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ESTIMATION OF LIVEWEIGHT OF SHEEP OF VARIOUS BREEDS FROM THEIR BODY MEASUREMENTS II. THALI SHEEP

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To develop a prediction equation for the estimation of liveweight of Thali sheep, body measurements such as height, girth and length and liveweight of 400 animals of this breed were recorded from Mianwali district. The mean height, girth and length were 26.12 ± .066, 29.77 ± .086 and 26.82 ± .085 inches, respectively. The average body weight was 63.85 ± .613 pounds. Significant correlations existed between various body measurements and liveweight of sheep. From the joint effect of body measurements, i.e., height (x_1), grith (x_2) and length (x_3), on the liveweight of sheep, the following equation was developed to predict the liveweight (Y) of Thali sheep :

$$Y = -234.6704 + (14.6005)x_1 + (5.5723)x_2 - (9.2750)x_3$$

The equation was tested for goodness of fit by comparing 20 randomly picked up observations to their estimates by means of chi-square test. The result showed that the equation fitted well with the data. The significance of regression was tested by analysis of variance and multiple correlation coefficients were calculated.

INTRODUCTION

Of the total area of Pakistan, 70.75 per cent constitutes range land, supporting millions of heads of livestock (Khan, 1970). Sheep form a major part of the livestock found on range areas of this country. However, inspite of the noticeable contribution made by sheep to the national economy, they have not received the required attention in respect of their management on scientific lines.

Among other things, the knowledge of liveweight of range sheep is considered very important for their proper management. A periodic check on liveweight can give a reasonable indication of the condition of animals. Also, equally important is to judge whether or not the animals are gaining and at what rate?

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A weighbridge is the device commonly used for weighing animals at livestock farms. Its use is costly, laborious and time consuming, especially on ranges where the animals are mostly kept in the interior. To avoid this cumbersome system of weighing animals, several formulae, especially for large animals such as buffalo and cattle have been developed. The present study aimed at developing a formula for predicting liveweight of Thali sheep using their body measurements such as height, girth and length.

MATERIALS AND METHODS

The data for this study were collected from various private sheep flocks of Thali breed maintained at different places/villages in Mianwali district. Four hundred animals were weighed and their body measurements such as height, girth and length were recorded. Those sheep in which at least first pair of permanent incisors had erupted were used. Such animals as were pregnent for over two weeks or were clipped for more than two weeks were not included in this study.

The following tools were used :

i. A long measuring tape.
ii. A spring balance with weighing capacity of 200 pounds.
iii. An easily adjustable 4×4 feet canvas (sheet) pan with strings attached at each corner for holding sheep while weighing.

The liveweight and body measurements were recorded in the morning before the intake of any feed. For weighing sheep, the canvas pan was hung with the spring balance. The three measurements taken were, height at withers, chest girth just behind the shoulders, and length from point of shoulder to the point of pin bone. While measuring, the animal was kept standing squarely with its head held up.

Methods of Analysis : The liveweight of sheep was considered as a dependent variable (Y), while height (x_1), girth (x_2) and length (x_3) of sheep were considered as independent variables. The method of linear multiple regression was used to estimate the liveweight by using independent variables. The partial regression coefficients were calculated which showed the relationship between the dependent and a particular independent variable, taking the other variables as constant.

The regression analysis was based on the method of least square. After obtaining the normal equation, this was transformed into the matrix notation. The inverse of matrix was worked out by inverting the matrix. It was then premultiplied with the right hand side (X'Y), which gave the values of unknown parameters β_j. The liveweights of a sample of 20 sheep, as actually recorded, were taken at random and compared with the estimated values obtained by using the regression equation. The actual and estimated liveweight values were tested with chi-square for goodness of fit.

To test the significance of multiple regression effect of independent variables on liveweight, the data were subjected to the analysis of variance and the F value thus calculated was tested for significance.

RESULTS AND DISCUSSION

The average height (x_1), girth (x_2) and length (x_3) of Thali sheep were $26.12 \pm .066$, $29.77 \pm .086$ and $26.82 \pm .085$ inches, respectively. The average liveweight was found to be $63.85 \pm .613$ pounds. The height, girth and length had the correlations of 0.648, 0.701 and 0.506 with liveweight in Thali sheep. The correlations among length, girth and hight were significant and ranged from 0.514 to 0.922.

Simple regression coefficients of liveweight on height, girth and length of these sheep showed an increase of 6.023 pounds in liveweight for every one inch increase in height, 4.977 pounds for each increase of one inch in girth and 3.652 pounds liveweight for every one inch increase in length. These regression coefficients were observed to be significant.

As all the independent variables affected the liveweight simultaneously, therefore, partial regression coefficients were calculated. The weight of these sheep increased by 14.6005 pounds for every one inch increase in height when the effect of other variables was held constant. Similarly, the liveweight increased by 5.5723 pounds with every one inch increase in girth when other variables were held constant, while the liveweight decreased by 9.2750 pounds for each increase of one inch in length. The equation so developed is given below :

$$Y = -234.6704 + (14.6005)x_1 + (5.5723)x_2 - (9.2750)x_3$$

where,

Y is the predicted liveweight in pounds and x_1, x_2, and x_3 are independent variables, showing height, girth and length in inches, respectively.

The chi-square test in respect of this equation revealed that there was no significant differences between observed and predicted liveweight of Thali sheep. The regression was tested by the analysis of variance showing the effect due to regression and deviation from regression. The value of F was 1487.39 which was highly significant (Table 1). These results are sported by the findings of Bozo (1967), Khan *et al.* (1978) and Khan and Subhan (1982).

TABLE 1. *Analysis of variance of data regarding body measurements and liveweight of Thali sheep*

Source of variation	Degree of freedom	Sum of squares	Mean squares	F. ratio
Due to regression	3	55108.06	18369.35	1487.39**
Deviations from regression	396	4892.24	12.35	

** = Highly significant

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