

Seedstock Production Systems

**2001 South Australian
Nuffield Scholar Report**

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Background

I have been involved in farming on the family farm since leaving school and thanks to my parents' attitude to succession planning I have been able to gradually purchase the plant, land and livestock over a period of time. This has allowed me autonomy in my own business while still working in a family operation. I currently farm in partnership with my wife Claire and we have two young daughters.

In 1989 I took over the Border Leicester stud and began exploring the possibilities which existed for a seedstock breeding business, in particular maternal genetics for the sheep industry. The Border Leicester stud is now our entire livestock enterprise. The stud has expanded to be 5 times the size over that time. Performance recording with LAMBPLAN was adopted and has been an integral part of the success of our business.

I have held the position of Chairman of the Australian Border Leicester Association and during that time was involved in the setting up of a group called SuperBorder\$. All the members of the SuperBorder\$ group have genetic linkages allowing genetic comparisons between the member flocks by LAMBPLAN. The rams with performance data which exceeds the group's specifications are labelled with a SuperBorder\$ tag. This concept has been very well accepted by the Australian lamb industry.

A goal of our business is to focus on industry benefit from what we do. The Australian lamb industry does not owe us anything and it is up to us to earn and maintain a place in the industry through the production of sheep which make a positive contribution. I have attempted to be involved in the lamb industry in many ways, commercial, breed society and with LAMBPLAN in the attempt to contribute in the development of a better product to the consumer.

It is through this involvement that I feel very excited about the future for the Australian lamb industry. Other commercial animal species have become more intensified and it poses the question, can it happen to lamb? A more realistic question is- what can we learn from them? How have the seed stock producers positioned themselves within their industry?

With this in mind I applied for a Nuffield Farming Scholarship to look at how other species have structured breeding businesses and to learn from the methods they are using or have used.

Introduction

My study of **seedstock production systems** is probably better defined as a study of animal breeding carried out for further breeding and the businesses built around the production and supply of genetics. It is often an intensive operation that is carried out with the aim of producing animals which offer producers a source of genetics providing productivity increases or benefits.

The intensity of the operations vary considerably from a visual selection made from within an animal population, to a highly technical selection of animals based on pedigree and measured performance of all animals in the pedigree, incorporating a vertically integrated supply of animals to meat consumers.

Marketing and promotion of seedstock operations plays an important role, influencing a commercial producer's choice of new genetics and their purchasing decisions.

Breed societies can often play an influential role in seedstock production. There is a large variation in how breed societies operate and the impact they have within the overall animal production business.

Animal breeders have been selecting livestock to produce an expected greater financial return. This selection has been often based on a balance of price, appearance and performance. For some breeders the balance is heavily weighted to one of these criteria. The production of Seedstock, is the basis of potential improvement to better and more profitable livestock for the future.

The selection of sires based upon price provides a low capital requirement but may reflect lower returns by producing animals out of specifications in a given time. There is only a limited amount of people who are able to use this method alone due to supply and demand.

Selection made on visual characteristics has served the industry very well over a long period of time but often it is hard to allow for different feeding regimes and presale preparations when comparing sheep produced by different breeders. Progeny from these sires can vary greatly from expectations.

There are now many systems across the world and used in many species which provide information about an estimated level of production that can be expected from progeny. This information can have a high level of accuracy depending on the amount of data in the system and linkages. There are important unmeasured structural traits which can be overlooked if performance data is used exclusively.

Performance recorded livestock are not better than unmeasured sheep just because measurements have been taken and put into a computer to produce the report ranking animals. The amount of genetic gain made by a seedstock business depends on what data is collected, the accuracy of the data collected, the way the data is analysed and how it is used.

Many of these issues are inter related and cannot be dealt with in isolation.

Marketing

The successful production of any commodity relies on successful promotion. Seedstock production is no exception. This can take many forms but for it to be successful it must be effective by attracting new clients to the business as well as servicing existing clients and building stronger relationships with them all.

Many seedstock producers produce promotional material which takes many forms but this is really complementary to the one to one contact that takes place with clients.

Several large seedstock operations have created a presence in different regions through the use of co-operators or franchisees producing seedstock for them as multipliers. It has also provided more product under their label, which provides greater brand recognition from their advertising dollar.

Labelling forms an important part of marketing and many seedstock operations. This takes place at many levels firstly it could be seen as the species, then the breed, then the seedstock producer. There are also examples of where the seedstock producers label is more important to the client than the breed. In most cases these operations are involved in composite breeding.

A successful label relies on a perception of

- Differentiation from like products
- Consistency
- Superiority
- Value for money
- Supply any time
- Backup

A few seedstock operations have taken the labelling further by value adding using contracted commercial producers to supply product directly to restaurants or supermarkets. This takes a lot of work and many labels have failed in the process of gaining brand recognition.

Breed Societies

Many breed societies are made up largely of small breeders who are not viable as stand alone seedstock businesses. This is because in a large proportion of cases rely on others to make the genetic progress and are in effect genetic multipliers for the breed. For these breeders the breed societies play a very important role for their breeders to promote the attributes of their breed within their breed and to the industry.

Often within the hierarchy of a breed are the breeders who are looked to for introduced genetics by many of the multiplier breeders. These people have an interest in maintaining seedstock sales based on breed characteristics and may lose commercial focus.

Some breed societies hold sales to market seedstock, often between members, to select from animals with high genetic merit. These sales also provide a forum for breeders to meet socially as they do at shows etc.

Throughout the livestock industry differentiations are often made based upon breed of animal. A breed of animal has distinguishing visual features which are essentially cosmetic which are often used for breed identification. Few of the exclusive visual breed characteristics provide economic gain, eg colour of cattle, ears, wool on the head etc. However there are many visual attributes which are common between breeds and between species, eg leg structure, teeth etc which benefit animal performance.

There are carcase quality, performance and environmental suitability differences between breeds. It is these differences that establish the usage throughout the wider industry. It is the breed characteristics which have commercial impact that should be the focus of breeding programs.

It is necessary for breed societies to build on the strong points of their breed and to do it well. With managed crossbreeding programs it will be these strong positive attributes of a breed, which will make it necessary to include the breed into the program.

It is very hard to generalise about breed societies as they operate in different ways and fulfil different roles. There are some which own and operate large complexes and employ several staff and others who rely on volunteers who work from home in their spare time. At each extreme or somewhere in between there is a point which suits a breed society based on its number of members and their willingness to pay for services and the ability of the breed society to provide services.

There are some very good examples of breed societies who have been very effective and have done a lot to facilitate members working together. One of the great successes would have to be Certified Angus Beef. The work began in 1994. It took 5 years of belief in the concept before it began to take off and became reality.

There are movements for some Breed Societies to become more flexible as they look to capitalise on the achievements of other breed societies. They are changing the breed type to be more similar to successful competitors. These breeds run the risk of falling further behind as they focus on others' achievements rather than their own.

I am not saying that breeds must not change but perhaps they need to properly assess what they want to change and its impact on their current strengths. It may be that a breed society may see its role as a niche for the pure line in a composite program and focus on the traits required to fulfil that role.

American Red Angus Society has in their constitution that they must be progressive. This assists them to remain fresh and receptive to new ideas. The term progressive is not saying that they must have continuous change but that they must be looking for ways to improve what they do.

There are several examples of breed societies who have members involved in group breeding schemes to assist with achieving faster rates of genetic progress. These schemes have worked well over time but are often constrained by a member not wanting to use a sire which doesn't meet their own breeding objectives. It is the variations in breeding objective which maintain diversity within a breed but this is the critical difference that exists between breed society operations and large seedstock producers.

New breeds often create a lot of interest within the industry. Sometimes they are thought to be a threat to existing breeds. This threat can cause breed societies to refocus on their strengths.

New breeds capture a wave of enthusiasm. This enthusiasm comes from two parts. The industry is enthusiastic about the potential of added performance and the breeders involved are enthusiastic about the gains to the industry which creates an excitement about their breeding programs. These breeders are not locked into tradition which means that they are open to many new ideas and they interact well while the breed is under expansion.

When the breed society is in tune with industry requirements, breed attributes are also in tune with industry requirements. It is very likely that the breed has a prominent place in the commercial industry.

The successful operation of breed societies depends on many factors like

- Management
- Vision
- Leadership
- Communication
- Support of the membership
- Support to the membership
- Clear goals
- Looking to the future
- Enthusiasm of members
- Critical mass
- Brand / breed recognition

Large Seedstock Breeding Businesses

Throughout the world there are many examples of people and corporate entities that have created successful businesses from producing and/or marketing seedstock. They have been able to achieve much of their success with the involvement of others using common business structures like franchising, co-operators, licensing or contracted production.

These systems provide the advantage in scale of operation, which provides benefits of

- consistency
- greater selection for genetic gain
- the ability to invest in new technology
- promotion
- use of expertise
- brand recognition

Once a seedstock production operation has sufficient scale, they have little or no reliance on outside genetics for unrelated bloodlines or to make genetic gain. In fact because of this they have bred from animals that have met their own breeding objectives for several generations providing greater consistency.

If sufficient information is in the database, there is a high probability that enough animals are able to be selected for a particular trait to develop a new breeding line. Smaller seedstock producers may have one or two animals with special characteristics but have insufficient numbers to fully develop a sustainable breeding line from which the industry can benefit.

Some of the larger breeding companies have invested in new technologies eg electronic identification systems, which enables them to handle more animals with greater accuracy. The readers and supporting computer software becomes more affordable when the costs can be spread over more animals.

Gene marker work is being carried out by many of the larger seedstock producers or marketers and now entrepreneurs, who are able to see the potential for markers to make a return on investment. The return on investment may come in different forms but is mainly achieved by greater efficiencies, marketing and promotion. It is possible that greater returns will come from the latter.

Genes have been found which effect production, conformation, processing, feeding, animal health and human health to name a few areas. This work is a growing area in seedstock production and biotech companies, often in joint ventures.

This is expensive work, as is genetic improvement, and seedstock companies have comprehensive agreements to protect their investment in their genetic work. In the grains, industry hybrid lines of seed are produced which are unable to reproduce viable seed. This work is now going on with hybrid lines of crustaceans that are unable to reproduce. It is only with this type of control that the seedstock company can afford to invest in genetic improvement and market development of their product, insuring that their work has no benefit to a competitor.

Promotion and advertising are an essential part of any business. To optimise the effect of the advertising, it is more effective if the product is perceived as unique or offering something better than the competitors. This policy is being adopted by some seedstock producers who are now no longer members of breed societies, and they have created a new label for their livestock that is exclusive to them. Their success will rely on very good marketing.

I would anticipate we will see less breed publicity and much more individual seedstock company promotion promoting their labelled maternal and their terminal line to the industry.

As a seedstock production business grows it tends to seek out people who have specific skills to help grow and develop the business. When visiting a seedstock production business they were asked- 'what are the two main success factors of your business?' Their response was- 'the people and the marketing'.

The marketing is often backed by a brand or logo which is easily recognisable to increase consumer recall of a product. Animal production is no different and as the scale of operations increase we also have an increase in labelling some of which is done at retail level. This is a very complex task as there must be sufficient supply all year and quality is critical.

As some of these companies have grown they have embarked upon their own in-house performance evaluation systems. Some of these use the BLUP system and others don't. This is something that needs to be kept in mind when trying to compare seedstock operations as it will be almost impossible to do so in many cases

Genetic evaluation systems

The basis of any livestock business is being able to make good decisions when selecting breeding stock. The methods used for selecting livestock are very diverse ranging from using the latest technology eg. gene markers and BLUP(Best Linear Unbiased Prediction), to breeders continuing to back their judgement using only visual assessment.

Throughout the world and throughout the species there are many systems which provide a genetic evaluation of animals based on performance records from each animal. Many of these organisations that do the data analysis are independent and either government or industry however in many large seedstock operations they have developed their own genetic analysis.

The standard for the data analysis is a system known as BLUP which not only takes into account the performance of the animal but all other relatives in its pedigree and their performance. It also adjusts the figures to a constant weight as well as to a constant age to produce EBVs (Estimated Breeding Values). Litter size is also allowed for in the calculations as is the heritability of the trait.

While BLUP is the industry standard, however there are some in-house genetic evaluations systems used by some seedstock producers which do use BLUP and some which do not. Many breed societies, breeding companies or genetic assessment organisations have graphs which show a significant increase in the rate of genetic progress since the introduction of BLUP in approximately 1990.

Genetic evaluation systems cannot perform miracles if data is inaccurate when it goes in. When using BLUP an accurate pedigree is required to take into account the performance of other related animals. There is a huge variation of how this data is being collected by sheep seedstock producers. Some mother up in yards weekly, some tag at birth and some are now DNA testing. DNA testing is still not 100% accurate at this stage of development. The result from multiple sire matings may be that it is not sire A,B or C, however it may be sire D or E, but in most cases it does provide a definite answer.

Accuracy figures are provided for traits by many of the organisations carrying out genetic evaluation, however there are many which do not. These figures provide an indication of how close the animal will breed to the EBVs.

BLUP will provide data for animals where no measurements have been taken so at times while an EBV has been produced, the accuracy is very low. This means that the actual performance can have a large range + or - of the EBV.

In some systems there is limited data collected on farm, some record weights as well and in other systems on farm ultra sound scanning is carried out for muscle and fat measurements by accredited operators.

The French use a system where the data of the animals' prolificacy, milk and weight is provided by information collected on farm. However, carcass information is often provided by sending one or two animals from a farm to a testing station. There they are given three weeks to acclimatise before the period of assessment begins with a weight

measurement. At the end of the assessment period the animal has ultra sound measurements taken to provide EBVs for that animal as well as for other related animals.

When on farm data is collected it is important that it has identified which animals have been run together so that their information is looked at as one group to find the variation that exists between animals run under the same conditions. This group can be linked to other groups that have a common pedigree allowing genetic comparisons to be made.

This type of analysis relies on good records so that data with high accuracy can be produced. I have heard several traditional seedstock producers say that the wrong animals are being selected but I wonder if this is due to their reluctance to collect accurate data and a low commitment to performance recording.

The differences between the genetic evaluation systems I observed lies in the level of commitment expected from the breeders using each recording system and I think there is a strong negative correlation to the amount of money government or levy funded organisations are contributing.

Genetic evaluation schemes are more often promoted to seedstock producers rather than to commercial producers who have the potential to implement and demand greater change from seedstock producers.

Performance recording systems do a very good job of the evaluation of animals but lack the networks and social interaction that have traditionally existed between small seedstock producers at shows etc.

The dairy industry has proven that using performance information in isolation is a very dangerous thing. In-breeding levels have increased significantly leading to low fertility, structural problems and short production life. The intensive nature of dairying has assisted the wide spread use of AI which has contributed to the creation of a gene puddle rather than a gene pool.

I was fortunate to come across a company in Canada marketing dairy genetics, Foundation Sires, who are proud of the fact that they have gone “back to basics” and not using BLUP in their bull breeding program. They are also proud that the bulls from which they are offering semen have been bred from 10 year old cows with solid performances. The business has show exceptional growth in the 3 years of existence.

The difference is that they are not trying to shorten the genetic interval by using estimations to select young high performance animals and are not concerned about the rate of genetic progress but are more concerned about proving their product over time.

It seems that there are so many genetic evaluation systems used across the world which do a similar job but it is not possible to make direct comparisons with animals assessed by different systems.

The real test of any system is the results and the long term accuracy of the predictions within the broader commercial industry.

Crossbreeding

Within livestock production systems, many species have achieved significant gains through heterosis or hybrid vigour. The poultry, pig and beef industry have adopted the use of a structured crossbreeding program to maximise production and meat quality.

Quite often it revolves around a crossbred maternal line and a crossbred terminal giving a four breed cross for the end product.

The Meat Animal Research Centre at the Clay Centre in Nebraska began cross breeding beef cattle in 1975 and still have the three cross bred lines running today. The Leachman cattle company who were also working on a crossbreeding program picked up some of the research done with the Clay Centre's MARC II line and have commercialised it through their "Stabilizer" line.

The Stabilizer contains 50% British breed (Red Angus & Hereford) and 50% continental breed (Gelbvieh & Simmental) with the British crossed to the continental on both the maternal and paternal side. I saw Leachman Stabilizers in the UK, USA and in New Zealand and they are in several other countries as well and are building a strong reputation.

Many companies involved in the pig industry have developed a four breed cross for their commercial production. They maintain the "pure" lines within their overall operations to produce to maximise their production.

The sheep industry has used a cross breeding system that has evolved over time, however we are now entering a time of unstructured crossbreeding. Traditionally in the UK lamb producers have used "mules" (Blue Faced Leicester X with either Swaledale, Welsh Mountain Ewe or Scottish Blackface) and in Australia the "first cross ewe" (Border Leicester X Merino) have been used very successfully for maternal lines in prime lamb operations.

Both of these countries are experiencing difficulty in the supply of these cross bred maternal lines which is leading to lamb producers considering other options. The use of performance data is aiding this change with producers preferring to use that in their selection rather than breed.

The possibility of establishing a composite line of sheep, which is self replacing, similar to Leachman's stabiliser line of cattle could well be worth exploring.

Based on work done with cattle at MARC, I would like to see research done with sheep to establish the breed interaction that exists in cross breeding which creates increased production from hybrid vigour.

The debate will continue regarding the use of performance data vs a fixed breed combination and the need for consistency of the progeny.

Summary

The key to having a successful seedstock production system is having the right people, a sound marketing strategy, and a good relationship with clients

Breed Societies often are fragmented in their approach to breeding programs and take a long time to respond to or initiate change. Conversely large breeding groups have the ability to respond precisely and more quickly to change.

Gene markers are being identified and patented by entrepreneurs.

I anticipate that we will see less breed publicity and much more individual seedstock company promotion promoting their animals that may or may not be breed related.

If we look at breed societies gathering people together to gain critical mass for marketing, breeding animals to a similar type for consistency and industry recognition, then some of these companies are fulfilling the same role.

A breeding company decrees what sires must be used to produce a consistent line of animals, however a breed society recommends to its members a style of animal and this is interpreted by its membership.

Brand recognition and labelling will play a large part of seedstock production at all levels of the supply chain. However the links of the supply chain may not be visible with individual branding.

The acceptance of performance recording by a seedstock producer seems to be directly proportional to the financial contribution made to the system. Subsidised systems often attract a lower level of commitment to collecting data and often this leads to less confidence in the results.

Crossbreeding is likely to take a larger share of the seedstock breeding businesses as the shift is to performance rather than skin deep breed characteristics.

Breed Societies consider licensing the use of their breed name to their members only when marketing breeding stock.

Commercial producers need to be more aware of the methods used for genetic analysis and be able to make comparisons between seedstock producers using their own in house assessment.

There should be a world wide QA system to accredit genetic evaluation systems.

Breed Societies need to identify and maintain the commercial attributes of their breed first before they begin to attempt to duplicate the role of a more successful breed.