

# Characteristics of local goat farming and rearing in Gorontalo, Indonesia

Fahrul Ilham<sup>1</sup>, Suyadi<sup>2\*</sup>, Gatot Ciptadi<sup>2</sup>, Tri Eko Susilorini<sup>2</sup>, and M. Fadhlirrahman Latief<sup>3</sup>

<sup>1</sup>Faculty of Agriculture, Gorontalo State University, 96128 Gorontalo, Indonesia

<sup>2</sup>Faculty of Animal Science, Brawijaya University, 65145 Malang, Indonesia

<sup>3</sup>Faculty of Animal Science, Hasanuddin University, 90245 Makassar, Indonesia

**Abstract.** A survey of 32 breeders was conducted to determine the characteristics of breeders and the management of local goat rearing in Gorontalo. Information from breeders was obtained by observation and interviews based on a list of questions in the questionnaire. The research on characteristics of local goat breeders in Gorontalo shows that the majority of main occupations are farmers (40.63%), with at least elementary school education (53.13%) and years of farming >6 years (71.88%). The total of goats kept by the majority of farmers is 1-5 goats (50%), kept in pens (53.13%) with a colony model (75%). Most feed given was grass and leaves (37.50%), with the primary source being grass/leaves growing around gardens, moorland, and fallow rice fields (40.62%). The group of food leaves provided consists of lead tree leaves (*Leucaena leucocephala*), goat wood (*Garuga floribunda*), java wood leaves (*Lannea coromandelica*), kelumpang leaves (*Sterculia foetida*), jackfruit leaves (*Artocarpus heterophyllus*), water spinach (*Ipomoea aquatica*), kapok leaves (*Ceiba pentandra*), banana leaves and peels (*Musa paradisiaca*), moringa leaves (*Moringa oleifera*). The grass groups given for goats are field grass, odot (*Pennisetum purpureum* cv. Mott), wild kale, corn (*Zea mays*), and concentrate in the form of tofu dregs, rice/corn bran. Some farmer respondents sometimes provide vegetables waste from the kitchen.

## 1 Introduction

Goat farming in the central part of Indonesia (Gorontalo) has long developed and produced tens of thousands of offspring and generations with good adaptability to the local environment of Gorontalo [1]. Apart from being a source of animal protein and income for farmers, local goat farming in Gorontalo has the potential to support the Nation's Capital (Ibu Kota Nusantara/IKN) of Indonesia, which is temporarily being built on Kalimantan Island, west of Gorontalo. The benefits of raising goats apart from producing meat, milk, and by-products are also for biomedical research [2, 3] and religious ritual facilities [4]. Local goats are germplasm that supports biodiversity, gene sources, recreational facilities, and facilities for education and research for elementary school students, college students, and researchers [5].

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\* Corresponding author: [suyadi@ub.ac.id](mailto:suyadi@ub.ac.id)

The development of the goat farming business in Indonesia and several Asian countries tends to be slow or even not developing [5, 6]. The general problem with goat farming in rural Indonesia is that farming is only a side business to fill free time or as capital/savings, which can be used anytime for urgent needs [7]. Even though it has become the primary source of livelihood for most African people, efforts to explore and commercialize the potential of goat farming have yet to be carried out [8]. Unavailable feed continuously is often the cause of decreased goat productivity in Indonesia, especially during the dry season. Adult goats need fresh forage every day of 10-20% of body weight or 2.5-3% of dry matter [9] and concentrate 2.5% of body weight [10]; if not fulfilled, it will affect the ability to reproduce [11]. The topography of the mainland of Gorontalo in Indonesia is mostly mountains and hills with temperatures of 19.60 °C - 35.90 °C, causing the growth of some plant vegetation to be less than optimal, especially during the dry season.

A livestock business can be successful if it can meet the daily needs of livestock owners. Likewise, the success of a local goat business is primarily determined by the quality, quantity, and continuity of forage, as well as the residents' participation in supporting local goat farming. Efforts to improve the genetic quality of local goats can be started by collecting all basic information on phenotypic characteristics, genetics, population structure and dynamics, and community management systems so that they can be used to develop local goat breeding programs [12-14]. This research aims to determine the characteristics of breeders and rearing management of local goats in Gorontalo. The availability of information on rearing systems and feed availability from the results of this research will greatly support the development of local goats in Gorontalo, Indonesia.

## 2 Methodology

The location of this research is Gorontalo Province, Indonesia, namely Gorontalo City, Bone Bolango Regency, and Gorontalo Regency. The distance between the three locations is close, so they have almost uniform geographical conditions. The total area of the three observation areas is 4,040.92 km<sup>2</sup>, average air humidity is 77.8%, temperature is 27.14°C, rainfall is 92.13 mm, rainy days are 9.24 days/month, and sunlight is 66.29%. The location for collecting research sample data is at an altitude of <100 meters above sea level (masl) [15].



**Fig. 1.** Interviews and observations of local goat farmer respondents in Gorontalo.

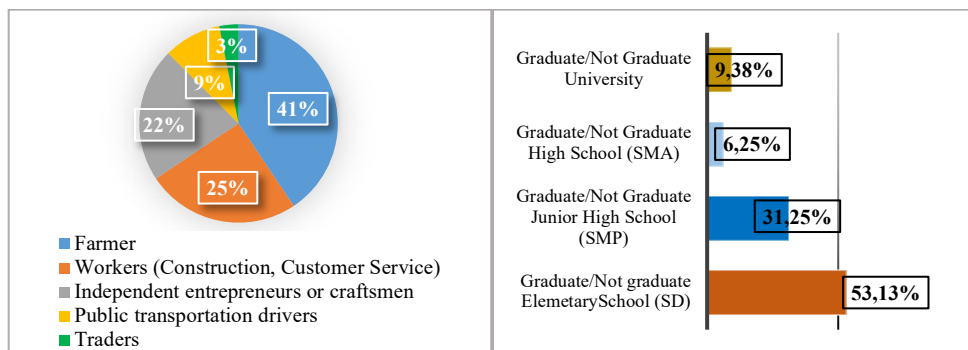
This research uses a survey method. Research data consists of primary and secondary data. Data was obtained by interviewing and observing the maintenance system implemented by the breeder. Interviews were conducted based on the list of questions in the questionnaire (Figure 1). The total number of farmer respondents was 32, male and female, and they were selected purposely. The variables observed were breeder characteristics (main occupation, final education, length of farming) and rearing management (total goat kept, rearing system,

pen model, feed source, and combination of feed types). The results of interviews and observations were quantitative descriptive analysis. All data obtained were analyzed using SPSS 16 statistical software tools.

### 3 Result and discussions

#### 3.1 Main occupation and education

The main occupation of local goat farmer respondents in Gorontalo is farmers (40.63%), with the main commodity being corn and supporting commodities being rice and secondary crops. Some respondents have their primary jobs as construction workers and customer service workers in offices (25%), independent entrepreneurs and artisans (21.88%), public transportation drivers (9.38%), and traders (3.13%) (Figure 2). Raising goats is still considered a source of side income in the family, so local goat breeders in Gorontalo do not focus on increasing livestock productivity. Farming work can also support the business of raising goats because managed agricultural land can provide feed for livestock, and livestock waste in the form of feces, urine, and leftover feed can be used as organic fertilizer for agricultural land [16].



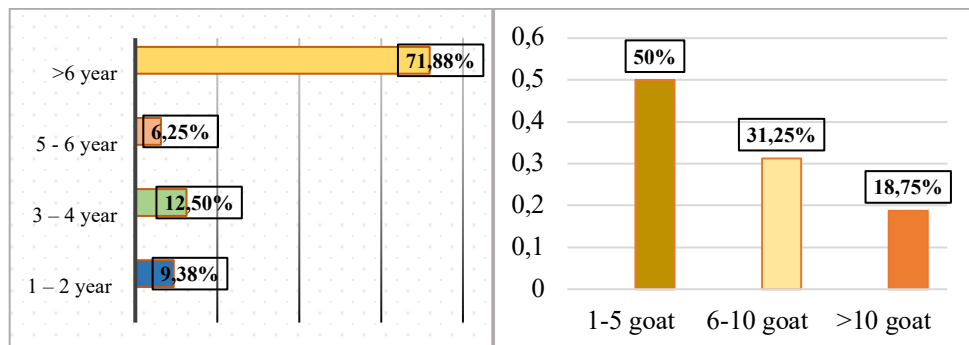
**Fig. 2.** Occupation (left) and final education (right) of local goat farmer respondents in Gorontalo.

The majority of respondents' final education was elementary school (53.13%), but some respondents did not complete elementary school. Some respondents were able to complete their education up to junior high school (31.25%), senior high school (6.25%), and even university (9.38%). The majority of sheep and goat breeders in India are illiterate (50-52%), completed primary education (31-35%), high school (11.67%) and tertiary education (3-5%) [17]. The level of education can affect the ability to manage livestock business and make strategic decisions when facing change. Higher education makes it easier for farmers to understand knowledge development and accept technological innovations [18]. Farmers with low education can be helped to increase their knowledge with practical goat farming training, for example, utilization of manure for compost, prevention and treatment of goat diseases, increasing breeding, and efficient marketing [19].

#### 3.2 Long-time raising and the total of goats kept

Long-time raising local goat breeders in Gorontalo are quite varied; most were over six years (71.88%). Some of the respondents were new to the goat farming business, namely 3-4 years (12.50%), 1-2 years (9.38%), and 5-6 years old (6.25%) (Figure 3). Age, farming experience, and business scale significantly relate to farming motivation [20]. The more extended

breeding experience causes farmers to have more knowledge, and it is easy to make strategic decisions because they have learned a lot from previous experiences and tend to be open to the latest information [21]. Farmers with much experience tend to be more skilled and have better livestock productivity than those with less experience.



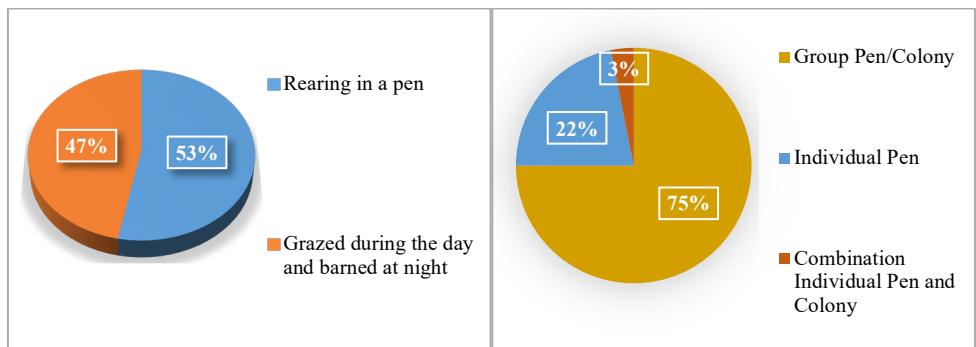
**Fig. 3.** Length of farming (left) and total of goats kept (right) local goat farmers in Gorontalo.

The total of goats kept by most respondents is 1-5 goats (50%), a few are 6-10 goats (31.25%), and the remainder are above 10 goats (18.75%). Goat farmers in India with less than 20 goats are considered a small population, more than 39 are a large population, and between 21 and 39 goats are considered a medium population size [17]. Factors that limit the ability of farmer respondents to raise goats in large numbers are the burden of higher maintenance costs and the availability of free time, considering that the respondent's main job is farming, not animal husbandry. Factors that influence breeders' lack of ability to raise livestock in large numbers are limited business capital and land for forage [22]. Limited livestock ownership means that the income received by farmer respondents is less, so it cannot be used as a primary source of income.

### 3.3 Management system dan pen model

The maintenance system applied by the majority of respondents is still simple, even though they are kept in pens (53.13%) (Figure 4). A small percentage of farmers release and allow their goats to search for food independently during the day and at night in a pen or fence around the house (46.88%). Most respondents keep local goats in pens because the land for grazing is decreasing, and they follow local government regulations that prohibit livestock from roaming around settlements because they disturb other residents. Keeping goats in pens can positively impact the soil quality of the housing area because the manure produced can increase Nitrogen, Phosphorus, Potassium, and worm populations in the soil [23]. The maintenance of native goats in the lowlands of Burundi, Africa, shows better and more expansive productivity and marketing than the highlands, occupied mainly by crossbred goats [24].

The goat pen model owned by the respondent breeders was in groups/colonies (75%) and kept in individual pens (21.88%), and a small proportion used a combination of both (3.13%). The floor of the colony pens owned by local goat breeders in Gorontalo uses a soil/cement mixture because it is cheaper and more practical, but cleanliness cannot be controlled. The colony pen model is often used by breeders who do nurseries to facilitate the mating process [25]. The colony pen model has advantages, including more freedom for goats to move, lower costs, less risk of accidents, and flexibility in supervision. Goats raised in groups in colony pens have better social behaviour, fewer clashes, and lower stress levels [26].



**Fig. 4.** Raising system and pen model of local goat in Gorontalo.

### 3.4 Types, sources, and combinations of feeding

The feed types often given to local goats in Gorontalo are grass, leaves, concentrates, and others. The grass group consists of paitan grass (*Axonopus compressus*), lamuran grass (*Dichantium caricosum*), kawatan grass (*Ottochloa nodosa*), belulang grass (*Eleusine indica*), and odot grass (*Pennisetum purpureum* cv. Mott). The leaf group consists of lamtoro leaves (*Leucaena leucocephala*), goat wood (*Garuga floribunda*), java wood leaves (*Lannea coromandelica*), kelumpang leaves (*Sterculia foetida*), jackfruit leaves (*Artocarpus heterophyllus*), water spinach (*Ipomoea aquatica*), kapok leaves (*Ceiba pentandra*), banana leaves (*Musa paradisiaca*), Moringa leaves (*Moringa oleifera*). The concentrated group consists of tofu dregs and rice/corn bran, and the other group consists of vegetable waste from the kitchen, such as banana peels. The diverse types of feed show that the land's carrying capacity is enough to support goat farming in Gorontalo. Many middle and lower-class farmers choose to breed local goats because they can use several types of low-quality feed. Most goats (93%) in Senegal supplement their animals with agricultural by-products, agroforestry, and kitchen leftovers [27].

The dominant feeding carried out by farmers was a combination of 2 or more types of feed, with the most common combination being grass and leaves (37.50%) and the least common combination being leaves and concentrate (6.25%). Goats like various forages, such as a mixture of grasses with legumes in the form of shrubs or leaves from various types of trees [28, 29]. Goats cannot grow well if given the same food continuously for a long time. Combination feeding aims to avoid saturation of goats with one type of feed. It is also one of the farmers' strategies to ensure that one type of feed in Gorontalo runs smoothly and always remains available.

Local goat farmers in Gorontalo generally do not have land specifically for forage or grazing. Daily goat feed needs are met by obtaining forage that grows wild around gardens, moorland, and fallow rice fields (40.62%) and partly by purchasing (Table 1). The type and amount of feed provided are still being determined; breeders only provide feed from nature, and no long-term forage reserves exist. Leguminous plants such as nuts for goat feed generally have limitations, namely seasonal availability, perishability, and limited volume [30]. This situation causes a decrease in goat productivity, especially during the dry season, due to lack of feed. Poor management of feed quality by breeders causes goats to be unable to maximize their potential and even reduce their reproductive performance [31].

**Table 1.** Sources feed combination, types, and combination feeding of local goats by farmers in Gorontalo.

Number	Sub Number	Variable	n (farmer)	Percentage (%)
<b>1</b>		<b>Source Feed Combination</b>		
	1	Uncultivated grass/leaves from gardens, moorland, fallow rice fields	13	40.625
	2	Grass/leaves are cultivated and uncultivated from gardens, moorland, and fallow rice fields.	12	37.5
	3	Cultivating grass/leaves	3	9.375
	4	Cultivated, purchasing, and uncultivated grass/leaves from gardens, moorland, and fallow rice fields.	2	6.25
	5	Some are cultivated and purchasing grass/leaves,	1	3.125
	6	Some are cultivated/uncultivated grass/leaves, and market waste/kitchen waste	1	3.125
			<b>32</b>	<b>100.00</b>
<b>2</b>		<b>Type and Combination Feeding</b>		
	1	Grass and leaves	12	37.50
	2	Leaves	6	18.75
	3	Grass, leaves, and combination grass-leaves	6	18.75
	4	Grass, leaves, and others	3	9.38
	5	Grass, leaves, concentrate, and others	3	9.38
	6	Leaves and concentrate	2	6.25
			<b>32</b>	<b>100</b>

## 4 Conclusion

The dominant characteristics of local goat breeders and raising management in Gorontalo are farming, the highest level of education is elementary school, the duration of farming is more than six years, the number of goats kept is 1-5, and the goat rearing system is kept in colonies. The dominant forage given is more than 1 type of feed, with the most combination being natural grass and leaves. The main source of local goat feed in Gorontalo comes from gardens, moorland, and unused rice fields. Efforts to commercialize local Gorontalo goats are necessary to increase farmers' income and welfare.

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