Livestock Science 130 (2010) 70–82

Contents lists available at ScienceDirect

Livestock Science

journal homepage: www.elsevier.com/locate/livsci

Returns on investment in sheep and goat breeding in South Africa ☆

S.J. Schoeman [a,*], S.W.P. Cloete [b,c], J.J. Olivier [b,d]

[a] Department of Animal and Wildlife Sciences, University of Pretoria, Pretoria 0002, South Africa
[b] Department of Animal Sciences, Private Bag X1, Matieland 7599, South Africa
[c] Institute for Animal Production, Elsenburg, Private Bag X1, Elsenburg 7607, South Africa
[d] ARC: Animal Production Institute, Private Bag X5013, Stellenbosch 7599, South Africa

ARTICLE INFO

Keywords:
Genetic resources
Performance recording
Breeding objectives
Monetary value
Small stock

ABSTRACT

The small stock industry in South Africa is of crucial importance as 80% of the agricultural land is unsuitable for intensive agricultural production. The contribution of 19 resource sheep flocks and goat herds towards breeding objective formulation, genetic improvement and parameter estimation was summarized. Substantial genetic gains resulting from selection for a range of economically important traits were demonstrated, lending impetus to the development and extension of the National Small Stock Improvement Scheme (NSIS). Responses in monetary values in the respective participating small stock breeds ranged from R0.098 for the Dormer to R0.818 for the S.A. Mutton Merino per small stock unit per annum for animals born in the interval from 2000 to 2006. This response is well below what was attained in the resource flocks and in the best participating flocks and herds. Even with this less than optimal change on a national basis, the impact on the sectoral economy is substantial. When related to the cost associated with the NSIS, this improvement is highly cost-effective. The impact of research and development in the small stock industry is therefore substantial, and the small stock industry is foreseen to continue playing an integral role in the national economy.

1. Introduction

Livestock production plays an integral role in the South African agriculture. It accounts for approximately 48% of the total value of agricultural output during the season of 2005/2006 (Abstract of Agricultural Statistics, 2008). Approximately 80% of the agricultural land is unsuitable for crop production, while the largest part thereof is not even suitable for either dairy or beef production. The small stock industry is consequently of crucial importance in the South African livestock environment.

Although pedigree recording and selection already started in 1904 through the establishment of the South African Studbook Association, performance recording was initiated in 1956 by the then Department of Agriculture and Technical Services. Fleece testing in South Africa has been practiced as early as 1934, but the formal fleece testing facility at the Grootfontein College of Agriculture at Middelburg was inaugurated in 1965 (Erasmus and Hofmeyr, 1984). Since then, small stock improvement services in South Africa have undergone several changes necessitated by changes in demand, adoption of new production technologies and advanced technological (statistical) procedures. The present South African National Small Stock Improvement Scheme (NSIS), which is operated by the Animal Production Institute of the Agricultural Research Council (ARC) consists of an integrated pedigree and data recording system namely the INTERGIS. It currently provides breeding values for economically important traits to all participating members of all small stock species. These also include information in composite breeds that were developed over several decades as was dictated by needs, environmental limitations and market requirements. The most important of such breeds are the

☆ This article is part of the special issue entitled "10th World Conference on Animal Production (WCAP)" guest edited by Norman Casey.

* Corresponding author. 25 Coronata Street, Paradyskloof, Stellenbosch, 7600, South Africa. Fax: +27 21 8800174.
E-mail address: schalkc@elsenburg.com (S.W.P. Cloete).

1871-1413/$ – see front matter © 2010 Elsevier B.V. All rights reserved.
doi:10.1016/j.livsci.2010.02.012

Dorper (meat), Dormer (meat), Afrino (dual-purpose), Dohne Merino (dual-purpose) and Boer goat (meat). The investment in the research that led to the development of these composite breeds had an incredible economic impact on the South African small stock industry as shown by their popularity, which has resulted in the flowing over of genetic material to other countries worldwide.

The objectives and other attributes of the National Small Stock Improvement Scheme are broadly the following:

- To supply breeders with objective performance information to improve the efficiency of production through genetic improvement of economically important traits and improved management practices. This also means that the perceptions of breeders have to be changed to focus on traits of monetary value to their clients (commercial producers). The most important trait to be improved is net reproduction rate under natural production environments (Olivier, 1999).
- To provide useful information for research and for the refinement of breeding objectives and improved breeding programme design.
- To provide an important instrument for human capacity development.

Initially, this scheme was guided by research done on various research flocks and herds throughout South Africa, which played a major role pertaining to the formulation of breeding objectives, the demonstration of genetic improvement, the estimation of genetic parameters and the identification and characterization of new traits of importance.

This review focuses on the values and contributions of resource flocks and herds and the eventual progress made and financial advantages in the national sheep and goat populations. Focus will mainly be placed on the input and output during the past approximately 20 years.

2. South African small stock resource flocks and herds

The South African small stock resource flocks and herds can be subdivided into two broad categories, namely research flocks and prestige flocks or studs maintained for demonstration. The first category mostly involved selection experiments and genotype evaluations that were carried out in a commercial environment. For the purpose of this discussion, a small number of flocks maintained for conservation purposes will be grouped with the first category. The latter category mostly involved flocks that were maintained under traditional conditions for stud breeding, but demonstrating scientific formulated breeding objectives. Economic realities resulted in the levels of management and nutrition being toned down in recent years in these flocks, with managerial inputs being more comparable to the commercial environment. Even though the main objective of some so-called stud flocks has not always included research, these flocks still yielded important scientific information. All flocks are mostly maintained by agricultural research and training institutes, that are situated throughout the sheep producing areas.

Olivier (1999) stated that the sheep selection experiments of the latter half of the 20th Century failed to grasp the imagination of the sheep farming public at large. In contrast, the public were better able to identify with the more traditionally managed flocks or studs that were maintained alongside. However, both categories contributed markedly to the improved understanding of scientific sheep breeding by the research community, and to the present South African sheep industry structures. These flocks and herds are largely self-maintaining and require no additional financial input. The important resource flocks contributing to the South African ovine knowledge base are therefore described below.

2.1. Research flocks and herds

The small stock resources available for genetic experimentation are listed in Table 1. The most important results from the respective flocks and herds will be discussed briefly.

2.1.1. Klerefontein Merino flock

Responses to selection for economically important traits in this flock, as derived from deviations from the Control flock, were disappointing in an initial study (Olivier, 1981). When it became possible to separate genetic trends from environmental trends by mixed model methodology, it was clear that genetic drift in the Control flock masked trends in live weight and clean fleece weight in the selection lines (Erasmus, 1988, 1990). It was speculated that the unintended genetic change in the Control line could be a function of random genetic drift and/or unintentional selection by the flock manager. The flock yielded data for parameter estimation for hogget live weight and wool traits (Erasmus et al., 1990; Snyman et al., 1996b), hogget traits (Snyman et al., 1998a) and reproduction (Delport, 1989; Snyman et al., 1998a; Olivier et al., 1998b). The flock was disbanded in 1983 in favour of other resource flocks that were maintained on Klerefontein.

2.1.2. Koopmansfontein Dorper flock

The Koopmansfonten Dorper flock was established with the view to breeding for different objectives deemed important in meat sheep breeding. Direct selection for weaning weight in ewes and rams in Group 1 resulted in the fastest direct genetic gain in this flock (Fig. 1; Neser et al., 1995). The second fastest direct genetic gain was found in the line selected according breed standards, leading Neser et al. (1995) to suggest that the breed standards must have emphasised animal size during the term of the selection experiment. The relatively poor performance of the line selected for weaning weight in ewes and for post-weaning feedlot gain in rams was unexpected. It could be that selection for post-weaning growth in the feedlot could select for other gene combinations compared to direct selection for weaning weight under pasture conditions.

Maternal genetic trends were much less pronounced than direct trends, with no clear selection line effects (Fig. 2; Neser et al., 1995). There was some evidence of an initial response in maternal breeding values in Group 2, but it was not sustained. The selection strategies applied therefore did not appear to have a marked influence on maternal breeding values for weaning weight in this flock.

2.1.3. Tygerhoek Merino flock

Initial results involved three lines, namely a line selected for an increased clean fleece weight with a check on fibre diameter (CFW line), a line selected for an increased wool S:P follicle ratio (S:P line), and an unselected Control line