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Farming scale impact on ration and dairy cow fs performances under traditional farm management in major producing province of Indonesia

Idat Galih Permana, Rika Zahera, Toto Toharmat, Despal Despal

Department of Animal Nutrition and Feed Technology, Faculty of Animal Science, Bogor Agricultural University

INTRODUCTION

Several factors limits dairy farming scale in Indonesia such as decreasing land and family worker availabilities as well as increasing concentrate price. Dairy cattle population, the major milk contributor in Indonesia (Indonesian Ministry of Agriculture, 2016) distributed mainly (99%) in Java island which is only 6.77% from the total Indonesian area (BPS, 2016). The cows distributed mainly in fertile highland with high agricultural to non-agricultural land conversion rate. According to National Dairy Survey (2012) in average dairy farmer cultivated 0.44 ha land to supply 62.7% forage required by 6.07 AU cows they kept. The remaining were supplied from other sources such as gathering natural grass from side road, under plantation area, or open field. Some farmer purchase agriculture by product which were seasonally available. Natural grass and plant by-product contributions determined sustainability of dairy farming especially in drought season (Despal et al. 2014).

Increasing human population pressure on the scarce resources have negative effects (Geertz 1963) such as reducing farmer capacity to provide forage for their cattle. Although the pressure on farmland could be relaxed through labor movement to urban sectors (Liu and Yamauchi 2014), however, it led to less family worker available and increase labor cost for agriculture sector in rural area especially worker for gathering natural grass. The lack of forage availability were overcome by dairy farmer by increasing concentrate supplement utilization in ration. The strategy increased farming cost and reduced farmer income. On larger holding farm however, human population pressure could be maintain through induction of technology and institutional innovation (Hayami and Ruttan 1985) as well as intensification in agricultural production (Boserup 1981).

The study was aimed at comparing impact of farming scale on dairy farmer capacity to provide feed and nutrition to their cattle and their impact to the cow's performances and farmer income in the four major dairy farm area.

METHODS

The study have been conducted in 4 major dairy cattle population provinces in Indonesia, namely West Java, DI Yogyakarta, Central Java and East Java. The study used survey methods with interview, direct observation and measurement as well as laboratory analyses. The amount of 129 farmers have been interviewed (43 in Wes Java, 29 in Central Java, 29 in DI Yogyakarta and 28 in East Java) and 415 lactating cows (145 in Wes Java, 105 in Central Java, 43 in DI Yogyakarta and 122 in East Java) have been observed to get information on cattle ownership, type and the amount of feed offered, milk production and farm income. The observations were aimed at confronting data from interview. Laboratory analyses were conducted to determine nutrient contents of feeds used and milk compositions.

Interviews were conducted by 4 trained enumerators with guidance of a questioner. The amount of feeds offered were measured gravimetrically, while milk productions were measured volumetrically. Cows' body weights were estimated using Schoorl's formula. Body conditions were scored according to five scales Penn State University (2004) procedure. Proximate analyses followed Naumann and Bassler (1997) procedures, while Ca and P sample preparation followed Reitz *et al.* (1987) procedure. Determination of Ca sample concentration followed AOAC (2003) procedure and P sample concentration determined using Taussky & Shorr (1953).

The study used imbalance randomized design. Collected data were analyzed using ANOVA procedure. Correlation between parameters have been analysis prior to regression.

RESULTS AND DISCUSSIONS

Farming scale, milk production, and farmer income are shown in Table 1 and nutrients offered are shown in Table 2. The table did not show any significant different between parameters observed due to large variation. The results showed that traditional dairy farming in Indonesia vary greatly in scale, capacity to provide nutrients, cow's performances and incomes. In average, traditional dairy farmer in Indonesia kept 6.61 AU with 76.33 percentage of lactating cow, where East Java province tent to be higher than other provinces. National Average

milk production was 13.81 L/d, higher than dairy cattle in tropic reported by Pérez et al. (2009). West Java Province tent to have better cow's performances than any other area in Indonesia. In Average, dairy farmer in Indonesia earned Rp 3.37 mio income per month, slightly lower than average national GDP income (Rp 3.8 mio) which showed that dairy farmer had lower exchange value and if the condition occurs in the long run, it will lead to disincentive of young generation to work in this field.

The amount of nutrient offered related to the feed resources availability especially forage which influenced by land occupation. In average, farmer in Indonesia provide macro nutrients (TDN and CP) above their cow's requirement, but not for micro nutrients (Ca and P). In DIY province, farmer offered less nutrients than their cow's required. The forage availability and nutrients offered in the different area explained cattle movement which frequently occurred since calf until lactating. Rearing mostly held in Central Java which can provided better nutrients surplus than any other provinces. Close to the calving period, the cows is transported to West or East Java which had advantage from their market value.

In term of nutrient procurements, higher holding farmer (East and Central Java provinces) were more resilient to the human population pressure by inducing technology such as utilization higher percentage of concentrate supplement and intensification in dairy farming production system (Liu and Yamauchi 2014). Labor shortages which were a serious issue in agriculture (Otsuko et al. 2013) were overcome through utilization of machinery such as chopper, hand tractor and milking machine. While West Java province, maintain nutrients supply by reducing farming scale.

Regression analysis on relationship between scale (X) and milk production (Y) showed a quadratic response Y = -0.5336X2 + 18.653X -17.883 with scale to achieve maximum production at 17.47 AU. There was no accurate estimation of nutrient availability can be produced from farm scale. With the current national scale (6.61 AU), farmer in Indonesia still have capacity to provide sufficient nutrient for their cows and increase their production level as well as income.

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KEYWORD : dairy cows, farming scale, income, nutrient sufficiency, performance

Table 1. Farming Scale, Milk Production, and Farmer Income

Parameters	National	Province			
		West Java	Central Java	DIY	East Java
Farming Scale					
Total cattle (AU)	6.61±5.30	4.98±2.70	7.10±5.48	2.88±1.42	8.95±5.30
Lactating cow (AU)	5.05±3.77	4.40±2.63	4.83±3.46	2.25±1.89	6.91±4.83
Lactating cow (%)	76.33±22.47	88.44±13.96	68.04±30.28	78.26±27.73	77.16±17.11
Milk Production (L/d)					
Total	68.40±55.59	64.17±33.04	60.08±43.89	25.50±17.25	96.91±78.75
Average	13.81±3.34	15.40±3.03	12.99±2.61	12.38±1.84	13.78±4.46
Income (Rp 000)					
Farm	3377±3211	3017±2000	3154±2467	1905±2467	4504±4276
Per lactating cow	643±300	695±342	642±279	627±416	604±278

Table 2. Nutrient Sufficiency

Parameters		Provinces				
		National	West Java	Central Java	DIY	East Java
Offered (kg)	TDN	8.70±3.06	9.84±2.71	8.56±2.27	6.50±1.42	8.61±4.17
	CP	1.82±0.74	2.02±0.54	1.89±0.77	1.36±0.31	1.71±0.95
	Ca	0.05±0.03	0.05±0.02	0.04±0.01	0.04±0.02	0.07±0.05
	P	0.03±0.02	0.04±0.01	0.03±0.01	0.02±0.01	0.03±0.02
Requirement (kg)	TDN	7.48	8.20	6.77	7.25	7.39
	CP	1.57	1.71	1.45	1.44	1.55
	Ca	0.06	0.07	0.05	0.06	0.06
	P	0.04	0.04	0.03	0.04	0.04
Balanced (kg)	TDN	1.22±3.00	1.64±2.72	1.79±2.27	-0.75±1.42	1.23±4.17
	CP	0.27±0.73	0.31±0.54	0.44±0.77	-0.08±0.31	0.17±0.95
	Ca	-0.01±0.03	-0.02±0.02	-0.01±0.01	-0.02±0.02	0.01±0.03
	P	-0.01±0.02	-0.01±0.01	-0.01±0.01	-0.01±0.01	-0.01±0.02

Note: TDN (Total Digestible Nutrient), CP (Crude Protein), Ca (Calcium), P (Phosphor)

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