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Sheep Updates 2003 - Plenaries

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SHEEP UPDATES

Biosecurity in the sheep industry will improve production and profits

Ashley Mercy, Department of Agriculture, Western Australia

KEY MESSAGES

Biosecurity planning is an essential part of reducing the risk of diseases and other threats to livestock industries. Lack of effective biosecurity procedures by individual sheep producers can result in costly incursions of diseases and adversely impact on profitability.

The WA Sheep and Goat Industry Biosecurity Plan provides a framework for enhancing biosecurity for these industries in WA. The challenge now is to ensure widespread involvement of industry, government, individual farmers, veterinary consultants and other industry stakeholders in implementing the Plan and addressing actions requiring attention. Livestock agents and sellers of breeding stock can play a pivotal role in encouraging clients to adopt sensible biosecurity procedures when purchasing livestock.

Veterinary and agricultural consultants can assist producers in developing and implementing individual farm biosecurity plans and protocols.

INTRODUCTION

Biosecurity planning is an essential part of reducing the risk of diseases and other threats to livestock industries. Lack of effective biosecurity procedures by individual sheep producers can result in costly incursions of diseases and adversely impact on profitability.

The development and implementation of biosecurity strategies have often been regarded as the responsibility of commonwealth and State governments. However, the devastating outbreak of foot and mouth disease in the UK and the world-wide spread of Bovine Sporadic encephalopathy (BSE) in recent years have highlighted the need for all stakeholders to work together to develop a comprehensive biosecurity package for the livestock industries.

In 2000, the Department of Agriculture Western Australia recognised the need for key industry organisations to work with government on developing strategies to reduce the risk and manage the impacts of key threats to the sheep and goat industries.

REVIEW

The process of managing the key threats to the sheep and goat industries involved identifying key threats, assessing their impact and risk and then developing plans to address them. This task was oversighted by an industry chaired Working Group.

The Sheep and Goat Industries Biosecurity Working Group (WG) was established in 2000 and comprised representatives of the major WA sheep and goat industry organisations, Department of Agriculture, livestock agents, Health Department, processors, livestock exporters, individual producers and private veterinary consultants. The WG identified a number of key threats and discussed these at a major industry workshop.

Threat identification

The major threats to the sheep and goat industries were subjected to in-depth strategic assessments by Department of Agriculture specialists. These threats included exotic diseases, surveillance, Johne's disease, liver fluke, footrot, farm biosecurity, animal welfare, food safety and residues.

The disease threats were ranked by both qualitative and quantitative analysis of the amount of damage the threat would cause to the industry if it became established in Western Australia.

Each threat was scored against seven criteria in a semi-qualitative assessment. The scores were weighted according to their perceived relative significance and summarised to give an overall score for the threat. An external assessment of the economic impact of the major disease threats to Australia and Western Australia was also commissioned.

Strategic assessments were considered as part of a draft plan, which was discussed with key industry stakeholder groups (industry organisations) prior to compiling the final plan. After final endorsement by the WG and stakeholders, the Sheep and Goat Industries Biosecurity Plan was launched in August 2002.

Full details of the Sheep and Goat Industries Biosecurity Plan for Western Australia and the underpinning strategic assessments can be found on the Department of Agriculture Western Australia's website at: www.agric.wa.gov.au.

KEY THREATS

The Sheep and Goat Biosecurity Plan identified key threats to these industries in Western Australia and makes recommendations for addressing these threats. Importantly the Plan identifies an action plan for each of the 96 recommendations and allocates responsibilities for each of these. The following is a summary of the major threats and proposed actions for addressing these:

National biosecurity

An incursion of an exotic disease into Australia would have catastrophic effects on the agricultural industries and the general economy. National barriers and strategies need to be maintained and strengthened to prevent the introduction of exotic diseases.

Disease surveillance

The decline in disease reporting by producers is a major concern in terms of effectiveness of disease surveillance and the risk of delayed recognition of an exotic disease. This issue is being addressed in consultation with industry.

Interstate biosecurity

Interstate barriers need to be maintained to prevent the introduction of animal pests and diseases not present in WA or which are subject to eradication. Ovine Johne's disease and liver fluke were considered to be the major disease threats to Western Australia from the Eastern States of Australia. Conditions for the entry of livestock into the State are regularly reviewed and strengthened if necessary.

Farm biosecurity

Lack of awareness and use of practical biosecurity measures by many producers is a major concern and can result in costly disease incursions. Practical biosecurity measures for individual livestock enterprises need to be promoted and adopted.

Endemic diseases

Strategies are needed to deal with state disease incidents and an industry contribution towards the funding of the Footrot Eradication Program is needed.

Animal welfare

Nationally agreed animal welfare practices need to be adopted by producers and promoted by communication programs involving industry. Involvement of industry stakeholders in the development and revision of Codes of Practice for Animal Welfare is essential.

Residues and food safety

Better on-farm practices, including QA systems are needed to minimise the risk of contamination from residues and microbiological agents. Contamination of merino wool by dark fibres was identified as a risk to Australia's current good reputation as a supplier of clean, high quality wool.

Research and training

Research needs to be maintained on important livestock diseases and a number of animal welfare issues. The lack of veterinarians with specialist training in disease and production issues of sheep and goats is a concern. The under utilisation of existing veterinary services by livestock producers is another major concern. A collaborative approach by industry, government, universities and the veterinary profession is needed to redress this with practical solutions.

Communications

A number of key messages on livestock biosecurity need to be communicated to industry and producers. This will require a collaborative and structured approach by all stakeholders.

EFFECT OF DISEASE ON PROFITS

Lack of effective biosecurity at the farm level can impact on the individual farmer as well as neighbours and the wider industry.

Sheep diseases can cost producers in three areas; increased cost of treatment, reduced production and loss of market access. The following estimated costs illustrate the very significant losses associated with two sheep diseases, lice and footrot. Table 1 shows the average cost of lice and virulent footrot infections in a flock of 3000 sheep assuming 50 per cent of sheep are infected with either disease.

Table 1. Average production and eradication costs of lice and footrot in a 3,000 sheep flock

	Loss of production		Eradication		TOTAL	
	Flock $	Per hd $	Flock $	Per hd $	Flock $	Per hd $
Lice	17,852	5.95	1,650	0.55	19,502	6.50
Footrot	8,849	2.95	22,230	7.41	31,079	10.36

The loss in wool production for lice was calculated from data reported by Wilkinson *et al*. (1982) and Niven and Pritchard (1985). For virulent footrot the losses from lower wool production, body weight loss, additional flystrike, reduced fertility and increased mortality have been calculated from Department of Agriculture, Western Australia reports Anon (2002) and Ghose *et al*. (2003).

The eradication costs include estimates for lice treatments and for footrot, the cost of two summer eradication operations, fencing and selling costs for culled sheep. The costs do not include the loss of market access, due to quarantine restrictions for footrot. The additional losses incurred by sellers of breeding stock such as studs, can be very high.

The losses from the introduction of footrot, lice and other diseases on individual farms can be avoided by sound biosecurity practices.

CONCLUSION

The process of developing a biosecurity plan for the Sheep and Goat Industries highlighted the need for industry and government to work closely together. The WG process demonstrated an excellent spirit of cooperation between stakeholders. Industry representatives stressed that they want to, not only be consulted on issues, but be actively involved in decision making and sharing responsibility.

The WA Sheep and Goat Industry Biosecurity Plan provides a framework for enhancing biosecurity for these industries in WA. The challenge now is to ensure widespread involvement of industry, government, individual farmers, veterinary consultants and other industry stakeholders in implementing the Plan and addressing actions requiring attention. Livestock agents and sellers of breeding stock can play a pivotal role in encouraging clients to adopt sensible biosecurity procedures when purchasing livestock.

Veterinary and agricultural consultants can assist producers in developing and implementing individual farm biosecurity plans and protocols.

KEY WORDS

biosecurity, disease, threats, livestock

ACKNOWLEDGMENTS

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Paper reviewed by: Rob Woodgate, Department of Agriculture Western Australia

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SHEEP UPDATES

Easy care sheep

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KEY MESSAGES

Reduced labour and input costs and improved consumer perceptions will arise from sheep that grow no wool on the head, legs or belly and are genetically mulesed, crutched, tail-docked and dehorned.

INTRODUCTION

Animal rights advocates have sustained their efforts to abolish tail-docking and mulesing. Increasing costs of monitoring, prevention and treatment of flystrike and the increasing cost of shearing have placed pressure on sheep farming. We proposed a phenotype for a sheep of the future that should be polled, with no wool on the head, legs, belly or backside and a genetically short tail that is bare of wool [1]. We have been studying each of these traits in detail.

REVIEW

Tail length

Historically, the breeds available in Australia and New Zealand all came from one group called the 'thin-tailed' sheep. Literature evidence suggested that short-tailed variants within the thin-tailed breeds might be analogous to the Manx gene in cats, including the fact that the homozygous condition is lethal and should be avoided [2]. Other breeds have been introduced like the 'fat-tailed' Karakul and Damara, and the Dorper which is related to the 'fat-rumped' breeds. The 'long-tailed' breeds are not represented but most importantly the 'short-tailed' breeds such as the Finnish Landrace are available and using this breed it will be possible to rapidly reduce the length of the tail.

Bare breech

Flystrike around the breech can be reduced by mulesing and crutching, both of which reduce the amount of wool around the perineum. We have shown that it is possible to achieve a genetically bare area of skin using cross breeding and selection and we were able to show the effect on flystrike (Figure 1). A large number of breeds and crosses were used and the sexes were run in separate mobs in those experiments so the reader is urged to pursue the full details [3].

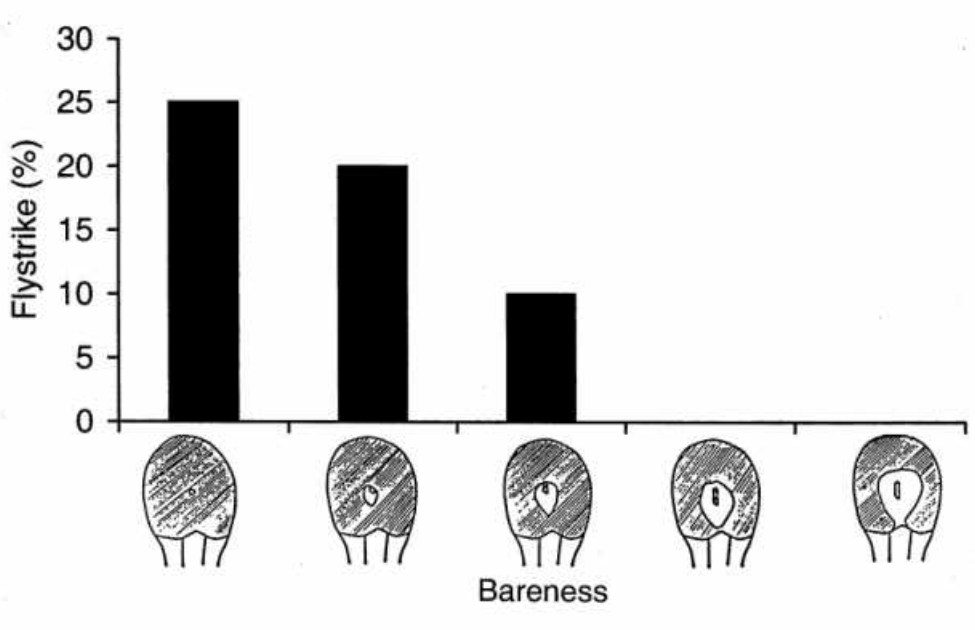

Figure 1. The effect of breech bareness on the proportion of lambs that were flystruck.

Bare points

We reviewed literature that showed open-faced sheep grow faster, are more fertile, and contrary to popular opinion they can produce as much or even more wool than woolly-faced sheep [1]. There will also be less contamination of fleece wool from the socks and head during conventional shearing and reduced requirements for shed hands. Also the greater visibility of eartags affords greater shearer safety and better welfare for the sheep although these are both likely to be difficult to prove by experimentation.

Bare belly

Very little is known about this trait and little more than when it was first reviewed [1] but belly bareness does become more prevalent with age [4]. We currently believe that it is controlled by a recessive gene or genes. However, there is a great deal of variation from animals that have a sparsely-haired belly from weaning to some that shed it seasonally. Others are bare of wool either on the brisket, around the navel or only around the udder. About 300 grams of wool grows on a woolly belly, and the lost revenue will fluctuate as wool price changes.

Restraint time

The traits listed above may produce correlated returns through improved lamb numbers and growth rates, but they will all reduce the wool cut. Without a change in the cost of shearing there may be little financial gain in the current market. Literature evidence was supported by our own experiments to show a drastic reduction in the time taken to shear each sheep [5]. Hoggets trimmed around the points, belly and breech to look like the breeding goal were shorn in half the time compared with their untrimmed counterparts. Fleeceweight was 1 kg lower in the trimmed groups, but if we consider that the wool lost is lower in quality and value, and that labour savings will accrue in the paddock and shearing shed, then costs will come down. Improved shearer safety coupled with reduced wear on shearing combs and cutters and less chance of cut teats, then there are advantages to this fleece cover pattern.

CONCLUSION

It is genetically possible to make progress in all the traits of our selection goal. In traits like tail length it is easy to observe progress. In bare bellies and bare breeches progress seems to occur in lumps, perhaps because they are recessive traits. All the traits have inexpensive assessment techniques and we predict a financial gain [6]. However producers do things like docking and mulesing for cultural reasons as much as for production reasons and some of these are discussed in the accompanying paper.

KEY WORDS

animal welfare, tail docking, mulesing, flystrike

ACKNOWLEDGMENTS

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Paper reviewed by: Stuart Young, AgResearch

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SHEEP UPDATES

Targeting the market's requirements - live sheep exports

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KEY MESSAGES

The live export trade to the Middle East is under pressure from strong competition from North African countries and Iraq.

The prolonged high prices for sheep in Australia are damaging the long-term prospects for the Middle East market.

Long tailed, entire ram lambs for the Haj are continuing to receive the support of the Saudi government, due to uncertainty over the health status of North African sheep. To target this market Australian farmers have to work closely with the livestock exporters, as the Haj moves forwards by 11 days each year.

Some producers may choose to specialise in producing fat-tailed sheep for the Middle East markets.

INTRODUCTION

Since the early 1970s the live sheep trade has been based around the export of cast-for-age merino wethers to the Middle East. This was a win-win position as Australian farmers generally kept flocks of wethers for their annual wool clip until they were about five years of age, and prior to the live export trade had relied on relatively weak mutton markets to dispose of them at the end of this period. This also suited the traders in most Middle East countries, as they were able to buy the older wethers, which in general are significantly heavier than younger wethers, on a per head basis, and sell the meat by weight.

The dynamics of the trade have altered considerably over the last decade with the total restructuring of the wool production industry, to the point where there are almost no wethers kept beyond two years of age in Australia. As well, the size of the Australian flock has shrunken considerably, through drought and economic factors, and markets for frozen and chilled sheep meats have expanded, creating strong competition and increased sheep prices. The Middle East trader has therefore had to adjust to smaller, lighter but much more expensive sheep.

REVIEW

Sheep numbers in Australia

It is well known that sheep numbers in Australia are at their lowest since 1949. It is not the purpose of this review to examine the reasons for this decline. However, it is pertinent to note the impact of this fact on the live export trade. As well as the price implications detailed below, there are other indirect costs associated with low sheep numbers. Shipping companies developed large single purpose vessels with the capacity to carry more than 100,000 sheep per load, during the early 1980s. These vessels still comprise the bulk of the fleet tonnage. They now invariably have to load in at least two ports and are mainly sailing well under full load capacity. This is adding considerably to the CIF price of sheep in the Middle East.

Competing uses for Australian sheep

As well as declining sheep numbers, Australian meat processors have been actively seeking new markets for sheep meat products around the world. Evidence of this, is the success of the prime lamb trade to the United States. Again, it is noted that this trade will impact on the viability of the live export trade, as there is competition for the animals in the Australian livestock market place, and there is competition in the Middle East for the consumer market.

It is noted that the lamb industry has undergone considerable growth in both production and prices over the past decade. Most of this growth has been in the export area. In the early '90s, 15 per cent of lamb production was exported; now it is 35 per cent.

Landed (CIF) prices for Australian sheep

As sheep numbers have fallen and demand has risen, price rises have been inevitable. In 1995, Australian sheep were US$38/head CIF at most Middle East ports. By 1998, CIF price had risen to US$45/head, and cushioned by a falling Australian dollar had risen to only $50/head by 2001. Now (July 2003) with the appreciated Australian dollar and firm domestic prices, the CIF price in the Middle East is US$70/head. This is an 84 per cent price rise in the space of nine years, and a 40 per cent price rise in the last two years.

With the forecast of continuing low sheep numbers in Australia, it also seems inevitable that these high prices will be prolonged. Like all businessmen, Middle East sheep traders are casting the net wide to try and find alternative sources of sheep. In some countries this is having a dramatic effect as can be deduced from the following table which shows the major Middle East markets and the volume of trade over the last five years and 2003 projections.

Australian live sheep exports (Head)						
	1998	**1999**	**2000**	**2001**	**2002**	***2003 forecasts***
To:						
Saudi Arabia	0	0	640,506	2,140,851	1,895,807	*1,800,000*
Kuwait	1,443,617	1,249,714	1,472,563	1,539,700	1,569,807	*1,460,000*
UAE	1,433,617	975,691	816,563	681,654	466,421	*410,000*
Jordan	836,964	1,067,678	712,585	542,366	606,384	*520,000*
Oman	476,445	424,371	531,327	481,484	351,906	*310,000*
Bahrain	374,240	465,405	404,752	388,172	385,878	*360,000*
Qatar	361,538	281,208	308,432	308,369	288,233	*280,000*
Other	53,533	561,712	534,680	728,969	590,226	*560,000*
Total	**4,979,954**	**5,025,779**	**5,421,408**	**6,811,565**	**6,154,754**	***5,700,000***
Source: ABS, MLA Forecasts in italics for 2003.						

Saudi Arabia and Kumaitare maintaining their market for Australian sheep for the moment, whilst UAE, Jordan and Oman have already begun sourcing sheep from elsewhere. It is worth noting that there are specific reasons why Kuwait and Saudi Arabia are maintaining their purchasing of sheep from Australia.

Kuwait has a wealthy trader who has invested many millions of dollars in breeding Awassi x Merino sheep in Australia. He is now uniquely positioned to capitalise on his investment and is currently exporting 250,000 head per year of his own sheep with plans to increase to 500,000 per year. As well, the Kuwaiti government are interested in long term food security in a region where this can be difficult to achieve. The government retain a majority shareholding in the main importing company, and are kindly disposed to Australia as a result of Australia's support against the former Iraqi regime. The Saudi government are interested in retaining Australia as a long term supplier despite past disputes as they have a major role as leader of the Islamic world to provide safe and reliable meat to all the pilgrims visiting the country for the major religious festivals.

Competition in the Middle East

There are many other potential sources of sheep throughout the world.

Sudan:
Sudanese Suwakni sheep are very similar to Damaras and are thus well adapted climatically, and popular on the Western provinces of Saudi Arabia, where they have been traded for many years. There are about 40 million sheep and goats in Sudan. The trip by dhow from Port Sudan to Jeddah takes only about 48 hours. With Saudi and European investment in the country the infrastructure has been built up to the point where there are now about one million sheep being exported live per year to Saudi, and about 250,000 carcasses per year to Jordan. They are however relatively expensive at US$80-85 per head CIF. At the moment there are no restrictions due to disease.

Somalia, Ethiopia and Eritrea:
There are estimated to be 80 million sheep and goats in these three countries combined. These are smaller fat tailed sheep called Barbary or Persian black head sheep. These countries are the source of the sheep that introduced Rift Valley Fever to Saudi Arabia in 2000. The Saudi government therefore is enforcing a ban on sheep from these countries. However, UAE, Oman and Yemen are all trading freely in these sheep. At times, their CIF price is as low as US$12 per head, but is currently about US$25 per head. These sheep have largely displaced Australian sheep from the UAE market. Again, with Saudi and European investment in the country the infrastructure has been built up to the point of making the logistics of the export industry viable.

Iraq:
There are estimated to be 20 million Awassi sheep in Iraq. During the late 1990s there were at least two million per year being exported through porous borders as they represented the only real source of hard currency for many people. They were very cheap, being as little as US$30 per head, and therefore represented major competition for Australian sheep. It is unclear how the export of these sheep will proceed under the new regime.

Uruguay:
The Uruguayan sheep flock has been decimated with the demise of wool prices and there was never a sound infrastructure for handling large numbers of sheep. These sheep are small and relatively unhealthy, but can be landed CIF for about US$60 per head at present. There will only be about two shipments per year.

New Zealand:
New Zealand has recently relaxed the lower age limit to allow younger sheep to be shipped. However, with the extra voyage time and the need to pick up fodder in Australia en route and to two port load in the North and South islands, there is still very little opportunity for New Zealand sheep in the market.

Romania:
There has been some recent renewed interest in sourcing sheep from Romania. There are some major impediments however. Saudi authorities will reject shipments with scabby mouth and vaccination is still not practiced there. As well, the Romanians can achieve good prices for their lambs in the Western European markets.

China:
There are great logistic and financial difficulties for shippers trying to assemble large shipments in China. There will never be realistic competition from this country.

The Haj Market

Each year, the Islamic Development Bank lets out a contract for 500,000 sheep to be made available for pilgrims to the Haj. These must be long-tailed and preferably entire ram lambs. However, due to chronic shortages the Saudi government allows ewes as well. This does not represent the entire Haj market as there are two million pilgrims in total who must each slaughter a sheep, so there are at least another 1.5 million sheep sourced during the Haj each year.

The significance of the contract is however, that once traders have been allocated a share in that contract, they are guaranteed a certain market and are therefore able to offer forward contracts to secure supplies.

As noted above, the Saudi government has a responsibility to ensure that only safe sheep are sourced for this purpose because of the great political and religious sensitivities. In Australia, this is reflected in the contracts that are offered, with some companies offering cash advances to secure supplies. The market would prefer fat-tailed long-tailed sheep but in the end accepts all breeds.

As the Islamic calendar is lunar based, the time of the Haj moves forward by 11 days each year. Earlier this year, shipments had to be completed in January. This year the date will move forward to late December and so on. In another six years, delivery will be October. It will become increasingly difficult to supply this contract from lambs born in that year because of insufficient time to reach market weight requirements. To compensate, the Saudi government have relaxed the minimum carcass weight by two kilogram to 13 kilogram for this year and are likely to relax it even further in future. However, this weight compensation will not be effective for ever, and careful planning between producer and exporter will be required to ensure Australia remains the preferred supplier for this major event. If it is well managed, there is an opportunity to secure an even larger share of this market. The main problem then becomes one of transport logistics. It is doubtful whether there will be enough shipping capacity to get the sheep there at the right time.

CONCLUSION

Australia continues to be a favoured source of live sheep for some countries in the Middle East. However, where there is free trade, without government interference, the Australian sheep are proving too costly and are losing ground rapidly to North African sheep.

As markets become more sophisticated the reliance on the live sheep trade will diminish and more export of frozen and chilled meat will occur.

The Haj market will remain a special case and will require careful management to ensure supplies of the right numbers of an appropriate weight to export are produced at the right time.

Fat-tailed sheep have traditionally commanded a premium in the market place. This should continue to be the case and may represent a way back into some of the markets that have been lost to competition from North Africa.

KEY WORDS

export, markets, live sheep trade

Paper reviewed by: Richard Norris

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ABS, MLA Forecasts in italics for 2003.

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SHEEP UPDATES

Setting flock breeding objectives

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SUMMARY

A breeding objective is simply a description of what characteristics are desired in the sheep under your management.

In any flock of sheep individuals are endowed with many characteristics, each differing greatly in magnitude or degree. To varying degrees these are controlled by genes, and can therefore be influenced by selective joining of ewes and rams.

A breeding objective should be long-term and ideally profit-driven - relating to those sheep characteristics which you believe will result in the best economic returns from the flock in your environment. It will relate to more than one characteristic or trait, each of which can be given whatever emphasis is desired.

To make progress, the traits must be:

- measurable or definable;
- heritable;
- of economic importance.

There is no right or wrong breeding objective. Acted upon intelligently, it powerfully modifies the performance of a sheep flock.

INTRODUCTION

If we accept that there is significance in breeding methods for sheep, and that breeding is associated with change, then it is imperative that we influence this change. For just as change can be for the good - 'better' sheep, more profit, it can also be for the worse - less appropriate sheep, less profit.

Although breeding and selection relevant to all common sheep breeds in Western Australia are covered, a special mention of the Merino can be made at this point. As a breed endowed with wool of the highest value, it has traditionally been selected with the majority of emphasis on wool characteristics. Obviously other traits have not been ignored, but most breeders and keepers of Merino sheep predominantly want sheep that grow more wool that is finer. 'Constitution', thrift, reproductive ability, growth rate, disease resistance, suitability for particular climates are all desired, but seldom measured and therefore seldom influenced.

Selective breeding has made the Merino what it is today, but it has been a much slower process than that achieved in other species and indeed other breeds of sheep. Many factors are responsible for this, for example:

- Diversity, in fact extremes, of environment in which sheep are measured. Meaningful comparisons have been confused.
- The range of wool quality attributes which do exist - for example fibre diameters of 13 to 30 microns.
- Many wool-growing Merino sheep enterprises are non-specialist; combination with cropping is particularly common.
- Ignorance.

- Scepticism about objective measurement by many perceived elite and influential stud sheep breeders.
- Confusion engendered by varying, contrary breeding philosophies and methods.
- The somewhat unique nature of sheep, as true dual purpose animals. These 'purposes' are conflicting and genuinely complex - with partitioning of nutrient intake between growth and wool production, the latter taking place at all stages of life and bodyweight path.

Whatever the reason, if breeding is to contribute to sheep enterprise profitability, as it must, then some unity and clarity of understanding is essential amongst all breeders and commercial sheep keepers.

To capture the potential gains from genetics, it is necessary to understand breeding principles, and be clear, confident and realistic about expectations.

This applies to sheep of any breed or genotype.

GENETIC IMPROVEMENT AND PROFIT

In any enterprise, profit is the difference between income and costs. Genetic improvement can decrease cost of production, by increasing production per head. In doing this, the efficiency of production is increased. Income is influenced by increasing the price received for the product through an increase in quality - as determined by market signals. For example:

- there is a premium for wool as it gets finer;
- heavier carcase weights attract a premium in lambs.

PROFIT DRIVERS FOR SHEEP ENTERPRISES

The ultimate products of sheep enterprises are wool and meat. Skins are certainly a product, but will not be considered here. For some individual farms, sheep are seemingly and effectively the end-product - ram sellers and producers of female breeding stock are examples.

For all but some pastoral zones, production per unit of area is generally accepted as the most important benchmark of productivity. It is assumed that this productivity is repeatable and sustainable for the system and the land resource. However it must be governed by market prices for the products. As an example, less wool per head is a feature of finer wool genotypes, but at times the finer wool may more than compensate to give a greater financial return per sheep. (Whatever the genotype, more sheep on the land resource will generally mean a greater efficiency of resource utilisation and more profit. Hence the overriding imperative to improve quality and quantity of pasture as the major feed source for sheep in Western Australia.)

The situation with Merino, and any wool-growing sheep, is interesting and bears reflection:

1. The wool grown by any sheep is responsive, in a predictable way, to nutrition, in that an increase in weight is associated with an increase in fibre diameter. With the traditional premiums for finer wool this has tended to even out sheep income over a range of seasonal conditions - good season, plenty of feed, more but broader wool. With the reduced price for the broader wool the result is often little change in income. Similarly a poor season results in less, but more valuable, wool. Such is not the case for meat production - less feed available simply means less product, with very likely quality discounts, amplifying the loss.
2. With wool growing constantly, in situations of bodyweight gain, maintenance and loss, non-reproducing sheep can be kept in a state of weight maintenance for years, with no gain in meat but growing wool as a valuable product of the feed resource. Not too long ago an all-wether flock was probably the most profitable! Hence, it is not surprising that breeders have concentrated on wool in developing breeding objectives.

Although the Merino as a pure breed is used in specialist wool production, it also contributes very significantly to prime lamb production (99 per cent of sheep meat produced in Australia is Merino-based).

Where meat and lamb production assumes priority in sheep enterprises, other breeds are utilised as a source of more specialist meat genetic influences. There is a range of breeds, each with particular attributes but with, in fact, greater variations within than between breeds.

Cross breeding is typically practised in the prime lamb industry, as a source of hybrid vigour, and to capture individual breed attributes.

Examples of the more common breeds are:

Maternal sire breeds:

Border Leicester
Coopworth
East Friesian
Finn

Terminal sire breeds:

Poll Dorset
Texel
Suffolk/White Suffolk
Dorper/White Dorper

CHARACTERISTICS (TRAITS) OF SHEEP UNDER GENETIC INFLUENCE WHICH AFFECT INCOME

Meat quantity	Bodyweight
	Carcase size
	Dressing percentage (carcase yield)
	Number of lambs weaned (lambing %)
	Growth rate
Meat quality	Fat score, fat distribution
	Carcase size
Wool quantity	Fleece weight
Wool quality	Fibre diameter
	Strength
	FD variation
	Clean colour
	Crimp/curvature
	Style

The above traits are significant in all environments. In some enterprises, generally more intensive in higher rainfall areas, additional traits affect the profitability of sheep enterprises:

Disease resistance	Internal parasites
	Blowfly strike

Although most breeders have specialised in improving a relatively small number of the above traits, there is no reason why all cannot be improved. This is the basis for a current national research project (Merino Validation Project), which has already demonstrated clearly the links between many of the traits, as a basis on which confident selection can proceed.

WHAT IS A BREEDING OBJECTIVE?

A breeding objective is a description of the attributes of your sheep flock at a defined point in the future.

It is important to have a long-term breeding objective:

- It sets long term production goals, recognising that change takes place over successive generations of sheep.
- Progress is faster if goals are consistent.
- It provides a basis against which to measure progress.

There is no mystery in sheep breeding. If a breeding objective is realistically set down, then progress against expectations can be measured and confirmed. Fine-tuning is possible.

WHAT IS IT REASONABLE TO EXPECT?

It is valuable to have in mind some idea of likely improvements possible with genetic selection within a flock of sheep. Adherence to proper genetic techniques and monitoring of the outcomes gives confidence to pursue and the ability to fine tune the direction of change.

Some examples are provided below.

Expected change in 10 years in a single trait, with other traits held constant, within a flock of sheep

Trait	Change	Comment
CFW	0.5 kg	Medium wool (21 µ). Less in fine, more in strong wool.
FD	2.5 µ	More if SS not maintained.
BWT	3.0 kg	Average (55 kg) sheep flock.
NLW	25%	Small heritability but large variation. South African data.

As more than one trait is selected for, the gain in each usually is less; however, with a wisely formulated breeding objective and selection index, the total value of the change achieved is greater.

BENCHMARKING GENETIC MERIT

The changes referred to above are quite separate from changes arising from use of superior rams (or ewes) from a separate source. As well as making sure you are making gains from selection within a flock or bloodline, it is vital to be aware of the merit of your flock as compared with that of the other available sources in Australia - if not globally. If you can be confident that other genetic sources are significantly better in desired traits, use of these will accelerate gains - the greater the difference, the greater the rate of gain.

Confidence in the merit of other genetic sources is obtained by genetic benchmarking exercises. These are now widespread and sophisticated, and rapidly identifying both individual sheep and flocks of demonstrated superior genetic merit.

Reliable information can be obtained from:

- central test sire evaluations;
- wether trials;
- ewe trials;
- on-farm ram, bloodline and breed comparisons.

If your flock is of a genetically less than desirable quality, then quite large improvements are possible and to be expected.

DEVELOPING A BREEDING OBJECTIVE FOR SHEEP

To have a successful commercial sheep enterprise with in-built increases in efficiency and profitability, a profit-driven breeding objective is essential. Without it a significant proportion of returns from other management initiatives are wasted - for example, fertiliser and parasite control programs.

Traits to include in the breeding objective will be:

- of economic importance;
- measurable or definable;
- realistic and practical to measure;
- heritable - the traits need to be under genetic control.

In addition what is defined must relate to a specific period of time.

Irrespective of breeding beliefs, measurements and assessments are imperative to make genetic progress, and to compare progress against others, such as through benchmarking.

Measurement of traits is required to:

1. establish where you are at present genetically;
2. measure future progress.

There is no 'right' or 'wrong' breeding objective. It relates to sheep under your management and control. It will vary between producers due to differences in environment, difference in markets, and each individual's expectations of future market prices. Just make sure you get the best information in deciding on the main features of the breeding objective - you must live with the consequences!

HERITABILITY

Heritability is a measure of how much of what is visibly apparent in sheep is influenced by genes. The higher the heritability of a trait, the more likely it is to be passed on to lambs, and the easier it is for breeding to improve that trait in the flock.

On a scale of 0 to 1.0, 0.3 or above is said to be high heritability. Below 0.1 is classed as low heritability.

A trait such as vegetable matter in wool affects wool price, but is not at all controlled by genes - it is entirely an environmental effect. It has zero heritability, and hence would not find its way into a breeding objective.

LINKS BETWEEN TRAITS

Most traits listed are controlled by many pairs of genes, and some affect more than one trait. As a result, selection aimed at changing one trait often has an effect on others. This can be positive or negative, advantageous or disadvantageous.

Genetic correlation is the term used to describe these linkages.

Correlations range from -1.0 (where there is a strong negative effect) to +1.0 (strong positive effect).

Table 1. Examples of some heritabilities and genetic correlations for Merino sheep

	CFW	FD	SS	CVfd	HWT	WEC	NLW	HFAT
CFW	**0.38**	0.25	0.10	0.00	0.35			
FD	0.20	**0.50**	0.25	-0.15	0.20			
SS	0.10	0.30	**0.35**	-0.40	0.00			
CVfd	0.10	-0.10	-0.55	**0.50**	-0.10			
HWT	0.10	0.05	-0.21	0.06	**0.49**			
WEC	0.00	0.05			0.04	**0.25**		
NLW	0.01	0.00			0.22		**0.04**	
HFAT	0.00	0.00			0.29		0.00	**0.19**

Fleece weight and reproductive ability

One correlation of concern recently identified and confirmed is a negative one between the above; in essence, selecting sheep for higher fleece weight without increasing bodyweight at the same time has the effect of reducing the number of lambs weaned. Specifically, there is a definite negative correlation between 'Wool Production Potential' (wool produced per kg of bodyweight from 6 to 18 months of age) and 'Ewe Productivity' (total weight of lamb weaned over the first three lambings). This has a number of implications in modifying selection indices: for example, selecting for simple bodyweight has the effect of selecting for fatter sheep (strong positive correlation - see table). This is not desirable from a meat quality aspect, so selection for reduced fat, and increased eye muscle area, would ideally be necessary.

ESTIMATED BREEDING VALUE

An estimated breeding value (EBV) is the best estimate of a ram's value as a parent compared with all other rams in the tested group. It is the best estimate of how the ram will pass on a particular trait to its offspring. They are calculated for each trait, and increase in accuracy as more offspring are born, and more records of other male and female relatives accumulate. Adjustment for environmental influences such as single or twin lamb, age of mother, and date of birth also increase accuracy.

It is usual to express EBVs in relation to 100 as the average of the tested and compared group. As an example, there are Merino rams with EBVs greater than 140 for the various traits measured over the 10 years of testing. This means that these individuals are 40 per cent better than the average of all the rams compared over that time. In the case of prime lamb sires, individuals with EBVs for specific traits of more than 180 have been identified.

SELECTION INDEX

A selection index combines all the listed traits in a calculation that takes account of performance merit (EBV) of a trait and its importance in the breeding objective.

It can be appreciated that selecting for some traits is worth more than others, either because the value of the gain is greater, or with a higher heritability faster progress can be made. A numerical, often dollar, figure is calculated, and this is then a common language for each trait.

The scores for each trait are added to give a total for each sheep. Usually the average index value of the flock is standardised to 100, such that sheep performing better than the flock average have an index above 100.

Within the Australian lamb industry, the sires tested have on average maintained a 4 per cent genetic gain per year over the last 10 years, on the 'Carcase Plus' index. This represents a 40 per cent improvement over the 10 years.

USING GENETICS - KEY MESSAGES

It can be appreciated from the above that genetics, although simple in concept, is complex in application. The associations between traits (sometimes conflicting), environmental variations, and fluctuating market price signals combine to confuse and distract many. Change has been hard to measure, and frustration in perceiving progress has tended to provide a situation where different breeding methods, not always soundly based, have attracted strong following.

1. What is irrefutable is that genetic progress has been and is still being made in a predictable manner, in traits associated with profit from sheep.
2. More than 200 Merino rams are now benchmarked in Australia, for the traits of major importance in wool production. This has been achieved at 12 sites across Australia, linked between sites and across years since 1990.
3. Meat-specialist breeds are nationally benchmarked to give accurate information on sheep suitability for individual markets.
4. Wether and ewe trials, linked between sites and across years, provide confirmation of strain genetic merit in a range of environments.
5. Use expert services in your breeding strategies. This means obtaining rams (or ewes) from a source which is: (a) demonstrably superior amongst known Australian genetic sources; and (b) utilising expert genetic services and sound genetic principles in its breeding methods, and can adequately demonstrate genetic progress in the traits you consider desirable.
6. If breeding your own rams, the same principles apply.

KEY WORDS

genetics, traits, selection, EBV

Department of Agriculture

Sheep Updates 2003

SHEEP UPDATES

Future feeding of sheep in Western Australia

John Milton and **Graeme Martin**, The University of Western Australia

KEY MESSAGES

The Merino ewe will be nutritionally managed through focused feeding to produce over 100 per cent weaned lambs from an autumn/early winter lambing in the agricultural areas of WA. As an integral part of the farming system the ewe and her progeny will produce quality wool, male Merino lambs will be suitable as shippers in periods of peak demand and the heavy carcases from the prime lambs finished in a feedlot will be suitable for high value markets such as those in the USA.

INTRODUCTION

There is no doubt that the Merino ewe is the mother of the WA sheep industry, be it for wool or meat. This pre-eminence is out of balance with the fact that the current number of sheep is at its lowest in 50 years. This paper outlines feeding and management strategies to lift the number of lambs weaned from Merino ewes and to increase the production of quality wool and sheepmeats.

REVIEW

The current recommendation for grazing management of reproducing Merino ewes for wool production in WA is to hold them in condition score three throughout pregnancy and drop lambs around the spring flush when the quality and quantity of pasture is not limiting [1]. The Lifetime Wool Project aims to refine the nutritional management of the reproducing Merino ewe to optimise the quantity and quality of wool that the ewe and her progeny produce over their life [1]. Postgraduate research in this project by Beth Paganoni will also provide information on how the nutritional management of the reproducing Merino ewe can affect the quality of the carcases produced by her progeny. The challenge will be to supply cost effectively the requisite nutrients for both the ewe and her lamb/s from our available feed resources, especially for ewes lambing before the spring flush of feed.

A number of WA sheep producers in the lower rainfall areas lamb their ewes in autumn/early winter to ensure that their weaners are well grown before summer for subsequent sale as shippers (mainly Merino wethers and ram lambs) or for slaughter (both first-cross and Merino prime lambs). These producers have considerable scope to lift sheep production in WA and many others are looking to sheep as a means of diversification. Two significant factors may also force more WA producers to move to an autumn/early winter lambing to meet these markets in the future. First, Ramadan moves forward 11 days each year so, in five years time, large numbers of young shipper sheep of a suitable weight will be needed for shipment two months earlier than at present. To meet this demand the lambs will either need to be born earlier to have sufficient time to grow out or have growth rates well above those currently being achieved from a winter/spring lambing. The alternative is to remain with a winter/spring lambing and carry the weaners over for shipment in the following year. This will allow producers to get extra wool from the weaners but poses managerial problems, for ram lambs destined for live shipment. Second, there is a big demand for heavy prime lamb carcases to be supplied year-round, especially to the USA. Unless the dentition requirements for lamb are altered or we markedly improve lamb growth rates without producing excessive carcase fat, it will be difficult to achieve year-round production of heavy lambs before their central incisor teeth erupt. However, with ewes lambing in autumn/early winter, the lambs will have more time to grow-out on green pasture before being finished in a feedlot the following year. Considered together, these factors point to a future in which a significant number of Merino ewes in WA will be lambing earlier, in autumn/early winter.

Mating in late spring/summer is not a problem for Merinos, but there is a challenge to devise cost-efficient systems to feed the ewe and her lamb/s over a season that is difficult in WA. As we shall see, mating Merino ewes in late spring/summer has the advantage of allowing us the degree of control that is

necessary for strategies of 'focused feeding' with which we can maximise the number of lambs weaned with desirable wool and carcase characteristics. Furthermore, this is a 'natural' program that will enable WA to claim that it uses 'clean, green and ethical' management practices that will become increasingly important for the future of our sheep industry.

Focused feeding

If we use the 'ram effect' to synchronise matings for lambing in autumn/early winter, we can implement focused feeding strategies to maximise the number of quality lambs weaned. It is already common practice to feed lupins to rams for seven weeks before mating to maximise their sperm production. This is essential for ram-effect matings because many ewes need to conceive to a joining that may last only a few days, especially if teasers are used. Feeding lupin grain to ewes for four to six days in the final stages of the oestrous cycle can increase twin ovulations by 20-30 per cent but feeding lupins for longer has produced variable results in on-farm trials. More research is needed to elucidate this problem fully but, as a rule of thumb, it is best to feed lupins regularly and for a shorter period to reduce both risks and costs.

Once ewes are mated, they are often ignored until the final few weeks of pregnancy because it is generally considered that there are no serious demands on her until the fetus begins to reach a significant size. However, the organs of the fetus develop during the middle stages of pregnancy and at that time there are critical periods when undernutrition of the ewe can have serious effects. The consequence of this may not be obvious until much later - after birth or even after sexual maturity. This phenomenon of 'fetal programming' can affect the wool quality, carcase quality and probably fertility of offspring. When we have a better understanding of these critical periods, we will be able to employ focused feeding to minimise the impact of possible nutritional stress during pregnancy.

If we are to wean more lambs in WA, then more of the lambs that are born will need to survive and prosper. We have found that feeding relatively large quantities of maize as a supplement in the last week of pregnancy can increase colostrum production nearly three-fold. A large increase in colostrum production increases the chances of the lambs surviving through better feeding at this critical stage, the formation of stronger ewe-lamb bonds and the improved vigour of healthier lambs, especially twins. Lupins are also effective under some circumstances but Georgget Banchero (a UWA PhD student) found them to be much less effective than maize to stimulate the production of colostrum. Maize is not an option for WA, so we need to evaluate the effectiveness of other high-energy grains such as wheat, triticale or barley. Whatever the supplement, it is a focused feed supplement that is fed at a high level only in the last week of pregnancy. Therefore the more accurately we know when the ewes are going to lamb, preferably within a week, the more money we can save.

With appropriate focused feeding, mature Merino ewes that are mated at around CS 3 for an autumn/early winter lambing and then finish a 12-week lactation at no less than CS 1.5 should wean at least 100% quality lambs in the agricultural areas of WA. These weaned lambs will need to graze quality pastures to enable them to reach a liveweight of around 40 kg by the end of the growing season. A legume-dominant pasture sown in the pasture phase of a phase-farming system could provide the quality feed needed to support this rate of liveweight gain. This legume-based pasture may also be used as a tool to control herbicide-resistant crop weeds, with any surplus spring pasture being conserved as silage so that the crop weeds do not set seed. This silage could be restrictively fed to the pregnant ewes when confined over autumn following a light grazing of crop stubbles during summer. In addition, the silage may be mixed with off-spec grain to produce complete feedlot rations to grow-out and finish the lambs to heavy weights prior to slaughter.

CONCLUSION

The Merino ewe will be nutritionally managed through focused feeding to produce over 100% weaned lambs from an autumn/early winter lambing in the agricultural areas of WA. As an integral part of the farming system the ewe and her progeny will produce quality wool, male Merino lambs will be suitable as shippers in periods of peak demand and the heavy carcases from the prime lambs finished in a feedlot will be suitable for high value markets such as those in the USA.

KEY WORDS

Merino ewe, nutritional management, focused feeding, quality wool, sheepmeats

Paper reviewed by: Emeritus Professor David Lindsay, The University of Western Australia

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SHEEP UPDATES

RECIPE FOR GETTING BACK INTO SHEEP

Bob Hall, JRL Hall and Co., Darkan

KEY MESSAGES

Now is as good a time as any to get back into sheep.

With sheep, the risks are low and the returns on investment are very good when compared to cropping.

Stocking rate and lambing percentage are the key drivers of profit.

INTRODUCTION

There is a lot of talk about getting back into sheep largely in the 'wheat belt' where many had abandoned them. Why is this so? Frankly, it has almost become a fashion. That is, no reason for doing it. Following fashion in farming is the way to ruin. By the time you get there it will be all over. Following fashion is expensive; everyone going in the same direction, pushing prices.

Neither is it a good thing to be attracted by current prices. Nor because crop is slipping and definitely not because the banker says so or thinks it is a good idea!

At the same time there are many good reasons for getting back into sheep all pointing to the mistake made when getting out of them. Paramount among these reasons is the chance of improving the profit of a farming system. A system that recognises the need for a percentage of pasture. This good rotation break, the weed buster, can also be nature's nitrogen factory. It can improve soil structure and out-perform other pulse break crops.

A properly designed sheep system will mop up spare labour and become a major diversification reducing risk.

Mainly get back into sheep because they can PAY.

Many sheep enterprises were destroyed by what I would term the abuse of gross margins. Crop at $300/ha, sheep at $50, get rid of the sheep and crop.

This over simplistic approach was seriously flawed in many areas:

- It ignored the cost of plant.
- Not recognised was the increasing variable costs of rotational farming, especially sprays and fertilisers.
- It worked on pretend yields rather than factual. Budgeted yields simply were not achieved.
- Sheep use all the acres, crop only some.

Cropping is a much more risky business. There is always some income from sheep even in a drought.

The worst mistake was to look at the fairly primitive figures from some of the sheep enterprises and not looking at how to improve them to increase profit. It is very import to look at your figures and also recognise potential as achieved by others. Many enterprises have the potential to double or better the performance UNDER THE SAME MANAGEMENT.

Sheep have massive variation in performance. That is wonderful. In any attribute they can be 50 per cent above or below the mean. Lambing percentage will vary from 50 per cent survival to 150 per cent. Body weight is highly variable as is micron, wool cut, and every factor of production. Without variance there can be no improvement. Variation is frankly, exciting.

REVIEW

So how do we go about it or improve?

Firstly, I am going to push for benchmarking. The best figures are from your own sheep enterprise over the years. Compare these with your neighbours, your district and perhaps elsewhere to obtain the parameters for profit. If you have no sheep get an expert to show you just how money can be made and what matters in achieving success. After that benchmarking on an annual basis is the road map to improvement. If you do it within a group of like-minded farmers it will be even more meaningful.

So GO FOR PROFIT. Unfortunately I must remind our speakers and audience of Hall's law of sheep production.

> "There are few, if any, inputs of choice to merino sheep that will yield an economical return".

In planning your sheep enterprise, get the basics correct and it will work. Plan your system, implement the plan and leave the fine-tuning and niceties until later - much later.

Everyone will be attempting to sell you things. Usually in the hope that you will appear modern or efficient. There are simply too many magic potions, the silver bullets with unreasonable parameters. Sheep like other things are subject to the law of diminishing returns.

Profit is not in:

- marketing
- exotics
- genetics
- feeding
- fashion.

Profit is in Pasture and the Sheep System. You see it is not sheep at all really. It is the conversion of pasture to product (wool and meat). It is almost unfortunate that we need the sheep, being a lot easier without them.

Start with the pasture. That means species and fertiliser. Yes some investment but it is the basis of sheep production and is the cheapest feed you can provide.

After that it is a case of designing the best system using the sheep to convert that pasture to product. It need not be complex, in fact simple is good. It can certainly be planned around the many constraints, seasonality, labour and skills available, finance, need for turnover, etc. etc.

All good systems will take notice of and utilise the benefits of KEY PERFORMANCE INDICATORS. With sheep none greater that the most basic of all - STOCKING RATE. Nothing is more maligned on occasion than a high stocking rate by those who simply do not understand how to make money from sheep. Sure there will be less wool cut per head but not per ha and finer to boot. Do not tell me that your sheep cut 7 kg, I will merely think you are grossly understocked and losing the chance to make money. What can be achieved? Pretty well 2 DSE/ha/100 mL rain. In terms of wool perhaps 10 kg greasy/ha/100 mL rain. (Some say clean but I think that is a bit over the top.) These figures are readily achieved if you have paid attention to the pasture and the sheep system.

The next KPI is LIVESTOCK TRADING PROFIT. Again with some discipline this can be a factor of planning and system. You should aim for at least 50 per cent to the wool proceeds and 100 per cent or more is readily achieved. Sheep meat has changed from an insignificant by-product to a major source of profit. Livestock trading is a compound efficiency factor.

Too low can be some or all of:

- too costly-paying too much for bought sheep;
- too low-lambing percentage or sale prices;
- too high-deaths.

Benchmarking will tell you where you have gone wrong.

Lambing percentage (%) is perhaps the most interesting or frustrating parameter. It is not too long ago that some academics were saying the lambing % simply did not matter. No wonder the merino % is

lousy! By the way, when I refer to lambing % I refer to lambs surviving to sale or one year of age to ewes originally mated. It can be over 100 per cent for merino, but rarely. It is a major challenge for the future.

Lambs can be purchased. This by feeding, care and attention and use of non-merino sires. I worry about all of these because one way or the other you are buying the lambs, and it will tend not to pay. Forcing ewes to have lambs that they really are not capable of sustaining.

I prefer to do it naturally:

1. Lambing at the correct time of the year.
2. Having fertile sheep.
3. Having fecund sheep.
4. Having sheep with mothering ability.
5. Purchasing wet, not dry sheep; preferably from a flock that has a record of high lambing % without too much feeding. These should be worth a large premium.
6. Cull rigorously. It is 'normal' for a ewe to rear a lamb, simply if it does not get rid of it. At least from the merino flock so that it does not perpetuate the problem. Yes, I know that the dry mob performs well the next year - they have had a rest, but not only will they be dry again but you are breeding sheep that will perpetuate the problem. By selection alone our clients have increased lambing by 100 per cent over 30-40 years.

Lambs cost money, one way or another feed will need to be used other than in very exceptional seasons.

With early lambs there is a need to feed the ewe. The problem is that they do not all rear the lamb inside them. Pregnancy testing will reduce the following cost but not eliminate it. $5.00 per ewe at 65 per cent lambing is $7.69 per lamb.

The alternative is to lamb later at a time when the ewe normally will not need much feed at all. In the early years this failed because it was forgotten that there is a need to feed the later dropped lamb over the summer. The cheapest, simplest, most efficient way is by the use of forage crops. Standing feed oats, perhaps on paddocks that are not too reliable for cash crops. Very cheaply grown and fed in situ. Wean the later dropped lamb, put them straight onto the oat crop and leave them on that all summer. Eventually as with most lambs a few lupins just to add a bit of protein towards the end. This will leave the stubbles for the ewes that are much more adapted to utilise them. Forage crops are actually cheaper than early dropped lambs feeding the ewe.

One thing about a return to sheep is that you will not have to trouble yourself greatly with terms of trade. This is where the niceties of the production systems cut in. Continual improvement in productivity is possible especially in the self-contained flock - an excellent reason for having one. Possibilities are:

- 1-2 per cent increase in lambing % compound per annum;
- 1 per cent wool cut at constant micron per annum;
- 1 to 2 microns less in 10 years without less wool cut;
- stocking rate increases of up to 50 per cent depending on the initial level.

Talk to some farmers, especially the younger ones about sheep and they will shudder. Why is it that they hate sheep? A great deal of it is to do with the lack of investment in the industry especially on sheep facilities. This is a facet of sheep that will need attention if they are to be more permanent this time round.

Some farms lack even the basic requirement of good fencing and water. The first improvements should be laneways for time saving stock movement and possibly dams where possible instead of tanks and troughs.

There is further investment well beyond this. It is strange that the very people who may waste money 'investing' in high priced livestock will not spend on the facilities required to keep them and be labour efficient. Simply the former does not require very much effort and is showy whereas the latter needs a deal of organisation and planning and no one really notices.

We tend to have larger farms these days. Massive investments in machinery. What is wrong with the sheep? What is required is a modern shearing shed-front fill raised board, some decent yards, the modern bugle design with a decent covered handling race, and some simply sheep machinery, crutching cradles, jetters, marking cradles, V machines and the like.

The whole lot for a mere $100,000. Less than a small tractor and a lot less subject to depreciation. Look at it any way you like it is less money than the investment in crop. $/ha; $/$1.00 gross margin, etc, etc.

Without wishing to sound like a Luddite, I repeat my theme, deal with the basics first. Pasture, system, profit. Fine-tuning can come later. Plenty of time to deal with fine tuning technology, trends and trendy, exotics and so on.

What can be expected for returns? It depends on the wool price.

Wool price	**GM/DSE**
$3.00/kg	$10.00 to $12.00
$4.00/kg	$15.00 to $17.50
$5.00/kg	$20.00 to $23.00
$6.00/kg	$25.00 to $29.00
$7.00/kg	$30.00 to $35.00

Unfortunately things that you like do not pay. This is the paradox with sheep.

Things like:

- feeding;
- buying high priced stock;
- having a lot of paddock feed wafting in the breeze;
- fat sheep;
- top prices.

It is all too easy to ignore what really matters for a profitable permanent sheep enterprise.

- Pastures
- Systems
- Facilities
- Husbandry
- Cost control and DIY skills.

After that it is quite simple really. Plan, invest and go for it!

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SHEEP UPDATES

Wool producer experiences with individual animal management

Maurie Stephen, Wool Producer, Armidale NSW

KEY MESSAGES

Using RF tags has brought mixed results primarily due to hardware and software limitations.

The use of RF tags provides a better system for recording individual animal information and an ability to act objectively on this information.

INTRODUCTION

For a number of years measurement of key production characteristics has been an important part of our breeding and management system. Warrane was one of the first commercial sheep properties to use on-farm fibre measurement, first with Fleecescan and in recent years with OFDA. We have also tested the rams for resistance to parasites through faecal egg counts and weighed both fleeces and animals.

REVIEW

Although convinced of the value of extensive measurement and decisions based on objective measurement, it is hard work collecting the data, reading and recording ear tags for every measurement. The opportunity to work with the Sheep CRC in developing the e-sheep concept came at a good time when we were looking at ways to streamline the data collection and management. The time seemed to be right to start with electronic 'RF' tags.

We now have over 6,500 sheep with RF tags and we are starting to see some of the benefits of the transition. However, not all of the equipment has worked first time and we are still having teething problems with some components of the system. There are however, enough benefits in the new approach to give us great confidence in the system for the future. The purpose of a trial with the Sheep CRC was in fact to identify aspects of the system that did not work well enough for a commercial operation so that further research could target these specific problems.

One of the specific experiments that we are doing is investigating the benefits in moving from colour tags to identify sheep with similar micron, to RF tags where exact information is available for each animal. Moving from micron groups to individual animal RF identification also allows us to incorporate additional measurements, such as fleece and body weights, into our management and breeding programs. With the RF tags we are not restricted to just micron.

Below is a brief summary of some of the equipment we have used and tested over the last year and applications we have been able to develop using the new technology.

System hardware

- RF tags with property and animal laser print.
- RFID readers and panel and stick.
- Intelligent reader with animal data.
- Barcode printers and readers.
- RFID drafting and handling.

RFID applications on-farm

- Faster and more accurate data collection.
- Genetic selection and breeding decisions.
- Management at shearing.
- Marketing - wool, meat and surplus stock.

Teething problems

- Hardware.
- Compatibility issues.
- Software.
- Reliability and tag retention.
- Visual tags.

Data backup

- Valuable data warrants careful handling and backup.

Future enhancements

- National sheep identification (NFIS).
- Improved RFID readers.
- Hand-held device for data entry.

CONCLUSION

The trial has been an interesting exercise. At times there has been excitement and anticipation as we have seen the amazing potential of electronic data collection and automatic drafting to implement management decisions. There has also been frustration when hardware and software did not match our expectations. We are however, increasingly confident that the new technology will become more reliable and predictable.

KEY WORDS

RF tags, electronic tags, RFID

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SHEEP UPDATES

The history of future sheep worm management

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KEY MESSAGES

In the past sheep worm control advances have been centred on new anthelmintic products and relatively simple management practices.

Sheep worm resistance to treatments is reaching a critical point in Australia and the rest of the world and there is only slim hope of new drench products reaching the market during the next few years.

Farmers must act now to learn to rely less directly on the drench gun and more on an individual property program based on the key principles of Integrated Pest Management (IPM). In the longer term, use of worm resistant sheep is expected to provide the main basis of worm control, but this will take time to become a widespread reality.

INTRODUCTION

The history of sheep worm *control* is highlighted by several 'major revolutions'.

The introduction of drugs such as thiabendazole in the 1960s, the arrival of multi-dose oral drenching guns, the development of the macrocyclic lactone group of anthelmintics (the ML's - ivermectin, abamectin and moxidectin), with ivermectin appearing on the Australian market in the late 1980s, and the management tool of summer drenching have all helped the Western Australian sheep industry to relatively easily control sheep worms.

However sheep worm resistance to treatments is an ever increasing problem world-wide and resistance to the macrocylic lactone group (the latest groups of worm control products) is now well recognised in Australia (for example, Palmer *et al*. 2001; Rendell and Lehmann, 2001; Love *et al*. 2003). There remains little hope of new sheep drench groups becoming available in the short to medium term (Soll, 1997; Waller, 1997) and so the 'new revolutions' in sheep worm *management* are more likely to be based around an understanding of the basic lifecycle of the worms and the principles of Integrated Pest (or Parasite) Management (IPM) rather than relying solely on something new to put in the drench pack.

REVIEW

THE 'NEW REVOLUTIONS'

Refugia

The proportion of the worm population that escapes exposure to a worm control measure ('refugia'; van Wyk, 2001), is receiving increasing attention as a critical consideration in the development of drench resistance. Currently, at a farm level, the most obvious refugia comes from worms inside animals that are not drenched. For example, a proportion of a mob requiring treatment could be deliberately left undrenched or all sheep in a mob with a lower faecal worm egg count are left untreated. Worm eggs and larvae on the paddock are also not exposed to treatments and therefore not subjected to selection for drench resistance.

Consideration of refugia becomes critically important in Mediterranean environments, such as southern Western Australia, where great selection pressure for drench resistance can be applied through the traditional practice of summer drenching (Besier *et al*. 2001). Following a summer drench the only worms remaining in the sheep are those that survived (are resistant to) the treatment. In a hot, dry environment the worm eggs and larvae on the paddock (the refugia) are largely destroyed by the inhospitable environmental conditions and so most of the future worm population in the paddock develops from eggs

put out by the resistant worms surviving in the sheep. This can lead to an increased level of drench resistance in the worm population next season.

If treatments can be timed when prevailing environmental conditions are favourable for the survival of at least some worm larvae (e.g. late autumn, winter or spring in Western Australia) and/or some refugia can be maintained inside at least some sheep over the hot, dry summer, the worm population will remain a mixture of resistant and susceptible individuals. Animals will put out a mixture of eggs that continue the worm cycle, but as resistant worms are typically in the minority they will be diluted amongst the susceptible worms and the impact on the overall drench resistance levels on the farm will be reduced.

Integrated Parasite Management

Generally, Integrated Pest Management (IPM) is a long recognised approach to the effective and sustainable control of particularly insect pests in horticulture. The implications of this approach are highlighted by the comments by van Mele *et al*. (2002) that "Many developing countries still ignore an IPM approach and rely on pesticides for a quick solution to deal with pest problems".

The parallels for Integrated Parasite Management and scope for urgent application of general IPM principles become obvious given the current and growing problem of drench resistance. Principles of IPM such as improved general management, utilisation of improved natural host resistance, employment of biological and/or environmental control and more considered, selective usage of antiparasitic chemicals all have potential to improve sheep worm management.

Specific application should translate into a coordinated overall management program developed for individual operations utilising experienced, up to date local veterinarians or consultants. Planned faecal worm egg count monitoring can be used to time treatments with consideration to both maintaining productivity and reducing further selection pressure for drench resistance, and also to assist with planned grazing management to control sheep exposure to the infective free-living worm stages. It is also possible to use faecal worm egg counts to actively select individual sheep on the basis of enhanced natural resistance to worms (Karlsson and Greeff, 2001) and this will be a key component of effective, sustainable worm management in the longer term.

Depending on the results of current research there could also be future potential application of biological control agents (for examples, Waller, 1997 and 1999) including worm larvae-destroying nematophagous fungi, utilisation of specific nutritional programs to facilitate greater sheep immunity to worms and further targeting of sheep treatments on the basis of individual need.

CONCLUSIONS

From a practical on-farm point of view there is an urgent need to rely less on indiscriminate treatments for sheep worms. The development of a customised, coordinated sheep worm control program, based on IPM principles and with general consideration to worm refugia, is critical to allow continued effective and sustainable sheep worm management.

KEY WORDS

sheep worm control, sheep worm management, drench resistance, integrated pest management, integrated parasite management, refugia

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