Reproductive performance of dairy cows in Yogyakarta province based on balanced ration given

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ABSTRACT: The research was done to investigate reproductive performance of dairy cows in Yogyakarta Province based on balanced ration given. Five farmer groups for each cooperative from sixty two farmer groups of three milk cooperatives, namely UPP-Kaliurang, Sarono Makmur and Warga Mulya were randomly pointed as respondents. Selected fifteen farmer groups (15 groups), by simply random were taken 120 farmers as respondents and 132 cow as a sample. For each farmer at least raised dairy cow and had reached second lactation. The research methods were field survey, interview, questionnaire, observation and laboratory analysis to gather both premiery and secondary data. Parameter measurements were calving interval, postpartum mating (PPM), service per conception (S/C), weaning time and consumption of dry matter (DM), crude protein (CP) and total digestible nutrient (TDN). Data were analyzed using multiple regression and description. The result showed that the average calving interval of dairy cow in Yogyakarta Province was 434.77±59.20 days. The result of regression analysis demonstrated that postpartum mating and service per conception had highly significant effect ($P<0.01$) toward calving interval, by regression line of $Y = 230.826 + 28.892\ X_1 + 33.587\ X_2 + 3.812\ X_3$, with determinant coefficient (R^2) as much as 0.687. The average of postpartum mating was 4.21±1.20 months, while service per conception 1.98±0.91 times and weaning time was 4.08±1.07 months. Balanced ration given for lactation dairy cows still deficient on DM 1,54 kg and CP 44,89 g. While during the dry period the deficient was 2,06 kg DM, 243,91 g CP and 1,35 kg TDN. It's can be concluded that calving interval in Yogyakarta Province was 434.77±59.20 days, postpartum mating 4.21±1.20 months, service per conception 1.98±0.91 times, weaning time 4.08±1.07 months respectively. While the balanced ration given has not yet satisfied the needs of dairy cows on protein in Yogyakarta by fulfilling limited energy, especially in the last two-month of pregnant when they lost a large quantity of energy and protein. The balanced ration given sufficiently only to dairy cow which has average milk production of 6 liters per day.

Key words: dairy cows, reproductive performance, balanced ration given

INTRODUCTION

Dairy cows potentially be developed to reach the national dairy milk consumption, nowadays Indonesia still have to import 70% from total requirement (Setiadi, 2009). Factors such as low reproductive performance and productivity of dairy cows in Indonesia can be predicted due to unfulfilled needs nutrient requirements.

Dairy cow on the traditional farmer showed that nutritional deficiencies/mal nutrition due to inability of farmers to gave nutrient requirements for dairy cow. Protein and energy is a vital nutrients for dairy cow, because it is needed for the synthesis of hormones, tissue repair, synthesis of milk and other physiological functions which are all required to maintenance, growth, milk production and reproduction (Lanyasunya et al., 2005).

The impact of nutritional deficiencies showed that in the poor performance of dairy cattle reproduction in Indonesia such as length of calving interval (20 months), low conception rates (32%), low service per conception (S/C: 3.6 times) (Putro, 2008). The dairy farming business influenced by the reproductive performance represented by how long calving interval is reached. The aim of this research was to observe the reproductive performance of dairy cows in DIY base on balanced ration

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given. From the presented reproductive performance data included calving interval and related factors, the right actions can be designed to minimize factors that inhibit optimum calving interval, selection, culling, and achieve optimum milk production.

Materials

Hundred and twenty farmers were chosen and hundred and thirty two dairy cow from the 3 dairy milk cooperation (UPP Kaliurang, Sarono Makmur, and Warga Mulya, Sleman Regency, Province DIY) were used as samples. The cow which used in this research were the Friesian Holstein Breed, that have already achieved the second lactation

Methods

The data were collected by the Proportional Stratified Random Sampling Design (Steel and Torrie, 1993). From 62 farmer group were randomly taken for 15 groups. Than 15 groups were taken from 3 milk cooperation, with 5 group each. From the selected farmer groups, 120 farmers were chosen as respondents and 132 cows as samples. Data which observed were : raising management, reproductive performance, and semen quality.

Observation Variables. Variables that observed in this research were : Calving Interval (CI), Postpartum Mating (PPM), Service per Conception (S/C), Weaning Period, balance the consumption of dry matter (DM), total digestible nutrients (TDN) and crude protein (PK).

Analyzed Data. Reproductive performance calving interval and related factors were analyzed by the multiple regression (Stell and Torrie, 1993). While reproductive performance data based on balanced rations given were analyzed by descriptions analysis.

RESULTS AND DISCUSSION

Calving Interval, Postpartum Mating, Service Per Conception, and Weaning Period

Data of the calving interval, postpartum mating (PPM), service per conception, and weaning period of the dairy cows at DIY are presented at Table 1.

Table 1. Calving interval, PPM, S/C and the dairy cows weaning period in DIY

Variables	Number (cow)	Means ±SD
Calving interval (days)	132	434.77 ± 59.20
Post partum mating (month)	132	4.21 ± 1.20**
Service per conception (times)	132	1.98 ± 0.91**
Weaning Period (month)	132	4.08 ± 1.07

** (P<0.01)

The Regression Analysis between calving interval and PPM, S/C and weaning period forming a linear regression equation, where Y = 230.826 + 28.892 X1 + 33.587 X2 + 3.812 X3. Regression coefficient of X1 (PPM) is 28.892. It showed that every month PPM longer will extend calving interval about 28.892 days. Regression coefficient of X2 (S/C) is 33.587. It showed that every increasing one time of S/C will increased the calving interval about 33.587 days. Regression coefficient X3 (weaning periods) is about 3.812. It indicated that every increasing one month weaning periods will extend calving interval about 3.812 days. The coefficient of determination (R2) is 0.687. It means that calving interval of dairy cow in DIY can be explained jointly by the reproductive performance (PPM, S/C, and weaning periods) as high as 68.7 percent, while 31.3 percent come from other unknown factors.

There were two partially independent variables (PPM and S/C) that have highly significant effects (P<0.01) on calving interval,on the other hand the weaning period have no effects on calving interval

(P>0.05). Sturman et al. (2000) reported that the PPM and S/C were important factor to determining the days open which was closely related to the calving interval on dairy cow.

The calving interval of dairy cows in DIY was 434.77 ± 59.20 days, compared with the ideal calving interval about 365 days suggested that there were about 70 days longer (Montiel and Ahuja, 2005). The longer calving interval was due to average days open in dairy cow of 168 days. Horan et al. (2005) reported that an average ideal days open length were 95 days, calculated from the 270 days of pregnant and 365 days ideal for calving interval. So that the days open in dairy cows delayed for 75 days from the optimum condition.

During the early post partum period, the energy demand for maintenance and production exceeds that of dietary energy intake and dairy cows enter a state of negative energy balance (NEB) during which they mobilized body reserves (Beever et al, 2006). Negative energy balance have impact on reproduction performance by delaying the interval from calving to the first ovulation, post partum estrus and days open (Putro, 2007)

According to the nutrient requirements of lactation dairy cow (NRC, 1988) the balanced ration given has not yet sufficed the needs of dairy cows protein requirements. Nutrient balance represented the difference between the nutrients consumed and nutrient requirement, showed in Table 2:

Table 2. Balance of consumption and requirement of DM, CP and TDN on dairy cows in DIY

Parameter	Number, cow	Average, head/day
DM consumption of forages, kg	132	6.43
DM consumption of concentrate, kg	132	3.97
Total consumption of DM, kg	132	10.40
Requirements of DM, kg	132	11.94
Balanced, kg	132	-1.54
CP Consumption of forages, g	132	584.81
CP Consumption of concentrate, g	132	396.82
Total Consumption of CP, g	132	981.63
Requirements of CP, g	132	1026.52
Balanced, g	132	-44.89
TDN consumption of forages, kg	132	3.69
TDN consumption of concentrate, kg	132	2.44
Total consumption of TDN, kg	132	6.12
Requirements of TDN, kg	132	5.76
Balanced, kg	132	+0.36
Body weight, kg	132	399
Milk production, liter, fat: 3,5%	132	8.40
DM, forages: concentrate ratio consumed	132	62:38

Table 2 showed that dry matter and protein intake of dairy cows in DIY has not yet sufficed both on dry matter and protein of 1.5 kg and 45.88 g/head/day respectively especially in the last two-month pregnant when they loose a large quantity of energy and protein (NRC, 1988). Many research reports have clearly demonstrated that energy, protein and minerals intake are the most important nutritional factors affecting reproduction and therefore milk production in dairy farms. Putro (2007), reported that nutritional deficiencies were a major contributing factor to the low fertility of dairy cow, it can reduced LH secretion, decreased diameter of the dominant follicle in the postpartum period, reduce the proportion of successful inseminations, increase early embryonic lost and prolong calving interval. Based on this research, result 11 dairy cow at the last two-month of a pregnant (dry off) when they lost a large quantities of energy and protein from the balance of ration given showed in Table 3.

Based on Table 3, dairy cows in DIY in dry period were loose a large quantity of energy and protein for the balance of ration given. Nutrient deficiencies including dry matter, crude protein and total digestible nutrient were 2.06 kg DM, 243.91 CP and 1.35 g kg TDN respectively. The lack of nutrient intake resulted in loss of weight and BCS. Body condition score (BCS) has been shown to be a good indicators of body energy reserves (Montiel and Ahuja, 2005). Body condition score not only affected reproductive performance, but also affected milk production and calf growth, more over BCS at dry and calving periods have associated both with weaning weight (Ciccioli et al., 2003).

Tabel 3. Balance of consumption and requirement of DM, CP and TDN on dairy cows in DIY during dry period

Parameter	Number (cow)	Average, head/day
Total consumption of DM, kg	11	10,18
Requirements of DM, kg	11	12,24
Balanced, kg	11	-2,06
Total consumed of CP, g	11	949,09
Requirements of CP, g	11	1193,00
Balanced , g	11	-243,91
Total consumption of TDN, kg	11	5,93
Requirements of TDN, kg	11	7,28
Balanced, kg	11	-1,35
Body weight, kg	11	407

When cows have low body energy reserves they may have a greater probability of suffering from diseases, metabolic disorders, reproductive failure and reduction in milk yield, and heifers are older at puberty (Edmonson et al., 1989). Many investigators have found a relationship between BCS at calving and pregnancy rate (Richards et al., 1986; Selk et al., 1988).

Post Partum Mating (PPM)

The result showed that PPM (first mating after birth) dairy cow in DIY was 4.21 ± 1.20 months. The regression analysis, showed that PPM have highly significant effect on the calving interval ($P < 0.01$).This result was longer 58 days, than Siregar (1996) and (Ya'niz et al., 2006) (126 vs 68 vs 79 days). Those the longer of PPM was influenced by prolonged Post partum estrus, due to the balanced ration given have not yet sufficed the needs of dry mater (1.54 kg) and protein (45.88 grams), especially in the last two-month of pregnancy when they loose large quantities of energy and protein. The balanced ration given was sufficient only to dairy cow which have average milk production of 6 liters per day (Table 2 and 3).

Nutritional status in the pre- and postpartum periods influenced subsequent reproductive performance. Thus, inadequate protein and energy intake during pregnancy or early lactation resulted in low BCS at calving and longer inter-calving period in beef cow (Laflamme and Connor, 1992). During the early postpartum period, under-nutrition increased percentage of anestrous cow. In beef cattle, this reduces the possibility for having a high percentage of cows that have initiated estrous cycles during the breeding season (Dziuk and Bellows, 1983; Richards et al., 1986). Cows fed only by grazing have greater probabilities for being anestrous (McDougall et al., 1995), and under-nutrition can induce anestrus, particularly in *Bos indicus* breeds (Jolly et al., 1995). During the early postpartum period in dairy cows there was a suppression of cycles of ovarian function, that more worse if the cow has a poor BCS. Energy deficit during growth and in the pre- and postpartum periods inhibits estrus onset and reduces fertility in females (Williams, 1989), because during a negative energy balance, growth and follicular maturation are inadequate, resulting in poor estrus manifestation and in deficient results in programs for synchronization of estrus (Stevenson et al., 1987).

Service per Conception (S/C)

The results showed that the S/C of dairy cows in DIY was about 1.98± 0.91 times. The S/C have highly significant effect to the calving interval (P <0.01). It was due to the high value of S/C will extend directly calving intervals of dairy cows in DIY. We also carried out semen quality analysis to the laboratory. The result expected to know if the S/C influenced to the length of dairy cows calving interval in DIY. The semen quality showed in Table 4.

Table 4. Average of semen quality in UPP Kaliurang, Sarono Makmur and Warga Mulya milk cooperation

Cooperation	Semen quality		Note
	Motility	Percent, %	
UPP Kaliurang	+++	75	Very good
Sarono Makmur	+++	75	Very good
Warga Mulya	-	-	Died

+++: heavy waves, active, fast moving, thick and darkness

Table 2. showed the semen quality in three different milk cooperation in DIY. The results showed that there were similar semen quality in both UPP Kaliurang and Sarono Makmur cooperation. The semen quality was very good in both cooperation (+++), while the semen died in the Warga Mulya cooperation. The died semen in Warga Mulya cooperation suspected due to run out of liquid nitrogen in the container. Watson, 1995 in Haugana et al. (2007) reported that the storage process of semen has a major influence on the vitality (viability) of spermatozoa in the straw.

The high value of S/C DIY dairy cows as a main factor on the length of calving interval in dairy cows in DIY. It might be due to a state of negative energy balance (NEB); the rate of low dry matter intake lags behind the rapid increase in milk production. The NEB and associated changes in some blood metabolites have been implicated in delayed first ovulation in dairy cows (Staples, 1990). Further, various metabolites in blood and milk have been associated with reproductive performance (Reist et al. 2000). Recently, there have been some reports on the relationships among the resumption of ovarian cyclicity postpartum and nutritional end points, such as body condition score (BCS), body weight and several plasma metabolites in high-producing dairy cows (Tailor et al. 2003). They have reported associations of prolonged intervals to first postpartum ovulation with some metabolic hormones, such as insulin-like growth factor I (IGF-I) and growth hormone.

Weaning Period

The regression analysis showed that weaning period have no significant effect to the calving interval (P> 0.05). It might be due to the weaning period have not affected calving interval directly and un uniform samples (dairy cows) based on weaning patterns. The results showed that average weaning period was average 4.08 ± 1.07 months. The length of weaning period in DIY caused by most farmers don't know the relationship and impact of weaning period to the ovarian activities post partum. It will impact on postpartum estrus and postpartum mating directly, so that there were no effort from the farmers to wean as soon. Suckling mechanism will be caused secretion of GnRH from the hypothalamus after partum due to stimulation of β-endorphin release, as a result caused prolong PPE and calving interval more than 12 months (Putro, 2007).

CONCLUSIONS

Research could be concluded that performance of reproduction showed calving interval in Yogyakarta Province was 434.77±59.20 days, postpartum mating 4.21±1.20 months, service per conception 1.98±0.91 times, weaning time 4.08±1.07 months respectively. While the balanced ration given has not yet sufficed the needs of dairy cows protein in Yogyakarta by fulfilling limited energy, especially in the last two-month pregnant when they loose a large quantity of energy and protein. The

balanced ration given sufficiently only to dairy cows which has average milk production of 6 liters per day.

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