b
TDN (kg)	2.24±1.98a	0.73±1.60ab	-0.01±0.94bc	0.75±1.44ab	-1.70±0.39c
PK (g)	361.97±4.23a	324.44±3.11a	-22.06±2.74a	170.38±4.24a	-476.89±1.47b
Ca (g)	-9.94±1.39b	32.62±1.24a	-26.65±3.91b	-14.16±1.50b	-22.48±8.21b
P (g)	-6.24±7.04b	12.37±6.33a	-17.70±2.31b	-10.31±8.68b	-16.01±2.61b

The table showed that the amount of feeds and nutrient provided varied between the villages observed. Tambakrejo village which has most dense population provided the least amount total feeds and proportion of forage to concentrate. Comparing the feed offered to cattle requirement, Tambakrejo village also provided feed less than the cattle need. All villages provided amount of DM above their cattle requirements, except tambakrejo village. Although farmer in Cemoroharjo provided sufficient DM to their cattle, but the TDN and protein offered were less which showed lower ration qualities used. All village provided less Ca and P minerals than their cattle needed except for Tunggalarum village.

Conclusion

Type and amount of feed offered related to the village typological area. Farmer in Tunggalarum provided balanced ration with forage to concentrate ratio 55 : 45 and satisfied cattle requirement. The less population densities, the higher dairy farmer capacities in providing feeds and nutrients for their cattle.

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