

**Easier managed sheep and beef cattle;
simplified, profitable and productive sheep
and beef farming.**

**A Nuffield Farming Scholarships Trust Report
by
Charley Walker**

**Sponsored by the
Royal Highland Agricultural Society of Scotland
and the
Royal Smithfield Club**

***“If you breed an animal that makes you money
and doesn’t cause you hassle,
you’ll soon get to like the look of it.”***

Anonymous Australian Breeder 2007

The views expressed in this report are entirely my own and do not necessarily represent the views of the Nuffield Farming Scholarships Trust, or my sponsors, or any other sponsoring body.

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Summary

The study was undertaken to discover ways of lowering inputs, particularly labour, in UK sheep and beef systems. Labour accounts for almost one third of the cost of sheep and beef production and any reduction will be valuable to profitability.

Canada, USA, Australia and New Zealand were visited in order to establish and understand the genetics, breeding strategies and management practices in use in each of these countries and to analyse their potential for application in the UK environment.

A series of case studies are presented which illustrate the main findings of the report in their overseas context. These findings are then analysed and presented along with recommendations in relation to the UK industry.

The key to simplification of management and reduction of inputs whilst maintaining output lies in using the correct genetics under the relevant management practices. Genetics or management alone will help, but will not allow the full expression of benefit. Improvements in genetics are permanent and cumulative, whilst management is shorter term and may be temporary. Genetic changes tend to be either slow and incremental or if radical to be expensive. Management change can be rapid and relatively cheap.

By co-ordinating improvements in genetics and management, costs of production can be significantly reduced without unbalancing the farming system. Farm infrastructure is a critical factor in providing the necessary resources to implement change and operate new practices. Often it is lack of capital to invest in farm infrastructure which restricts the ability to make changes to management or genetics.

Introduction

I am married to Andrea and have two children, Tom and Jessica. We farm a 250 hectare upland unit in the Scottish Borders, 30 miles East of Edinburgh. 80 suckler cows and 800 ewes are managed on a low input organic system.

The ewe flock is partly New Zealand Romney and partly wool shedding "Easycare" crosses. Ewes and hogs are lambed at grass in May. Lambs are fattened on clover, rape and chicory. The cow herd is pedigree Welsh Black, bred pure. Cows calve at grass in April and May. Progeny are finished off grass or sold store at 18 months old.

The emphasis for our system and genetics is on reducing inputs whilst maintaining output. We enforce a strict culling policy for animals requiring individual attention or unable to perform in our system. We do not employ labour, we do not house stock and we do not use concentrate feed. Being organic, we do not use fertiliser or pesticides.

I grew up on a mixed farm in the Midlands and on leaving school travelled to Africa, Australia, New Zealand and the USA before studying for my degree in Agriculture at Harper Adams. The things I learnt on my travels and from my interest in nature, made me begin to challenge accepted agricultural practices in the UK. In the years after I left college I began to develop some of the ideas I had with our own small flock of ewes and in my employment as a stockman.

When we took on a farm tenancy in 2001 we were able to put some of these practices into operation on a larger scale. Indeed, some were necessary for business survival with the poor economic climate and a substandard farm infrastructure.

Our progress then accelerated as we joined discussion groups and made contact with like minded individuals. The ability to share experiences, both good and bad, was invaluable and led us into genetics and systems that whilst continually evolving, have now stood the test of time and provided us with a firm footing on the farming ladder.

We owe a debt of gratitude to those producers, consultants and academics who were prepared to challenge accepted practice and through their pioneering spirit establish new (or perhaps old) ways of operating.

Background

Labour accounts for almost one third of the total cost of sheep and suckler beef production in the UK. Where reasonable physical performance of an enterprise already exists, reducing labour input offers the best opportunity to improve profitability. Our quest for maximizing production has often led us into genetics and systems that require high levels of input, particularly labour. Productivity is often confused with profitability but high productivity does not necessarily generate high profit. Success should be measured by net profit, not by ability to maximize yield. We should judge ourselves by the results of our efforts rather than priding ourselves on the effort itself.

A small but increasing number of UK producers are using genetics and management practices which allow significant reductions in labour and other inputs without compromising output. Their focus on net rather than gross margin has improved their profitability and often their lifestyle as well. Having developed our farming system and livestock genetics in a similar way, I wanted to continue this progress and benefit from the experiences of overseas producers. This was the motivation for my study.

I intended to discover the genetics, breeding strategies and management practices in use in Canada, USA, Australia and New Zealand and to analyse their suitability for application in UK production systems.

Study Tour Overview

Following the contemporary scholars conference in Canada and a scholars trip to Brussels I chose to join the Australian Global Focus Programme in China and Ireland. I was also able to make some Nuffield visits whilst on holiday in Sweden. These group trips offered the opportunity for spirited debate between scholars from different backgrounds and had given me a much broader perspective of world agriculture as I embarked on my specific study travel to Canada, the USA, Australia and New Zealand.

Canada

I visited Canada for the contemporary Scholars Conference in February 2007 and returned to Alberta for a week in September 2007. Canada relies heavily on exports of beef, particularly to the USA. Alberta accounts for 68% of Canadas beef production. My focus was on cattle, particularly suckled calf production in a harsh climate, and alternative wintering options. I visited several stud and commercial operations and also visited an ovine embryo transfer unit involved in exporting genetics overseas. Canada was one of the few places where I was based in one place for any length of time and I deeply appreciated the insight into life, living and farming that this afforded.

USA

I visited the USA for 3 weeks in October 2007. I attended the Katahdin Hair Sheep International Expo in North Dakota and the Leachman Cattle of Colorado female sale along with other autumn breeding and production sales. I was especially interested to visit the US Meat Animal Research Centre in Nebraska and was keen to gain an understanding of the feedlot industry as well as visiting ranches and farms. With just 7 million sheep and 96 million cattle in the USA, I expected the focus of my visit to be on beef production but found this not to be the case. The sheep industry is quite fragmented with a general theme of smaller flocks of ewes numbered in the hundreds in the East and large range flocks of several thousand in the West. Hair sheep are quite popular, particularly in the more fragmented regions of the East.

Most beef and lamb production in the USA is focused on producing animals for a feedlot, involving an intensive finishing period on a cereal based diet. However, there is increasing interest in grass fed beef, which has a brand like status attached to it. Per capita consumption of beef in the USA is 100 times that of lamb. In reality, most Americans do not eat lamb, but few do not eat beef. Almost 50% of US lamb consumption is Australian & New Zealand product.

Australia

I visited Australia for 4 weeks in November and December 2007. My visits were to South Australia, northern New South Wales and southern Queensland. I was able to mix my visits to stud and commercial producers with meetings with geneticists, researchers, veterinarians and breed society officials. I was particularly interested to see both ends of the spectrum in terms of wool production in a country where the sheep industry has polarized with fine wool Merinos at one end and hair sheep at the other. However, the Merino is still very much the mainstay of Australian sheep production.

Australia has a harsh and varied climate and many areas were suffering from the ravages of drought during my visit. The resilience and upbeat attitude of Australian stockmen shone through the sometimes gloomy atmosphere. The harsh realities of economics and climate have created a very progressive, ruthless business culture.

71% of beef production in Australia is from Queensland and NSW and over 60% of sheepmeat production is from NSW and Victoria. Australia is reliant on export markets for almost half of its beef and lamb production and almost all of its wool production.

New Zealand

I visited New Zealand for 5 weeks during December 2007 and January 2008 and I was fortunate to visit again for 3 weeks during September 2008 on an ASDA Beeflink Scholarship. My extensive time in the country allowed me to visit a huge number of sheep and beef operations, both stud and commercial, as well as breeding centres, technology providers, consultants, geneticists, academics and researchers.

The NZ climate varies widely from the balmy North to the Fjords of the South and the dry East coast to the much wetter west coast, but as a country it has conditions most comparable to the UK. New Zealand has a pastoral livestock based agriculture. At the time of my visits dairying was seeing record returns, beef production was holding its own but sheep production was under severe pressure from low product prices, drought and resource pressure from the dairy boom.

In economic terms, conditions are very different to the UK. New Zealand has had no production subsidies since 1984 and has developed very efficient systems of production able to survive at world prices. This has led to farming units of a significantly larger scale than is usual in the UK. The fact that New Zealand relies on exporting 80-90% of its beef and lamb production has required them to be excellent marketers of their product and to be highly innovative in their production systems. The average sheep to cattle ratio on NZ sheep and beef farms is two thirds sheep to one third cattle, with a general tendency for more cattle in the North and more sheep in the South.

Table 1: Production and export reliance of countries visited

Country	Beef production 000 tonnes	Sheepmeat Production 000 tonnes	% Beef Exported	% Sheepmeat Exported
UK	860	324	7	25
Canada	1,600	9	37	<2
USA	12,000	100	5.4	<2
Australia	2,200	683	44	46
New Zealand	494	535	79	90

Sources: UK: AHDB(LMC), Canada: Agriculture & Agri-Food Canada, USA: USDA, Australia: MLA, NZ: MWNZ

Case Studies

Case Study 1: Wairere Romneys & Composites, Wairarapa, New Zealand

The Wairere Romney stud was established in 1929 and is now the foremost ram seller in New Zealand, selling almost 4,700 rams in 2006 from the 29,000 ewes. Around 75% of sales are pure Romneys and the remainder composites based on the Romney. I was fortunate to be able to spend time with owner and director Derek Daniell and his stock manager Simon Buckley.

The Wairere home property consists of 1080 hectares of medium to steep hill country rising to 532 metres above sea level in the Wairarapa, at the southern end of New Zealand's North Island. Only 2% of the land is flat. The climate is variable, with cold wet winters and dry summers with strong winds. Average rainfall is 1100 mm, but with average summer rainfall of just 370 mm per annum.

In 1967, Derek's father, John Daniell, challenged accepted practices by mating the best of his unregistered ewes to his top stud rams. This gave him a large population base to work with and precipitated rapid gains in fertility, mothering ability and growth rate. By running ewes at high stocking rates in big mobs and exposing them to droughts and wet winters only those animals with the strongest constitution were retained.

In the late 1980's Derek decided to sell rams bred from Waireres commercial ewes. Based on performance, ewes had already been circulated between the recorded and commercial flocks and this decision allowed significant increases in ram sales to cater for the high demand for Wairere rams.

Through the 1990's, the ram breeding flock was expanded to 25,000 ewes. Joint breeding ventures were set up around NZ. Here, Wairere ewes are multiplied up to produce breeding stock to feed into Wairere and the joint venture sales programme. This approach allows proven Wairere genetics to be proliferated at a faster rate and has been replicated by other ram breeders in New Zealand.



Romney Rams, Wairere

It is policy to mob stock animals in a competitive environment in order to apply selection pressure for constitution and growth rate, and to cull rigidly for production gains in a commercial environment. Ram lambs are run in groups of over a thousand and subjected to this policy. Rams offered for sale are in the top 30% and priced according to their ranking on genetic merit. Prices range from \$400 to \$1050.

Ewes are set stocked for lambing and the only intervention is for the parentage tagging of lambs. Whilst some studs have opted for the convenience but extra cost of using DNA parentage, Wairere has stuck to their policy of tagging at birth and single sire mating. Wairere feel that with their ewes of good mothering temperament this practice is the most cost effective.

Wairere, like many other stud breeding operations in NZ has faced a significant challenge from composite bred maternal lines in recent years. In order to meet this demand for more diverse genetics, Wairere has developed a series of composite options for its ram clients. The Romney and east Friesian breeds are the main breeds used but a summary of types is shown in Table 2 below:

Table 2: Summary of Wairere Composites

Ram Type	Composition	Strengths
Romney	Romney	Constitution, Performance
Breakthru	1/2 EF 1/2 Rom	Enhanced performance
Earlylamb	1/4 EF 1/4 Poll Dorset 1/2 Rom	Early high growth lambs
Multiplier	1/4 EF 1/4 Finn 1/4 Texel 1/4 Rom	Increased prolificacy
Muscle	1/2 Texel 1/4 EF 1/4 Rom	Higher meat yield
TefRom	1/4 Texel 1/4 EF 1/2 Rom	A good balance of traits
Midmicron	Dohne Merino/ Romney	Fine wool + performance
FuTuRo	1/4 Finn 1/4 Texel 1/2 Rom	Good balance of traits
TexRom	1/2 Texel 1/2 Romney	High meat yield and lamb survival
Dominator	1/2 Dorset Down 1/4 EF 1/4 Rom	Hybrid vigour for fast growth

EF = East Friesian; Rom = Romney

source: Wairere literature

Composites make up around 25% of Waireres ram sales and offer clients the opportunity to target specific traits. I met several commercial producers who, having used composites from other studs for a number of years, were now using Wairere Romneys to improve constitution.

Case Study 2: Mount Linton Station, Southland, New Zealand

Mount Linton Station comprises 11,200 hectares near Otatau in Southland. Up to 55,000 ewes and 2000 breeding cows along with progeny are carried at any one time. Included within these figures are significant numbers of performance recorded animals. General Manager Ceri Lewis and Genetics Manager Hamish Bielski were good enough to give me an insight into their operation.

The Angus Herd

The recorded breeding herd at Mount Linton comprises almost 900 cows and heifers. Around 300 bulls are annually offered for sale and are in high demand for their ability to thrive in the challenging Southland environment. The herd has been performance recorded since 1991 and are well above average on the Angus Associations self replacing index. Although genetics have been brought in from outside, most notably Australia, the proportion of homebred sires used is increasing to reflect the importance of those animals bred in the Southland environment. Breeding objectives are excellent maternal performance whilst improving growth and carcass traits.

Bulls are offered for sale with a 3 year guarantee for fertility and structural soundness and free transport to the purchasers property. Prior to sale they are inspected and approved by a certified Angus assessor, are tested for BVD, EBL and semen quality and have a TB free status. Bulls are sold by private treaty with most sold as yearlings.

The Terminal sire flocks

Flocks of Suftex (Suffolk/Texel composite) and Texel ewes are run to breed terminal sire rams, although part of the Texel flock is bred with more emphasis on maternal traits for use in maternal breeding programmes. These flocks are run on a separate unit at the station under commercial style management. There are over 1600 ewes recorded through Sheep Improvement Limited (SIL).



Suftex ewe rearing triplets, Mount Linton

The ewe flock has a no drench policy and the young stock are specifically challenged to see how they perform under pressure, particularly in relation to parasites. Sheep Genetics manager Hamish Bielski believes that it is important to select terminal sires

primarily for their growth and meat characteristics but feels they must still have the constitution and ability to perform within a typical commercial farming system.

It is policy that only rams from within the top 25% are offered for sale and there is a 2 year structural guarantee.

Extensive use of technology is made in the breeding programme:

- **Ultra sound scanning** for carcass characteristics
- **CT scanning** for meat yield and carcass qualities - Innervision identifies sires with the more meat, less fat qualities, Innervalue identifies sires that have more meat in the high value areas i.e loin and leg.
- **Animate breeding program** prevents inbreeding and maximises sire/dam genetic matches
- **Electronic identification** maximises accuracy in recording and minimises time in yards
- **WormFEC** to assess performance under an increased worm challenge
- **DNA markers** to identify parentage and specific traits present in animals:
 - **MyoMAX** a DNA test for a gene which increases carcass weight and lean meat yield.
 - **LoinMAX** a DNA test for a gene which increases loin muscling.
 - **WormSTAR** a DNA test which identifies animals that shed less eggs onto pasture (parasite resistance) and animals that grow well in the presence of parasite challenge (parasite resilience).
 - **Shepherd** a DNA based parentage system that provides pedigree information and eliminates the need for tagging at birth and single sire mating.

Mount Linton is also involved with AgResearch and Ovita in research to identify the lamb survival gene.

The Mount Linton Maternal Flock

Ceri Lewis has initiated a highly selective breeding programme with the aim of improving maternal performance on Mount Linton and its clients properties. The programme will utilize the massive gene pool available on the station of over 50,000 ewes to exploit the process of natural selection that such a large population base allows. The top 3-5% of animals able to thrive under the pressure that is generated by running large mobs of three to seven thousand in a harsh environment, will be selected to form an elite flock.

The aim is to breed a hardy, low input but fertile animal able to grow like a terminal in all environments. They will also be selected for disease resistance and resilience, and be dag free. The ultimate genetic make-up will comprise Texel, Perendale (RomneyxCheviot) and Romney.

The initial intake to this elite flock are 400 two toothed. These are the relatively few survivors of an extremely tough series of selection criteria that started with 15,000 ewe hoggets. 10,000 of these were selected to be mated and these were then reduced to 3,000 based on those which had got in lamb whilst performing best through a tough

winter and remaining dag free. Those that reared a lamb, continued to remain dag free and put condition on after weaning then proceeded to the next stage.

The remaining 900 two-tooths were then mated to elite Texel and Perendale sires. These scanned 174% and the final selection was made based on sheep that scanned multiples, held their condition through the winter, were meaty, had sound feet and were dag free.

This left the 400 two-tooths that survived these strict selection policies to form the start of the Mount Linton Maternal flock. To remain in the flock in the future, they must continue to satisfy these exacting criteria.

They have all been DNA profiled so that parentage of their progeny can be established without interfering at lambing time. Rams used over these ewes have also been used over the recorded Texel ewes in order to establish strong genetic linkage between the flocks to help in analysis and breeding decisions.

The selection process described will be continued for the next five years. Ultimately it is anticipated that there will be a flock of 1500-2000 elite performance recorded maternal ewes.

Case Study 3: Amarula Dorpers, Moree, NSW, Australia

The Amarula Dorper Stud was established by Justin and Lorroi Kirby in 2000 after a visit to South Africa convinced them that the Dorper had a good future in Australia. They had seen ewes with lambs at foot thriving on shrubs and bushes in a low rainfall area, and were impressed by the breeds hardiness, survivability and low maintenance requirement. The stud now has a base flock of 500 high class ewes with the top 10% of ewes selected for embryo transfer programmes and the resulting genetics made available at the annual “on property” production sale and at the National Dorper Sale.

The Dorper has the ability to utilise poor quality feed to rapidly gain weight. It also adapts to better quality feeding systems such as improved pastures and feedlots and has excellent feed conversion. The breed has high fertility, with multiple births prevalent. Amarula routinely gets lambing rates in their 500 ewe stud and 1,000 ewe commercial flock of 130% to 150%. Their polyoestrus (nonseasonal) breeding ability enables the ewes to lamb three times in 2 years, meaning an annual lambing percentage of around 200%. They have good milking ability and mothering instinct.

Justin and Lorroi are committed to developing the Dorper in Australia because of its hardiness and adaptability, combined with high fertility and low maintenance.



Justin Kirby with Dorper rams

Gordon Gilder, commercial client of Amarula

Gordon is a commercial sheep producer running 5,000 Dorper ewes. In the 1990's he became disillusioned with wool production and was “sick of having his lifestyle dictated by the life cycle of a blowfly”. He identified that much of the cost of sheep production is related to wool and was convinced to move into hair sheep exclusively for prime lamb production. Typical performance is 130-140% lambs weaned per lambing with an 8 month lambing interval, although he is tending back to a single lambing period in the autumn in the wake of recent difficult seasons. There is no assistance for ewes at lambing. The aseasonal breeding qualities of hair sheep make them ideal for flexibility in Australia's difficult climate.

Case Study 4: US Meat Animal Research Center, Nebraska, USA

The US Meat Animal research Center (USMARC) is a US Department of Agriculture (USDA) facility administered by the Agricultural Research Service (ARS) comprising 35,000 acres in Nebraska. There are female breeding populations of 6,500 cattle of 18 breeds and 3,000 sheep of 10 breeds. Scientists at the facility develop new technology to increase the efficiency of livestock production. I was the guest of Dr.Kreg Leymaster and had further meetings with other scientists and staff at the facility.

Research at USMARC has been instrumental in establishing the benefits of hybrid vigour or heterosis and this features heavily in their breeding programmes. The most interesting aspect of my visit was Dr Leymasters development of the Easy-Care Maternal Line of Hair Sheep.

The Easy-care Maternal Line

The objective is to create a prolific, easy-care maternal line of hair sheep that can raise triplets on pasture without labour or supplementary feed. This addresses the twin aims of the sheep industry - to increase numbers of lambs sold per ewe mated, and to reduce labour input to sheep enterprises. Ultimately it is anticipated that there will be extensive use of crossbreeding systems to take advantage of direct and maternal heterosis effects on fitness traits crucial for easy-care sheep in low input production systems.

Desirable traits identified for an easy-care maternal line:

- Fertile
- Prolific
- Maternal (milk and behaviour)
- Adaptable
- Perform on forage
- Parasite tolerant
- Scrapie resistant
- Wool shedding or hair coat
- Polled
- Short tailed
- Moderate size
- Acceptable conformation
- Sound feet

Previous and ongoing research at USMARC has identified the benefits of Romanov crossbred ewes for fertility, length of seasonal fertility, prolificacy, lamb survival and ewe longevity. Romanov crossbreeds significantly outperformed even Finnsheep in these areas and are therefore used in evaluation of maternal lines at USMARC.

There is further ongoing research evaluating the ability of the Dorper, White Dorper, Katahdin, Dorset and Rambouillet to complement Romanov genetics through comparison of crossbred females in both high and low input systems of production. Although having lower prolificacy than other crosses, the Romanov X White Dorper was the top performer in terms of weaned weight of lamb per ewe due to its higher lamb survival and growth rate. Romanov X White Dorper ewes averaged 2.04 lambs reared per ewe lambing at three years of age. Some 62% of triplet bearing ewes weaned their

entire litters from pasture alone with no shepherding input, shattering the common perception of many sheep producers and scientists.

The results of this work have led to the decision that the easy-care maternal line will comprise $\frac{1}{2}$ Romanov, $\frac{1}{4}$ White Dorper, $\frac{1}{8}$ Katahdin, $\frac{1}{8}$ USMARC Composite (Terminal). As stated, the Romanov X White Dorper was the best performer and hence comprises 75% of the mix. The inclusion of Katahdin and USMARC Composite is partly for easy-care traits (parasite tolerance and hair of Katahdin) and marketing issues (size, conformation and scrapie resistance of Composite), but also to increase the retention of hybrid vigour effects from 50% in a two way cross to 66.6% in the four way cross.

The USMARC Easycare Maternal Line of Hair Sheep



1/2 Romanov



1/4 White Dorper



1/8 Katahdin



1/8 USMARC Composite

Source: Dr Kreg Leymaster, USMARC

This breeding programme is already under way and 2010 will see the first matings of F1 ewes to F1 rams with the goal of ultimately reaching 4,000 ewes. The F2 generation will then be suitable for evaluation with other maternal breeds in a low input pasture lambing system.

Case Study 5: Puzzlewood Ranch, Texas, USA

Puzzlewood Ranch is a 6,000 acre flat to rolling pastureland property near Palestine in Texas. The ranch runs 1500 crossbred beef cows and 5500 hair sheep along with progeny. The ranch is owned and run by Swiss brothers Jean and Alain Galley who also own and operate two further properties in Mexico and split their time between these three properties. I was inspired by my time spent with Jean at Puzzlewood.

Having been asset stripped by the former owner and left in a run-down state the ranch is in ongoing development. At the time of my visit in October 2007, around 3000 acres had been developed with subdivision fencing, waterlines, laneways and handling yards. Both brothers have travelled extensively, and at Puzzlewood combine the best aspects of their gleanings from around the world. To this end, they employed a NZ grazing consultant to help with the designs for development and began by erecting a six wire electric fence around the property able to contain all classes of grazing livestock.

The next stage was to subdivide this into a series of 80 acre paddocks. Judicious siting of watering points means that each of these paddocks can be easily subdivided into four twenty acre paddocks when necessary. This infrastructure was crucial in being able to operate the rotational grazing system that the brothers feel is necessary to optimize productivity from the property.

The rotational grazing system involves regular shifts for almost all stock classes, with animals never remaining in the same paddock for more than 3 days, except when they are lambing and calving. This means relatively few, but very large mob sizes. During my visit I was involved in a pasture shift of a mob of 700 cows and calves, which happened very quickly and smoothly as the cattle are so conditioned to the system. The paddock layout and siting of central handling facilities means that stock can pass close to the yards in the course of their paddock rotation, further facilitating handling operations.

The main grass species are bermudagrass and ryegrass which generally allow a 10 month grazing season with supplementary hay fed when necessary. The main water lines have been installed with capacity to carry irrigation as well as drinking water, although irrigation has not been necessary with the current stocking rate and 50 inch rainfall.

The Ewe Flock

The ewe flock is Barbados Blackbelly in origin but with increasing influence from the Dorper rams which have been used for maternal replacements and for finished lamb production. One brake on genetic development in the sheep flock was the initial difficulty of sourcing enough hair sheep females. Jean is an advocate of hair sheep, particularly the Dorper, citing their meaty high yielding carcasses and the lack of shearing, tail docking and fly control along with their natural parasite resistance as the main advantages over traditional breeds. There was some issue with foot problems in the humid climate of the region, but this was being tackled in robust fashion with their policy of culling animals that gave problems as individuals.



Dorper cross ewes and lambs, Puzzlewood Ranch

Ewes are lambed in spring and autumn and the aseasonal (unaffected by season) breeding habits of hair sheep are a real benefit in maximizing production and providing continuity of supply in this way. Ewes generally achieve 3 lambings in 2 years but some are able to lamb every 6 months. A drift lambing system is operated in order to continue the rotational grazing system. In this way ewes that have lambed since the previous shift are left in the paddock when the remaining in-lamb ewes are moved on. Predation from coyotes can be a real problem at lambing time but the presence of cattle and guard dogs has helped to reduce this problem to very low levels.

The Cow Herd

The base cow herd is Red Angus. These cows are bred to Tuli, from Zimbabwe, or Nelore, from Brazil, to produce crossbred, non Brahman offspring with heat tolerance from their sire and docility from their Red Angus dams. These crossbred cows are then bred to South Devon bulls as terminal sires. The South Devon is used for its excellent meat tenderness qualities and reasonable, but not excessive size. All of these offspring are for slaughter. Cows are calved in a similar manner to the drift lambing for the ewes and also calve in spring and autumn.



Tuli and Nelore cross cows, Puzzlewood Ranch

The ranches excellent infrastructure, management system and choice of genetics mean that it is an easily run, low input operation with just 2.5 labour units employed along with two contract labourers hired twice a year for two days to work with the stock. The half labour unit is the result of each Mexican worker being given two months off each year to return to his family in Mexico. The workers take this family leave in rotation. The only machinery on the ranch is two ATV's, a pickup truck and small tractor.

Ultimately the brothers plan to develop the rest of the ranch, and think that when fully developed it should carry 2000 breeding cows and 7000 ewes and their lambs.

Florisol ranch, Queretaro, Mexico

Jean and Alain own the 200 acre Florisol ranch near Queretaro in Mexico which is all down to alfalfa (Lucerne) under irrigation and supports 5000 hair sheep of Pelibuey origins bred to Dorper rams. Contrary to accepted practice, the pure alfalfa stand is grazed in situ, with bloat problems avoided by strip grazing with half hourly shifts of the fence. In this way each animal ingests a mixture of stem and leaf rather than purely leaf.

The grazing period amounts to 5 hours a day and involves grazing the alfalfa right down to the dirt in order to encourage the killing of parasites by sunlight. The last break of the grazing each day is left stemmy so, as the first break in the morning, it provides bellyfill before the richer leaves are grazed. The sheep are yarded for the rest of the time to protect them from predators and reduce labour requirement.

At any one time the flock is grazing in three large mobs, one of weaned lambs, one of ewes with lambs and one of dry pregnant ewes. High stocking densities ensure that sheep receive a mix of stem and leaves at each grazing to eliminate bloat problems. Animals which prove particularly susceptible to bloat are culled.

The alfalfa was originally sown with orchardgrass but this has disappeared under the intensive grazing regime. Chicory and plantain are being hand sown into bare spots in the alfalfa and will provide minerals and improved parasite resistance.

The Ranch is run by a manager with a man for irrigation, two fence movers, a general farmworker, a cook and a maid. Other than irrigation equipment, machinery consists of a pick-up, tractor and a bicycle. The labour force reflects the cheap cost of labour in Mexico.

All lambs and cull ewes are marketed direct to the local population for a Mexican delicacy known as Barbacoa. In order to provide more consistent supply, there are 3 lambing periods with ewes averaging 1.5 lambs per lambing and 1.4 lambings per year. The lambing periods avoid the summer rainy season and the winter frost season. The ranch also sells breeding stock to other producers, with a high demand for $\frac{3}{4}$ bred Dorper females.

Their breeding line at Florisol is distinct from that at Puzzlewood, as the brothers are keen to have the sheep at Florisol bred for a semi-arid climate whilst those at Puzzlewood are bred for humid, sub-tropical conditions.

Case Study 6: Kaisers Celtic Cattle, Ponoka, Alberta, Canada

Randy Kaiser runs 110 Welsh Black and 70 Galloway stud cows and sells around 35 bulls a year. He describes his focus for selection as being “on animals that work for us, not the other way around”. He pays particular attention to udders, feet and depth of rib. He prefers to measure ribeye per 1000lbs of carcass rather than just ribeye as this has led to increased size and therefore increased input in other cattle. Mature cow weight is around 550kgs and heifers are around 400kgs when bred to calve at two years old.

He operates a rotational grazing system and is able to save up grass known as “carry over grass” so that his cattle graze well into December despite the harsh Canadian winter. Alfalfa (Lucerne) is included in his pasture mixes and its strength, taste and height encourages the cattle to forage down through 4 to 6 inches of snow where they find other grasses available.

Once the carry over grazing is finished, cattle move onto bale grazing of hay. Bale grazing is a term used for the practice of positioning bales across a pasture in such a manner that they can be strip grazed through the winter. Rows of bales are placed with about twenty feet between bales and at least twenty feet between rows so that access is not restricted. Electric fence posts are inserted into an adjoining row of bales when frozen ground or lack of snow prevents penetration. Stock are usually given access to fresh bales every 2 to 7 days depending on conditions. Pastures do not generally require re-seeding the following spring. The system requires good management in order to minimize wastage but drastically reduces winter feeding costs.

The benefits of bale grazing are numerous - reduced labour and machinery for winter feeding, no labour and machinery for cleaning out corrals and spreading manure, an even spread of manure across the field, and reduced nutrient loss. The bales provide some shelter from the wind, but in more exposed areas additional portable shelters are used. Bale grazing can be used to improve areas of lower fertility, and has been proven to provide far more nitrogen and subsequent grass yield because of the direct application of urine, which is largely lost in a winter corral system. Producers operating this system do not even think of rejected feed as waste as it has benefits in terms of providing a mulch layer and ultimately slow release nutrients back into the soil. This system is also practiced for sheep.

Other winter grazing systems I encountered in Canada were swath grazing, which involves the strip or block grazing of a swathed cereal crop, usually oats or awnless barley, and bunch grazing. Swath grazing had potential to reduce wintering costs significantly and had the advantage of providing higher feed value because the feed grain is integral to the crop. Large swaths are preferable to reduce spoilage from weather, and to this end there is some benefit from later sowing, although this may be offset by reduced yields. The economics of this system depends on grain prices, as there is a crop opportunity cost foregone. It is advantageous to provide some straw bedding in order to reduce the temptation for cattle to lie on the swath. Other swath grazing systems involve the use of crop residues following harvest of the grain portion of the plant but have less feed quality. “Bunch” grazing is the collection into a large heap of the crop residue behind the harvester as opposed to leaving it in a swath. The advantage of this system is that the chaff, which has the highest feed value, is suspended in the straw where it is more accessible to the cattle, rather than filtering to the ground and being wasted.

Findings and Recommendations

Genetics and Breeding

Attitude

I was impressed by the business-like attitude of breeders and producers who did not let tradition or emotion stand in their way. They simply could not afford to. This was epitomised by one of my hosts - "If you breed a flock or herd that makes you money and doesn't cause you hassle you'll soon get to like the look of them."

Producers were much more willing to use crossbreeding or change breed if it suited their breeding objectives. They were very conscious of the benefits of hybrid vigour, particularly for the improvement of lowly heritable maternal traits associated with easier management. There was a sharp emphasis on efficiency rather than outright production.

Hybrid Vigour and Composite Breeding

Hybrid vigour or heterosis, describes the improvement in performance of crossbred progeny compared to the expected average of their parents performance. Previous research at USMARC with both cattle and sheep breeds has shown the benefits of hybrid vigour.

Gains from hybrid vigour are often far faster than gains from within breed selection, particularly for less heritable maternal traits. Hybrid vigour can have highly beneficial effects on maternal traits of high economic importance but low heritability, and is exploited widely by breeders and producers around the world. To this end many breeders operate composite breeding programmes, blending two or more breeds into their chosen line. Those that do have purebred lines are often supplying the purebred element of composite breeding programmes or themselves offer composite lines based on their purebreds. Correct selection of composites will lead to animals with improved fertility, vigour and longevity compared to purebreds. These are all traits beneficial to lowering inputs.

The difficulty of composite breeding programmes is that they tend to produce animals with a wider range of phenotypes, they require larger numbers of animals and they can be quite complex. It is also difficult to use Breeding Value information because it is distorted by the effects of hybrid vigour. This was an issue under debate during my visit to Lambplan in Armidale, Australia. Closed composite breeding programmes - where after initial establishment, the flock or herd is closed to new genetics in order to establish uniformity of appearance - will begin to see a reduction in the effects of hybrid vigour over time. For this reason most composite breeding programmes were "open". This means that new genetics can be brought in at any time, allowing great flexibility and often meaning more variation in phenotype.

Selection Criteria

Throughout my travels a strong interest in maternal genetics was very evident. Most producers considered it essential for an animal to give birth and suckle its young without assistance, and would not tolerate poor structure or constitution. They enforced strict culling regimes for animals or their progeny who could not meet these criteria or perform in their system.

In contrast to the UK, the big name flocks and herds were those supplying maternal breeding lines to commercial producers. In the UK, the widespread use of terminal sire breeds in maternal lines and excessive selection for terminal traits in maternal breeds has required increased inputs which often outweigh the increase in output achieved.

Sexual maturity

In all the countries I visited almost all producers calved heifers at two years old and many lambed yearling sheep. Animals that could not conceive and rear progeny at a young age were considered unsuitable as future breeding stock. This adds selection pressure for fertility, and over time will tend to lead to a population of animals able to achieve good performance under this regime. In harsher environments, producers were willing to waive this policy if conditions dictated, but were usually planning on it at the outset of the season. The use of crossbreds or composites provided a way of accelerating performance gains in this area.

Serving Capacity

Male stock were often expected to serve more females than is usual in the UK. The extremes that I encountered were 1 bull to 70 cows in the USA and 1 ram to 200 ewes in New Zealand, with bulls generally expected to mate around 50 cows, and rams from 50 to 200 ewes depending on circumstances.

Rams and bulls were bred in conditions that reflected the commercial environment in which they were expected to perform. This was a huge benefit to commercial producers, and was reflected in the constitution, longevity and serving capacity of these animals. The potential difficulty of presenting stock for sale against others that had received intensive treatment was overcome by holding single vendor sales, either as on farm auctions or private sales.

Scale

The scale of many breeding operations was vast and allowed for intense selection pressure. The potential for accelerated genetic gain of such flocks and herds could only be matched in the UK through large scale co-operation between breeders. The tiny flock and herd size of many UK stud breeding operations is a brake on genetic gain and does not encourage production under commercial conditions.

Performance Recording

Strict pedigree recording through breed societies was generally not considered of value unless it was supported by performance recording figures. In some cases, most notably NZ, breed societies had been overshadowed by large scale breeders offering performance recorded stock which were not society registered. This removed the emotional baggage that so often goes hand in hand with pedigree breeding, and allowed breeders to use the genetics most fitting for the situation – breeders relied on performance figures and the good word of their commercial clients to sell their stock for them, not inflated sale prices or show rosettes. When breeding for easier management, simple, large scale selection against poor performers will be more cost effective than detailed, small scale selection for the best performers in these traits.

Breed Societies

Breeding stock should be produced in conditions that represent the commercial environment rather than pampering and feeding for the show or sale ring. They should be of suitable temperament and of known health status. Breeds and Breed societies will be sidelined if they ignore the needs of commercial producers.

DNA Technology

DNA technology will have an increasing role to play in genetic selection, but is currently over hyped and over priced - particularly for sheep. There is a risk that clever marketing by technology companies to processors and retailers will force breeders into selection decisions that are to the detriment of other traits.

Welfare

In our society the “mutilation” of animals (tail docking, de-horning, castration, mulesing) is unlikely to remain acceptable except when unavoidable for welfare reasons. We use genetic selection to improve performance traits and society will expect us to use the same methods to minimize animal suffering.

Lessons from Nature

I observed the ways of nature and the characteristics of some of the more extreme or peripheral breeds and genetic strains. The adaptation of wild animals to their environment is exceptional; nature prevents weakness from propagating weakness by the crude but ruthlessly effective method of natural selection. This is an underlying theme in analyzing the genetic traits important for easier management.

Recommendations for genetics and breeding in the UK

- The selection of easily managed breeding stock should be based on these three underlying principles:
 1. Ability to give birth, suckle and rear their progeny without assistance
 2. Ability to minimise labour and veterinary inputs by selection against poor constitution, structure or temperament
 3. Ability to perform well on grass and forage rather than concentrate feeds
- Producers should take control of maternal genetics by operating self-replacing herds or flocks or by finding proven sources of breeding stock.
- Animals requiring individual attention or that do not perform in the system should be culled and their progeny should not be used for breeding.
- Producers should concentrate on female stock for the farm environment and on male stock for the market environment.
- The benefits of hybrid vigour should be fully exploited as these are particularly marked for many maternal traits, which tend to be less heritable.
- Breeders should use performance recording to improve selection and to demonstrate the commercial benefits of their stock to clients.
- Breeding programmes should focus on efficiency of production rather than outright production.
- Breeders should co-operate in breeding programmes in order to derive the benefits of scale.

Calving

Very few cattle producers had split calving periods, and none that I met bulled for more than nine weeks. Indeed, many only bulled for 6 weeks and I was made aware of one who only bulled for 3 weeks! A single, tight calving period is a key pre-requisite to an easily managed, profitable beef production system by increasing average weaning weight and improving cow fertility through a longer calving to bulling recovery period. The benefits of hybrid vigour which has such an effect on fitness and fertility traits were fully exploited.

Calving assistance was sometimes considered acceptable for heifers but rarely for cows who, if they had needed assistance, would be culled and their progeny not bred from. The use of large framed continental terminal sires was limited with Angus and Hereford sires predominating. Most producers I met purchased bulls with breeding value figures and considered ease of calving to be a key trait.

Heifers were almost exclusively calved at two years old, and were generally not considered eligible for further breeding if they did not rear a calf at this stage. This policy increased output and added selection pressure for those animals able to perform in the system. Some producers were prepared to offer preferential treatment to these heifers when they were rearing their calves to maximise their chances of conceiving again but others felt that they had to survive in the herd and that in this way they were adding further selection pressure for constitution. Where replacements are bought in there is a stronger case for offering better feed when they are rearing as they are not settled into the herd in the same way that a homebred heifer is. The other notable advantage of calving heifers at two years old is that this restricts their mature size and therefore reduces their feed requirement without reducing their offsprings genetic potential.

Producers overseas often operated very flexible weaning policies in order to cope with the vagaries of the climate. If facing a feed shortage they would wean early and concentrate the best feed towards the growing stock whilst making breeding stock use their body condition. Other producers would wean late in order to reduce cow condition during pregnancy to reduce birthweights and therefore calving problems at subsequent calving.

Recommendations for calving

- Bull cattle for no more than 9 weeks and preferably just 6 weeks
- Avoid multiple calving periods
- Calve heifers at two years old
- Do not breed from animals requiring calving assistance or from their progeny
- Use sires with easy calving breeding values
- Offer preferential treatment to bought in first calvers but consider not doing so for homebreds
- Use weaning date as a management tool

Lambing

I repeatedly came across flocks whose lambing percentages were as good as many in the UK despite being lambed outdoors with little or no intervention during lambing. Many producers considered it a pre-requisite not to intervene or interfere with stock at this critical point in their lives. The saving in labour, housing and veterinary inputs was dramatic.

Sheep were generally lambed at pasture under a set stocking regime in order to reduce disturbance and consequent mis-mothering. Stocking rates for single bearing ewes were much higher than for twins to reduce the risk of lambing difficulties because of high birth weights. Many producers did not go near the ewes during lambing as it was felt the positive impact of doing so would be outweighed by the potential disturbance caused. In New Zealand I met several producers achieving lamb weaning percentages between 145% and 165% (ewes mated) who operated this policy. Producers in Australia too, considered this aspect of natural selection to be a key factor in maintaining lamb survival and maternal ability. Yearling sheep were often lambed, providing benefits in terms of extra output and earlier assessment of performance. Given suitable genetics, management and infrastructure it is possible to run three thousand ewes per labour unit.

In order to replicate these systems and policies in the UK two factors need to be borne in mind. Firstly, animal welfare standards and the welfare lobby would not allow entirely unattended lambing to take place. In the UK we are forced to consider animal welfare at an individual animal level rather than the more pragmatic view of considering the broader effects on a population of animals. Secondly, in order to lamb at grass and for the ewes to derive their entire nutritional requirement from grass, lambing dates will need to be later than is the norm. Whilst this creates a challenge in terms of finishing lambs before the end of the growing season, it does reduce or eliminate concentrate feeding to the in lamb ewe.

Recommendations for outdoor, low input lambing in the UK

- Lambing should be timed to allow for 3 to 4 weeks of pre-lambing nutrition from spring grass and thereby reduce or eliminate concentrate feeding
- Ewes should be lambed set stocked at pasture, having settled into their lambing fields at least one week prior to lambing to familiarize them with their environment and reduce mis-mothering
- Ewes should be grouped by scanned litter size, with singles tightly stocked and triplets lightly stocked
- Prior to lambing ewes should be repeatedly exposed to vehicles and personnel that will be monitoring lambing
- When monitoring lambing shepherds should only intervene in welfare cases or where they are convinced they will have a positive impact on the flock as a whole and not just on an individual animal
- Ear taggers or notchers should be carried at all times in order to identify those animals or their progeny that require individual attention
- Ewes should have highly visible tags in order to identify from a distance those that give problems but do not require catching
- Towards the end of lambing, the stocking rate for singles should be reduced in order to encourage optimum growth

Lambing Percentage

Number of lambs born per ewe mated per year (Lambing percentage) was recognized as a key economic driver but was approached in different ways. In some areas of Australia and the USA higher productivity was achieved through accelerated lambing every 8 or every 6 months.

Although such systems require more management, in the right environment they were still of relatively low labour input. However, their application in the UK environment would not tend to be so due to climatic and nutritional factors. A key factor in achieving good performance in these systems was the aseasonal breeding capacity of the types of sheep used. Often these were hair sheep of African origin.

In other areas higher litter sizes were sought for conventional once a year lambing. In NZ there has been considerable research and farmer experimentation in this area, and whilst there is a minority of producers who feel that increasing triplet births is desirable, the consensus of opinion was that once a pregnancy scan of 175-180% is being achieved, the benefit from additional lamb numbers is offset by higher wastage and lower weaning weights.

Research undertaken for MWNZ has shown that for every incremental gain in scanning percentage after around 180%, a triplet tends to be substituted for a twin rather than a twin for a single. Whilst this effect holds true for breeding populations, the daughters of different sires show significant differences in their triplet:twin:single ratio. This indicates that with careful recording and selection it will be possible over time to raise lambing percentage without significantly raising the proportion of triplets.

The development of the easycare maternal line at USMARC is the most ambitious and successful attempt at high prolificacy in a low input system and the results are quite astonishing. High numbers of triplet litters (over 60%) are successfully being born and reared in an unshepherded pasture lambing system that uses no supplementary feed. Trials show that the ewes are able to cope with the system and do not suffer unduly from mastitis or reduced longevity. The project at USMARC pushes the boundaries of sheep production well beyond their accepted norm and does so on a large scale.

One of the factors associated with higher lambing percentage which is often overlooked is that it does not just mean increasing numbers of lambs to sell, it means increased selection pressure on replacement breeding animals, leading to faster genetic gain in the chosen traits. Some flocks of low lambing percentage are left with almost no selection pressure on their female replacements.

Recommendations

- For easier management, aim for a scan of around 180% with high survival. This will be preferable to a higher scan with moderate survival.
- Think in terms of kilogrammes of lamb weaned per kilogrammes of ewe mated rather than number of lambs reared
- Develop breeding values for twinning ratio
- Select sires whose daughters have a high twinning ratio rather than just for high prolificacy

Grassland and Grazing Management

Production from grass was a key element of many systems but there was also a strong emphasis on cereal based diets for feedlot finishing of cattle and sheep, particularly in Canada and the USA and to a lesser extent Australia. The rising grain price had driven a significant move to reduce the feedlot feeding period or at least the total amount of grain fed in all these countries. Some producers in these countries and most in NZ were focussed on grass finishing their animals. The benefits of this were huge and offered producers the opportunity to produce at significantly lower input costs although higher class management was required in comparison to the blueprint “factory style” finishing of feedlots. In New Zealand I repeatedly witnessed cattle growth rates of over 1.5kg from grass/clover pastures with no supplementation.

Grazing management in almost all of these systems was based on some form of a rotational system. The most extreme of these involved a mob of 700 cows and calves on daily shifts in Australia and the Technograzers in New Zealand with daily shifts of multiple mobs of cattle on very small cells of 0.1ha. Other producers operated more ad hoc systems using fields and less frequent shifts. In areas with the most comparable climate to the UK, particularly New Zealand, rotational grazing was the norm except for certain stock classes at certain times of year (eg Ewes at and just after lambing). Whilst rotational grazing systems may require management input on a daily basis, they do allow for considerable adjustment in pasture allocation relative to the season. Even where set stocking was practised, there was constant consideration of pasture covers and stocking rates with adjustments being made as necessary.

Producers in NZ had a number of management aids in grassland management, ranging from the well trained eye, through pasture measuring sticks, plate meters and pasture cuts to sophisticated computer software for modeling and allocating grass that was linked into economic budgeting.

In New Zealand, chicory and plantain were often grown either as a stand alone crop or included in pasture mixes. Chicory is recognized as having an anthelmintic effect as well as being of high nutritional value and plantain provides a high mineral content. Their properties mean that they are usually targeted at lamb finishing or growing but their perennial growth pattern means they have potential throughout the growing season. Chicory persists best under rotational grazing management and is winter dormant.

Overseas producers managed their stock in a manner which allowed them to make use of body condition at critical times of the year when feed availability was low or expensive. Their choice of genetics and their pasture management were the key factors in optimizing performance in this area. Their willingness to use this inherent ability of livestock was far greater than we are used to in the UK.

Recommendations

- Use rotational grazing systems to maximize production from grazed grass
- Utilise animals body condition more during periods of feed shortage
- Consider growing chicory as a perennial lamb finishing crop with anthelmintic properties

Wintering

None of the producers I visited outside Europe housed cattle for wintering or calving although many in the colder climates of North America were in confinement lots for winter and some for calving.

Wintering of cattle is the largest cost for Canadian beef producers, conventionally accounting for 70% of their costs of production. The winter feeding period is around 200 days from late October to mid May with temperatures as low as -40c. Whilst not as extreme, UK beef producers face similar pressures and can therefore learn from their Canadian counterparts.

Carry over or deferred grazing can be used to shorten the feeding period, particularly in the first half of winter. After this point quality can be insufficient to satisfy demand and pasture damage has a bigger impact on subsequent growth.

The system of swath grazing would face significant challenges in the UK because of direct weather spoilage during the autumn period due to our wet climate in comparison to the cold but dry climate of Alberta. However, the grazing of straw swaths or bunches, if correctly supplemented could provide a cheaper alternative to in-wintering.

Bale grazing offers considerable scope for cost reduction and although it works best with hay rather than silage is a viable proposition in the UK, even if it requires the feed to be presented in feeders. (see Case study 6)

In New Zealand, grazed pasture was saved for winter use and forage crops or silage used to bridge the periods of no pasture growth. Producers were much more willing to utilize the condition of their animals to get them through a lean period than we are used to in the UK. Rotational grazing systems were important in providing the ability for producers to stockpile grass or forage crops and then to ration them effectively throughout the winter.

Recommendations for wintering

- Use rotational grazing as a tool to utilize grazing efficiently and to stockpile grass for deferred grazing
- Use forms of bale grazing for out-wintering to minimize labour and machinery input
- Use the condition on animals as a feed resource
- Integrate forage crops and crop residues into out-wintering systems
- Provide shelter from the wind

Wool

In Australia, Canada and the USA there was increasing popularity and commercial acceptance of wool shedding or hair sheep. These sheep either grow an all hair fleece which moults similar to cattle or they grow a tight but short wool and hair fleece which sheds at a suitable period in the spring or early summer. The wool is not collected and causes surprisingly little mess on the pasture. In New Zealand, interest in such sheep was very limited, although there was significant research into “bare points” sheep which still have a fleece but have bare legs, belly, breech and head in order to reduce wool related tasks but retain a saleable fleece.

The drivers for this differed in detail but in principle came down to the continuing low price for strong wool compared to the costs of harvesting it and the associated costs of managing sheep with wool. Whereas fine wool production seems to have a healthy future, the strong wool produced in the UK and other parts of the world has too low a value to be worthwhile continuing with.

There are numerous breeds of these sheep around the world and they account for 10 to 15% of the worlds sheep population. On my travels I saw the Katahdin, Dorper, White Dorper, Barbados Blackbelly, Damara, Persian Blackhead, and Wiltipoll, and here in the UK the Wiltshire Horn and its composite derivative the Easycare. Hair sheep are known to have higher internal parasite tolerance than wool sheep due to their genetic origins.

The wool shedding or hair sheep allows the producer to fundamentally change the way that sheep are managed by eliminating the need for several flock management tasks, some of which are normally carried out when the ewe is suckling lambs. Shearing, crutching, tail docking and blowfly control are unnecessary, and shepherding and gathering can be reduced with resultant cost savings and increases in growth rates of lambs. Table 3 shows the cost savings compared to the loss of saleable wool.

Table 3: Wool related costs for 1000 ewe flock

Operation	Notes	Pence per ewe
Shearers	Per ewe(incl. hoggs & rams)	123
Labour at Shearing	2 casuals for 2 days (7.5/hr)	24
	Shepherd for 4 days (10/hr)	32
Lamb growth loss at Shearing	150g/day for 3 days	45
Crutching ewes	Per ewe	45
Labour at Crutching	Shepherd for 2 days	16
Dagging 25% of lambs	At L% of 150 @ 45p	17
Labour for Tail docking	Total time 6 hours	5
Lamb growth loss at Tail docking	150g/day for 3 days	45
Blowfly control	Pour-on twice @ 50p	100
Labour at blowfly control	Shepherd for 2 days	16
Lamb growth loss at blowfly control	150g/day for 1 day	15
No deaths of cast ewes	5 per 1000 ewes	25
Reduction in shepherding for cast ewes	30 days at 1 hour per 1000 ewes	30
Total Cost Saving		538
Wool income foregone	2.72kg @ 21p/kg	57
NET SAVING FROM HAIR SHEEP		481

No allowance is shown for the increased growth of hair sheep due to the re-direction of protein from wool to meat production, and the increased parasite tolerance of hair sheep is not accounted for. Neither does it take into account the increased management time and flexibility available when these tasks can be eliminated or reduced. The table is not meant as a cast iron model of hair sheep versus wool sheep, it merely serves as an illustration of the potential benefits to a conventionally run wool sheep flock, and as a model on which producers can base their own assessment of the benefits of hair sheep in their particular system and environment. It can be seen that even if wool price increased to a pound a kilo, there is still potential for a significant cost saving.

In order to breed a flock of wool shedding sheep, producers will need to breed animals that are at least 50% wool shedding breed and very often 75%. This is a drawback for producers as they go through a transitional period with wool related tasks still necessary for a portion of the flock for a number of years but little saleable wool to offset these costs. However, the current prices for UK wool are so pitiful that this is not a big issue. Some UK breeders anticipate achieving a fully wool shedding flock that is able to retain 37.5% of its original non shedding genetics in the make up of its ewes through backcrossing. Others are happy to use the wool shedding genetics to achieve a wool shedding flock as quickly as possible and thereby reduce the complications of the transitional period. There is a danger in this approach that other traits may be set back by the focus on wool shedding alone.

There is a dearth of knowledge in this area and little ongoing research. Wool shedding ability varies with season, age of animal, nutrition and original breed. Kinder, milder seasons in the UK seem to precipitate earlier shedding. Animals often improve their level of shedding with age and definitely shed more readily when in fitter condition. These factors make selection more difficult, although the fact that it is obviously a highly visible trait is a bonus. Attempts to isolate the genes responsible for wool shedding have proven elusive, as it seems that it is a multi gene trait.

The hair or wool shedding breeds currently in the UK are the native Wiltshire Horn, its composite derivative the Easycare, the Katahdin and the Dorper. All have desirable attributes and will play a key role in lowering inputs of UK sheep production. The native breeds are proven in our environment, the Katahdin proven in similar environments and parasite tolerant, and the Dorper growthy, high yielding and an excellent forager.

It must be remembered that whilst hair or wool shedding sheep have a strange appearance to our eye, sheep were without wool for several million years prior to being domesticated by man ten thousand years ago. There is no doubt that wool is now a cost rather than a benefit to the UK sheep industry.

Recommendations for wool

- Wool shedding genetics should be used to breed the wool off sheep to eliminate the costs and stress associated with wool related tasks, thereby improving profitability and quality of life for sheep and shepherds.
- Research should be undertaken into the genetics behind wool shedding to assist breeders in making selection decisions

Livestock handling and identification

Well designed handling systems reduce the time and physical effort for routine tasks and improve animal and operator welfare. Mobile and automated systems can increase these benefits further. Fenced laneways and subdivision of fields facilitate stock movements and encourage better utilization of pasture whilst reducing stress.

I witnessed electronic identification (EID) in use for both cattle and sheep and was impressed by its operation and potential. There is no doubt that the system does work and can be made to work in the UK. It has huge potential for mass data capture for breeding selection and enterprise benchmarking.

I saw Racewell, Prattley and Combi-clamp automated sheep handling systems in use, often in conjunction with electronic identification. The ability to maintain a high throughput of animals without significant operator or animal stress was very impressive.

I was able to meet the esteemed animal behaviourist and handling expert, Temple Grandin and benefit from the excellent work she has done in improving handling facilities and methods of handling farm animals. Her input has completely changed many peoples approach to the way they handle animals from one of dominance to encouragement and has improved welfare for animals and handlers alike.

Recommendations

- Visit Temple Grandin's website at Grandin.com
- Install fenced laneways for ease of stock movements
- Use electric fencing to subdivide pastures
- Consider using EID to streamline performance recording
- Consider automated handling for increased efficiency of labour use

Welfare

Easily managed or low input livestock systems are sometimes charged with being of poor welfare. As in all aspects of livestock production, the welfare of the animals relates more to the genetics and management than it does to the system itself. When well run, these systems are in fact of higher welfare as they allow stock to express more of their natural behaviour.

The charge that low or no input lambing or calving systems are of poor welfare is generally unfounded. This is borne out by performance figures which often show increased survival in extensive systems although there is no doubt that if poorly run these systems can lead to serious welfare problems. However, experience shows that survival is usually better where stock are left undisturbed. This indicates that many of the problems that are associated with conventional UK systems are created by the system or environment itself. Animals giving birth in a shed are unable to exhibit their natural behaviour, suffer a massively increased disease challenge, and have to cope with the stress of having their progeny and themselves handled by humans, whom they instinctively consider as a predator. In outdoor systems, the argument that a particular animal could have been saved if assisted, misses the point that it is the outcome on a flock or herd basis that really counts.

Certain aspects of livestock management are serious welfare issues. I experienced at first hand the effects of the PETA campaign against mulesing of Australian sheep and the threatened boycott of their wool. (Mulesing is the removal of folds of skin around the breech area of sheep to reduce incidence of flystrike – the practice occurs without anaesthetic and has attracted much negative publicity to the Australian wool industry). As a result of this pressure, Australian Wool Innovation has agreed to end mulesing by 2010.

Whatever the rights and wrongs of the argument, there can be no doubt that in modern Western Society practices that involve animal mutilation are likely to become unacceptable, and therefore either illegal or commercially unviable in the near future - unless they have a strong welfare case to the contrary. We use genetic selection to improve performance traits and society will expect us to use the same methods to minimize animal suffering.

Recommendations

- Be aware of potential welfare issues
- Educate the wider industry and public about the benefits of lower intervention systems
- Consider breeding objectives and management practices that will mitigate future welfare issues

Conclusion

There is no doubt that by basing genetic selection and breeding policy around the fundamentals of nature's ruthless but effective methods, and then by allowing those animals to express their natural behavioural instincts that have been honed over endless millennia, performance results as good as those of intensive systems can be achieved, and at a massively reduced cost.

There is a tendency to view our animals as helpless and entirely dependent on human assistance, when in reality the only reason they are dependent on our assistance is because we over-ride nature's selection methods and place animals in environments which do not allow them to express their natural behaviour.

The most important aspects of lower input systems are a genetic selection policy that mimics the way in which nature prevents weakness from propagating weakness and management practices that focus on managing whole flocks and herds rather than on lavish care and attention for individuals.

The single most fundamental aspect of easier managed sheep is the switch to hair or wool shedding sheep. Whilst this seems radical, the economics speak for themselves. No business should continue producing a commodity which shows returns well below the true cost of production, and which dictates many of the management practices employed in the business.

Postscript

I have enjoyed my Nuffield Scholarship immensely and have met many inspirational people. My study has given me clarity of vision and emboldened me to take actions that would previously have been difficult. I am enjoying implementing my findings as we develop our genetics and systems further.

The most obvious change that has occurred over the course of my study is our switch to hair sheep from wool sheep. Having had Romney sheep in the family since the 1960's this has not been an easy change to make in the heart but is incredibly easy in the head. As well as crossing our Romney ewes to UK bred Easycare we have also established a flock of Canadian bred Katahdin hair sheep which will ultimately form part of our composite mix.

Our genetic selection for sheep and cattle will continue to be founded on the principles I have described in this report and the management practices recommended in this report that were not previously in operation are being incorporated into our farming system. Chicory is being grown as a lamb finishing crop and our use of rotational grazing systems has increased. The fencing programme has been accelerated to provide further subdivision for these systems and handling systems have been re-designed to incorporate the principles that Temple Grandin preaches. We have also invested in automated sheep handling and electronic identification.

Since returning from my travels I have enjoyed sharing my findings and experiences by giving presentations, hosting farm visits and contributing to discussion groups. I look forward to continuing this and to developing and expanding on the ideas that we have implemented as a result of my study.

Appendix 1: Study Itinerary and Contacts

New Zealand

The Royal New Zealand Show	
James (NSch) & Janine Parsons, Northland	Commercial sheep & beef
Michael Warren, Wairarapa	Turanganui Romney Stud
Roger (NSch) & Barbie Barton, Wairarapa	Tuohine Romney Stud
Derek Daniell (NSch) Wairarapa	Wairere Romneys and Composites
Bayden Wilson & the team at Rissington Breedline	Rissington sheep and cattle studs
Grant Massey, Hawkes Bay	Rissington Partner breeder
Rob & Mary Anne Burrows, Canterbury	Hereford and Romney Studs
Richard Wakelin, Wellington	MWNZ & SIL
Greg & Siwan Shaw, Taumaranui	Commercial sheep & Beef
Bruce Orr, Taupo	Stock agent
Jeremy Williams, Gisborne	Ingleby Farming
Bill Lott, Fairlie	Dorper stud
Jason MacDonald	Kelso Composites
Ken, Taupo	Landcorp Studs
Clayton McElwee, Taupo	Wrightsons land agent
Andrew & Wendy, Matt & Lou Totman	Sheep & beef, Charolais Bull trial
Bruce & Sarah Hoban, Canterbury	My hosts for the Royal NZ Show
Les Keeper (NSch), Queenstown	Dairy Farmer
Russel & Pam Welsh, Southland	Tefrom composite breeder
Vaughan Templeton (NSch),	Ex sheep now Dairy farmer
Trevor Potter, Southland	Poll Dorset Stud
Sarah Adams & Mike Tait, Dunedin	Catapult Genetics
The team at Prattley, Temuka	Prattley Animal Handling Systems
Jon Hickford, Christchurch	Lincoln University
Blair Davies, Christchurch	NZ Merino marketing
David Scobie & Dennis O'Connell, Christchurch	Agresearch
John McEwan, Christchurch	Agresearch
Tricia Johnson, Christchurch	Agresearch
Julie Everitt Hicks, Christchurch	Agresearch
Allan Richardson (NSch), Otago	Avalon Organics beef & sheep
Edward, Hamish & Sarah Ottrey, Otago	Commercial sheep & beef
David & Kate Menzies	Commercial sheep & beef
Richard & Janice Craigie, Otago	Commercial sheep and beef
Clive Walden & Jorga Ralph, Northland	Beef finisher using technograzing
Lyndsay & Erica White, Northland	Beef producer & finisher
John Blackwell, Northland	Beef finisher & sheep producer
Chris Boon, Whangarei	Consultant & researcher
Bob Thomson, Whangarei	Beef & sheep consultant
Grant West, Tangiteroria	Commercial sheep & beef
Guy Hoban & Regan Poole, Palmerston North	
Harry & Chloe Weir & Team, Pamerston North	Kiwitech Grazing Systems
Professor Steve Morris	Massey University
Dr Cord Heuer	Massey University
Willie Falloon, Wairarapa	Waigroup Angus Stud
The team at Tararua Bull Breeding Centre, Woodville	
John & Georgie Lane, Poukawa Research Farm	On-farm Research

Peter & Willy Butler, Hawkes Bay
Jamie Gunson, Hawkes Bay
Cameron Lane, Brownrigg Agriculture
Gray Pannett, Otago
Simon Glennie, Dunedin
Charles & James Reid, Traquair, Otago
Jason Archer, Invermay
Ceri Lewis & Hamish Bielski, Southland

Beef finishers & sheep producers
Beef finisher using technosystems
Lamb finishing & Wagyu beef
Limehills Hereford Stud
Abacus Biotech consultancy
commercial beef & sheep
Agresearch
Mount Linton Station

Australia

Andrew (NSch) & Tracie Heinrich, Ellamatta White Suffolks, Kangaroo Island, SA
Tom & Annie Hughes, (Wiltipoll sheep)Kars Pastoral Co, Strathalbyn, SA
Island Pride sheep dairy, Kangaroo Island, SA
Deb Lehmann, Veterinarian, Kangaroo Island, SA
Justin & Lorroi Kirby, Amarula Dorper Stud, Moree, NSW
Toby Scales, Cleavers Organic Meats, Tamworth, NSW
Gordon Gilder, NSW
Sam Bryce, Warwick Freestone feedlot, NSW
Richard & Heather Apps, Armidale, NSW General Manager, Sheep Genetics, MLA
Steve Skinner, Breedplan, Armidale, NSW
Colin Rex, ABRI, Armidale, NSW
Wayne Upton, AGBU, Armidale, NSW
The team at Hereford Australia, Armidale, NSW
Mick & Natasha, John & Margaret Tombs, Bundarra, NSW
Arthur Gates, Poll Dorset stud, Armidale, NSW
Ronald(NSch) & Sally Thompson, Chinchilla, Queensland
Andrew & Camilla Philip(NSch), Childers, Queensland
Shaun(NSch) & Debbie Welsh, Tabulam, Queensland

Sweden

Henrik Labom, Eslov
Agneta Berglund, Eslov
Sven Olof Hagg, Sonarps Charolais, Skane
KC Ranch, Skane
Kiviks Appelhus, Skane

USA

Katahdin Hair Sheep International Expo, North Dakota
Jim Morgan & Teresa Mauer, KHSI
Wes Limesand, North Dakota State University (NDSU)
Dr. Leroy Boyd, NDSU
Dr Justin Luther, NDSU
Dr Christopher Schauer, NDSU
Dr Paul Berg, NDSU
Kelly Bruns, South Dakota State University

Marcus Maxwell, Scottish Borders
Sandy, Anne & Tom Welsh, Scottish Borders
Iolo Owen (NSch), Anglesey
Stephen Fell (NSch)
Peter Baber, Devon
Philip Hinman, Pembrokeshire
David Rossiter, Devon
Rob Parker (NSch)
John Yeomans (NSch)
Wynn (NSch) & Chrissie Owen
Nigel Elgar (NSch)
Neil Perkins (NSch)
Sam Boon (NSch), Signet
Duncan Pullar, Signet
Dr David Hughes

Appendix 2: Further Reading & Contacts

Profitable Beef Production edited by Duncan Smeaton and published by the New Zealand Beef Council

Improved Lambing Percentage)

Improved Lamb Growth)

Feed Planning for Sheep Farmers)

Genetic Improvement for Sheep Farmers)

Grass-fed Beef by Julius Ruechel

Stockman GrassFarmer magazine edited by Allan Nation

Animals in Translation by Temple Grandin and Catherine Johnson

Grandin.com Temple Grandin's website on livestock handling and behaviour

Easicare Sheep systems by John Vipond, SAC

Managing the change to lower input systems with UK sheep breeds by John Vipond, SAC

Appendix 3: Explanation of terms

Gathering = Mustering/Rounding up of stock

Tupping = Mating/Joining

Hogg = Hoggett/Yearling ewe

Two tooth, Gimmer, Thieve, Teg = Ewe between 1 and 2 years old/A hogg once it has lambed

Ram:ewe or Bull:cow ratio often expressed as a percentage, particularly in USA i.e 1 ram to 40 ewes = 2.5%

Mickey Mouse in UK = A tinpot or "half baked" operation

Mickey Mouse in Australia = A sharp or well run operation

Mickey Mouse in USA = A cartoon character