Dairy Cattle Nutrient Sufficiency Kept under Traditional Farming Practice During Rainy and Drought Seasons

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ABSTRACT

A study of seasonal effect on nutrient sufficiency and its impact on lactating cow performances kept by traditional farmers, members of KPSBU cooperative-Lembang was intensified on the data and sample collected in two periods (October – November 2012 for drought season and February 2013 for rainy reason). Pairing data from seventy seven lactating cows were included in the development model. The amounts of feed offered were weighed and their nutrient contents analyzed to get proximate compositions (Dry matter, ash, crude protein, lipid and crude fiber), Ca and P contents, in vitro fermentability and digestibility. Total digestible nutrients (TDN), metabolisable energy (ME) and net energy for lactation (NEl) were calculated. The cow performances (body weight, body conditions score, milk production) were recorded. Descriptive statistics were used to describe the main and range values of each parameter. One way ANOVA was used to compare the effect of seasons. Correlations between parameters were made prior to regression analysis. The results showed that no effect of the seasons was identified on the cow performances and feeding practice coefficients except for "days in milk" (DIM), milk fat content, NEL and forage to concentrate ratio which were higher in drought season than rainy season. Although the farmers got difficulties in collecting forage during drought seasons, but forage proportion in the rations were higher than in rainy season due to higher forage DM contents which contributed to higher NEL and resulted in higher milk fat content. Only milk protein content had a correlation to the amount of feed and nutrient offered. Other performances parameters needed details feed utilizations parameters such as fermentabilities, digestibilities, ME and NEL although their estimate models were still unconvincing.

Key Words: Dairy performance, Drought, Nutrient sufficiency, Traditional dairy farming

INTRODUCTION

Our previous study concluded that farming systems influence the farmer strategy in coping with difficulties in providing feeds during drought season. The similar result was also found by Hardie et al (2014) which concluded that feeding strategies extremely vary which determine animal performance and farmer income. Traditional dairy farmers located in surrounding horticultural area provide better nutrition for their cows by utilizing crop waste and produced more milk in compare to small scale dairy enterprise which located in dairy business area of having limited access to the waste crop. Although the traditional farming system produces more milk, however, in both systems, nutrient provided for the cows could not support a long term persistency of high milk production (Despal et al. 2013) causing a high replacement cost. There is a need to in-depth study the feeding strategy separately.

Most of animal nutritionist agree that lack of feeding during drought season become one of the major constraints in developing livestock in tropical countries. However, our finding showed that in both systems, the farmers provided feeds more than their animal required especially for macro nutrients. The farmers need more time to gather forage and more budgets to spend on feed cost during the drought season because of the slower growth of forage as a result of limited water available. Higher sunlight intensity during summer or hot

seasons reduce protein content and increase fibre fraction faster (Narvaez et al. 2010) which led to decrease forage quality. There is a need to improve the dairy farmers feed utilization efficiency by providing model of performance prediction so that farmer could provide feeds according to the performance targeted. Our effort to estimate dairy performance using feeds and nutrients offers could not provide sophisticated model due to lack of correlation between the parameters. There is a need to include feed and nutrients utilization parameters to get a better prediction equation.

The study was aimed at describing and comparing feed offered and utilized at rainy and drought seasons to better estimate dairy performances and improve feed efficiency.

MATERIALS AND METHODS

The study was conducted in two periods (October – November 2012 for drought season and February 2013 for rainy reason) observations. A number of 30 farmers were interviewed and 133 lactating cows were studied. Seventy seven of paired lactating cows (found in both seasons) were used for detailed study. Cows productivity providing body weight, body conditions score, age, DIM, period of lactation, milk production, milk components (fat, lactose, protein, solid non fat), feed and nutrients offered (DM, ash, CP, fat, CF, Ca, P), and utilized (fermentability, digestibility, metabolized, net energy available for lactation) were measured and estimated.

Cow body weight was estimated using Schoorl method as used by Jaelani et al. (2013). Body condition score (BCS) was determined using 5-point scale as used by Roche et al. (2009). Milk components were scanned using Lacto scan type S_L. Nutrients offered were analyzed using proximate analysis (AOAC 1988), Ca and P contents determination were prepared using Reitz et al. 1987) and determined using Taussky and Shorr (1953) method for P and using AOAC (2003) for Ca. Fermentability of organic material in rumen to produce VFA in vitro was quantified using steam distillation method and fermentability of protein was quantified using Conway method. Digestibilities was analyzed using in vitro two stage (Tilley and Terry 1969) and Hohenheim gas test (Menke et al. 1979). ME and NEl were calculated according to the formula given by Menke et al. (1979).

Descriptive statistics were used to describe the average and distribution value of each parameter measured. One way ANOVA was used to compare the effect of seasons. Correlations between parameters were made prior to regression analysis. Dairy cows performances were estimated using linear regression procedure. Data analyses were done using SPSS 16 (2007) statistical package software.

RESULTS AND DISCUSSION

Lactating cow performances, feed offered and utilized. Average and standard deviation of parameters observed were shown in Table 1.

There was no signigicant different in lactating cow performances between rainy and drought seasons except for lactation cycle in drought season was higher than rainy seasons indicating a tendency of rainy season calving. Milk production in rainy season tent to be more higher than drought season. Decreasing milk production in drought season resulted in higher total solid content of milk especially milk fat content which was significantly higher in drought season than rainy season. Increasing milk fat and fatty acid due to availability of fresh grass during summer

Table 1. Lactating cow performances, feed and nutrients offered and utilized

Parameters	Units	Drought		Rainy	
		AVG	STD	AVG	STD
Cow Performances					
BW	kg	442.5	35.8	439.6	33.6
BCS		2.7	0.2	2.6	0.2
Age	years	5.08	2.02	4.81	2.00
Lactation Period	times	3.13	1.86	3.06	1.73
Lactation cycle	months	7.50[a]	4.74	5.72[b]	4.35
Milk Production	liters	16.79	5.43	18.08	5.53
Milk components					
Fat	%	4.61[a]	1.46	4.04[b]	1.51
Lactose	%	4.12	0.40	4.14	0.61
SNF	%	7.42	0.78	7.49	1.11
Protein	%	2.95	1.62	2.83	0.68
Feeds and nutrients offered					
DM	kg/head/day	24.64	8.28	24.01	8.81
ASH	kg/head/day	2.60	1.04	2.66	1.31
Fat	kg/head/day	0.89	0.28	0.83	0.29
CP	kg/head/day	3.02	1.15	2.82	1.04
CF	kg/head/day	5.33	2.04	5.29	2.35
Ca	kg/head/day	0.04	0.01	0.04	0.01
P	kg/head/day	0.06	0.02	0.06	0.02
TDN	kg/head/day	15.43	5.11	14.73	5.03
NFE	kg/head/day	12.73	4.06	12.22	4.25
Forage DM	kg/head/day	14.31	7.51	13.56	7.76
Concentrate DM	kg/head/day	10.33	3.59	10.46	3.95
Forage Proportion	%	56.33	14.31	54.65	0.13
Ration fermentability					
NH_3	mM	9.76	0.89	9.53	0.72
VFA	mM	113.11	27.60	107.71	26.24
Ration digestibility, metabolize, and available for lactation					
DMD	%	50.96	5.22	49.88	5.57
OMD	%	59.29[a]	5.63	57.33[b]	6.09
ME	MJ/kg	8.88	0.97	8.65	1.06
NEL	MJ/kg	7.31[a]	0.78	7.00[b]	0.78

Note: different superscript at the same row indicated significant different ($P<0.05$)

was also reported by Talpur et al. (2008). Increasing fat content in drought season milk might be caused by increasing digested crude fibre offered of forage origin and increasing net energy available for lactation.

The results showed that traditional dairy farmer of KPSBU cooperative members are more resilient to the seasonal availability of forage. Although the farmer needed longer time in gathering the forage and spent higher cost in providing feeds during drought season, however, the farmer still provided sufficient nutrients for their lactating cows. Dairy farmer in Lembang adapted to drought season through several strategiessuggested by Huffman (1959) such as 1) growing heat and drought resistant grass, 2) maintaining land moist, 3) decreasing grass defoliation and combining with puchasing forage, 4) giving shade to the grassland, 5) fertilizing soil. None of the observed farmer conserved their forage.

Correlation between parameters observed are shown in Table 2.Cows body weight negatively correlated with ash and crude fibre offered, while milk protein had correlation with macro nutrient intake except for fat. Feeds utilization and source offered alot of more information to

the variation of cow performances.Cattle body weight and score had positive correlation to the energy utilization but negatively correlated to forage offered and proportion. Similar correlation was also found with milk production but not to milk components. Although feed utilization and sources could be used in explaining variation of cow performances, however, their contribution are still low and no convincing model could be build. There are several others factor that influence the cow performance such as feed intake.

Table 2. Correlation between parameters observed

Parameters	Cow performance							
	Body weight &score		Milk production and components					
	BW	BCS	Production	Fat	Lactose	SNF	Protein	TS
Feeds and nutrient offered								
DM	-0.105	0.024	-0.003	0.042	0.073	0.046	.151*	0.051
Ash	-.154*	-0.056	-0.077	0.095	0.08	0.048	.140*	0.091
Fat	0.092	0.093	0.111	-0.075	0.073	0.043	0.022	-0.035
CP	-0.031	0.066	0.032	-0.018	0.044	0.022	.153*	-0.003
CF	-.169*	-0.032	-0.085	0.105	0.057	0.029	.154*	0.089
Ca	-0.022	0.078	0.098	-0.103	0.043	0.031	0.053	-0.061
P	0.061	0.069	-0.001	-0.01	0.083	0.053	0.027	0.017
TDN	-0.081	0.067	0.014	0.007	0.062	0.034	.157*	0.021
Feeds utilization								
NH_3	0.054	-.151*	-.232**	.278**	.258**	.225**	0.063	.305**
VFA	.267**	0.024	-0.042	0.001	-0.015	-0.023	-.215**	-0.01
DMD	.232**	0.093	0.123	-.165*	-0.039	-0.056	-.185*	-.145*
OMD[2)]	.186*	.136*	.195**	-.243**	-.150*	-.155*	-.193**	-.248**
ME	.212**	.133*	.223**	-.241**	-0.123	-0.124	-.197**	-.232**
NEL	.242**	.140*	.142*	-.219**	-.143*	-.146*	-.248**	-.226**
Feeds sources								
Forage	-.184*	-0.046	-0.111	0.119	0.055	0.037	.197**	0.103
Concentrate	.134*	.147*	.217**	-.146*	0.053	0.03	-0.055	-0.092
Forage proportion	-.195**	-0.117	-.235**	.187*	0.035	0.032	.150*	.150*

*. Correlation is significant at the 0.05 level (1-tailed).**. Correlation is significant at the 0.01 level (1-tailed).

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