# Live Weight Estimation of Gwembe Goat (*Capra hircus*) from Measurement of Thoracic Girth

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## Abstract

Thoracic girth was taken and correlated with live weight from 41 goats (30 females and 11 males) in South Zambia under on farm condition. Live weight was estimated using a linear model. Coefficient of determination ($R^2$) values was 0.71. The predictive equation for the live weight from thoracic girth LV (kg) = (0.659 x TG) (cm) – 17.467 can be considered enough satisfactory.

## Keywords

Barometry, buck, body measurments.

## Introduction

Body measurements can be used to predict live weight fairly well in the situation where weighbridges are not available (Berge, 1977; Buvanendran et al., 1980; Goonerwardene and Sahaayuraban, 1983). The accuracy of functions used to predict live weight or growth characteristics from live animal measurements is of immense financial contribution to livestock production enterprises. The ability of the producer and buyers of livestock to relate live animal measurements to an easily obtainable measure is essential for a better production and value-based trading systems. This ability will also adequately reward livestock stockmen rather than the middlemen that tend to gain more profit in livestock production business, especially in the developing countries.

The objective of the present study was to estimate live weight based on a linear body measurement on Gwembe goat (*Capra hircus*) from Zambia. Being a meat purpose breed, with high hardiness, it seemed interesting to provide stockmen to an easy tool to esti-

mate the live weight of their animals.

## Material and Methods

### *Animals*

The data for this study were obtained from 41 goats (30 females and 11 males) from different flocks kept extensively in different farms of the Lusitu area, Gwembe Valley, at South of Zambia. Animals were kept under traditional management: no routine health management system is applied and the goats are routinely bred following heat apparition to rams under non controlled natural mating, and no supplementary feed is provided. Only those animals considered pure breed and of apparent good health were considered for this study. Field data collection was performed during August 2011 (dry season).

### *Live animal measurement*

Animals were weighed suspended on a hanging dynamometer. Thoracic girth was measured as the body circumference immediately caudal to the front leg and was measured with a flexible tape. Measurements were performed by different people.

### *Statistical analysis*

The PAST software (Hammer et al., 2001) was used to obtain the statistics of the two variables and to test a linear regression to obtain prediction equations of live weight.

## Results and Discussion

The results obtained for the studied animals (Table 1) showed that mean weight ranged between 13.1-32.7±5.4 kg and 12.0-27.1±4.8 kg for females and males respectively (Figure 1). Varying range of scatter observed in the weight distribution (CV between 24.7 and 26.2 %) can be attributed to the fact that the animals are all raised under slightly different management or environmental conditions. Both measurements presented a normal distribution. No statistical differences appeared between sexes for thoracic girth. Pearson (raw) correlation between live weight and thoracic girth was 0.84335. The lineal regression and the predictive equation for body weight are presented in Figure (2). Coefficient of determination ($R^2$) value was 0.71. From the obtained field data the formula LV (kg) = [0.659 x TG] (cm) – 17.467 could be established as a good predictor.

Lungu (in Lovelace et al., 1993) established another formula for Zambian goats (LV= [0.89 x TG] – 33.78, but it seems less accurate than the obtained in thus study (9.7 % of difference in our research, 210

in theirs). In this study, our animals were lighter than the studied by Lungu (average live weight = 31 kg for Gwembe females).

## Conclusion

This report has demonstrated that a prediction equation for live weight using the thoracic girth is possible and that this measurement can predict body weight with good precision. This observation agrees with many previous publications for donkeys (de Aluja et al., 2005), goat (Olatunji & Adeyemo, 2009), sheep (Afolayan et al., 2006; Parés, 2008), etc. The thoracic girth measurement is easily performed, being the distance around the body of the animal immediately behind the front legs. Probably a multiple regression with the addition of other measurements to chest girth would result in significant improvements in accuracy of prediction. However, under field conditions, live weight estimation using chest girth alone would be preferable because of difficulty of the proper animal restraint during measurement. This thus reduces the practical usefulness of using other body measurements in conjunction with chest girth.

But it would be ridiculous to say that this would mean that the animals with thicker thorax would tend to be more profitable in terms of reproduction. Selection according uniquely to thoracic girth is extremely risky and also dangerous. It must be an obvious truth that a male which gets valuable daughters is worth more as a breeder than another who has thicker thorax but gets mediocre and bad daughters. Stockmen must be convinced that the way a buck or she-goat breeds is the only really efficient way to test his worth, so the live weight is basically a tool to evaluate animals for meat purposes.

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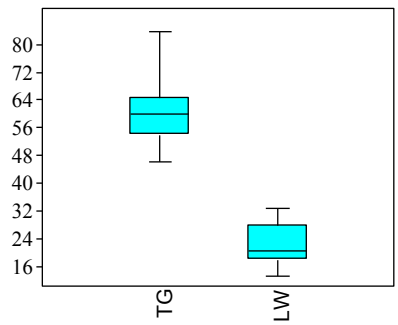
**Table (1):** Summary of live-measurement traits for GOATS (N=30 females and 11 males).
LW: Live weight (kg); TG: thoracic girth (cm).

| FEMALES | LV | TG | MALES | LV | TG |
|---|---|---|---|---|---|
| Min. | 13.1 | 46.0 | | 12.0 | 45.5 |
| Max. | 32.7 | 83.5 | | 27.1 | 72.0 |
| Mean | 22.0 | 60.0 | | 18.3 | 53.83 |
| Stand. Dev. | 5.429 | 7.761 | | 4.802 | 8.310 |
| Median | 20.4 | 59.8 | | 17.2 | 52.0 |
| Skewness | 0.245 | 0.739 | | 0.569 | 1.046 |
| Kurtosis | -1.180 | 1.473 | | -0.747 | 0.730 |
| CV (%) | 24.68 | 12.94 | | 26.18 | 15.43 |
| Shapiro-Wilk W | 0.936 | 0.957 | | 0.934 | 0.884 |
| P (normal) | 0.072 | 0.265 | | 0.453 | 0.118 |

Females:




Males:

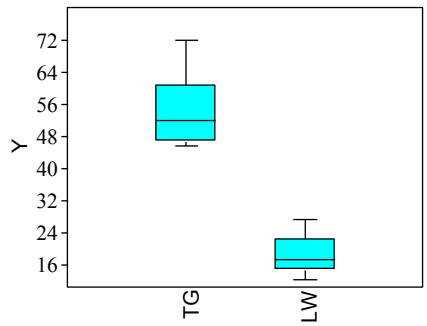



**Fig (1):** Box plot (average ± standard deviation) for live weight (LW) and thoracic girth (TG) form females and for males.

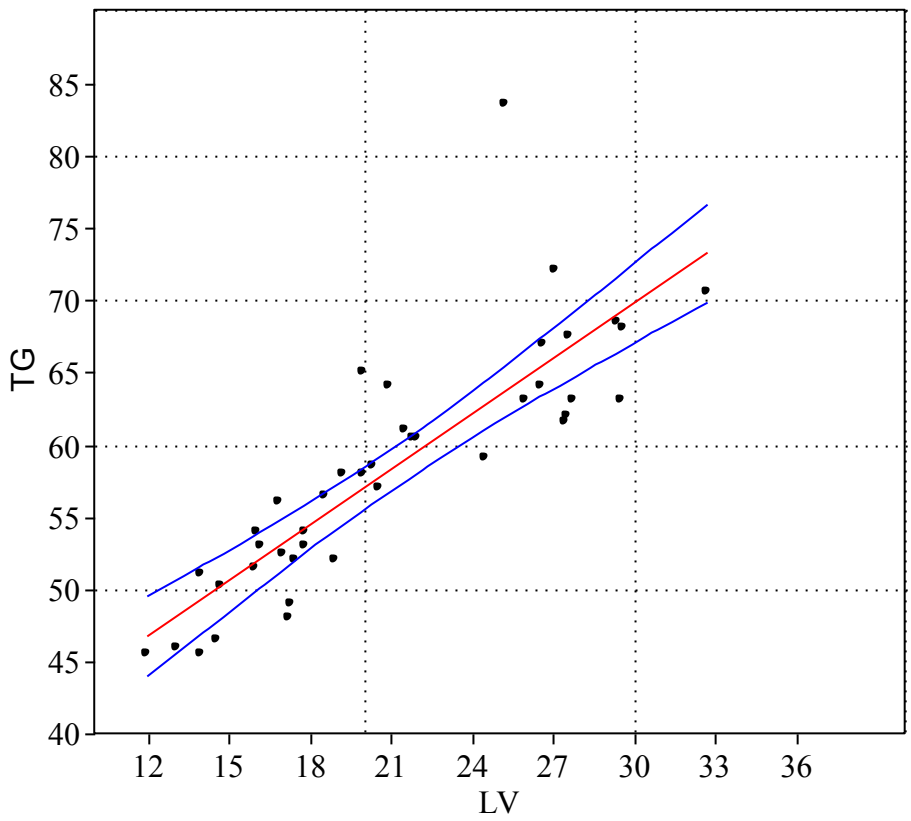



**Fig (2):** Linear fit for live weight (LW) and thoracic girth (TG) and RMA analysis. (95 % confidence)

LV (kg) = (0.659 x TG) (cm) – 17.467

RMA Regression
Slope a: 0.65974
Intercept b: -17.467
Std. err. a: 0.056768
Std. err. b: 11.189
Chi squared: 0
r: 0.84335
$R^2$: 0.71125
t statistic: 9.8012
p(uncorrel): 4.505E-12
Permutat. p: 0.0001
p(a=1): 5.282E-07
95% bootstrapped confidence intervals:
a: [0.5001; 0.8068]
b: [-25.38; -8.735]