

Improvement of Milk Production with Half Day Milking; a Case Study of Communal Goat Housing in Sukorejo, Yogyakarta, Indonesia

Yuni Suranindyah, Kustantinah, and E. R. Ørskov

Abstract—The case study was conducted to show the effect of milking method in goat called half day milking on the milk production and the growth of kids. Data were collected by interviewing farmers and investigating goat production in the communal goat housing from June 2008 to May 2009. The interview was conducted to collect data about goat management. The observations were conducted on 10 goats, which were selected based on the uniformity of age, number of kid born/goat and the milking method in practice. The samples were divided into two groups; those were full 3 months nursing and half day milked goats (in this group the kids were separated from goat during the previous night milking and then the kids were allowed to suck the goat during the day). The result showed that the communal goat housing had 138 goats and 25% of the farmers milked the goat. The implementation of half day milking increased the milk production significantly ($P < 0.05$) and it did not affect the kids' growth. It was concluded that half day milking was beneficial to increase milk production. In the communal goat housing was possible to implement the result of this innovation to all members of the farmer group as a method in increasing goat milk production.

Keywords—Communal goat housing, milk production.

I. INTRODUCTION

KEEPING goat in Indonesia has many purposes, such as to produce meat, manure and milk. Etawah-crossed breed is one goat breed which has been promoted as dairy goat in Indonesia. Actually, this breed is a dual purpose goat. It is a result of crossing between the Jamunapari (Etawah) and the local goat. Goat milk from Etawah-crossed breed was constrained by low productivity of milk per goat. Referring to [7], [8] milk production of Etawah-crossed breed varied from 850 to 922 ml/day. This was found to be lower than the production level of pure Etawah goat which was about 3.8 to 4.5 kg/day [14]. Apart from genetic effect, the problem of low milk production by Etawah-crossed breed was probably associated with feeding and the milking management.

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Commonly, goat milk for human consumption was collected during the late lactation, as majority of goat nurse their kids until 3 months of age.

In Indonesia Etawah-crossed breed goats are concentrated in several regions of Java, especially in the upland area. The example of high populated location of Etawah-crossed breed goats is Sleman Regency, in Central Java. In this region, the goat has been mostly raised by small farmers in a communal housing system. The roles of the group was advantageous for farmers as reported by [16], [5]. Farmer grouping functioned as a media of extension service, disseminating innovation and activates the member to improve productivity.

The increasing milk production of a goat can be achieved by improving its management, such as the management of milking. As reported by [21] milk production and the lactation period of Etawah-crossed breed goat increased significantly by its early weaning. According to [2], restricted milking by separating the kids in adjacent place it was possible to maintain milk production.

Several farmers in "Sukorejo" group have implemented a method of restricted milking by separating the kids during the previous night, in order to obtain milk for human consumption by hand milking. This method is innovative work for the group, however prior to the dissemination to the group member, there is need to evaluate the impact on milk production and the growth of kids.

II. MATERIALS AND METHODS

The study was carried out in "Sukorejo" farmer group. Data were collected by interviewing 36 farmers and investigating the production level of 10 Etawah-crossed breed goat from June 2008 to May 2009.

Interview was conducted using questioner containing questions pertaining to the system of the communal goat housing, farmers' characteristic and management of raising goats. Data related to production level were collected from goat samples. The samples consisted of goats in second lactation and delivered twin kids. There were two groups; the first group was half day milking goats, while the second one was full 3 months nursing goats. 'Half day milking' method was conducted by separating kids from the goat in an adjacent place for one night previous milking. The goat was milked by hand in the consecutive morning; afterward the kids were allowed to suck their dam until evening. 'Half day milking' method was started one month after kidding. The full 3

months nursing goats weaned their kids at 3 months of age, and then milked by hand until the end of lactation.

During the investigation the data of kids including the birth weight, weaning weight, type of birth, mortality and milk production of the goat were collected. The data were statistically analysed by calculating mean values and comparing them by ANOVA.

III. RESULTS

The Communal Goat Housing System and Farmers Characteristics

The communal goat housing of 'Sukorejo' is situated in the north of Yogyakarta, Indonesia. The area occupied 3 ha, located in a village on the altitude of 500 m above sea level with daily temperature varied from 23 to 32°C. The distance between farmers' houses and the communal goat housing varied from 0,1 to 1,0 km. Within the area, each farmer allocated 250 m² of land to establish goat house and to produce forage. There are also available public facilities, such as places for milk collecting, manure processing and meeting area. Etawah-cross breed goats were raised in the slatted house and fed grasses, multipurpose tree leaves or crop by-products using cut and carry system. Daily activities such as feeding, milking and cleaning goat pens, were conducted individually by farmers in this area.

Table I showed the performance of the group. The population were limited to 138 goats, which belonged to 36 farmers. The type of farm was small, as it was associated with the fact that raising goat was a only secondary activity.

TABLE I
THE PERFORMANCE OF COMMUNAL GOAT HOUSING IN SUKOREJO

Variables	Value
Population in the group (head)	138
Number of farmer (person)	36
Number of farmer conducted milking (person)	9
Goat occupancy (head/farmer)	3 to 4
Land ownership (m ² /farmer)	1000 to 5000

The primary job of farmers in this group was producing mixed crops with vegetables and fruits as the majority crop. Typically, the location of goat pens was close to each other in the group. This situation gave opportunity to attain effectiveness of extension service.

Productivity of Goat in the Communal Goat Housing

The main purpose of raising goat in this group was to produce goats for sale and manure (75% of total respondents). Only 25% of the respondents stated that the main purpose was producing milk. In spite of only small number of farmers who preferred to produce milk, the result of present study indicated a shift of goat production objective.

Despite of a change in the objective of goat production, the practice of milking was not conducted for the whole lactation period. Commonly, milking the goat was started after weaning time, therefore milk for human consumption only came from

the late lactation. Consequently, there was only little milk be collected for sale or consumption, as shown in Table II.

TABLE II
MILK PRODUCTION AND LACTATION PERIOD

Variables	Treatment	
	Half day milking	Full 3 months nursing
Total milking day (day)	123.2 ± 6.1 ^a	39.6 ± 9.8 ^b
Lactation period (day) ^{ns}	153.4 ± 6.9	129.6 ± 9.8
Milk production (l/lactation)	63.6 ± 11.5 ^c	20.7 ± 6.8 ^d

a, b, c, d means within row with different superscripts were significantly different at P<0.05.

In the communal goat house, majority of goats nursed the kids until weaning time at about 3 months after parturition (full 3 months nursing). The present study found many farmers conducted restricted kids separation to collect goat milk for selling. The implementation of half day milking resulted no difference of lactation period (Table II). In general, the lactation period of goat in this study was shorter than 6 months. Milk production and total milking days increased significantly (63.6 vs. 20.7 l/lactation and 123.2 vs. 39.6 days) as the result of implementation of half day milking methods. The period of milking was about 40 days constituted the time toward dry period when milk yield declined.

In this present study, half day milking represented a restricted milking method. The effect of implementation of half day milking showed a positive effect on milk production, however the impact of milk restriction for kids need to be evaluated. Table III showed comparative kids performance from birth to weaning.

TABLE III
THE PERFORMANCE OF KIDS

Variables	Treatment	
	Half day milking	Full 3 months nursing
Birth weight (kg) ^{ns}	2.97 ± 0.11	3.11 ± 0.28
Body weight at 1 month after birth (kg) ^{ns}	7.08 ± 0.53	7.07 ± 0.34
Weaning weight (kg) ^{ns}	13.10 ± 1.07	15.00 ± 2.45
Daily gain:		
birth to 1 month of age (g) ^{ns}	137.0 ± 15.9	132.0 ± 11.3
1 to 2 months of age (g) ^{ns}	123.0 ± 23.2	144.3 ± 23.7
2 to 3 months of age (g) ^{ns}	103.0 ± 29.7	116.7 ± 34.0
Kid mortality (%)	11	10

^{ns} non significant

From birth to the weaning period the weight of kids did not change by the implementation of half day milking. The daily gain and the weaning weight of kids which undergo the restricted separation was smaller in compared to those in full 3 months nursing, but the value was not statistically different (Table III).

Lactating goat in 'Sukorejo' commonly was fed leguminous tree leaves, grasses supplemented with rice bran or cassava root. Although separation was conducted for kids of half day milking group, there was opportunity for them to adapt better

to the solid feed. As about 2 weeks of age, the kids gradually adapted to consume the same type of feed as eaten by the dam. The weaning weight of kids ranged from 13.1 to 15.0 kg and pre-weaning from 10 to 11% of the total samples.

IV. DISCUSSION

Goat production in the communal goat house of 'Sukorejo' could be classified as small scale, as the ownership was only 3 to 4 goat/family. Referring to [19] the numbers of owned of goat being 5 could be classified as small size of goat flocks. However, by providing manure as fertilizer the role of goat in the present study was important, in multi crop production. On the other hand, mix cropping yielded by-products for goat feed. This system was similar to common production system in other regions where livestock, especially small ruminants played a role as saving account and generated multi product [13], [19].

As it was reported previously by [20], there was no purpose of producing milk by keeping Etawah-crossed breed goat and according to [22] milk production was only the third rank of purpose. This result showed that recently farmers have been motivated to utilize Etawah-crossed breed, as dual purpose breed not only to produce kids but also as the milking goat. Although there was only small number of farmers who conducted milking (25% of total farmer), a good initiative activity has been started to improve goat production in the group. Sharing experience among farmers was supported in the communal goat house, where the communication occurs frequently.

According to [16] group approach was commonly more successful to empower people. In the group, people showed dependency on each other and interactions might occur, therefore the objective of the group could be attained by mutual work. A study in communal cattle houses by [6] showed that interaction among farmers was the most important factor which affected the effectiveness of extension service. The result of field study in 'Sukorejo' indicated that performance and characteristic of the group could ensure to develop cooperation and possible to disseminate many innovations to improve goat productivity.

To improve milk production, there was need of a strategy, for example by manipulating weaning. In full 3 months nursing goat, milk was majority consumed by kids; while in half day milking group, there was approximately half of milk production was collected for selling, since the first month after kidding. In full 3 months nursing goats, the total milking day was short due to late start of milking. Total milking days were measured from the beginning of hand milking (at 3 months after parturition) to the end of lactation. Consequently, there was only small amount of milk could be collected from full 3 months nursing goat, on average 20.7 l/lactation. On the contrary in 'half day milking', the goat produced more milk (60.0 l/lactation), because peak milk yield was included in the milking period. As described by [8] the maximum production was attained during the first 90 days of lactation.

In general, the lactation period of goat which last for 129 to 154 days, was shorter than the previous reports by [17], [8] as about 6 months in Etawah-cross breed and [10] 6 to 7 months

in mixed goat breed. As described by [4] the dry period started at 111 to 115 days, in addition [1] showed that in most breed of goat peak milk yield occurs about 6 to 8 weeks after parturition. Since the period of lactation was short a suitable milking management combined with feeding supplementation was probably effective to increase milk production and growth rate of kids.

Weaning is characterised by the breakdown of the doe and kids bond. There are many weaning methods, for example by smearing faeces on the udder of the dam or by covering the udder every morning. The other method was conducted by separating kids from the dam in an adjacent corral which enable them to have contact [2]. In relation to weaning, proper knowledge of natural suckling behaviour of kids was needed to determine the level of milking restriction that can be implemented without affecting the growth [9].

The result indicated that implementation of half day milking did not decreased the growth rate of the kids, similarly reported by [15], growth rate of sheep was not altered by daily separation. This case occurred because the goat was allowed to nurse the kids during the day. According to [18] suckling behaviour in goats showed a large reduction in duration between the 1st and 3rd weeks post-partum. Decreasing duration of the suckling suggested that kids quickly adapt to eat herbage. In the present study, the kids of half day milking group probably started earlier to meet their nutrient requirement from solid feed than the kids of full nursing group. In this case, stress might be reduced, since the kids were only temporary separated in adjacent place. Similar study was reported by [2] in sheep. Weaning by separation of ewes and lambs into adjacent corrals appeared to be less stressful. As suggested by [9] nursing and milking the goats once or twice per day to obtain additional milk production without great reduction in growth rate of kids.

The level of pre weaning mortality was lower than the result of [12] ranging from 35 to 60% for kids under small holder management. The weaning weight of kids of about 13 to 15 kg was in the range of previous reports by [11], [3], [21] as 8.7 to 16.4 kg.

The results of the study represented the situation of a small scale goat management. Although the data were only collected from field study or explorative, the result show the situation in the farm. The implementation of a certain method of rearing in practice will be interested if it could show a good result. Based on the aspect of productivity, the results of implementing half day milking were quite impressive, as it showed additional milk with normal attainment of weaning weight. This data was valuable to consider strategy toward the improvement of milk production using Etawah-crossed breed goat. Although the goat constituted as a dual purpose breed, the potency to produce more milk could be improved by an appropriate management.

A positive result of a study that was already conducted in farmers' site could be used as a resource for extension service. In respect to implementing half day milking, there is need to disseminate the result of the study to farmers in the group. The impression of the result of this study was that farmers might

obtain more income by selling milk while the effort of raising kids was not affected.

It was concluded that half day milking increased milk production and there was no significant effect on weaning weight, daily gain and pre weaning kid's mortality. In the communal goat housing, the positive result of the study was possible to be shared as new information related to the effort of improving productivity of Etawah-crossed breed goat. However, more controlled investigations are needed to find more detailed data relating to milk production, feed consumption and hormonal control of restricted separated kids and their dam.

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REFERENCES

[1] AFRC, Handbook of the Nutrition of Goats. Wallington: CAB International. 1998, pp. 50-51.

[2] A. Orihuela, E. Suarez and R. Vasquez, "Effect of restricting suckling on the social bond between ewes and their 10-week-old lambs," *Livestock Production Science*, vol. 87, pp. 259-264, 2004.

[3] B. Setiadi, I. K. Utama, and I. G. M. Budiarsana, "Reproductive and productive efficiencies of Etawah Grade goats under various mating managements," *Journal of Animal Science and Veterinary*, vol. 2, pp. 223-236, 1997.

[4] B. B. Singh, and P. P. Singh, "Performance of Jamnapari goats," *Indian Veterinary Journal*, vol. 51, pp. 326-332, 1974.

[5] F.T. Haryadi, and Y. Tsuya, "The relationship of beef cattle farmer's characteristics and the extension effectiveness of livestock innovation in the two models of livestock resettlement area; based on the experience of an extension method used in Yogyakarta Province, Indonesia," *Bulletin of The College of Agriculture Otsunomiya University, Japan*, vol. 18, pp. 11-18, 2002.

[6] F. T. Haryadi, "Cohesiveness level of beef cattle farmers' group at Ngudi Raharjo I Bokoharjo Prambanan Sleman Regency, Yogyakarta Province," *Mediagro*, vol. 2, pp. 89-100, 2006.

[7] H. Tarmawati, "Correlation between body exterior and milk production of Etawah-crossed goat in Mandiri group, Nganggring, Turi, Sleman, B.Sc. thesis, Faculty of Animal Science, Gadjah Mada Univ., Yogyakarta, Indonesia, 2006.

[8] I. K. Utama, and I. G. M. Budiarsana, "Etawah grade goats as the source of income of farmers in Indonesia," *Livestock Research*, vol.1, pp.81-85, 1997.

[9] J. A. Delgadillo, P. Poindron, D. Krehbiel, G. Duarte, and E. Rosales, "Nursing, suckling and postpartum anoestrus of Creole goats kidding in January in subtropical Mexico," *Applied Animal Behaviour Science*, vol. 55, pp. 91-101, 1997.

[10] J. C. Flamant, and P. Morand-Fehr, "Milk production in sheep and goats," in "Sheep and Goat Production," I.E. Coop, Ed. Amsterdam: Elsevier Science Publishing Company, 1982, pp. 275-295.

[11] K.M. Abdel-Rahman, and S. El Kaschab, "Nutritional performance of Damascus and Jamnapari crossbred growing male goats," *Small Ruminants Research*, vol. 27, pp. 279-281, 1998.

[12] L. R. Ndllovu, and L. Simela, "Effect of season of birth and sex of kid on the production of live weaned single born kids in smallholder East African goat flocks in Nort East Zimbabwe," *Small Ruminant Research*, vol. 22, pp.1-6, 1995.

[13] M. J. Otte, A. Costales and M. Upton, "Smallholder livestock keepers in the era of globalization," in *Proc. AHAT/BSAS International Conference: Integrating Livestock-Crop Systems to Meet the Challenges of Globalisation*, Khon Kaen, 2005, pp. 1-12.

[14] M. Knights, and G. W. Garcia, "The status and characteristics of the goat (*Capra hircus*) and its potential role as a significant milk producer in the tropics: A Review," *Small Ruminants Research*, vol. 26, pp. 203-215, 1997.

[15] P. Orgeur, N. Mavric, P. Yvove, S. Bernard, R. Nowak, B. Schaal, and F. Levy, "Artificial weaning in sheep: consequences on behavioural, hormonal and immuno-pathological indicators of welfare," *Applied Animal Behaviour Science*, vol. 58, pp. 87-103, 1998.

[16] S. S. Hariadi, "Study on the factors which affected successful of farmers group as learning, cooperation and production." Ph.D. dissertation, Faculty of Pshycology Science, Gadjah Mada Univ., Yogyakarta, 2004.

[17] S. Tjokrohoesodo, "Milk production of Etawah-crossed goat in Karangmalang, Yogyakarta," unpublished.

[18] T. Bungo, M. Shimojo, Y. Nakano, K. Okano, Y. Masuda and I. Goto, "Relationship between nursing and suckling behaviour in Tokara native goats,". *Applied Animal Behaviour Science*, vol. 59, pp. 357-362, 1998.

[19] T. D. Soedjana, "Economic of raising small ruminants," in "Small Ruminant Production in Humid Tropics," W. M. Tomaszewska, I. Mastika, S. Gardiner, A. Djajanegara, and T. R. Wiradarya, Ed., Surakarta: Sebelas Maret University Press, 1993, pp. 336-368.

[20] W. L. Jaya, "Natural increase of Etawah-crossed goat in Turi, Sleman," B.Sc. thesis, Faculty of Animal Science, Gadjah Mada Univ., Yogyakarta, Indonesia, 2007.

[21] Y. Suranindyah, "The effect of season and feed management on reproductive efficiency of Etawah Grade goat kept by smallholders in an upland area of Yogyakarta," Ph.D dissertation, Dept. Agric., Univ. of Aberdeen, Scotland, 2004.

[22] Y. Suranindyah, "The characteristic of goat production in the upland of Yogyakarta," in *Proc. of AHAT/BSAS International Conference: Integrating Livestock-Crop Systems to Meet the Challenges of Globalisation*, Khon Kaen, 2005, pp. T43-44.

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