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Application of Buck Rotation System to Improve the Quality of Goat Phenotypes and Genotypes in KUBE X Sejahtera 005 Farmer Group

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Abstrak

Goats are the leading livestock commodity in Samigaluh sub-district. The goat population in Samigaluh sub-district was 15,866 goats (16.7%) of the total goat population in Kulon Progo which reached 95,257 goats. Peranakan Ettawa (PE) goats are widely kept and bred because of their high quality and price value, some are crossbred with local goats called Bligon. Limited access and quality bucks are one of the obstacles in breeding and improving the quality of goats, the use of artificial insemination (AI) in goat breeding has a low success rate. This community service (PkM) aims to educate and foster awareness and active role of farmers in maintaining and improving the quality of goats from the reproduction side. The PkM partner is the KUBE Sejahtera X Binangun 005 livestock group which is a productive community group within the scope of the UGM assisted village in Sidoharjo village. Transfer of knowledge and skills has been carried out using counseling methods, interactive discussions, and practice in selecting superior males and applying the Buck Rotation System to maintain and improve the quality of goats phenotypically and genotypically. Evaluation of PkM by taking the parameters of knowledge and skills of farmers in assessing and selecting superior bucks and recording reproduction by implementing the Buck Rotation System. Results achieved, the training participants of the KUBE Sejahtera X Binangun 005 farmer group understand the importance of reproductive health, reproductive recording, the impact of inbreeding and are able to judge and select bucks in accordance with SNI 7352:2008.

Abstract

Goats are the leading livestock commodity in the Samigaluh sub-district. The goat population in the Samigaluh sub-district was 15,866 goats (16.7%) of the total goat population in Kulon Progo which reached 95,257 goats. Peranakan Ettawa (PE) goats are widely kept and bred because of their high quality and price value, some are crossbred with local goats called Bligon. Limited access and quality bucks are one of the obstacles in breeding and improving the quality of goats, the use of artificial insemination (AI) in goat breeding has a low success rate. This community service (PkM) aims to educate and foster awareness and the active role of farmers in maintaining and improving the quality of goats from the reproduction side. The PkM partner is the KUBE Sejahtera X Binangun 005 livestock group which is a productive community group within the scope of the UGM assisted village in Sidoharjo village. Transfer of knowledge and skills has been carried out using counseling methods, interactive discussions, and practice in selecting superior males and applying the Buck Rotation System to maintain and improve the quality of goats phenotypically and genotypically. Evaluation of PkM by taking the parameters of knowledge and skills of farmers in assessing and selecting superior bucks and recording reproduction by implementing the Buck Rotation System. Results achieved, the training participants of the KUBE Sejahtera X Binangun 005 farmer group understand the importance of reproductive health, reproductive recording, and the impact of inbreeding and can judge and select bucks by SNI 7352:2008.

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INTRODUCTION

The KUBE Sejahtera X Binangun 005 farmer group is a productive community group in economic and livestock activities that is part of the UGM-assisted village area in Sidoharjo village and was a partner in community service activities (PkM). This PkM analyses the situation and problems faced by target partners and portrays the existing conditions of partners who focus on goat farming. The farmer group is located in Munggang Wetan hamlet, Sidoharjo village, Samigaluh sub-district, Kulon Progo district, Yogyakarta Special Region in the Menoreh highland plateau. The majority of goat rearing in the Menoreh plateau area of Samigaluh sub-district is done conventionally, meaning that most farmers have not used livestock technology and do not even know about livestock technology (Prabowo *et al*.,2021). Colony pens, especially for ruminants, is also being established in farmer groups to facilitate the management of the farm to be more organized and directed (Mashur *et al*.,2019). Plantation and animal husbandry are the main activities that contribute to the livelihood of the population in Sidoharjo village. The livestock sector is the main focus of the service theme, especially goat farming. Samigaluh sub-district is the second largest contributor to the total goat population after Girimulyo sub-district in Kulon Progo district. In 2022, the goat population in Girimulyo District reached 15,866 goats, or 16.7% of the total goat population in Kulon Progo, which reached 95,257 goats. The goat population in Sidoharjo village reached 1,653 goats, with details of 711 Bligon goats and 942 PE (Peranakan Ettawa) goats (DPP, 2023). Traditional farmers are interested in local goats because they are easy to care for, fast to give birth, and resistant to the tropical environment in Indonesia. Community service (PkM) is a tangible manifestation of commitment to contributing positively to society. In this context, this PkM program aims to educate and foster awareness and the active role of farmers in maintaining and improving the quality of goats in terms of reproduction through the application of the goat Buck Rotation System to maintain and enhance genetic and reproductive quality in goats in Sidoharjo village, Samigaluh sub-district, Kulon Progo district. Buck rotation system is one method used to improve goats' genetic quality (Getachew *et al*.,2022). Cases of inbreeding can lead to decreased reproductive performance in goats and genetic defects (Khan *et al*.,2007). The application of the Buck Rotation System is considered quite realistic in improving the performance of goat offspring and avoiding previous genetic defects (Ahuya, *et al*.,2005). Livestock reproductive health management is the process of planning, organizing, implementing, and controlling reproductive factors through optimizing available resources so that livestock productivity can be maximized. Livestock health can be optimized, and the reproductive quality of livestock can be improved according to the desired standard (Mashur *et al*.,2019). The PkM partner group has been implementing health management with assistance from the PkM team, especially helminthiasis control, as a process to increase livestock productivity. Problems in the PkM partner group were low pregnancy rates and reproductive inefficiency due to a lack of superior buck. Low pregnancy rates cause a decrease in production and inhibit the rate of population growth. Solutions include superior buck selection, reproductive monitoring, and recording to increase pregnancy rates. The limited number of bucks causes the ability to mate many females in one period of time to be low and also causes a decrease in quality. The results of the evaluation by the service team were the potential for inbreeding caused by limited bucks in the goat population in the community service partner group. The PkM activity carried out is to introduce and transfer knowledge for the application of the Buck Rotation System. The purpose of PkM activities is to prevent inbreeding and improve the genotypic and phenotypic quality of young goats in partner groups.

METHODOLOGY

Time and place of implementation

Community service activities (PkM) were carried out from June to November 2024. The location of PkM activities at KUBE Sejahtera X Binangun 005 farmer group, Munggang Wetan hamlet, Sidoharjo sub-district, Samigaluh kapanewon, Kulon Progo Regency, D.I. Yogyakarta. The target participants in the service activities are members of the farmer group.

Problem analysis and solution

The limited number of bucks in the PkM partner group, which only has 1 buck, causes low pregnancy rates and potential inbreeding. Utilization of Artificial Insemination (AI) has not been able to be a solution because the success rate is still low. The utilization of buck from outside the farmer group is constrained by poor transportation access, which has the risk of accidents and high costs. The solution is to increase the number of quality buck and implement Buck Rotation System.

Implementation of community service activities

Community service activities are implemented through counseling, interactive discussions, and practice. Counseling was conducted to provide knowledge about livestock breeding, the impact of inbreeding, judging, and buck selection, referring to SNI 7352: 2008 (SNI, 2008). The practice was conducted to provide participants with skills in goat judging and superior buck selection. The practice of goat judging was conducted in the PkM partner group's cage. This is useful for participants to be able to choose a quality buck according to the classification of their livestock.

Evaluation of community service activities

Evaluation of the success of the activity is measured by giving a pre-test to participants before the counseling activity is carried out and giving a post-test to participants after the counseling activity is completed. Pre-test and post-test will be given in writing. The target to be achieved in the implementation of this activity is that at least 80% of participants understand the material presented in the counseling. Participant activeness in interactive discussion sessions is another indicator used to evaluate activities.

RESULT AND DISCUSSION

Sidoharjo Village is one of 7 villages in Samigaluh Sub-district, Kulon Progo Regency, Yogyakarta Special Region. Geographically, Sidoharjo Village is included in the Menoreh plateau area with an area of ± 1,352.68 ha and an altitude between 400-800 meters above sea level. Topographically, Sidoharjo village is an undulating hilly area with a land slope between 30-80% with road access that is mostly in the form of block roads or dirt roads with a width of around 2 m. As a community service partner, KUBE Sejahtera X Binangun 005 farmer group is located in Munggang Wetan hamlet, which is part of Sidoharjo village. The farmer group manages goat livestock commodities, and other activities include processing agricultural waste into silage as alternative animal feed and organic fertilizer with the main ingredient of goat manure. KUBE Sejahtera X Binangun 005 farmer group has a goat population of up to 60 goats consisting of PE (Peranakan Ettawa) and Bligon goats. The cage system is divided into colony and individual cages, which are generally located near the farmer's house with a stage type (figure 1). This type of stage pen used in goat rearing on the Menoreh plateau is commonly used by farmers. The stage type of cage was chosen because it makes it easier to clean the manure and ensures the biosecurity of the cage. Cage is one of the most important requirements in the farming business (Hurriyyah *et al.*,2019). Stage pens have the advantage of making it easier to collect manure under the cage without disturbing the livestock (Suherman & Kurniawan, 2017). Stage pens keep livestock out of contact with infective worm eggs that are shed with feces. These worm larvae could theoretically infect livestock in the pens or even auto-infect them because the worm eggs are already filled with larvae and hatch very quickly (Purwaningsih *et al.*,2017). Goat pens near the house with traditional management and manure collected in a hole under the shed are common in Menoreh plateau and Samigaluh (Prabowo *et al.*,2021). Livestock pens near the house are not recommended because they may cause disease, including transmitting disease to humans or zoonosis. Residual feed and manure can cause pollution in the form of unpleasant odors, as well as provide poor aesthetics (Nugroho *et al.*,2018). Livestock waste has an impact on environmental pollution and triggers an increase in methane gas, becomes a source of disease, and disturbs comfort and aesthetics (Nenobesi *et al.*,2017). KUBE Sejahtera X Binangun 005 farmer group conducts goat manure processing activities into organic fertilizer as a solution for the management of livestock waste and goat manure to reduce the potential for disease due to goat manure (Prastowo *et al.*,2023).

Figure 1. Goat colony cage of farmer group KUBE Sejahtera X Binangun 005.

Implementation and outcomes achieved

Counseling and practice were carried out on Thursday, August 8, 2024, at the house of Mr. Subari, who is a member of the KUBE Sejahtera X Binangun 005 farmer group (figure 2). Counseling and interactive discussions focused on the theme of livestock breeding, the impact of inbreeding, judging, and buck selection, referring to SNI 7352:2008 (SNI, 2008). The counseling activity was attended by 51 farmers. The discussion on livestock breeding was interactive, especially on breeding and the productive age of goats. The reproductive calendar was introduced to help farmers estimate the reproductive cycle of the livestock they raise. Reproductive calendars will be more efficiently and accurately used if recording of livestock reproduction is also carried out because the two are interrelated.

Figure 2. Some of the community service participants took a photo with the UGM PkM team.

The availability of sufficient bucks is necessary to maintain the quality of young goats. KUBE Sejahtera X Binangun 005 farmer group only has one buck that is used to mate with mature females. The buck is group-managed and has been kept for 4 years, with an age of about 5 years. With only 1 buck, it has not been able to meet the needs and standards of the ideal point of reproduction of breeding goats in the partner group, which has more than 40 adult female goats. The existence of a buck that has been used as a stud for 4 years has the potential risk of inbreeding, so it can reduce the quality of young goats produced. A healthy buck can mate with females as many as 25 female goats (Devendra *et al*., 1994). Inbreeding is the process of breeding animals with genetic similarities and having the same ancestors for the last 5 - 6 generations (Savedge, 2017). Inbreeding in animals has the potential to produce offspring that are born deformed or weak or die (Vogt *et al*.,2019). Inbreeding can cause a decrease in goat milk production in the next generation (Paiva *et al*.,2020), litter size birth and weaning (Mahmoudi *et al*.,2018), negative impact on certain reproductive traits, such as delayed age at first pregnancy and birth (Sahoo *et al*.,2023), and decreased birth weight (Kasap *et al*.,2020). The impact of livestock inbreeding ultimately affects the

economic conditions of farmers (Ali *et al.*,2022). The solution offered by the community service team for the problems in the KUBE Sejahtera X Binangun 005 farmer group is to procure new quality bucks for the implementation of the Buck Rotation System and the implementation of reproductive recording. The solution to the inbreeding problem is to insert new quality bucks into the population or artificial insemination (AI) without damaging the existing plasma nutfah. In this way, it is hoped that genetic improvement will occur (Ridhwan *et al.*, 2008). A reproductive recording system is essential to reduce inbreeding (Ridho *et al.*, 2021). The application of Artificial Insemination currently cannot be used as a solution for goat farming because the success rate of pregnancy with this method in goats is still low, so it was not chosen as a solution by the community service team. The success rate of artificial insemination in small ruminants in Indonesia is still low (Inounu, 2015). Judging and selection of bucks refers to SNI 7352:2008 (SNI, 2008) about the Standard of Peranakan Ettawa (PE) Goats. The qualitative characteristics of PE goats are a combination of white-black or white-brown fur, a convex facial profile, small horns of males and females that curve backward, and a short tail. Quantitative traits of PE goats are divided into 3 age groups: 0.5 - 1.0 years, >1.0 - 2.0 years, and >2 - 4 years. The quantitative trait criteria measured are body weight, shoulder height, body length, chest circumference, ear length and mane length (rewos/gembol), more details are presented in tables 1 and 2.

Table I. Quantitative Requirements for Male PE Goats.

No.	Parameter	Unit	Age (years)		
			0.5 - 1.0	**>1.0 - 2.0**	**>2 - 4**
1	Body weight	Kg	29 ± 5	40 ± 9	54 ± 11
2	Shoulder height	Cm	67 ± 5	75 ± 8	87 ± 5
3	Body length	Cm	53 ± 8	61 ± 7	63 ± 5
4	Chest circumference	Cm	71 ± 6	80 ± 8	89 ± 8
5	Ear length	Cm	23 ± 3	26 ± 4	30 ± 4
6	Mane length (rewos/gembol)	Cm	11 ± 4	14 ± 5	23 ± 5

Source: SNI 7352:2008 (SNI, 2008).

Table II. Quantitative Requirements for Female PE Goats.

No.	Parameter	Unit	Age (years)		
			0.5 - 1.0	**>1.0 - 2.0**	**>2 - 4**
1	Body weight	Kg	22 ± 5	34 ± 6	41 ± 7
2	Shoulder height	Cm	60 ± 5	71 ± 5	75 ± 5
3	Body length	Cm	50 ± 8	57 ± 5	60 ± 5
4	Chest circumference	Cm	63 ± 6	76 ± 7	81 ± 7
5	Ear length	Cm	24 ± 3	26 ± 3	27 ± 3
6	Mane length (rewos/gembol)	Cm	11 ± 4	14 ± 6	14 ± 5

Source: SNI 7352:2008 (SNI, 2008).

In this community service activity, the UGM PkM team provided 3 bucks for the implementation of the Buck Rotation System (figure 3). The Buck Rotation System is a strategy to prevent inbreeding. Each buck is made a mating schedule with a certain adult female goat and recorded, in the next mating period, the bucks will be rotated with different female goats so that it is hoped that later the young adult female goats will not be mated by their male elder bucks.

Figure 1. One of the buck donations from the UGM PkM team from a total of 3 bucks.

Before the counseling and practice, a pre-test was conducted first. The pre-test conducted in this activity was not done in writing because some of the farmers were elderly so that to measure knowledge about livestock breeding and the impact of inbreeding it was done verbally by the resource person by giving general questions about goat reproduction to the participants and appointing several participants to answer and respond to additional answers from other participants. The majority of livestock in Samigaluh sub-district are still maintained conventionally. This is because the level of knowledge of farmers is relatively low. This condition is because the level of education of the majority of farmers is at the Elementary School (SD) level, which is 50.75%, so the desire to find out more modern livestock knowledge is hampered (Prabowo *et al*., 2021). In general, community service participants understand reproductive health based on their experience while raising goats which are still conventional. Reproductive recording has never been done and they do not understand the real impact of inbreeding. In the post-test assessment, namely after the practice, participants already understand the importance of reproductive health and recording. Participants are also interested in the implementation of the Buck Rotation System, especially to increase the pregnancy rate of their goats. Counseling as an out-of-school education system for community members, especially those in rural areas, is an effective method to improve their knowledge, skills and mental attitudes to become more productive (Setiana, 2005).

CONCLUSION

Members of the KUBE Sejahtera X Binangun 005 farmer group and community members participating in community service understand the importance of livestock breeding including reproductive health, reproductive recording, and the impact of inbreeding. Community service participants have the ability to judge bucks and choose the right bucks according to SNI 7352:2008. The procurement of bucks into the goat population of the community service partner group is part of the implementation of the Buck Rotation System.

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