Farmer's Characteristics Associations with the Knowledge for Sheep Estrus Detection in Batur Village, Banjarnegara, Indonesia

Hubungan Karakteristik Peternak dengan Pengetahuan Deteksi Estrus Domba di Desa Batur, Banjarnegara, Indonesia

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Abstrak

Ketepatan dalam deteksi birahi merupakan hal penting di dalam menejemen breeding. Penelitian ini bertujuan untuk mengetahui hubungan antara karakteristik peternak dengan kemampuan mendeteksi birahi pada domba. Data dikumpulkan dengan cara wawancara kepada 33 peternak di Desa Batur, Banjarnegara, Indonesia, yang telah memelihara domba dengan tujuan pengembangbiakan dan pengalaman beternak paling sedikit selama dua tahun. Pengetahuan peternak untuk deterksi birahi dibagi menjadi tiga tingkatan, yaitu tingkat rendah, menengah, dan tinggi. Hasil penelitian ini menunjukkan bahwa pengetahuan peternak tentang deteksi birahi pada tingkatan rendah, menengah, dan tinggi berturut-turut adalah 51,5%, 27,3%, dan 21,2%. Terdapat hubungan yang nyata antara pendidikan formal, pendidikan informal, jumlah ternak, lokasi kandang, lamanya berada di kandang, dan kepemilikan pejantan untuk pengawinan terhadap tingkat kemampuan deteksi birahi. Dapat disimpulkan bahwa terdapat hubungan antara karakteristik peternak di Desa Batur dengan kemampuan mendeteksi birahi pada domba yang didominasi pada tingkat rendah, sehingga diperlukan peningkatan pengetahuan peternak terkait deteksi estrus.

Kata kunci: Analisis korelasi; deteksi estrus; induk domba Batur; pengetahuan peternak

Abstract

The accuracy of the estrus detection was important in sheep breeding management. This study aimed to determine the correlation between the farmers' characteristics and the knowledge on estrus detection of their sheep. The data were collected by interviewing 33 farmers, who have raised sheep with a breeding system for at least two years of experience in Batur Village, Banjarnegara, Indonesia. The farmers' knowledge for estrus detection was divided into three-level, namely low, medium, and high levels. The results showed that the farmers' knowledge for estrus detection was 51.5%, 27.3%, and 21.2% on the low, medium, and high levels, respectively. There was a significant relationship between formal education, informal education, number of sheep, the sheepfold position, stay duration in the sheepfold, and the ram ownership for mating toward knowledge of estrus detection level. It can be concluded that there is a relationship between farmer

characteristics in Batur Village and the ability to detect estrus in ewes, which is dominated at low levels, so it is necessary to increase farmers' knowledge regarding estrus detection.

Keywords: Batur ewes; correlation analysis; estrus detection; farmers' knowledge

Introduction

Batur Village is one of eight villages located in Batur District, Banjarnegara Regency, Central Java, Indonesia. The village is located at an altitude of 1,666m above sea level with a temperature of 14-20°C and a humidity of 84-85% (Central Bureau of Statistics, 2016; Ibrahim *et al.*, 2021a). These conditions are suitable for horticultural activities. Maintenance of agricultural land is essential to maintain their soil fertility. Farmers usually raise livestock to provide fertilizer for their agricultural land. Batur sheep is one type of livestock that is mostly kept by farmers and suitable for the geographic conditions of Batur Village (Ibrahim *et al.*, 2020). Batur sheep have been raised by the community in Batur District and its surroundings since 1974, which results from crossbreeding between the Thin-Tailed sheep and Merino sheep. Since 2011 the Batur sheep have been established officially become one of the Indonesian local breeds of sheep by the Ministry of Agriculture of the Republic of Indonesia. Batur sheep have wool-covered their bodies. Female Batur sheep can reach 82.0 kg with good mothering ability. Some of the reproductive characteristics of Batur sheep 10-12 months for the first mating, 15-19 months for first lambing, 1-2 lambs for litter size, 17-19 days of estrus cycles, and 25-35 hours for estrus duration (Ministry of Agriculture, 2011). Most farmers in Batur Village carry out their sheep farming activities as a side job to produce a lamb (Ibrahim *et al.*, 2021b).

The key success in sheep breeding is fertilization, which is determined by ewe estrus' initial and duration (Alhamada *et al.*, 2017). Good estrus detection was critically important (Jurame *et al.*, 2018). Inaccurate estrus detection was associated with lost profits due to extended lambing intervals and days open, milk loss, veterinary cost, etc. Evaluation of estrus detection is an important step in interpreting reproductive performance in the livestock. Complete and accurate records were required, including all heats, services, birth, and lambing dates are necessary. Traditionally, estrus detection relies on visual observation and physical change of the sheep (Alhamada *et al.*, 2017; Nurfitriani *et al.*, 2015). The normal heat cycle in ruminants repeats regularly and is accompanied by the appearance of symptoms of estrus (Jurame *et al.*, 2018).

Farmers in Batur Village mated their ewes with a natural mating using the rams. Estrus detection was still done traditionally with seen the visual appearance of the sheep's behavior. The method of estrus detection is obtained from their experience and the exchange of information between both farmers and extension agents. The mating process usually involves mixing a male, either own a neighbor's or a herd's, in their ewes pen for several months. Knowledge and technology adoption in animal husbandry were influenced by farmers' characteristics (Putra *et al.*, 2019). The study of farmers' characteristics was critical to measure livestock management's success (Rahmah and Somanjaya, 2019), including knowledge in estrus detection. This study aims to determine the relationship between farmers characteristics with the level of knowledge for sheep estrus detection in the Batur Village, Banjarnegara, Indonesia.

Materials and Methods

This study was approved by the Animal Care and Use Committee of the Faculty of Veterinary Medicine, Universitas Gadjah Mada, with the ethical clearance number 002/EC-FKH/Int/2019. This study was conducted in Batur Village, Batur District, Banjarnegara Regency, Central Java Province, Indonesia, in April 2020. The data were collected by interviewing 33 farmers, who have raised sheep with a breeding system for at least two years of experience. The questionnaire was used to collect information about farmers' characteristics and the farmers' knowledge about estrus detection. All the variables are defined in Table 1. The farmers' knowledge aspects observed in this study

Table 1. Variables' definitions and their measurement

Variables	Definitions	Type of measurement
Dependent category		
Farmers' knowledge for estrus detection	The level of farmers' knowledge on ewe's estrus detection dividing into 3 categories	Categorical (1=Low, 2=Medium, 3=High)
Independent variables		
Age	Age of the main farmers in the household in years	Continuous
Mainly working	The main job of the farmers	Dummy (1= sheep farmers, 2= crop farmers, 3= labor, 4= trader, 5= village officer)
Formal education	The formal education of the farmers	Dummy (1=failed to pass elementary school; 2= elementary school, 3= junior high school, 4= senior high school; 5= college)
Informal education	Informal education of the farmers such as participating in livestock training and counseling	Dummy (1=no, 2=yes)
Livestock purpose	The main purpose of sheep farming	Dummy (1= main job, 2= side job)
Sheep farming experience	Experience in raising sheep in year	Continuous
Farmer group member	Participation of the farmers become members of farmer groups	Dummy (1=yes, 2=no)
Number of sheep	Total number of sheep kept by farmers in head	Continuous
Sheepfold location	The pen location for sheep farming	Dummy (1= join with the house, 2= in the yard, 3= join with the farm group)
Stay duration in the sheepfold	The daily average of duration time the farmer in the pen	Continuous
Ram ownership for mating	Origin of the ram to mating the ewes	1= private, 2= farmers group, 3= neighbors

were visual aspects according to farmers for determining their sheep were on estrus condition. These knowledge aspects were divided into three categories based on the accuracy value of visual behavior and the physical change of vulva condition for estrus detection (Nurfitriani *et al.*, 2015; Dilla *et al.*, 2017; Baliarti *et al.*, 2020), namely low, medium, and high levels.

Low level categorized if farmers know their estrus with the sheep's signs that often squeal/moan, restless, and decreased appetite. Medium level if the farmers knew the estrus with their sheep's signs that often squeals/moan, restless, decreased appetite, and like to ride other sheep. High level if the farmers knew the estrus with their sheep's signs that often squeals/moan, restless, decreased appetite, often ride other sheep, discharge mucus from the vulva, and the vulva was swollen, reddish, and warmer. Descriptive statistics of variables were presented in Table 2, while the level of the farmers' knowledge on estrus detection was

presented in Figure 1. The correlation between farmer and farm characteristics with knowledge of estrus detection levels examined using SPSS program version 25 (IBM Inc, USA).

Results and Discussions

Figure 1 presented that the majority of farmers (51.5%) were categorized into low levels on the ability of estrus detection in their
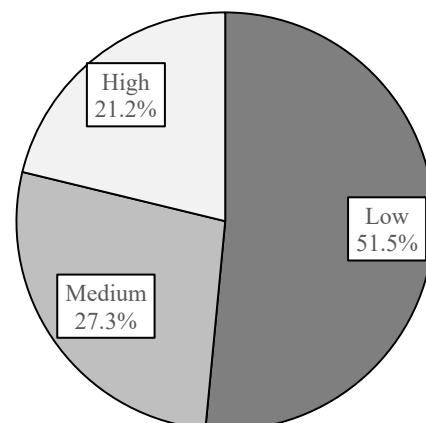

Figure 1. Farmers' knowledge levels to detect estrus in ewes

sheep, followed by medium level (27.3%) and high level (21.2%). It showed that the knowledge of farmers in Batur Village was still lacking. Most farmers still pay less attention to estrus in their sheep, but farmers do other ways to keep their sheep pregnant. Farmers who have their own ram usually raise them by joining with the ewes, while farmers who do not have their own ram usually borrow ram from neighbors or herds to join the ewes for several months. This is considered easier, however, there is additional work and costs for the ram's maintenance.

The joining method of ram and ewes over a period of time without estrus detection may be a profitable way for farmers who have their own ram. However, sheep that were kept in one pen and mixed continuously will be susceptible to inbreeding. Problems will also occur with breeders who do not have their own ram or who keep their sheep in farmer group pens. The condition due to the herd's number of rams was limited, only around 1 to 3 rams per herd. The rams belonging to the herd are raised together by creating a maintenance schedule for the group members. However, when this ram was used by a member of the farmer group to mate his ewes in a combined manner, the responsibility for maintaining the ram becomes the burden of the breeder for the duration of the joining period.

The duration of combining ram into ewes pens up to 2 months. It was to ensure that their ewe can be mated by ram so that if the first period fails, the mated could be successful in the next period. This caused the ewe that was not being combined and which may be in estrus, cannot be mated. Of course, the situation will be disadvantaged due to the increase in these lambing intervals. The rotation of the ram in the farmer group is flexible. For group members who need it can request a few times from other members who are combining them. For farmers who can detect their ewe's estrus, they will

Table 2. Descriptive statistic of the variables

Variables	Unit	Mean	St. Deviation	Min	Max
Age	Year	44.82	11.75	25	68
Mainly working	Dummy	2.24	1.06	1	5
Formal education	Dummy	2.30	1.07	1	5
Informal education	Dummy	1.33	0.48	1	2
Livestock purpose	Dummy	1.79	0.48	1	2
Sheep farming experience	Year	11.02	9.35	2	40
Farmer group member	Dummy	1.42	0.50	1	2
Number of sheep	Number	10.52	8.04	2	35
Sheepfold location	Dummy	2.06	0.83	1	3
Stay duration in the sheepfold	Hours/day	2.65	1.60	1	7
Ram ownership for mating	Dummy	1.79	0.93	1	3

Table 3. Spearman's rank correlation between respondents' characteristics toward knowledge of estrus detection level

Characteristics	Correlation coefficient (r)	p-value	Significance
Age	-0.055	0.760	ns
Mainly working	0.238	0.182	ns
Formal education	0.520	0.002	**
Informal education	0.414	0.017	*
Livestock purpose	0.009	0.962	ns
Sheep farming experience	0.222	0.214	ns
Farmer group member	-0.106	0.558	ns
Number of sheep	0.426	0.013	*
Sheepfold location	-0.505	0.003	**
Stay duration in the sheepfold	0.556	0.001	**
Ram ownership for mating	-0.555	0.001	**

** = highly significant (P<0.01); * = significant (P<0.05); ns = non-significant (P≥0.05)

borrow a ram for direct mating or combining for 1 to 2 days and then returned to the previous member, or according to mutual agreement. For farmers who can ensure that their ewe was estrus and that the mating is successful, they will return the ram to the group so that the risk and burden of raising the ram were lighter due to the responsibility returns to all group members.

Many factors, environmental, managerial, and sheep-related, play a role in estrus expression/detection. Farmer and farm characteristics will influence the adoption of technology and practice in livestock management, including livestock reproduction management (Hidayah *et al*., 2019; Widarni *et al*., 2020b). The results of the correlation analysis of the relationship between farmer and farm characteristics with the knowledge levels for sheep estrus detection were shown in Table 3. It can be seen that it is a significant correlation between formal education, informal education, number of sheep, sheepfold location, stay duration in the sheepfold, and ram ownership for mating by farmers with knowledge levels on estrus detection for Batur sheep. The value of the correlation coefficient (r) on these variables is in the range of $0.40 \leq r < 0.70$ where according to Guildford's rule that the relationship of these variables is quite meaningful with a (+) or (-) sign determining the direction of the relationship (Rahmah, 2014; Ibrahim *et al*., 2021b).

Formal education is a level of education usually organized by an institution (Andarwati *et al*., 2018). The education factor is expected to assist the farmers in efforts to increase the production and productivity of the livestock being raised (Hastang *et al*., 2018). In this study, formal education has positively correlated with the level of farmer' knowledge for estrus detection. This indicated that the higher farmers' education level, resulting in the good ability of estrus detection. It was related to Rahmah and Somanjaya's opinion (2019) that the higher level of formal education of the farmers was expected to be more rational in their mindset and their reasoning power. Followed by Hastang *et al.* (2018) that an adequate level of education will have an impact on improving the performance and ability of their livestock business management.

The farmers' informal education was related to how much knowledge farmers gain, both technical and managerial (Muharastri *et al*., 2015). In this study, informal education was the participation of farmers in training, seminars, and counseling related to livestock management. This study showed a positive and significant relationship between informal education and farmers' knowledge level for sheep estrus detection. It indicated that farmers who have attended informal education would be better at estrus detection for their sheep. Farmers who attend more training will get more information and skills in the livestock business (Budisatria *et al*., 2019; Widarni *et al*., 2020a). The experience of raising sheep in this study did not affect the knowledge of sheep estrus detection level. It was due to that most livestock management activities were carried out by following hereditary practice, including in determining the sheep estrus detection. Apart from being obtained from hereditary knowledge, the sheep farming experience was also obtained from livestock observations (Rahmah *et al*., 2018; Rahmah and Somanjaya, 2019). Farmers who follow informal education related to livestock management will add insight and experience for farmers, including reproductive management. Hidayah *et al.* (2019) stated that more experienced farmers would be more careful in running their livestock business.

The number of sheep owned by the farmers reflects the scale of the farm business. This study showed a positive and significant correlation between the number of sheep ownership and the knowledge level on the estrus detection. Farmers with more livestock will have more motivation and seriousness in livestock farming (Nurdayati *et al*., 2020). The location of the sheepfold also has a significant effect on the ability of sheep estrus detection. In this study, there was a negative correlation. The closer the farmers' sheepfold to their house, the easier it is for farmers to check the condition of their livestock. Farmers who keep their sheep in the farmer group sheepfold usually go to the pen only during feeding and sanitation, usually done two to three times a day. Meanwhile, the farmers who joined and sheepfold with the house or beside the house were likely to find his

sheep not only during feeding and sanitation but also with more time. Besides, if something or strange happens to their sheep, farmers would be quicker to see and handle it. This is in line with the results that there was a positive and significant correlation with the farmers' duration of spending his time in the sheepfold. The length of the sheepfold duration, the ability of sheep estrus detection was better due to the farmer having more time to spend in the sheepfold and paying more attention to his sheep.

Ram ownership in this study has a negative and significant correlation. It is indicated that farmers who have their own ram will be better known for sheep estrus detection. Farmers who have their own ram will usually keep the sheep together with the ewes continuously. Most of the farmers kept in pens near their houses. Meanwhile, farmers who do not have their own ram will borrow from their neighbors when they want to mate their ewe, or farmers who join farmer groups will borrow from their group. The presence of a ram can be used as a biostimulator, which can stimulate the emergence of estrus, detect the presence of estrus in silent heat sheep, and naturally mate the estrus sheep (Baliarti *et al.*, 2017). Besides, it also makes it easier for farmers to identify their sheep that are in estrus because rams will provide behavior to estrus ewes, namely oro-nasal contact, flehmen, mounts orientation response, mounts, and services (Baliarti *et al.*, 2020).

Farmer groups have an important role in developing farmers' capacity, especially in knowledge transfer (Abdullah, 2016). However, the participation of farmers in the farmer groups in this study still did not have a significant effect because the function of the farmer groups was not maximized due to lack of meetings and training and many members of the farmer group who kept their sheep not in the farmer group's sheepfold so that technical communication was related livestock innovation among members was still not optimal. The main job and business objectives also do not significantly affect because most farmers in Batur Village have almost the same motivation to raise livestock, namely as a side job purpose (Budisatria *et al.*, 2018). Likewise with the farmers' age, which has no significant effect, because estrus detection is the experience and knowledge, they gain over time they run the farm business. Thus, farmers who have more sheep and keep the sheep near their house with the intensity of being in sheepfold for longer and have higher formal and informal education tend to have knowledge skills for sheep estrus detection. It needs to be training and counseling on sheep reproductive management, especially in terms of estrus detection, so that farmers' ability to improve production and reproductive performance of their sheep can be realized.

Conclusion

The results may conclude that the low levels of sheep estrus detection were dominant in Batur Village. This is related to their characteristics such as formal and informal educations, sheep farming experience, sheepfold location, stay duration in the sheepfold, ram ownership for mating, and the number of sheep by farmers. Increasing farmers' knowledge about reproductive management, especially estrus detection, is needed to improve the production and reproductive performance of their sheep.

Acknowledgments

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