

Live Weight Estimation in Pelibuey Sheep Breeders using Digital Image Analysis

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ABSTRACT

The present work was carried out in the sheep unit belonging to the Guayabal Farm of the Mayabeque Province. 20 Pelibuey breeders were used in the same conditions of handling and feeding; with the aim of estimating the body weight of the breeders using Digital Image Analysis (DIA). Live weight was estimated from four methods (A and B) from the area of the animal in a digital image and by the method (conventional) that used the thoracic perimeter and weighing on the scale. For the processing of the images, the DIA 2013 software was used. With the weights estimated by the four methods (A, B, conventional and scale), a simple ANOVA was performed to determine if there were differences between the methods used. The results obtained showed that there are no significant statistical differences between the methods under analysis. The system proved to be reliable and less subjective than descriptive-type linear features and even instrumental measures.

Keywords

Pelibuey sheep, weight estimation, thoracic circumference, digital image analysis

Introduction

The sheep meat production process has as a central element the developing lamb at the foot of the sheep, both subjected to the extensive grazing process, whose efficiency depends on the reproductive performance of the sheep, the growth speed of the lambs and the availability of nutrients for the sheep and the lamb (Avila and Osório, 1996).

Hair sheep are an important potential source for the production of meat under tropical conditions, which until now has not been exploited to the maximum, present good adaptation to the tropical environment, which allows their exploitation in various types of systems, which They range from grazing with a low level of technology to intensive production systems, although with certain technical limitations to be resolved (Sanginez and Castellano, 1997).

The increase in economic gains within a livestock farm can be obtained with an efficient use of available resources, in this case food, since the good or bad management of the feeding of the animals is the number one factor that affects the production. However, the high cost of food makes its acquisition more difficult, the efficient use of nutrients depends on adequate supplementation, which is of vital importance in determining productivity (Cantú, 2008).

In the directives for the work and genetic and genealogical control of the Pelibuey sheep in Cuba, published by the Ministry of Agriculture (CENCOP, 1984) it is proposed to carry out a system of body measurements that allow characterizing the growth of the animals of this breed. Therefore, the objective of this work is to estimate the body weight of Pelibuey breeders through digital image analysis and compare it with traditional methods.

Methods

For the elaboration of this work, 20 sheep breeders of the Pelibuey breed belonging to the small ruminant area of the Guayabal Farm will be used. Animals from the breeder category were used, they were kept under the same handling and feeding conditions.

These animals had their thoracic perimeter measured and a photo was taken from the dorsal view with a reference object of known dimensions. Using a 6.2 megapixel Kodak C613 camera.

For the processing of the images, the DIA 2013 software was used, which made it possible to determine the area in pixels that each animal occupies (using the edge determination method) and using an object of known dimension (in the image). Then the live weight was estimated from the formulas proposed by Wang *et al.* (2008) and Schofield (1990).

Method A: $W = 360.44 \times A^{1.3006}$

Method B: $W = 368.10 \times A^{1.3499}$

Where: W is the estimated live weight in kilograms and A is the area in cm² of the animal in the image.

These animals were weighed on the scale and the weight was estimated by thoracic perimeter using the conversion table proposed by Ortiz *et al.* (1999).

To measure the thoracic perimeter, Castro (1982) was taken as a reference, who states that this is done with the measuring tape behind the back.

Data Analysis

With the estimated weights, a simple ANOVA analysis of variance was carried out to determine if there are differences between the methods used, using the statistical package SSPS Statistics v22.0.0.

Results

All the estimates of live weight (LW) were obtained by methods A, B and C and the one determined by the scale of the sheep under study. Table 1 shows the results of the simple analysis of variance (simple ANOVA) when comparing the PV estimated by the four methods (A, B, conventional and weighing on the scale) under study.

Table 1. Simple analysis of variance of the conventional method and by image analysis.

Method	Average (kg)	DS	± ES	CV (%)	S.I.G
A	28.73	4.82	1.08	16.77	NS
B	26.67	4.64	1.04	17.41	
Scale	28.65	6.24	1.40	21.79	
Conventional	28.30	6.10	1.36	21.57	

As can be seen in Table 1, there is no statistically significant difference in the estimation of live weight by conventional methods (weighing in scales and by thoracic circumference) and that estimated by digital image processing.

Discussions

In this regard, Negretti and Bianconi (2005) state that the digital analysis of images has proven to be a practical and easy system if we want to estimate the weights in the different domestic species.

Ochoa (2009) affirms that the method of digital analysis of images by determining the area does not offer, statistically, significant differences with the conventional methods.

We agree with what was stated by Pope and Moore (2002) who affirm that the importance of the method of estimating live weight through digital image analysis is given that it does not require physical contact between the operator and the animal. Reduces stress on animals and the possibility of accidents, thus favoring management actions.

These results indicate that it is a system that can be used to estimate live weight in Pelibuey sheep. In longer-haired breeds, the same results could not be obtained, but other formulas could be used in the estimation.

The system is faster, more reliable, and less subjective than descriptive-type linear features and even instrumental measurements. And it allows the results to be easily recorded in a permanent electronic file, which coincides with what was stated by Sakowski and Cytowski (1996).

Conclusion

By means of the digital image analysis method, it is possible to estimate live weight in Pelibuey breeders.

The formulas used to estimate live weight did not show statistically significant differences with the conventional thoracic girth method and weighing on the scale.

The digital image analysis method proved to be a viable method for estimating live weight.

With the application of this method, direct physical contact between the operator and the animal is avoided, favoring handling actions.

The method used allows the data to be digitally recorded, favoring its later use.

Limitations and Future Studies

- Expand the sample in future observations and use other categories.
- Create a software that allows calculations to be carried out automatically, as well as the determination of the body area by means of an edge detection system.

- Extend the study to other categories and animal species to know the behavior of the estimation of live weight through digital analysis of images.

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