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# On-farm Phenotypic Characterization of Indigenous Goat Types in Selected Districts of South Gondar Zone, North Western Ethiopia

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**Abstract:** This study aimed to gather basic information on phenotypic characteristics and develop live weight estimation equations based on body measurements of indigenous goat types in selected districts of the South Gondar Zone. Multistage purposive sampling was employed based on the potential of goat production. For generating quantitative and qualitative data, linear body measurements were taken from 630 mature goats. Dentition was used to estimate the age of goats as age group one (1PPI), age group two (2PPI), and age group three (3PPI). Data were gathered through field observations and linear body measurements of sampled populations. The most frequently observed coat colors were white (23.80%), white and red (18.57%), red (13.70%), gray (13.17%), brown (9.50%), and black (6.03%). Moreover, the most frequently observed coat color patterns of the sampled goat population in the study area were plain (65.1%), followed by patchy (25.2%) and spotted (9.7%). Sex of animals affected ( $P < 0.05$ ) body weight and all of the body measurements except for ear length and tail length. The animals' location difference affected all body measurements ( $P < 0.05$ ), except for heart girth. The age of animals contributed significantly to differences in body weight and all linear body measurements. The correlation coefficient was consistently highest between body weight and chest girth in males ( $r = 0.90$ ) and females ( $r = 0.83$ ). Multiple regression analysis revealed that Chest girth was the most crucial trait in predicting body weight. There was no standard weighing balance for selling live animals at reasonable prices.

**Keywords:** Linear Body Measurements; Multiple linear regression analysis; Quantitative and qualitative traits.

## 1. Introduction

In Ethiopia, livestock is an essential and integral component of agriculture, the backbone of the economy in terms of its contributions to agricultural value-added and national GDP (ILRI, 2011). Ethiopia is one of Africa's largest countries in terms of livestock populations, comprising 54 million goats, 71 million cattle, 43 million sheep, 13.33 million equines, 7 million bee colonies, and 57 million chickens, excluding nomadic areas, and is genetically diverse. Although Ethiopia has a diverse range of large and small ruminants, their productivity has been constrained by numerous complex challenges. Indigenous goat breeds constitute over 95% and 99.77% of the small ruminant population of Africa and Ethiopia, respectively (CSA, 2022). In Ethiopia, the distribution of goats varies between highland and lowland areas. Approximately half of the goat population is kept by pastoralists in the lowlands, while the remaining half is found in small flocks on mixed highland farms. This distribution highlights the significant role goats play in pastoral and mixed farming systems across the country. Goats have a short reproductive cycle and a high multiplication rate compared to large ruminants.

Having developed certain valuable genetic traits, such as the ability to perform better under low conditions and climatic stress, tolerance to infectious diseases and parasites, as well as heat stress, these peculiar traits enable goats to cope with the stressful nature of the vast marginal lands in the region. Goats also have socio-cultural roles in traditional societies. They have often been referred to as the 'poor man's cow' and serve as an essential source of savings for the agrarian community, particularly in developing countries (Seyed et al., 2014). Understanding the existing diversity of management strategies among small-scale keepers (housing, watering, feeding, and health control) and their associated challenges would help develop effective intervention strategies. Characterizing a local genetic resource based on morphological traits plays a crucial role in the classification of animals, particularly in terms of size and shape, which can serve as a reasonable economic indicator (Okpeku et al., 2011). The goat population of Ethiopia has been phenotypically classified into 11 distinct kinds or major breed types, as well as five additional subtypes. However, genetic and molecular characterization revealed only eight distinct breed types or populations in the country. It's well understood that morphological measurements are a critical method used to evaluate and assess the characteristics of various animal breeds. These measurements can help to provide basic information on the suitability of the animals for their selection (Yakubu, 2010). Although phenotypic characterization is vital for breed identification and classification, it is relatively shallow in the South Gondar Zone. Moreover, previous works done by some scholars (Birara et al., 2021; Belete et al., 2022) are not detailed enough to fully explain the potential and physical characteristics of the breed in the zone.

Furthermore, it was area-specific in its coverage and expression of the potential of these animals. In addition to these facts, breed characterization is a prerequisite for animal conservation, documentation, and proper utilization (FAO, 2012; Gizaw et al., 2011). Moreover, the study area has a diversified goat population, but phenotypic characterization has not been conducted so far.

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