Increasing sheep productivity through flushing and artificial insemination technology

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ABSTRACT

Ngemplak village, Windusari subdistrict, Magelang district, is one of the impoverished villages in Central Java province in 2022. Efforts to increase sheep productivity have the potential to increase community income. Almost every farming household in Ngemplak village keeps sheep, but their productivity is still very low. In order to increase people's income, sheep farming must be used as a business area that can increase income. The effort carried out through this community service activity is to change the pattern of raising sheep into a profitable business venture while increasing productivity. Increasing productivity is carried out by improving nutrition and genetic quality through flushing technology and artificial insemination (AI) using frozen sperm from superior males to obtain offspring that are superior to their parents. Flushing technology uses the PGF2α hormone to synchronize estrus, then continues with AI technology and pregnancy detection. It was concluded that the application of flushing technology, artificial insemination, was well understood by the group members (5 out of 20 people), who were 100% synchronized in estrus so that all could undergo AI. Successfully pregnant (Conception Rate) 28 tails (93%) with lambing rate (lamb crop) 100%. Group members have also realized the importance of livestock raising as a business venture.

Introduction

Ngemplak village, Windusari subdistrict, Magelang district is one of the villages in poverty in Central Java province in 2022. The population of Ngemplak village is almost 100%, and it keeps sheep as a side business. This is supported by environmental conditions, including the availability of feed and human resources who have raised sheep for generations. Most farmers realize that raising sheep is very helpful in meeting urgent economic needs. In general, sheep productivity in this area is still relatively low and has not contributed significantly to income. This is because rearing patterns are still traditional, with low genetic quality, low reproductive efficiency, non-profit orientation, and very low use of technology.

Sheep has a market share with relatively high demand and can still be met by domestic products. However, export opportunities to the ASEAN or Middle East regions remain open. The possibility of a surge in demand for sacrificial needs is also huge. On the other hand, this opportunity is also threatened by the invasion of products from neighboring countries, the possibility of a flood of frozen meat from free areas, and dangerous diseases. Therefore, efforts need to continue to increase the competitiveness of sheep products, including by improving the genetic quality of local livestock (Utomo & Rasminati, 2022).

This traditional husbandry problem is hereditary without any touch of production technology; livestock is kept only with minimal feed, and the cleanliness of the livestock and pens does not meet health requirements. This low genetic quality is caused by the lack of quality seed stock and inbreeding, which results in low productivity. Because the quality of feed does not meet the needs of livestock, sheep reproduction will also experience obstacles, resulting in low reproductive efficiency rates. The purpose of raising sheep for savings overrides productivity because raising sheep is only for savings, not for a profitable business.

The solution to the problems mentioned above is through efforts to increase business motivation, use feed technology with local ingredients, and improve genetic quality by applying flushing technology and artificial insemination using frozen sheep sperm.

The sheep farming community in Ngemplak, Windusari sub-district, Magelang, needs reproductive management implementation. Reproductive management includes meeting animal feed needs, regulating reproduction from the time of estrus until healthy and normal calving, and utilizing superior males and selected sires so that, ultimately, it will increase reproductive efficiency. Increasing business motivation is done to increase the contribution of raising sheep, which provides profits, not just a savings function. In general, people will change their way of thinking about raising livestock as a business by seeing firsthand (exemplifying) a profitable and profitable sheep farming business.

This PPM activity aims to increase the productivity of sheep by improving reproductive management by applying hormonal flushing technology (lust synchronization) and injectable insemination technology (IB = Artificial Insemination) and increasing motivation for the sheep farming business, which was initially traditional to become business oriented. The benefit of this activity is to produce descendants of sheep in the Ngemplak village community so that they will have sheep with superior genetic quality.

There is an increase in understanding of the importance of artificial insemination in sheep using superior sperm, a change in mindset from traditional to a modern farming

mindset, a change in orientation from non-profit orientation to farming with a profit orientation, as well as the importance of reproductive management to increase high reproductive efficiency so that will increase profits for the farm.

The low reproductive efficiency of sheep in society is generally caused by a lack of nutrients in the feed. The feed given is generally monotonous, namely only forage or hay. The nutritional needs of sheep will be used for basic living, growth, production, and reproduction. Reproduction is controlled by reproductive hormones; reproductive hormones are composed of nutrients such as protein. Low protein intake in feed will cause a lack of hormonal levels. This lack of reproductive hormone levels will disrupt reproduction (Utomo & Rasminati, 2017; Feradis, 2010).

Increased reproductive activity such as puberty (first estrus), reproductive cycle, return of estrus after lambing (postpartum estrus), postpartum mating technology, lambing interval (lambing distance), and successful pregnancy and parturition can be done through flushing technology. There are two flushing technologies, namely feed flushing and hormonal flushing. Flushing feed provides extra energy and extra protein before the reproductive phase (puberty, estrus, mating, etc.). Hormonal flushing is the administration of reproductive hormones to cause lust or estrus. Administration of reproductive hormones (FSH, LH, PMSG, HCG, PGF2α), which is carried out before the sheep reaches puberty, is called lust induction, while giving hormones after lambing is called lust synchronization (Utomo, 2021).

Flushing Feed Technology, which uses locally fermented ingredients with egg yolk, is a technology that has been the result of community trials with satisfactory results. Flushing feed is given every time before mating, giving birth, and breastfeeding for about ten days. Local feed ingredients, such as flushing ingredients, originate from local microbes (rice), banana blossoms, bamboo shoots, catfish, and egg yolks as feed supplements that produce maximum-quality reproductive hormones.

Besides flushing feed, mating solutions with AI and applying a reproductive calendar will help achieve this target. The reproductive calendar contains when livestock must have their first heat, first mating, first calving, return to heat after giving birth, and return to pregnancy after giving birth, which are the parts that must be applied to each parent. Recording must be carried out in an informative and continuous manner so that the reproductive control function can be carried out to achieve a target of giving birth three times in 2 years or a calving interval of 8 months.

AI technology is a mating technique that uses artificial tools to channel spermatozoa into the reproductive tract of adult females in heat (estrus). IB technology can be done with fresh or frozen sperm (frozen semen). Frozen semen requires a freezer as a means of storing sperm cells by gradually reducing the temperature with a diluent that meets the requirements of a frozen sperm diluent. The principle of freezing is to reduce the metabolic rate as low as possible so that it can last a long time during the storage process so that, at any time, it can be awakened again for fertilization.

AI with frozen sperm stored in a salt cooler as an effort if estrus does not co-occur so that the frozen sperm needs time to survive until it is time to use. The materials used to maintain the quality of frozen sperm can use simple cooling agents, namely ice and table salt. So, sperm quality will be maintained for at least 72 hours. Hopefully, this method will increase the efficiency of frozen sperm, which does not have to use liquid N2 and will, of course, experience difficulties in procurement.

Selection activities are carried out to obtain superior broodstock based on quantitative and qualitative assessments to produce quality broodstock. Apart from that, group members who can select super sires need to be well understood by all group members so that they are not mistaken in determining prospective sires or bulls to be used in breeding. The direction of the selection must be apparent based on the group's goal of producing lambs that can grow sufficiently with high final weight production by measuring birth weight and weight at weaning (3 months). This is done because birth and calf weights are genetically correlated with growth and final weight (Hardjosoebroto, 1994).

Group members must understand sheep's production ability and how to select prospective mothers and super bulls by looking at the high birth weight, highest weaning weight, and the highest one-year weight among the group. Understanding sheep breeding patterns is important for group members because it determines the formation of superior sheep breeds. Livestock is a bio-factory (living factory), as stated by Prof. Habibie, so the factory must have the ability to produce production according to expectations. This ability is what is meant by genetic factors.

Reproduction management must be carried out to create a profitable business target, namely that the parent must be able to give birth three times in 2 years. If explained, the calculation of 3 times per two years is: The gestation period is 5 months, and the mother must be pregnant again after giving birth no more than three months. The definition of 3 months of pregnancy consists of uterine involution lasting 40-50 days; if you go into estrus immediately

in AI with S/C 2, then in precisely 3 months, the animal will become pregnant again after giving birth. The problem of delayed lust is usually due to breastfeeding, which requires much nutritional intake so that lust does not appear. The solution for adding extra energy and protein, which we call flushing feed, is expected to be able to induce lust even when breastfeeding (2 months).

Method

Community services program activities in the Ngemplak village sheep farming group will occur from July to November 2023. The implementation of this activity involves all group members, numbering around 20 people.

The method for implementing this community services program includes outreach activities to the parties, then awareness methods, training (practice), procurement of stimulant materials and tools, mentoring, and evaluation of participant satisfaction.

Socialization was carried out to parties related to the implementation of this Community services program, including the Livestock and Maritime Service at the Magelang district level as well as representatives at the sub-district level, structural government parties from the regional development planning department of Magelang district (BAPPEDA and LITBANGDA Magelang district), sub-district level up to villages and hamlets/hamlets are the relevant parties who will be contacted regarding the implementation of this Community services program.

Through these parties, it will be easier to implement the Community services program technically and bureaucratically so that it will be able to guarantee the program's continuity and facilities in the future. The parties will also ensure that this group can rise to overcome the problems faced by implementing a community services program. This activity is central to socialization before community service program activities are implemented. Furthermore, socialization was carried out with participants in the Ngemplak village sheep farming group regarding implementation time, material and tool requirements, and activity schedules until the final part was an evaluation of the activities.

In general, the method for implementing this community services program is through awareness techniques, such as carrying out AMT and counseling about the importance of sheep farming as a source of sustenance for group members. Awareness was raised regarding the importance of the sheep business with the application of technology because technology increases business efficiency.

Awareness through AMT activities is intended so all participants understand their identity and life goals to build motivation and enthusiasm for life. Through this effort to raise sheep, it is hoped that the goal of life will be achieved successfully, namely through hard work with the belief that the business he is involved in will bring results if done seriously. Understanding that failure in business is typical, what is extraordinary is rising again. That God created humans with the same capital but with different fates. Many things, including attitudes, cause this difference in fate, thought patterns, action patterns, and self-confidence. In this AMT activity, participants will be brought into a productive mindset by utilizing time management. It is hoped that after participating in AMT activities, participants will have a productive mindset, action patterns, and attitudes to pursue their life goals. AMT activities were also carried out with a visit from the management of the Ngemplak village sheep group to the Berkah Makmur livestock group in Banyusidi village, Pakis District, Magelang. This activity was carried out on September 25, 2023, for ten people to increase business motivation and understand production and marketing systems and organization.

Training activities with direct practice will provide a deeper understanding so that skills will arise to do something related to increasing sheep production. Training activities, which include training in making flushing, giving flushing, observing estrus, implementing IB, and detecting pregnancy, will become experiences in his life that, if done repeatedly, will positively impact his abilities. The training was carried out directly at the sheep drum with trainers and accompanying students. The target of this training is that 80-90% of participants understand what has been done and can carry it out independently so that group members not only understand but understand how to carry out an activity to apply technology in the sheep farming business. Activities that have been carried out include:

1. Educating on the importance of continuously providing sufficient and perfect feed for sheep to their nutritional needs and ensuring their growth in the fattening program and the continuity of their reproduction in the breeding business. Activities continued to increase motivation for the sheep farming business for the Ngemplak village sheep farming group.
2. Training in lust synchronization techniques as part of reproductive management activities. The synchronization technique uses the hormone PGF2α, which is injected intramuscularly two days before IB, to bring about lust together.
3. Artificial insemination (AI) is carried out after 48 hours when estrus or lust appears. The appearance of lust is characterized by the presence of red, swollen, warm, and

slippery on the outer part of the female reproductive tract (vulva). IB uses frozen sperm from Dorper sheep facilitated by the Magelang Regency Livestock and Fisheries Service. This training activity has been agreed to be carried out in the afternoon after the Nourishment prayer, from 14.00 to 18.00 WIB.

4. Increasing business motivation was conducted by conducting comparative study visits to the Berkah Makmur sheep farming group (cooperative) in Banyusidi village. The Berkah Prosperous Cooperative consists of 20 sheep farmers who have successfully run their businesses and benefit all their members. The visit was carried out on Monday, September 25, 2023, for 1 day by ten representatives of Ngemplak village breeders.

Furthermore, regular mentoring activities are carried out to determine the capabilities of the training results and provide direct direction for the correct implementation of technology applications. The team also actively assists in caring for, maintaining, and cultivating sheep to achieve an optimal increase in lambs according to the group's desired targets. The community services program team also assists in the implementation of this technology application actively in the field on an ongoing basis because this group has been bound using a partnership MoU as a partner business group with the UMBY Animal Husbandry study program and with the LPPM-UMBY.

Partner participation during community services program activities, which include awareness and active training activities, is demonstrated by members' participation in various activities, from making flushing raw materials to implementing artificial insemination (AI), namely in preparing meeting places, preparing materials and practical tools, and attendance at every meeting. Village officials from the welfare department make invitations to participants every time a training activity is held and provide notification of mentoring activities.

Apart from that, the team also coordinated with the Magelang Regency Livestock and Maritime Service to ensure the sustainability of this activity so that the group would receive continuous assistance when this program was completed. Apart from that, the department will assist with the group's programs and business facilities. The facilities in question include providing frozen sperm straws regularly.

Activity evaluation is carried out by providing participant feedback on all activities. The evaluation shows that the response and ability to implement the results are independent training after this community services program activity is completed. Apart from that, there is

also an evaluation of the results of applied technology in the form of speed of estrus, success of IB, and pregnancy. The community services program is always guided by the fact that if what is done during training is part of a problem-based need and brings about significant change, then, of course, the activity will be ongoing. The community services program team will also coordinate with parties such as the village, sub-district, especially the welfare department, and related technical agencies such as the Magelang Regency Fisheries Service and the PPL, which oversees the Windusari sub-district. This coordination is carried out to provide information on productive activities that are always technically accompanied by business capacity and marketing.

Results and Discussion

Ngemplak Village has an area, according to land use (2013), namely dry land in the form of yards/buildings covering an area of 20.40 ha and dry land/gardens covering an area of 329.20 ha. Dryland for state/private plantations is 10.00 ha, pastureland 2.82 ha, with an arid land area of 262.42 ha. Ngemplak Village has village topography as a slope/ridge with a height of 1348 meters above sea level.

The number of hamlets in Ngemplak village is four, 4 RWs and 26 RTs, which are classified as self-sufficient villages. Ngemplak Village has a total of 602 households, with 970 male adults, 911 female adults, 385 male children, and 352 female children, with a total (2013) of 2,618 people. So, the total population based on gender consists of 1,355 men and 1,263 women. The population density in Ngemplak Village is 723.20 people/km2, with an area ratio of 3.62 km2 and a population of 2,618 people. Meanwhile, the average number of people/households in Ngemplak village is 4.3 people/family.

Activities that have been carried out are coordinating the implementation of PPM with village heads and hamlets as well as village secretaries to determine the time for socialization with sheep farming community groups on July 3, 2023. Furthermore, socialization activities, FGDs, and motivation for sheep farming businesses were carried out on July 18, 2023, followed by 20 participants and five village officials. Participants were enthusiastic about this activity, especially in developing sheep farming as a profitable business using quality seeds through Artificial Insemination (AI) technology. It was agreed with the group that AI would be held using the sperm of superior males using the lust synchronization technique. The group's request is for 100 broodstock to be in AI.

Figure 1. Management of the Ngemplak village sheep livestock group, Windusari District, and UMBY servants in 2023

From this activity, the group agreed to hold a business visit for ten livestock group managers to the Berkah Makmur Cooperative, Banyusidi village, Pakis sub-district. The Berkah Makmur Cooperative is a community business unit seeking mutual benefit. Its sheep farming business has successfully provided financial benefits to all its members. Sheep cultivation has been developed as a business that markets to the Jogyakarta and Kedu areas. This group received initial funding from Central Baznas and is a Community Service partner area of UMBY. Entrepreneurship comparative study visit from representatives of traditional sheep breeders to the Berkah Makmur cooperative in Banyusidi village, Pakis District, Magelang on Monday, September 25, 2023. The visit lasted for half a day from 10.00 to 14.00 WIB. During the visit, participants received information about the history of the founding of the Berkah Makmur cooperative and its business journey to success in marketing lambs outside the region. This visit opened the horizons of representatives of the sheep farming community in Ngemplak village, who believed that raising sheep can provide a living and is the primary source of family income.

Discussions related to maintenance, feed, organizational management, and marketing were discussed thoroughly at that time. Of the 10 participants who participated in the visit, 100% expressed satisfaction and interest in developing sheep in Ngemplak village as a business.

Figure 2. Discussion with the group regarding activities for implementing IB technology.

The first stage of understanding reproductive management is synchronizing estrus using PGF2α and AI using frozen Dorper sheep sperm obtained from the Magelang District Fisheries Service. Synchronization occurred on Monday, August 28, 2023, in sheep livestock groups and breeder houses. A total of 30 sheep were injected with the PGF2α hormone, so they experienced simultaneous heat. The synchronization implementation was assisted by 7 UMBY animal husbandry students who are members of the Animal Husbandry Student Association (HIMASTER). After synchronization, the sheep experience heat simultaneously within 48 hours. So, on Wednesday, August 30, 2023, artificial insemination was carried out using frozen Dorper sheep sperm. Of the 30 synchronized ewes, 100% experienced heat so that all could be AId. From the AI activities, 28 birds (93%) succeeded in becoming pregnant. Of this number, 100% of the sheep successfully gave birth.

Figure 3. Implementation of AI Technology

The application of IB technology has been technically understood by 5 of the 20 group members. Of these five people, they can inevitably carry out artificial insemination. Meanwhile, of the 20 sheep owners at IB, 100% said they were delighted and would apply it to the sheep farming business.

Conclusion

Almost 99% of the people in Ngemplak village keep sheep part-time; the people have the desire to get high profits from raising sheep and need the knowledge to utilize superior breeders and improve reproductive management. Of the 30 sheep that were synchronized, 30 of them showed signs of lust (100%), and artificial insemination was carried out with frozen Dorper sheep sperm. The result is that 93% of AI females are pregnant. Maintaining feed quality and routinely carrying out AI are recommended to accelerate the population and improve the quality of sheep breeds.

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