

PRODUCTION PERFORMANCE AND ECONOMIC BENEFITS OF SHEEP FARMING IN MANATUTO MUNICIPALITY, TIMOR-LESTE

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ABSTRACT

Sheep are one type of small ruminant livestock that are very important for rural communities to meet the customary and economic needs of families. This study aims to obtain information about the livestock system, productivity, and benefits of sheep products for the cultural and economic needs of sheep farming families. This study used a survey method with a 95% confidence interval. The determination of the survey location was carried out using the purposive sampling technique and the determination of the sample size using the Slovin method. The selection of respondents used the random sampling method. The variables observed were herd structure, reproductive performance, utility of sheep products to meet the customary and economic needs of farming families, and product sales systems. The survey results showed that around 95% of respondents still use the traditional extensive system, without technical control and attention to the quality and frequency of animal feed. This system is less appropriate in efforts to overcome reproductive problems, the age of the first pregnancy of sheep, resulting in low productivity, mortality rates reaching 1%, the age of first lambing reaching 12 months, and the age of weaning of sheep usually 3 to 6 months. All informants stated that culturally, sheep are the most important animals in their lives, therefore, sheep farming must be maintained at all times. Sometimes they sell the sheep production, but only to finance some of the family's sudden needs. It is concluded that it is difficult to influence farmers to increase sheep productivity, especially in the research location because the main purpose of sheep farming is only to maintain cultural life, not market oriented.

1. INTRODUCTION

The development of animal production is often used as one of the other main targets in an effort to provide highly nutritious food to consumers, in the context of reducing hunger and malnutrition through the provision of animal protein-based foods, and to improve the producer's economics. Sheep is a type of small ruminant that has great potential for developing production and this type of livestock has adapted well to the environment and local food availability.

Sheep in Timor-Leste are kept by 2983 households, and in the Manatuto municipality only around 103 households, whose main objective is to firstly satisfy the family's cultural needs and secondly the economic needs (Timor-Leste Agricultural Census, 2019). Farmers generally still do not care about the rearing system, as well as livestock structure and productivity, which has a negative impact on the development process and efforts to increase the quality of production and selling value. Thus, in efforts to increase the sheep production, it is very necessary to improve the rearing system, reproductive management, feed quality and technical assistance, especially on productivity issues in order to minimize calving intervals and growth as far as possible (Dagnew et al., 2017). The factors that

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influence the productivity of sheep and goats are the raising system, age, production frequency, nutritional needs and period of gestation (Susilawati, 2008). Implementing good management in sheep production activities is very helpful in determining the right weaning age and calving interval to enable ewes to be lambing twice in eighteen months with a high-quality litter size of lambs. Basically, sheep breeders in rural areas have two important goals, namely maintaining social and cultural status as respected people and secondly as saving in the family. This research aims to obtain information regarding the rearing system used by breeders, productivity performance, and the cultural and economic benefits of sheep raised using a traditional system.

2. MATERIALS AND METHODS

2.1 Description of the research site

Manatuto is one of the municipalities of Timor-Leste, located in the center of the country. It has a population of 45,541 inhabitants and an area of 1,783.3 km². The municipality of Manatuto borders the municipalities of Baucau and Viqueque to the east and Manufahi, Aileu and Díli to the west. It reaches both the south and north coasts of the island, and is only one of two municipalities to do so (the other is Lautém in the far east), and has the most geographical diversity. To the north is the Strait of Wetar, to the south is the Timor Sea (Timor-Leste population Census, 2015). The research data collection period starts on September 20 to December 20, 2023 or is carried out for three months.

2.2 Sample size estimation

This study used the survey method with 95% interval confidence, including interviews with sheep owners as respondents and carried out direct observation of the object under study, including the rearing system, feeding method, frequency and the quality of food provided. In the process of determining the research site used the intentional sampling method based on secondary data from the household Census of Manatuto municipality. In determining the sample size, Slovin method was used according to the recommendation of Sugiyono (2014) with the following formula:

$$n = \frac{N}{N \cdot d^2 + 1} \quad \text{where:}$$

n = Total sample (head household as respondent)
N = Total population (sheep farmer) d² = Desired percentage.

A total number of households as sheep breeders who were concentrated in the municipality of Manatuto out of a total of 103. Therefore, the formula is as following:

$$n = \frac{103}{1 + 103 \times (0.1)^2} = 50,74 \sim 51$$

According to the Slovin formula, the minimum research sample that must be interviewed is 51 sheep breeders. To determine the respondents, it used the simple random sampling method with the intention that all producers registered in the municipality of Manatuto had the same opportunity to be selected as respondents.

2.3 Observed variables

The variables observed in this research were livestock structure, pregnancy period, number of lambs, age at weaning, age at which ewes first gave birth, production system, mortality rate, and method of sale, as well as the economic benefits (value) of sheep products.

2.4 Interview method

The survey method in this research uses direct techniques, namely conducting interviews with respondents based on a semi-structured questionnaire designed to obtain primary data. Questionnaires are a very important material in survey research to obtain the primary information, to be processed and analyzed according to each variable that wants to measure and observe. The interview is a technique used to ask questions carefully so that the interviewee, possibly, provides accurate information according to the researcher's objectives. The conception is the implementation of a survey is a process whose objective is the collection of thematic, valid, and reliable information, obtained from the individual answers given to a set of questions by a representative group of respondents, which produced conclusions that can be generalized to the universe of the study population (Sugiyono, 2014).

2.5. Data analysis

The data obtained in this study were coded, tabulated, and subjected to descriptive statistical analysis according to [Sampurna & Nindhya \(2008\)](#), using the SPSS program, Version 25, to determine the mean, mode, standard deviation, standard of mean error and relative percentage of each variable observe

3. RESULTS AND DISCUSSION

3.1 Production system

Based on the results of observations and interviews, it shows that about 70% of the total respondents still use the extensive or subsistence system. Approximately 25% of total respondents use a semi-intensive system and 5% are starting to try using an intensive maintenance system. The factors that encourage farmers to continue using the system are because it is considered easy and does not require high production costs, as well as technical assistance in the process of raising sheep. This system greatly affects the productivity and quality of sheep production and reproduction because the maintenance system is still simple and primitive. Farmers are unfamiliar with modern maintenance systems that use technology to improve feed quality and good management to improve sheep productivity. The other factors that influence the breeders main to change the production system from extensive to intensive is culture and economic viability. According to [Murdjito et al. \(2011\)](#) and [Welday et al. \(2019\)](#), breeders who have small capital only keep sheep and goats on a small scale, which is around 2-7 heads so that production is low. [Supriyanto et al. \(2019\)](#) states that the more sheep and goats owned by the breeder will affect the way of thinking to accept and adopt new innovations in their livestock production. In addition, basically, sheep farming activities are still classified as secondary activities from other agricultural activities. Detailed research data about the sheep-rearing system, is shown in Figure 1.

3.2 Sheep feed resource

The feed resource and availability in research area is shown in Figure 2. In general, sheep breeders state that during the day the sheep are taken to the pasture to look for food, and in the afternoon, they can be given additional food in the form of leaves available at the breeding site, such as leucaena and hibiscus leaves.

Local feed production, especially legumes such as leucaena and hibiscus, has great potential and is developing well, but because it has not developed well and in large quantities, production is still minimal and not enough to meet the needs of sheep feed. One of the important factors that need to be considered in sheep fattening is a guarantee of feed continuity ([Mayulu and Suhardi, 2016](#)).

However, due to the limited knowledge of farmers and feed utilization was not maximized to increase sheep production. About 90% of respondents stated that according to their knowledge, good feed for sheep is classified into three types, namely field grass, young leaves, and legumes, as well as separate feeding methods to maximize feed efficiency. The respondents stated that, there is no need to pay attention to the nutritional problems of the feed because the purpose of keeping sheep is for a long period and can sell or slaughter when needed. Whereas sheep really need energy, protein, vitamins, minerals, fiber, and water to live and produce properly. Nutritional needs for sheep in generally not the same or different between nations but the implementation always refers to a list of tables that have been available for livestock conditions in the Asian region, even though the agro-climate is both tropical ([Mayulu and Suhardi, 2016](#)). Therefore, the results of the observations in the research indicate that there is a need for technical assistants, especially with regard to advising and transferring new technologies in intensive livestock farming, but with a reduction in production costs so that can be achieved by small rural producers.

3.3 Herd structure

According to the results of the study, it was found that the total sheep per household (breeder) was 2 to 16 heads with an average of 7.98 ± 2.84 heads per establishment. Total sheep calculation is performed during the dry season, namely in May or at the end of the rainy season, as ruminant productivity is highly dependent on feed quantity and quality. In May, the availability of food (local grass) is high enough to increase the production, which is one of the factors that determine the productivity of sheep. The results of the observations show that basically the producers do not know a good way to maintain the size of sheep, mainly in the summer period. Sheep are small ruminant animals that reproduce quickly and have great potential to be used by the community as a source of

protein, besides being able to be sold to get money quickly and as an important material in customary matters (Lusi et al., 2022). About the sheep population structure, the results showed that there were differences in the number of sheep population structures in each breeder. Basically, it can be classified according to age, namely lamb aged 1-3 months, young lamb aged 4 to 7 months, and adult sheep aged 7 months and over. The results of the analysis showed that, the total number of sheep owned by farmers, the herd structure was as follows: ram lamb is 14,98%, ewe lamb is 11,61%, and adult ram is 16,85% and 56,55% is the adult ewe of the total sample observed. The proportions of physiological status and sex were classified into two groups as shown in Table 1.

In accordance with the results of the classification in Table 1, it can be seen that the highest percentage is the adult sheep and adult ram, meaning that from March to May the sheep structure is still stable, without additional any stock, for reasons of no disturbance such as illness, loss, and theft. The sex ratio is still in accordance with the needs, because several adult ram can be sold to meet the economic needs of the family. The number of sheep that have been observed as many as 5579 heads with details as shown in Table 1 with a sex ratio of 1:3 (1 adult ram versus 4 female sheep). This result is not the same as the recommendation from Mulyono and Sarwono (2012) that to get a good sheep production, the reproduction ratio should be 5:16 (5 adult ram compared to 16 adult ewe) or one adult ram can serve 3-4 adult ewe.

3.4 Sheep reproduction performance

The results of the descriptive statistical analysis of sheep reproduction performance for each variable observed in this study, consisting of mean, standard deviation, mode and percentage are shown in Table 2. These results indicate that sheep kept in subsistence production systems showed low reproductive performance.

3.5 Gestation period, litter size and mortality rate

3.5.1 Gestation period

Based on the results of the descriptive statistical analysis presented in Table 2, it appears that the

gestation period of adult ewe is 5.78 ± 0.07 months, so it shows that the fastest is 5.71 months and the longest is 5.86 months, and about 43.40% of the total respondents stated that the adult ewe gestation period was normally around 5 months, and it is considered normal gestation period. According to Welday et al. (2019) the normal gestation period for adult ewe is 144.90 - 150.94 days or about 4.83-5.09 months.

3.5.2 Litter size

The result of litter per ewe lambing in this study was at least 1.11 and the largest was 2.79 with a mean of 1.95 ± 0.08 . This means that the number of lambs born from each ewe ranges from one to two and can reach three, although this rarely happens. Therefore, this is still considered a low ewe production and is most likely caused by poor farm management. According to Mulyono and Sarwono (2012) that normally a ewe can produce 2 heads per lambing, although there are also ewe that can produce 4 to 5 heads per ewe lambing, which rarely happens. The results of this study do not differ from the findings of Sarwono (2011) that a ewe can produce 1.31-2.69 offspring, with an average of 2.0 ± 0.88 per ewe lambing. The respondent state that peak fertility is from late September through November. Ewes have an average cycle length of 17 days, with most being between 14 and 20 days, while does have an estrus cycle of 18 to 22 days, and they display estrus for 24 to 48 hours, and the gestation period ranges between 144 and 152 days.

3.5.3 Mortality rate

The results of the descriptive statistical analysis showed that the lamb mortality percentage from birth to weaning was 1.24 - 1.5%, and about 39.60% of those interviewed stated that the number of lamb mortality in general was 1 per lambing. Death of the Lambs occur due to lack of technical control, poor feed quality, lack of pens for safe shelter for sheep and lack of attention from producers. Therefore, mortality is one of the most dangerous and economically detrimental factors in the industry of animal production. According to Sudrajat et al (2021), the mortality rate in sheep production can reach 3.95 - 5.77% per ewe lambing. The high mortality rate is likely caused by the old pregnant mother in intensive maintenance not getting enough nutrition. With the grazing system, the feed obtained is likely to be only grass, so it is not sufficient for good production, when

compared to the semi-intensive and intensive maintenance systems the feed given in terms of quantity and quality can meet the needs of life and production.

3.6 Ewe first lambing and weaning age

One of the parameters is the age at first lambing. The results of the descriptive analysis showed that ewes kept extensively at the study site generally the ewe first lambing at 10.65 - 13.23 months or with an average age of 11.94 ± 1.29 months. The statistical analysis results showed that it was not much different from the answers from 61.30% of respondents that generally the ewe first lambing at the age of 12 months and can give lambing faster or less than 12 months if given high-quality feed. The results of this study are considered better when compared to the research results of [Perwitasari & Bastoni \(2019\)](#) which states that, ewes first lambing at 15-18 months of age with an average litter size of 1.57 per lambing. In accordance with the results of interviews, the weaning age of young ewes occurred in the age range of 5-6 months with an average of 5.61 ± 0.07 months. Approximately 43.10% of the total respondents stated that in general lambs can be weaned at the age of 7 months. [Mayulu and Suhardi \(2016\)](#) recommends that weaning can occur naturally at the age of 3 - 6 months, because at that age the young sheep and goat are able to find their own food. According to [Sulastri \(2001\)](#), when weaning young sheeps, it is also necessary to be aware of live weight, as there is a very close relationship with its development and survival in the future. As related by [Sarwono \(2011\)](#) that sheeps will grow healthy if their body temperature is around 39.5-40.5°C, heart rate is 70-80 per minute, and breathing rate is 12-13 times per minute.

3.7 Utility of sheep farming products in the culture and economy

Almost 95% of all respondents stated that they must maintain and develop sheep production because it is essential to meet traditional needs, especially as an irreplaceable material in offerings to the souls of people who have passed away. The respondents stated that the sheep's liver is very important for cultural purposes and this organ cannot be replaced by other organs from any animal. The type of cultural habits in the research location is one of the factors that encourage the producers to continue

breeding and developing sheep production, however, sheep farming always requires constant attention from the farmers, because the sheep cannot return to the pen alone without being herded. To ensure the safety and comfort of the sheep, the shepherd must lead them to pasture to find their food and bring them back to their pen in the afternoon.

Livestock farming (especially sheep breeding) has been the foundation supporting the livelihoods of local people from nomadic times until the present-day. [Welday et al. \(2019\)](#); [Utomo and Rasminati \(2009\)](#) state that the contribution of the agricultural production to the economy is crucial (about 45% of gross income). In Manatuto municipality, sometimes farmers sell their sheep when they need money to meet the family's needs, specially to fund their children's school and healthcare cost. Sales system normally based on the external condition (fat or thin), age and sex of the sheeps. Between young and adult there are always price differences and ewe and ram also have price differences. The price range is between \$25 to \$50 for lamb and \$75 to \$200 for adults, depending on the body condition and sex of the sheeps. About 87% of respondents stated that they always sell sheeps in the summer season because at this time there is a lack of quantity and quality of animal feed, especially grass and legumes such as grasses and young leaves that as potential type of animal feed in the research local. The annual income from sheep farming in the Manatuto municipality is shown in Figure 3 below.

The analysis results obtained presented in Figure 3 show that around 28% of sheep farmers only obtain income between \$100 and \$150 per year, 34% earned an income of US\$200 to US\$500 and 38% of respondents earned \$550 to \$2,000 income per year. Thus, although the main purpose of raising sheep is to fulfill traditional needs, but on the other hand, it can generate income to improve the family economy, even though its contribution is not much compared to other income of agricultural activities. In general, sheep farmers in the research location still consider sheep farming as a side activity compared to other agricultural activities in the family because the main goal is to maintain social status, especially in customary matters. Thus,

farmers are not business-oriented and do not prioritize the economic value of sheep farming.

4. CONCLUSION

The results of the research on the production system, herd structure, and productivity showed that all interviewees in general still use the traditional extensive system, not paying attention to the problem of herd structure, the quality and frequency of feeding, and productivity management, including production, reproduction and feed quality due to negatively affecting the productive performance of animals. Farmers sell their animal products when they need money to finance some urgent family needs. The price of animals is always based on the external condition, age, and sex of the animals intended for sale. In this way, breeders begin to understand that sheep farming is not only used to meet cultural needs but can contribute to improving the family's economic needs.

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6. CONFLICT OF INTEREST

All authors have declared that there is no conflict of interests regarding the publication of this article.

REFERENCES

- Dagnaw Y., Urge, M., Tadesse, Y., & Gizaw, S. (2017). Sheep Production and Breeding Systems in North Western Lowlands of Amhara Region, Ethiopia: Implication for Conservation and Improvement of Gumz Sheep Breed. 179–197. <https://doi.org/10.4236/ojas.2017.72015>.
- Mayulu H. and Suhardi. (2016). The Feed Intake and Daily Weight Gain of Locally Sheep Fed with Amofer Palm Oil Plantation and Mill's Byproductbased Complete Feed. International Journal of Science and Engineering. Vol. 10(2):67-73. **Doi:** 10.12777/ijse.10.2.67-73. Home page: <http://ejournal.undip.ac.id/index.php/ijse>.
- Murdjito G., I.G.S., Budisatria, Panjono, N. Ngadiyono & E. Baliarti. (2011). Performances of bligon goats kept by famers in girisekar, village, panggang gunungkidul. Bulletin of Animal Science.pp 86-90 **Doi:** <https://doi.org/10.21059/buletinpeternak.v35i2.595>.
- Mulyono S. and Sarwono B. (2012). Slaughter Goat Fattening. Spreader (Penebar Swadaya), Jakarta, Indonesia. **Book.** ISBN: 979-489-786-8, ed. 3.
- Perwitasari F.D. & Bastoni. (2019). Income Analysis Business Sheep Livestock of Intensive in the Cirebon Districts. Jurnal Peternakan Indonesia. ISSN 1907-1760. E-ISSN 2460-6626. Vol. 21 (1): 1-9. DOI: 10.25077/jpi.21.1.1-9.2019.
- Sampurna, IP and Nindhya. (2008). Data analysis with SPSS in Experimental Design. Book. Udayana Press. Publisher. ISBN: 978-979-8286-40-7. Ed. I. May 2008. Pp 25-34.
- Sarwono B. (2011). Breeding Superior Goats. Self-help Spreader. **Book-** ISBN: 9790025149 9789790025141. Pulisher *Penebar Swadaya* goup, Surabaya. Indonesia
- Sudrajat A., Budiastria I.G.S., Bintara S., Rahayu E. R. V., Hidayat N., and Christi R. F. (2021). Productivity of Etawah Crossbreed Goats (PE) in the Livestock Park Kaligesing. p-ISSN 1410-5659 e-ISSN 2621-5144. Jurnal Ilmu Ternak, Juni 2021,21(1):27-32 Published by Faculty of Husbandry UNPAD. **DOI:** 10.24198/jit.v21i1.33390 .Unpad Press.
- Sugiyono. (2014). Educational Research Met-hods Quantitative, Qualitative, and R&D. **Book.** Jakarta Indonesia.
- Sulastri. (2001). Estimation of Genetic Parameters of Growth Traits and Relationships between Qualitative and Quantitative Characteristics of Etawa Crossbreeds in the Singosari Livestock Technical Implementation.
- Lusi D., Yurmiati H., and Ramadani D. (2022). The Effect of Rearing System on Productivity of Garut Ewes. *Jurnal Produksi Ternak Terapan*.

Vol.02, nu. 03. ISSN: 2722-6611. DOI: 10.24198/jptt.v3i2.42288.

Supriyanto, Saputro, A.D., Akimi. (2019). The Changing of Breeder Behaviour to Foot Root Disease Treatment of Sheep. Vol.16, Issue 30. Pp. 86-92. <http://jurnal.polbangtanyoma.ac.id/index.php/jp3/index>

Susilawati T. (2008). Differences in Productivity of Etawa crossbreed goats between natural mating and artificial insemination in Malang District. **Thesis**. Faculty of Animal Husbandry, Brawijaya University. Malang, Indonesia (In Indonesian).

Timor Leste population Census. 2015. Manatuto in number. www.statistics.gov.tl

Utomo Sand N Rasminati. (2009). The development potential of goat for poverty reduction in Utopia, Windusari Subdistrict, Magelang Regency. International Conference on Food Science and Technology (FOSCiTech. doi:10.1088/1755-1315/379/1/012009.

Welday, K., Urge, M. and Abegaz, S. (2019). Sheep Production Systems and Breeding Practices DOI:10.4236/ojas.2019.9101. Zones of Tigray, Northern.

Table 1. Classification based on the phase and sex of sheep

Classification	Total	Percentage (%)
- Ewe lamb	648	11,61
- Male lamb	836	14,98
- Adult Ram	940	16,85
- Adult ewe	3155	56,55
Total	5579	100.00

Source: results of study (2023)

Table 2. Productivity Performance of Sheep kept in subsistence production system

Characteristics	$\bar{X} \pm sd$	Mode	Percentage (%)
Gestation period (month)	5.78±0.07	5	42.20
Number of lambs per birth	1.25±0.08	1	54.70
Mortality rate (%)	1.35±0.13	1	40.50
Mating interval (month)	12.24±0.12	12	65.50
Interval calving (month)	14.05±0.50	13	72.25
Weaning age (month)	5.61±0.07	7	43.10
Weaning weight (kg)	16.36±4.34	14	51.19

Source: Primary data

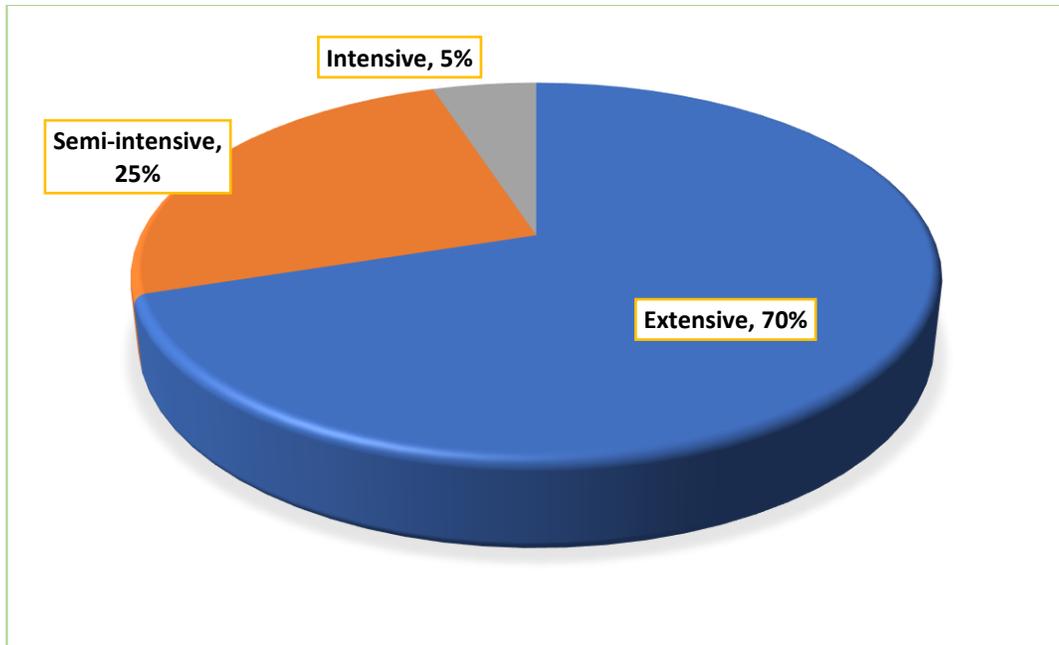


Figure 1. Sheep Production System in Manatuto Municipality (n=53)

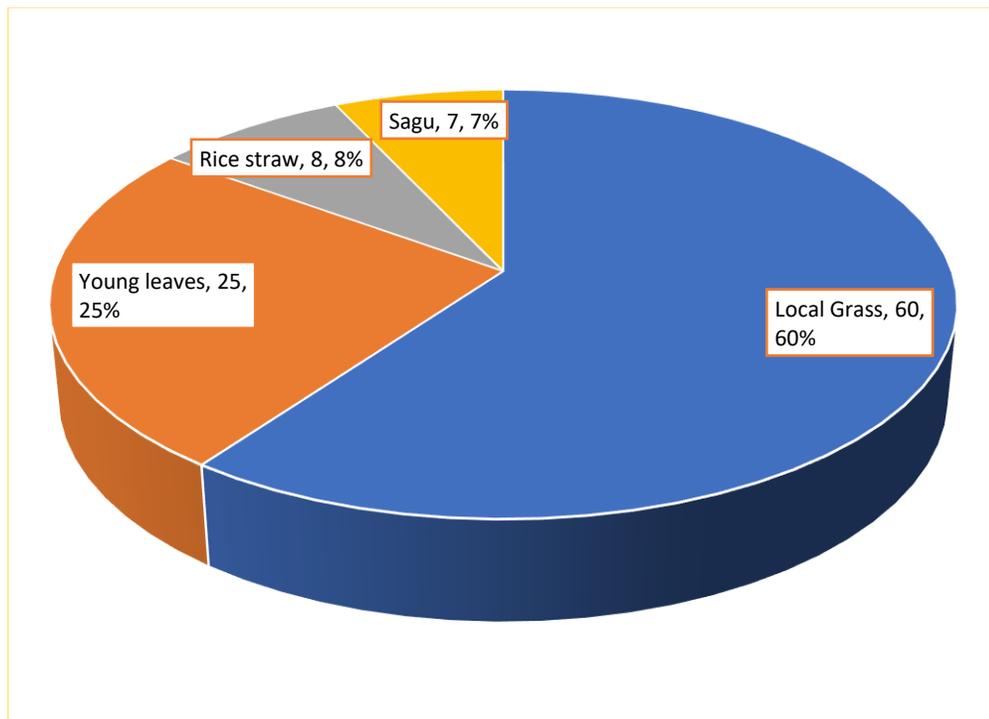


Figure 2. The type of feed most used by farmers in the research location (n=53)

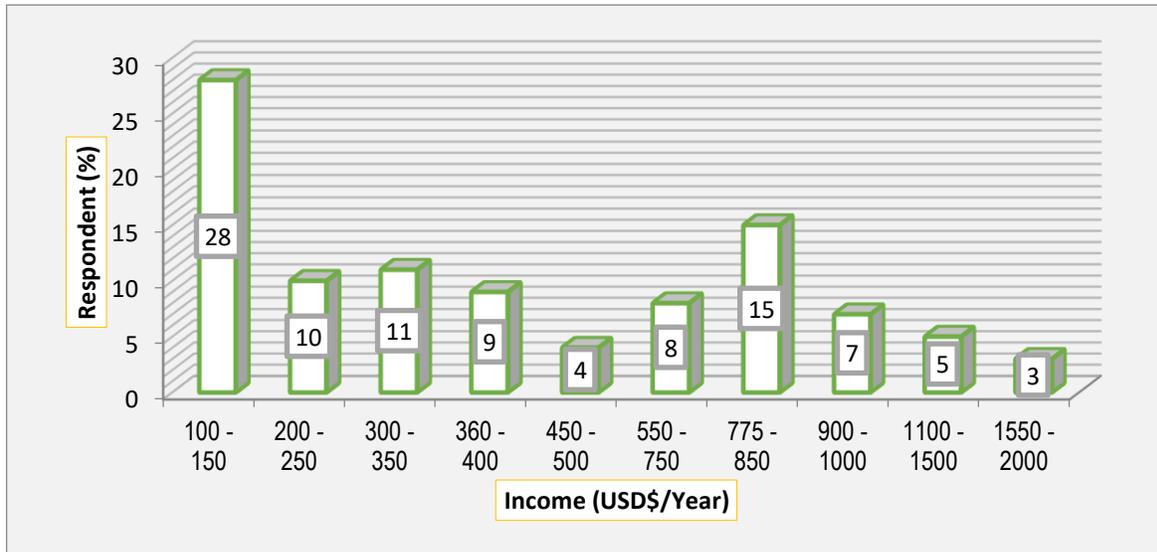


Figure 3. The annual income from sheep farming in Manatuto Municipality, Timor-Leste (n=53)