Characterization and typology of goat production systems in West Muna Regency, Southeast Sulawesi, Indonesia

S Rahadi, E D Kusumawati, Kuswati, N Isnaini, L Hakim, G Ciptadi, T Susilawati and V M A Nurgiartiningsih

1Department Student, Faculty of Animal Science, Brawijaya University, Malang, East Java, Indonesia
2Faculty of Animal Husbandry, Universitas Kanjuruhan Malang, Malang, East Java, Indonesia
3Faculty of Animal Science, Brawijaya University, Malang, East Java, Indonesia
4Faculty of Animal Science, Universitas Halu Oleo, Kendari, Southeast Sulawesi, Indonesia

Email: vm_ani@ub.ac.id

Abstract. Goat farming is one of the important activities for the community in West Muna Regency, Southeast Sulawesi Province, that contributes to the social and economic development of this region. The present study aimed at characterizing the goat farming and its typology. The study was conducted in West Muna Regency with the land area of ± 906.28 km2 or ± 90.628 ha. Fifty-five goat farmers were surveyed. The collected data related to the production method and the farm characteristics covering six main topics, namely a) education, b) labor number, c) goat size and structure, d) facility and equipment, e) feed management and grazing, and f) breed. The data were analyzed descriptively using percentages for each observed variable. The result of the study could classify the goat production system in West Muna Regency as a family system and as one of the subsystems, with the average ownership was six goats. The farming mostly is done using an intensive method (76.36%) with traditional housing technology and low feeding technology application. The study found that farmers’ educational background was low; also, there was no investment and technical assistance for developing goat farming in this region. Thus, it is necessary to conduct an economic study to find out the economic status of the business. It is suggested to establish a farmer association and provide technical assistance to enhance business productivity.

1. Introduction
Nowadays, the agricultural sector faces uncertain futures. Farmers must be able to develop sustainably in order to have a key role to meet the needs and welfare, economic viability, social inequality, and to improve social justice to preserve nature and prevent environmental damage. In this context, this research aimed to identify problems, opportunities, weaknesses, and strengths which found and could be developed by the farmers in order to find a condition that allows the sustainability of the farming business.
Rural area development is a strategy to equalize development in order to reduce urban and rural development disparities. There is a very close relationship between agricultural development and rural development. Rural development will not be able to succeed well if it ignores agricultural development, and agricultural development is difficult to separate away from rural areas because the critical success factors of farmers and land are in rural areas [1].

Small ruminants (i.e., sheep and goat) are important commodities to enhance the socio-economic welfare of the community in developing countries predominantly in the tropical regions to fulfill the nutrition, income, and intangible benefits (e.g., saving, insurance, cultural and ceremonial purposes) [2]. West Muna Regency is located in the island area of Southeast Sulawesi Province, which is highly potential for goat farming due to its agro climate and geophysics. Small ruminants are selected because traditionally, the local community has farmed them since long time ago. Small ruminants bring huge contributions to the economic life of the farmers, especially those living in dryland and island with the purpose of meat production. Conductive agro-climate, pasture, and other natural kindness which provides broad spaces and huge potentials for goat farming.

However, the lack of information about goat farming potential and data about the number and location of productive farms detain its development programs. Insufficient information concerning the actual numbers of the farmer, condition, and farm characteristics contribute to this problem. Those become the underlying reasons this present study is important to be conducted that is the potentials of goat farming in West Muna Regency to support the development program. The result of this study can be used as a reference for the concerning institutions to formulate related public policies and to design the plans and implementation of farming development.

2. Methods

2.1 Area of the study
This research was conducted in West Muna Regency which has ± 906.28 km² or ± 90.628 ha areas. It selected Tiworo Kepulauan sub-district as the location of the study because this sub-district has the highest goat population with 13.34 goats/km². Tiworo Kepulauan sub-district is located at 25-100 meters above sea level. The climate of West Muna Regency is tropical. Its average temperature is 25.8-28.3 °C with two seasons, rainy and dry seasons [3].

2.2. Data collection and statistical analysis
The data were collected through a survey and personal interview on fifty-five goat farmers in their farm location from May until July 2019. The total goats that respondents raised were 331 goats.
Respondent answered a set of open and close-ended questions, including a structured questionnaire. Each session lasted for about 1-2 hours. The collected data related to the production method and the farm characteristics covering six main topics: a) education, b) labor number, c) goat size and structure, d) facility and equipment, e) feed management and grazing, and f) breed, the data were analyzed descriptively using percentage for each observed variable [4].

3. Results and Discussion

The level of education in a farming business affects the productivity of business [5]. The majority of respondents’ farmers were graduated from elementary school (43.64%), followed by high school graduates by 25.45% (Table 1). The education level may affect farming behavior [6], it directly affects the farm's technological level because individuals with higher education level find it easier to understand and assimilate new technology, and therefore, they stand a higher possibility of adopting new technologies [7].

The result of this study found that most farmers (77.73%) worked in the agricultural sector. Besides, there were some farmers who also worked as a government employee, trader, and other professions (27.27%). All farmers lived in the village where their farms were located (Table 1). Farmers' residence is very relevant because it contributes to time efficiency allocated on farming activities and monitoring their goats as well as solving the problems easily.

Table 1. Social profile analysis of goat producers in West Muna Regency.

| Variables                        | N  | %   |
|----------------------------------|----|-----|
| Level of education               |    |     |
| Illiterate                       | 5  | 9.09|
| Elementary                       | 24 | 43.64|
| Junior High School               | 3  | 5.45|
| Senior High School               | 14 | 25.45|
| University                       | 9  | 16.36|
| Farmer Training Activity         |    |     |
| Yes                              | 0  | 0   |
| No                               | 55 | 100 |
| Living Location                  |    |     |
| In town                          | 0  | 0   |
| In the village                   | 55 | 100 |
| Bank Financing                   |    |     |
| Yes                              | 0  | 0   |
| No                               | 55 | 100 |
| Accounting                       |    |     |
| Annual                           | 0  | 0   |
| Eventual                         | 55 | 100 |
| Does not make                    |    |     |
| Participation in a farmer association | 0  | 0   |
| Yes                              | 0  | 0   |
| No                               | 55 | 100 |
| Type of activity                 |    |     |
| Farmer                           | 40 | 72.73|
| Government Employee              | 5  | 9.09|
| Trader                           | 3  | 5.45|
| Self-employment                  | 3  | 5.45|
| Others                           | 4  | 7.27|

N = number of questionnaire answers
% = percentage of questionnaire answers

All farmers in this study did not access bank loans for their goat farming. This is allegedly for by the fact that goat farming was not their main profession, but just as a part-time activity, saving, and
social status, which had not been oriented to a professional business. All farmers in this study stated that they did not have a specific book to record their revenue and expenditure (Table 1).

This study showed that all of the farmers (100%) were not involved in any farmer associations or organizations. Association or organization could be an alternative option for the farmer’s development, encourages them to learn and improve their production rate [8], the establishment of farmer association or organization is necessary to overcome the existing problem, i.e., the absence of guidance or training provided by the government.

The average of farmers’ age who interviewed was 48.82 years old (Table 2). The old age of farmers may be caused by the consequences of migrating young people to the city center to get better living conditions. Young men are more interested to migrate due to economic and educational factors. Viewed from the supporting and inhibiting factors, the city offers many promising job vacancies. Besides, better education facilities in the city are also one of the reasons for continuing their study [9].

The majority of farmers had been active in goat farming for 5.42 years on average, and have been rearing goat for 20 years (Table 2). Farming experience may influence the business productivity [5]. Regarding family labor, the average number of labor involved in goat farming was 1.51 people; the average family member was 4.31 people. The main job which is done by labors is taking fodder, cleaning the goat house, and doing the disease control. Family labor was not paid, thus, they reduced cost for external labors [10].

Table 2. Quantitative variable analysis of farmer’s age, activity duration, and labor employed in goat farming in West Muna regency.

| Variables                        | Average | Standard deviation |
|----------------------------------|---------|-------------------|
| Farmer’s age (year)              | 48.82   | 12.12             |
| Duration of goat farming (year)  | 5.42    | 6.12              |
| Number of the family member (person) | 4.31    | 1.65              |
| Family worker (person/day)       | 1.51    | 0.63              |

Regarding the housing facilities, 87.27% of the interviewed farmers used housing, while 12.73% of them did not. There are two types of goat house, dirt-floored house (56.25%), and wooden batten floored goat house (43.75%) (Table 3).

Table 3. Qualitative variable analysis of the technological aspects favorable for goat rearing in West Muna Regency.

| Variables                        | N   | %        |
|----------------------------------|-----|----------|
| Materials used for the house:    |     |          |
| Wood and dirt floor              | 21  | 38.18    |
| Wood and wooden batten floor     | 27  | 49.09    |
| No housing                       | 7   | 12.73    |
| Types of house                   |     |          |
| Dirt floor                       | 21  | 56.25    |
| Wooden batten                    | 27  | 43.75    |

N = number of questionnaire answers
% = percentage of questionnaire answers

The adopted farming management systems were extensive, semi-intensive, and intensive (table 4). The majority of farming was intensive farming (76.36%). With regard to housing management, 95.83% of goat farming did not concern with age and sex. Actually, every goat should be housed according to its age and physiological status. About 97.92% of the farmers periodically sanitize the goat house, 40.43% of them cleaned it once a week, 27.66% of them do not have a fixed schedule, 17.02% of them cleaned it every three days, and 14.89% of them cleaned it every day. Sanitation
plays an important role in improving livestock's health status [11]. Regarding feeding activity, there is a huge variation of supplied fodder, as shown in Table 4. About 76.36% of farmers feed their goats using legumes, 12.73% with native grass, 9.09% with native grass +legumes, and 1.82% with legumes and concentrated feed. The legumes often used were *Gliricidia sepium*, *Calliandra calothyrsus*, *Leucaena leucocephala*, jackfruit leaves (*Artocarpus heterophyllus*), white teak leaves (*Gmelina arborea*). A total of 67.27% of farmers did not give drinking water for the goat, although in the dry season, and only 10.91% give additional salt.

**Table 4. Qualitative variable analysis of the technological aspects favorable for goat rearing in West Muna Regency.**

| Variables                          | N  | %     |
|------------------------------------|----|-------|
| **Farming pattern**                |    |       |
| Intensive                          | 42 | 76.36 |
| Semi-intensive                     | 7  | 12.73 |
| Extensive                          | 6  | 10.91 |
| **Housing management**             |    |       |
| Mixed                              | 46 | 95.83 |
| Separated based on the physiological status | 1  | 2.08 |
| Individual                         | 1  | 2.08 |
| **Goathouse cleaning**             |    |       |
| Yes                                | 47 | 97.92 |
| No.                                | 1  | 2.08 |
| **Frequency of goat house cleaning**|  |  |
| Every day                          | 7  | 14.89 |
| every three days                   | 8  | 17.02 |
| Once a week                        | 19 | 40.43 |
| Not fixed                          | 13 | 27.66 |
| **Feeding type**                   |    |       |
| NG                                 | 7  | 12.73 |
| M                                  | 42 | 76.36 |
| NG+L                               | 5  | 9.09  |
| L+ C                               | 1  | 1.82  |
| **Drinking**                       |    |       |
| Yes                                | 18 | 32.73 |
| No.                                | 37 | 67.27 |
| **Use of mineral supplement (salt)**|  |  |
| Yes                                | 6  | 10.91 |
| No.                                | 49 | 89.09 |

NP= native grass, L= leguminosa, C= concentrate
N = number of questionnaire answers, % = percentage of questionnaire answers

The genetic composition of the goat was dominated by kacang goat (78.85%), etawa crossbreed (21.15%) (Table 5). Farmers who only rear kacang goats reach 81.82% with the consideration that the kacang goats are easier to be sold because buyers are intended as a sacrifice for religious purposes and rituals. This is in line with the statement that in developing countries, the need for small ruminants is for saving, insurance for an emergency condition, cultural purpose, and other ceremonial purposes [2]. The majority of farmers had less than three females (50.91%) and 3-5 female goats (40.00%) used for reproduction. The majority of farmers (70.91%) did not have a male goat, which could lower the population growth rate, this could be seen from the long kidding interval, which was complicated by the absence of artificial insemination technology adoption.
Table 5. Quantitative and qualitative variable analysis of herd composition and type of goat in the West Muna Regency.

| Variables                                               | N   | %      |
|---------------------------------------------------------|-----|--------|
| Genetic composition of the goats                        |     |        |
| Kacang                                                  | 261 | 78.85  |
| Etawa crossbreed                                        | 70  | 21.15  |
| Distribution of goats by productive farm                |     |        |
| Breed only kacang goat                                  | 45  | 81.82  |
| Breed only etawa crossbreed                             | 7   | 12.73  |
| Breed kacang goat and etawa crossbreed                  | 3   | 5.45   |
| Total number of female goats                            |     |        |
| Absence of female goat for reproduction                 | 1   | 1.82   |
| <3                                                      | 28  | 50.91  |
| From 3 to 5                                             | 22  | 40.00  |
| >5                                                      | 4   | 7.27   |
| Total number of male goat for reproduction              |     |        |
| Absence of male goat for reproduction                   | 39  | 70.91  |
| <3                                                      | 15  | 27.27  |
| From 3 to 5                                             | 0   | 0.00   |
| >5                                                      | 1   | 1.82   |

N = number of questionnaire answers
% = percentage of questionnaire answers

4. Conclusion
The result of the study could classify the goat production system in West Muna Regency as a family system and as one of the subsystems, with the average ownership was six goats. The farming activity of respondents used an intensive method (76.36%) with traditional housing technology and low feeding technology application. The study found that farmers’ educational background was low; this study also found that there was no investment and technical assistance for developing goat farming in this region. It is necessary to conduct an economic study to find out the economic status of the business. It is suggested to establish a farmer association and to provide technical assistance to enhance business productivity.

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