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Ram Focus – matching rams to buyer flocks

N.B. JOPSON AND P.R. AMER

Abacus Biotech Limited, PO Box 5585, Dunedin

ABSTRACT

A new software package has been developed to assist ram breeders to target rams to buyers' flocks. "Ram Focus" leads the potential buyer through a short series of questions relating to the buyer's current levels of animal performance, aims and future expectations. The answers to these questions are used to calculate economic values for individual traits, which are subsequently combined into an index customised for the buyer. The end result is that Ram Focus re-ranks the suitability of rams for alternative commercial flocks. Examples are presented of how the suitability of rams changes between commercial flocks, first using examples of differing reproductive performance, and second, differences in expectations of a drench failure.

Keywords: Sheep; economic weights; breeding ram; genetic improvement.

INTRODUCTION

A feature of the New Zealand sheep industry is the diversity of environments in which farming takes place. Add to this international markets that undergo periodic fluctuations due to exchange rates, consumer trends, political instability and the like, and choices about lifestyle and direction made at the level of individual farms, it becomes clear that the process of optimising ram purchases for a given property is no trivial task. Conventional wisdom has been for the ram buyer to purchase rams from a ram breeder with a similar breeding objective, so that the buyer is carried along by any genetic improvement made in the breeder's flock. A large effort in recent years has gone into educating the sheep industry about estimated breeding values (EBV) and on how they can be used (Geenty, 2001). As a result, there is increasing use of EBVs to aid in ram-purchasing decisions within a breeder's flock, and across flocks where across-flock EBVs are available (Clarke, 2003).

There are a number of techniques that can be used to combine the EBVs in order to make optimal progress across the wide range of traits that can be evaluated within Sheep Improvement Limited (SIL). Techniques like independent culling levels, in which animals are culled on the basis of a threshold for a single trait, or EBV, regardless of how they perform in all the other traits, are often very inefficient for making optimal progress towards a particular breeding objective. Breeding indexes that incorporate weightings applied to each of the various EBVs to give an overall ranking for rams allow a farmer to balance the contribution of the various interacting traits in order to optimise the overall genetic gain. Ideally, these weightings should be expressed in economic terms, although this is not always possible. Breeding organizations such as SIL have invested in developing industry-standard indexes to simplify the selection process for their ram-breeding clients. Sub-indexes have been developed for growth, meat production, wool production, reproduction, parasite resistance, and an overall index bringing together all of the available information (Amer, 2000). There is also differentiation between terminal and dual-purpose roles in commercial sheep production.

These indexes are a major step forward in the sheep

industry, particularly because individual breeders often sell rams across a broad range of commercial farm types. However, a shortcoming for the application of these indexes to assist ram buyers is that the economic weightings are calculated to match an industry average farm, while individual properties often deviate significantly from industry averages. The economic value for a given trait is not necessarily linear throughout its range. For example, the value of increasing the number of lambs born per ewe lambing depends on the mean fertility (reproductive rate) of the flock (Amer *et al.*, 1998). When the number of lambs born per ewe lambing is low, the value of producing an extra lamb born per ewe is high. But when lambing percentage is already high, the value of producing the extra lamb is greatly reduced, and can become negative under some circumstances. This is because survival of triplet lambs is very much lower than either single or twin lambs and the increase in lambs born is offset by both an increase in mortality and a reduction in lamb weaning weights. Furthermore, the relative importance of maternal versus growth and carcass traits in ram selection depends to a large extent on the proportion of the ram's daughters expected to be kept as replacements.

Ram Focus was developed to address the differences among commercial sheep farms. It does this by surveying each ram buyer to obtain farm specific performance parameters and then uses the survey results to customize a selection index to rank rams for that buyer.

METHODS

Survey questions

The prospective ram buyer is asked a number of questions relating to their flock structure, performance levels and future expectations for products and their returns. Ideally, the buyer should be interviewed by a trained operator to ensure the integrity of the survey, but the questions have been designed to be as simple as possible. In this way, training requirements should be minimal. The nature of genetic improvement is that the gains are not rapid, but they are permanent and cumulative. As such, the survey questions collect information about current levels of performance, and have

a time horizon of five years for the future product expectations and returns. The survey comprises 23 questions divided into five categories, namely:

General flock information

- Purpose for which the rams are being purchased (e.g., terminal sire, or for a given proportion of ewes retained as replacements)
- Normal lifetime of the ram in the flock
- Average mating ratio

Future pricing estimates

- Expected return for a 17 kg carcass in five years time
- Expected premium for an increase in carcass weight in five years time
- Expected price for wool in five years time

Reproductive information

- Scanning percent (lamb foetuses observed per ewe scanned if known)
- Lambing percent at docking (lambs docked per ewe joined if known)
- Lamb survival rate for single-born lambs (lambs alive at docking per lamb born)
- Lamb survival rate for twins
- Lamb survival rate for triplets
- Lamb survival rate for lambs born to hoggets
- Proportion of the ewe lambs retained that lamb as hoggets

Carcass performance

- Target carcass weight for ram lambs
- Target carcass weight for ewe lambs
- Proportion of ram lambs graded overfat at slaughter
- Proportion of ewe lambs graded overfat at slaughter
- Proportion of ram lambs graded underfat at slaughter
- Proportion of ewe lambs graded underfat at slaughter
- Proportion of lambs drafted on the basis of GR rather than weight or age

Additional trait information

- Proportion of lambs shorn prior to slaughter
- Proportion of lambs sold as stores
- Risk of drench failure in the flock (Nil, low, medium and high)

Index calculation

The answers to the survey questions are translated into parameters that are in turn incorporated into equations defining the economic weights applied to individual EBVs. For numbers of lambs born, parasite resistance and the discounted genetic expressions coefficients, the equations applied constitute approximations of the more sophisticated models described by Amer *et al.* (1998), Amer *et al.* (1999) and Amer (1999), respectively. The equation for fat is based on assumptions that a group of animals slaughtered will follow a normal distribution, and based on this distribution, genetic differences in ram EBVs for fat depth will change the proportions of ram and ewe lambs grading over- and underfat. Changes in the percentages of animals sold as stores changes the emphasis on weaning weight versus carcass weight in a similar manner as described by Amer (2000).

RESULTS

An example for one flock and four hypothetical ram buyers

The following example considers four commercial farmers seeking to purchase rams from the same stud breeder. There is a total of 1360 rams in the list of rams available for selection. Each of the farmers has a unique set of conditions in which the ram's descendants must perform. The survey answers for each of the four ram buyers are presented in Table 1. Buyers A and B have exactly the same levels of performance and price

TABLE 1: Answers to the Ram Focus survey for four hypothetical buyers

	Buyer A	Buyer B	Buyer C	Buyer D
Description	Average performance, no internal parasite problem	Average performance, internal parasite problem	High fecundity, poor survival	Low fecundity, high survival
Proportion ewes retained as Ram retention (years)	35% 3	35% 3	35% 3	35% 3
Mating ratio (rams: ewes)	1:100	1:100	1:100	1:100
Pricing estimates	MWBES*	MWBES	MWBES	MWBES
Scan percent	130 – 150%	130 – 150%	>180%	110 – 130%
Dock percent	110 – 130%	110 – 130%	150 – 180%	<110%
Survival (singles, twins triplets) %	90, 85, 55	90, 85, 55	90, 75, 55	95, 90, 65
Current carcass weights (rams, ewes) kg	17, 15	17, 15	17, 15	17, 15
Percentage overfat (rams, ewes)	2-3%, 5-6%	2-3%, 5-6%	2-3%, 5-6%	2-3%, 5-6%
Percentage underfat (rams, ewes)	<10%, <10%	<10%, <10%	<10%, <10%	<10%, <10%
Percent drafted for GR	50 – 90%	50 – 90%	50 – 90%	50 – 90%
Percentage shorn for slaughter	90 – 100%	90 – 100%	90 – 100%	90 – 100%
Percentage sold as stores	10 – 20%	10 – 20%	10 – 20%	10 – 20%
Probability of drench failure	Very low	Very high	Average	Average

* New Zealand Meat and Wool Board Economic Service estimates

TABLE 2: Weaning weight (WWT), carcass weight (CW), number of lambs born (NLB) and adult faecal egg count (AFEC) EBVs, SIL dual purpose overall (DPO) index and the Ram Focus index ranks for five rams considered for purchase by four hypothetical ram buyers

	EBV's					DPO rank	Ram Focus index ranks			
	WWT	CW	NLB	AFEC	SIL DPO		Buyer A	Buyer B	Buyer C	Buyer D
Ram 1	2.22	1.57	0.160	-26.9	833	10	1	3	2	1
Ram 2	1.38	1.00	-0.014	-53.4	713	42	176	9	15	46
Ram 3	2.43	1.85	0.058	-31.2	707	51	8	65	11	14
Ram 4	1.41	1.21	0.093	-28.8	643	111	16	40	57	15
Ram 5	2.18	1.47	-0.020	-29.1	560	244	76	106	18	7

expectations, and differ only in that Buyer A has a very low expectation of a drench failure, while Buyer B has a high chance of having a drench failure. Buyers C and D have similar production figures except for Buyer D having high fecundity and poor survival, while Buyer D has average fecundity, but high survival rates.

The results from Ram Focus for six rams are presented in Table 2, along with some key EBVs and the SIL DPO index. The results demonstrate the kind of re-ranking that can occur when the breeding objective varies significantly between properties. Ram 1 demonstrates that some rams can be expected to perform well in a number of differing circumstances. This ram had high EBVs for weaning weight (WWT) and carcass weight (CW), and the highest EBV for number of lambs born (NLB). He was also the least favourable for adult faecal egg count (AFEC), but he was not greatly inferior to the other rams for this trait.

The other four rams have been selected to demonstrate how individuals can change index rank for differing breeding objectives. Rams 2 and 3 demonstrate differences in index rank coming from changes to the relevance of a single trait (in this case internal parasite resistance, for Buyer A versus Buyer B). Ram 2 rises 167 places and Ram 3 falls 57 places when the value of parasite resistance changes from having very low to having high value within the flock. Ram 2 has the lowest EBV for WWT and CW, and the second lowest EBV for NLB, but its EBV for AFEC is so far superior to any of the other rams that when the breeding object includes heavy emphasis on this trait, the ram's overall economic merit improves dramatically. While Ram 3 has the highest EBVs for both WWT and CW, its low value for AFEC means that animals with more favourable parasite resistance EBVs rank above it when parasite resistance is an important component of the overall breeding objective.

Rams 4 and 5 demonstrate the changes in rank that can occur when the reproductive performance varies between high fecundity with low survival (Buyer C) and low fecundity with high survival (Buyer D). The economic value of Ram 4 is higher in the low fecundity situation compared to the high fecundity due to the highly favourable EBV for NLB. When fecundity in a flock is low, the value of addition lambs is relatively high. However, when fecundity is already high (i.e., Buyer C), the value of increasing fecundity further, although still positive, is greatly reduced. This puts greater emphasis on the other traits like WWT and CW. As Ram 4 is only moderately favourable in these traits, his overall

performance is not worth as much to Buyer C as to Buyer D and so his value index ranking falls. Ram 5 demonstrates the reverse situation, in which the unfavourable EBV for NLB is less of a negative to Buyer C who already has good fecundity than to Buyer D who would still benefit significantly from an improvement in fecundity.

DISCUSSION

The software is initially aimed to be operated by SIL technical advisors to aid in ram purchase or selection decisions, and ultimately by ram breeders themselves. Ram Focus demonstrates that when the average animal performance for a given ram breeder or buyer differs significantly from the industry average, that the best sires for those situations may be significantly different from those that rank well on an industry average basis. This does not negate the need for the ram buyer to identify ram breeders or breeding groups with similar breeding objectives to their own. It does allow the ram buyer to select the rams best suited to their own unique circumstances from either within- or across-flock analyses once the breeder or breeding group has been selected. The questionnaire has been set up with the goal of taking a matter of only a few minutes to complete, but to gain sufficiently detailed information to enable calculation of trait economic values that are better suited to an individual property. Default values are important in keeping the survey simple, and a number of the defaults are updated based on answers entered for other questions. For example, if the farmer knows lambing percentage at pregnancy scanning and at docking, then the survival rates of singles, twins and triples are automatically updated.

In addition to the benefits already discussed, Ram Focus also provides a basis for breeders to use results from all of their buyers to modify their own indexes to better suit their clients future needs. The questionnaire effectively gives them a survey of the breeding objectives for their entire clientele. However, the breeders must bear in mind that they need to be forward looking, as the consequences of their current selection decisions are much longer term than those of commercial ram buyers.

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