PERFORMANCE MEASUREMENT INDICES ON THE BUYING BEHAVIOUR OF RAM BUYERS IN THE HIGHVELD MERINO CLUB

D du P S Jordaan, D Poonyth and O T Doyer

**Department of Agricultural Economics,
Extension and Rural Development
University of Pretoria
Pretoria, 0002
South Africa**

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Abstract

Merino rams are an important input in the Merino breeder's production process. Breeders need to make informed decisions when buying rams because of the influence that the ram will have on the characteristics of the herd, especially with regards to the characteristics of the animal that are deemed economically important. Before the advent of performance testing through objective measurement a system of subjective evaluation was used to determine the breeding value of Merino rams. The use of the subjective system of evaluation seemingly continues and the prevalence of this system of evaluation raises the question to what extent ram buyers are using performance measurement indices in aiding them in their buying decision. This study finds that performance measurements supplied to buyers are indeed used to determine the economic value of an animal. These performance measurements are, however, only responsible for determining a small proportion of the economic value of an animal.

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Introduction

The genetic characteristics of the sire are of paramount importance in domesticated and managed animal populations. The genetic and phenotypic characteristics of the sire are expressed in it's progeny which is of special significance where the characteristics have an economic and financial value.

A Merino ram can be regarded as a production input consisting of a collection of characteristics that are considered desirable or undesirable as dictated by the economic value of these characteristics. Because these characteristics are not explicitly traded in a market place there are no observable prices for these characteristics. However, the quantity and quality of each of these characteristics contributes to the final value of the ram. Therefore, each characteristic has an implicit price and associated marginal value.

Before the advent of scientific and objective performance measurements farmers used subjective measurements to determine the breeding value of specific rams at auctions. These measurements are seemingly still used at auctions to determine the economic value of an animal and this raises the question whether sufficient scientific and objective performance measurements are provided to potential buyers to make informed purchasing decisions. This paper attempts to quantify the utilisation and impact of the scientifically objective measures generated by animal improvement schemes on the buying behaviour of the members of the Highveld Merino Club.

Subjectively evaluated traits in ram selection

A general inquiry amongst Merino breeders reveals that, before the advent of performance recording and objectively measured performance indices, a subjective system of evaluating certain traits was used to determine the breeding value of specific rams. These subjective measurements mainly pertain to the build and wool of the animal. The subjective measurements of the build include characteristics of the head, body, front and hind legs, colour of the hoofs and the occurrence of split hooves. Evenness of crimp, softness of handling, variation in crimp, yolk characteristics, staple, tip, belly and points describe the characteristics of the wool (Olivier, Delport, Erasmus and Eksteen, 1987).

Roux (1961) has however pointed out numerous shortcomings of the subjective system of evaluation for Merinos and this was the precursor to the development of the objective system of evaluation.

Objectively evaluated traits in ram selection

The introduction of objective measurement as an aid in the evaluation of breeding stock was the first major step in modernizing stock evaluation techniques. The Merino breed in particular has been the subject of widespread research. Although breeders were initially reluctant to make use of performance measurement data, a large proportion of Merino stud breeders in South Africa currently make use of performance measurement data for evaluating their stock (Erasmus, 1990).

C.R. Henderson started developing the "mixed model methodology" in 1949 as an aid to handle unbalanced data, which characterise animal breeding problems (Henderson, 1984). Initially the methodology proposed by Henderson was viewed with much scepticism but it eventually led to the development of the "animal model" (Quaas & Pollak, 1980) that is generally regarded as the ultimate technique to evaluate animals for breeding purposes (Erasmus, 1990).

The "animal model" provides best linear unbiased predictions (BLUP) of breeding values, as deemed important by their economic value, for single or multiple traits. The high reliability of these predictions are of great practical value because evaluations of animals can be made across contemporary groups. This implies that, amongst others, animals from different studs can be directly compared (Erasmus, 1990).

The most common objectively measured traits used for the evaluation of Merino animals are clean fleece weight, mature body weight, mean fibre diameter and wrinkle score. Clean fleece weight and fibre diameter are considered as the most important objectively measured traits since income is the product of quantity and price. This is substantiated by the fact that clean fleece mass is the true measure of quantity and fibre diameter is the most important factor determining the price of Merino wool (Erasmus & Delport, 1987).

Merino veld ram clubs

The next step in the objective measurement of breeding values was to implement the system in practice. Veld ram clubs were established to enable the implementation among different breeders. There are currently 16 veld ram clubs operating across the South Africa. Ram lambs, at the age of weaning, are received at these centres and shorn. After a period of about six months they are shorn again and performance tested. The rams are then offered at a public auction after another period of about six months, with performance testing information, but with the breeder anonymous.

The fundamental aspects of the veld ram clubs are that the rams are raised under normal grazing conditions of the region, objective performance measurement information is generated and made available to prospective buyers, rams from different breeders receive the same treatment and prices are not influenced by the name and status of the breeder. After the sale, the breeder of each ram is announced (Poggenpoel, 1990).

In this paper a hedonic price function is used to determine the relative importance of Merino ram performance measurements on the auction prices of rams from the Highveld Merino Club. The paper is organised as follows: the next section gives a brief discussion on methodology used. Section 3 discusses the data and data source. Section 4 reports the empirical results. Section 5 is the conclusion.

Methodology: The hedonic price approach

Following Waugh(1928), pioneered the use hedonic prices when he evaluated the influence of quality factors such as colour, size etc. on prices of vegetable, . Since then the methodology has been used in various applications on agricultural and food products.

The basic assumption of hedonic price analysis is that consumer preferences are based on the characteristics of the good. Assuming that goods are composed of m attributes or characteristics (z_1, z_2,…,z_m) the utility function for a representative consumer is an amalgamated function of services or attributes, which relate to various characteristics as proposed by Ladd and Zober (1977).

$$U = U(Z_1, Z_2, \ldots\ldots , Z_m) \qquad (1)$$

where z_j is the amount of the jth attribute contained in the good. The level of each attribute achieved by the consumer depends on the quantities (Q_i) of different products and the amounts of the jth attribute contained in one unit of good i represented by x_{ij} in z_j. Then z_j can be formulated as follows:

$$Z_j = f_j(Q_1, Q_2, \ldots.. Q_n, x_{1j}, x_{2j}, \ldots.., x_{nj}) \qquad (2)$$

By substituting (2) into (1) the utility function can be expressed as function of level of attributes per unit of good and on the amount of consumed goods:

$$U = U(Q_1, Q_2, \ldots.., Q_n, x_{1j}, x_{2j}, \ldots., x_{nj}) \qquad (3)$$

The consumer maximizes equation (3) subject to the budget constraint I:

$$\sum_{i=1}^{n} P_i Q_i = I \qquad (4)$$

where P_i (i = 1, 2, …,n) is the unit price of the Ith consumed good. The solution to consumer maximisation problem, yields the linear hedonic price equation for the price of good i, i.e., $P_i = b_1 X_{i1} + b_2 X_{i2} + \ldots. + b_n X_{im}$ \qquad (5)

where x_{ij}, is the amount of attribute j associated with a unit of Q as it has been defined above and β_j is the marginal implicit price of the jth attribute and it is assumed constant (Angulo, Gil, Gracia & Sánchez, 2000).

The attributes of Merino rams are based on their ability to transfer desirable traits such as build and wool characteristics to its progeny. Ladd and Zober (1977) assume that each attribute can contribute positively or negatively to individual utility. They provide a methodology to assign monetary values to a product's attributes. For each ram the buyer purchases, the price paid for the ram should equal the sum of the marginal yields of the characteristics provided by the ram, multiplied by the marginal implicit prices of the ram's characteristics (Ladd & Zober, 1977).

Regression techniques have been used to determine marginal implicit prices. In such models the price of the product is the dependent variable and the attributes of that product are the independent variables. A similar approach is followed in this paper. Theoretically the model can be expressed as follows:

$$P_i = \alpha + \beta_1(LMI) + \beta_2(SVI) + \beta_3(VDI) + \varepsilon \qquad (6)$$

where P_I is the deflated price in Rand, LMI is the body mass index, SVI is the clean fleece index and VDI is the fibre diameter index.

Data and Data Source

The Merino Breeder's Society of South Africa provided the data used in this paper. The auction prices and performance measurements for individual rams from the Highveld Merino Club for the public auctions held during 1995, 1997, 1999 and 2000 were obtained. The indices of producer prices of slaughtered stock (sheep) and wool were used to deflate the prices of rams fetched at the respective public auctions to account for possible inflationary effects on the prices of the rams.

Empirical Results

Equation 5 was estimated using the simple OLS estimation procedures. The estimated result is reported in table 1 and table 2.

Table 2: Parameter Estimates and Marginal Values of Merino ram characteristics
(Deflated by the producer price index for wool).

Variable	Estimated Coefficient	t – Statisitcs
LMI	46.2644	7.6055
SVI	10.0453	2.4316
VDI	-48.0630	-4.6474
Adjusted R^2		0.2384
F – statistic		24.0649
Durbin Watson statistic		1.7304

Table 3: Parameter Estimates and Marginal Values of Merino ram characteristics
(Deflated by the producer price index for mutton).

5

Variable	Estimated Coefficient	t – Statisitcs
LMI	50.2037	7.7068
SVI	11.0388	2.4953
VDI	-51.7478	-4.6725
Adjusted R^2		0.2435
F – statistic		24.7063
Durbin Watson statistic		1.6581

The two suggested models are not entirely robust with adjusted R^2 values of 0.24, which is a very common phenomenon in hedonic equations due the cross-section nature of the data. . All the variables in the respective models have the respective sign and are statistically significant at the 5% level of significance indicating that the variables significantly explain some of the variance in the prices of rams from the Highveld Merino Club. The cross-section nature of the data suggests potential problems with heteroskedasticity. A diagnostic tests for heteroskedasticity was, however, not found to be problematic (ARCH LM test at the 5% significance level).

The presence of significant parameters is indicative that these parameters can explain some of the variance in the prices of rams from the Highveld Merino Club. The fibre diameter index of a ram has the greatest effect on price with a marginal value of between R48.06 – R51.75. This result can be expected since much emphasis is placed on the fibre diameter of a fleece since wool with a lower fibre diameter fetch higher prices. The price that a ram from the Highveld Merino Club fetches is also very sensitive to changes in the fibre diameter index with a percentage change in the fibre diameter resulting in a –3.58 percent change in the price of the ram.

The body mass index of a ram has the second biggest effect on price with a marginal value of between R46.26 – R50.20. From this result it can be concluded that buyers prefer heavier rams. The reason for this preference could be that wool producers would like to, on occasion, capitalise on good mutton prices whilst still producing wool. Heavier rams are therefore able to transfer the genetically desirable and economically important trait to it's progeny. Prices are also very sensitive to changes in the body mass index with a percentage change in the body mass index resulting in a 3.67 percent change in the price of the ram.

The clean fleece index of a ram has the smallest effect on price with a marginal value of between R10.05 – R11.04. This result is indicative that although the clean fleece index plays a significant role in determining the price of a ram, the effect that it has on the price of the ram is very low. Prices are also not very sensitive to changes in the clean fleece index with a percentage change in the clean fleece index only resulting in a 0.12 percent change in the price of the ram.

Given the low adjusted R^2 it can also be concluded that a buying behaviour is not exclusively influenced by the set of performance measurements generated by the activities of the Highveld Merino Club. Other, probably subjective, characteristics also play a role and this raises the question whether the data that is supplied at ram auctions is sufficient to aid a prospective buyer in making an informed decision when buying a ram.

Conclusion

It can be concluded that the performance measurements supplied to potential buyers of rams at auctions of the Highveld Merino Club can be effectively used to determine, to some extent, the economic value an of animal. Given the fact that these performance measurements are, however, only responsible for determining a small proportion of the economic value of an animal it can be concluded that an insufficient amount of objectively determined information which are supplied at public auctions to help potential buyers in making informed decisions. The lack of sufficient objectively determined information manifests itself in the continued use of subjective evaluation techniques that have been proven to be with numerous shortcomings.

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