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Sires for more valuable lambs

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ABSTRACT

Specialist terminal sire breeds offer several advantages to the commercial farmer, particularly their ability for rapid change in relevant traits in response to market signals. The production, survival and disease resistance benefits resulting from the hybrid vigour in the crossbred progeny have also been widely documented. Terminal sires breeds also provide for efficient utilisation of between breed differences in carcass quality and mature weight. However, terminal sires are presently under utilised by the NZ sheep industry.

In future this situation is expected to change. Long term trends suggest that carcasses will be paid for on the basis of weight of lean meat. In addition, terminal sire breeders are increasingly using performance recording systems allied with methods of estimating carcass composition, both of which have markedly improved in recent years. Terminal sire breeds are the logical method to distribute major genes affecting growth and carcass quality. The identification, characterisation and "packaging" of these genes will become increasingly routine.

Keywords: Sheep, terminal sires, breeds, meat, genetic selection.

INTRODUCTION

The use of terminal sire breeds is at its lowest level in the NZ industry for over 60 years. This is despite the importation of new terminal sire breeds to NZ, processing trends favouring the greater use of these breeds as meat sires, and the introduction of advanced breeding technologies for their improvement. Probable reasons for this situation are briefly outlined, as are the benefits of their present and future use. Finally a prediction about their future impact is made.

Historical use of terminal sire breeds in NZ

The proportion of breeding ewes mated to terminal sires in NZ has varied widely over the past 100 years. Their use increased dramatically after the start of the frozen meat industry, remained stable for the next 20 years, and has declined steadily over the last 40 years. In 1962, 29% of all adult rams were from terminal sire breeds. Equivalent figures in 1977 and 1989 were 16% and 10% respectively (Carter and Cox, 1982; Anon, 1990). Based on a lambing percentage of 100% and the need to retain replacement stock from purebred progeny, it can be estimated that in excess of 40% of lambs slaughtered in 1960 were from terminal cross sires, declining to 13% in 1989. Independent estimates (Anon, 1995a), suggested terminal sire crossbred progeny comprised 14% of lambs slaughtered in 1993.

The low interest in producing terminal cross progeny has been ascribed to many factors. These include the difficulty of obtaining quality replacement females, and lower culling rates in purebred female progeny. However, external factors are likely to have been the major cause. Initially their decline in use was caused by a switch in the type of lamb required by our overseas markets, from a "down-cross" lamb suited for the British market at the time, but which contained excessive fat compared to today's customer requirements, to a leaner carcass where less emphasis was placed on conformation. Usage of the Southdown breed, which was especially

suited to production of this carcass type, declined dramatically as premiums for "down-cross" lamb transformed into penalties. In 1960, 27% of all adult breeding rams were Southdowns, while in 1989 the figure was less than 0.6%. This change masked a smaller increase in the larger terminal sire breeds such as the Suffolk and Dorset breeds from 1.6% in 1960 to around 9% in 1989. These larger breeds did not attain the earlier popularity of the Southdown, partly because the benefits of their use were masked by fluctuations in relative meat and wool prices. For example, in 1987/88 lamb meat only provided 6% of sheep and beef farms' gross revenue, while wool accounted for 45%. In 1993/94 the proportions were 22 and 28% respectively (Anon, 1995a). Until recently, poor incremental returns for above average carcass weights were also a major disincentive. These limited the full benefits of faster growing terminal sire crossbred progeny to drought prone areas, where there are major difficulties in achieving good carcass weights with purebred animals.

Advantages of terminal sire breeds

However, terminal sires do have several important advantages that should not be overlooked. The first is that they allow the rapid introduction of specialist genetics, tailored for the particular market niche, in sale lambs. Specific examples of this include the leanness and large eye muscle size of Texel crosses and the rapid growth of the Oxford Down (McEwan *et al.*, 1988; Clarke *et al.*, 1988). Secondly, they allow improvements in the biological efficiency of meat production, by the use of dam and sire breeds differing in genetic size. The smaller dam breed, which requires less food for maintenance, produces a large rapidly growing hybrid offspring. Estimates in other species suggest up to an extra 20% production of lean meat per MJ of food costs if the sire breed is two-fold heavier in mature weight than the dam breed (Fennessy & Thompson, 1989). In practice the benefits in growth and carcass composition under NZ conditions have been well described by Clarke & Meyer (1982). This work

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showed increases in lamb production (a combination of lamb survival and growth rate) of around 30% for progeny from the heavier mature weight terminal sire breeds, such as the Dorset and the Suffolk, relative to purebred Romney progeny. The introduction the Texel and Oxford Down in the mid-eighties with their subsequent release in 1990, followed by the American Suffolk more recently, has also had an impact. Obviously, the exact benefits depend on the breed and strain used, as these can vary widely. For example, in a comparison of Texel x Romney and purebred Romneys from a Romney flock with a history of intensive performance selection (McEwan *et al.*, 1994), Texel x progeny were approximately 9% heavier at 8 months of age. In a Merino cross comparison (McEwan *et al.*, 1995), Dorset x, Texel x, and Oxford Down x Merino animals had 30, 18 and 25% heavier liveweights respectively at 8 months of age compared to purebred Merinos. Thirdly, cross-bred progeny exhibit substantial hybrid vigour, and although it has only a small effect on lamb growth (0-9%; Clarke *et al.*, 1982a), it also affects other traits of economic importance, such as lamb survival to sale and resistance to disease. McEwan *et al.*, (1994) reported two- to three-fold lower faecal egg counts in Texel x Romney progeny relative to pure bred Romneys, and in another experiment (McEwan *et al.*, 1995) significantly higher antibody levels in Texel x, and Oxford x Merino progeny relative to pure Merinos. While these experiments did not estimate the proportion of hybrid vigour, they do suggest hitherto undescribed economically important benefits may accrue from the use of these terminal sire breeds. However, lower wool yield at slaughter is often a disincentive to the use of terminal sires. In the longer term a change in the method of payment for pelts could alter this differential.

Market trends favour increased terminal sire use

Obviously, the likely future use of terminal sire breeds will depend on market trends and these all support increased use of terminal sires. Increasingly, carcasses are being further processed prior to export. As costs of such processing are carcass based, yield of lean meat will become the primary criterion for financial reward, with penalties for excess fat content. Thus the heavier carcasses produced at the same age by terminal cross lambs are likely to be appropriately rewarded in future, as will carcasses with an enhanced yield of lean meat. These trends are already present as emphasised by the relative economic values estimated by the NZ Animal Breeding Trust of \$2.40 per kilogram of lean and -\$1.80 per kilogram of fat. As post slaughter carcass evaluation technologies improve it is expected that these differences will be maintained or increase further.

Performance selection in terminal sire breeds

Another advantage that can be obtained by the use of terminal sires is that selection pressure can be concentrated solely on traits required to achieve increased returns from the sale of meat. In comparison, dual-purpose breeders have to direct a considerable proportion of available selection pressure on dam production traits, and this reduces progress in the meat traits. Of course this is only useful if well defined genetic evaluation systems are available and the genes identified can

be widely disseminated. In the past there has been much criticism of the lack of performance-based selection in these breeds. However, this has altered in the past decade. Major advances in live animal evaluation systems have been achieved. Ultrasonic assessment of carcass composition is now widely utilised in the terminal sire breeds. Coupled with this has been the estimation of the economic worth for changes in lean and fat content, and accurate estimates of the genetic relationships between carcass components and their ultrasonic predictor traits. Performance selection, based on this technology, will more than double the increase in carcass return compared with selection based on liveweight alone. Inclusion of computed tomography (CT) into evaluation systems could potentially increase this more than 3 fold (Table 4). The availability of a CT machine at Lincoln University for animal measurements now makes the use of this technology in NZ feasible. These measurement techniques are expensive, so elite animals need to be widely used to disseminate their superior genes. Previously the small flock sizes of the terminal sire breeding flocks were an impediment. However, the introduction of advanced genetic evaluation systems and use of laparoscopic AI allow both across flock and across year genetic evaluation of individuals and the wide dissemination of the genes of those rams identified as superior. These procedures are presently being used by terminal sire breeds in Great Britain and the rate of genetic progress achieved is near the maximum possible (G. Simm pers. comm.). In NZ, artificial insemination is now widely used in the Texel breed and they have recently combined this with a progeny testing scheme for elite sires coupled with a full carcass evaluation procedure (Anon 1995b). Together these technologies provide a powerful vehicle to improve returns from the use of terminal sire breeds by the commercial farmer.

TABLE 4: Expected responses per unit of selection pressure (i) using a lean growth index, based on a relative economic values of \$2.40 and -\$1.90 per kg change in carcass lean and fat respectively using a variety of predictor measurements (from Jopson *et al.*, 1995).

| Selection traits measured | lean (kg) | fat (kg) | \$ |
|--------------------------------------|-----------|----------|-----|
| liveweight (LW) | +0.26 | +0.14 | 34 |
| LW + ultrasonic fat depth | +0.24 | -0.01 | 61 |
| LW + ultrasonic fat and muscle depth | +0.25 | -0.03 | 65 |
| LW + Computed Tomography | +0.37 | -0.17 | 121 |

The future

In future, the identification and use of major genes for growth and carcass quality will provide a further major incentive for the use of terminal sire breeds. These genes are actively being sought by researchers throughout the world, hastened by the rapid advances of DNA technology. Any genes identified pose few problems in consumer acceptance as they are essentially a "natural" part of the variation present in the sheep species. A major advance has been the construction of a sheep genetic map (Crawford *et al.*, 1995).

Already rare gene variants of potential economic importance in growth and carcass traits have been identified in commercial species. Examples include the double muscling