Hiba Cig Cymru/Meat Promotion Wales

Livestock Scholarship Report 2015

Effectiveness of DNA Shepherding and EID tracking in extensive systems to determine parentage within stud flocks.

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Background

Born and bred on the family farm in Talley, Carmarthenshire farming has always played a part in my life and will continue to do so with greater emphasis needed on flock performance and productivity with the growing pressures on the farming industry. Banc Farm is a 400 acre unit owned by my parents and there is also a further 250 acres rented by myself, run as a separate business, in the surrounding area to help me get established. The work is shared between the two units but ran as two separate businesses.

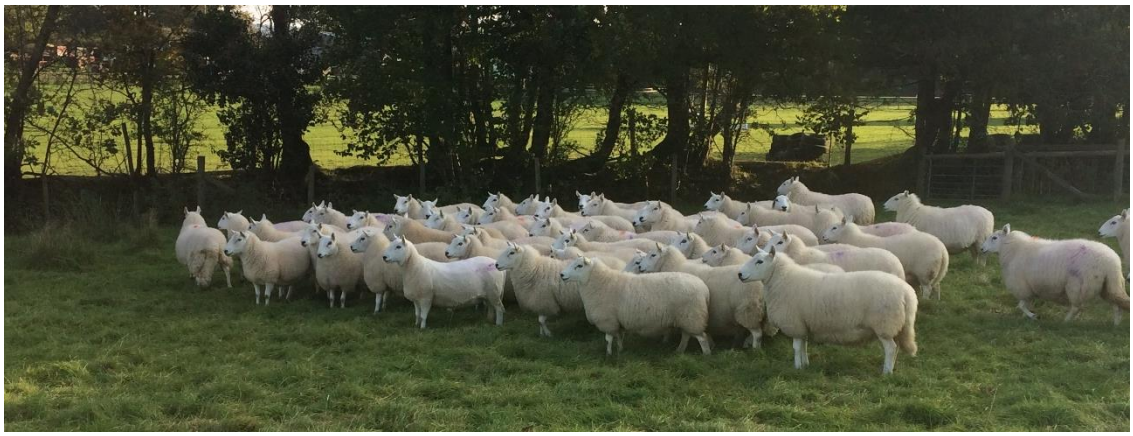
1300 ewes, 300 ewe lambs and 20 suckler cows are run currently with numbers increasing each year with the uptake of more land and increasing stocking density. With a great interest in sheep, they become the main priority with the cattle being used as a management tool to try and maintain quality within the pastures for increased performance in the flock.

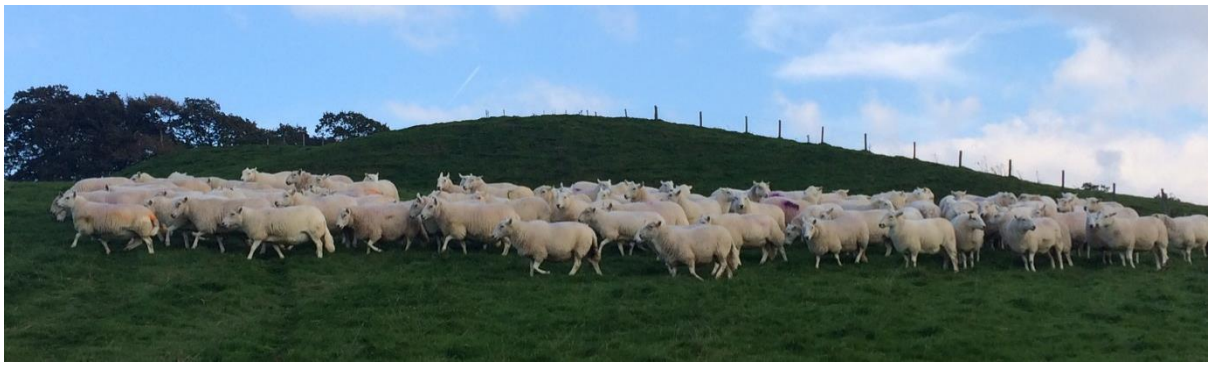
The main flock consists of Improved Welsh ewes and using Aberfield and Aberdale rams over them to produce crossbred ewes to go on the lower land to produce terminal lambs. The tradition of years gone by to breed good looking sheep is becoming less important with a growing interest in genetics and performance recording. Performance recording of the Welsh ewe flock will be the next step to take place to keep a track on progress and to improve performance and production. Improving the nucleus ewes will then have a knock on effect all the way through to the finished lambs from the crossbred ewes, hence maximising returns. Once established we will also look into selling some rams to the industry.

Having worked with performance recorded flocks that will pay attention to figures and make breeding decisions using them (on the condition that the sheep are still correct) it is evident that there is a huge potential to improve performance with knowing parentage.

The majority of performance recorded flocks within the UK would be smaller flocks, lambed indoors and tagged at birth. With the current system of outdoor lambing the Welsh ewe flock on the hill ground with minimal interference it became relevant to look at systems in New Zealand and Australia where larger flocks are being recorded in a similar system to that one desired at home. They are able to accurately record parentage which is vital to generating EBVs (Estimated Breeding Values).

This Scholarship was a huge opportunity for me to be able to travel to New Zealand and Australia to meet some interesting and forward thinking people. HCC, Innovis and Focus Genetics have been a massive help to me to be able to set up farm visits as well as meetings with scientists, geneticists and various company directors. This has allowed me to see the farmer point of view as well as how the parentage technology works currently and how it is progressing forwards to the future.





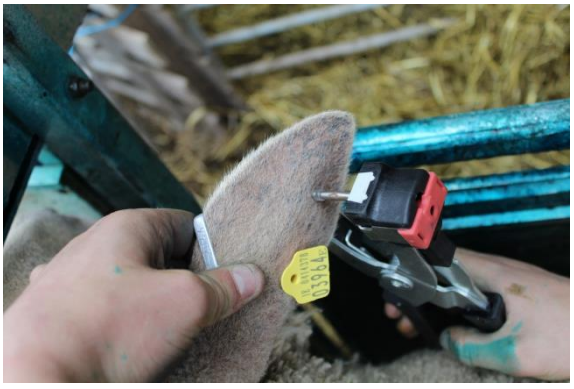
Introduction

In developing a keen interest in performance recording I then moved on to research ways in which I could do this both efficiently and effectively. The processes of weighing and scanning are the same across all systems but the recording of parentage can be done in a number of ways. The most common way in the UK would be tagging at birth, which is a practical method in an indoor lambing system, however accuracy can be affected by a number of things such as the certainty that the ewes were mated by a specific ram and then also ensuring there is no miss mothering at birth. For a farmer who currently has multi-sire mating and lambing outdoors with minimal interaction at lambing then this would result in a totally different approach and management of their system.

From this I began researching into alternative systems of recording parentage. For each system I have researched its advantages and disadvantages whilst also looking at its costs which is obviously a key part of any system. Looking at these points allowed me to weigh up the different options which would suit different enterprises in different ways. I was able to see four different methods of physically working out parentage which were, DNA Parentage, EID Tracking, Tagging at birth (outdoors) and mothering up the lambs to ewes post lambing.

DNA Shepherding is a method of recording parentage by DNA, tissue samples are taken from the whole flock initially and then lambs each year, usually at 4 weeks of age when they are docked. These samples are linked up to an EID number and then sent to a lab for analysis. These can then be sorted to match up with dams and sires from the original database of samples from the flock. The time frame for results is usually around 4-6 weeks.

One of the main advantages are Mobs can be multi sire mated and then lambed in convenient mob sizes for the farm and the result of this system will give the genetic mother of the lamb, not the rearing mother in the event of lamb thefts at birth so miss-mothering is not a problem.



EID Tracking (MatchMaker) works by having EID tags in both the ewes and the lambs, so lambs can be tagged at 4 weeks of age at a time of convenience such as docking, and then the ewes and lambs will walk through an EID reader. The EID reader will usually be incorporated into a short race between a paddock and a point of interest for the sheep, such as a water trough. As the lambs walk with the ewe through the reader, the information will be stored over a period of weeks and then the data analysed to see the frequency of certain lambs following ewes within a time frame. This system requires single sire matings and a record of these mobs kept for future use. The results of this process will give the rearing mother of that lamb, not the genetic mother in the event of some miss-motherings.

Tagging at birth is done at the point of lambing where shepherds will be on a lambing beat and go around tagging new born lambs and writing these tag numbers down against the tag number of the ewe. The ewes usually have larger management tags to allow the shepherd to see the number easily. The shepherds will regularly check the ewes to minimise error due to miss-mothering. Mating groups have to be single sire mated.

The mothering up process is done post lambing at a time convenient to the farmer. A small number (usually 8-10) of ewes are drawn out of a mob into a smaller paddock, which are then further split into a few groups and then taken into a small handling pen keeping an eye on the specific lambs matched up with the ewes. They are then singled out and a tag put into the lamb and a note made of the lamb tag against the ewe tag. This method requires single sire mating to determine the sire and the rearing mother is recorded if any mix ups have occurred at lambing.

Summary of Visits

NZ Farm Visits

7th & 8th November Opoho with the Powdrell Family

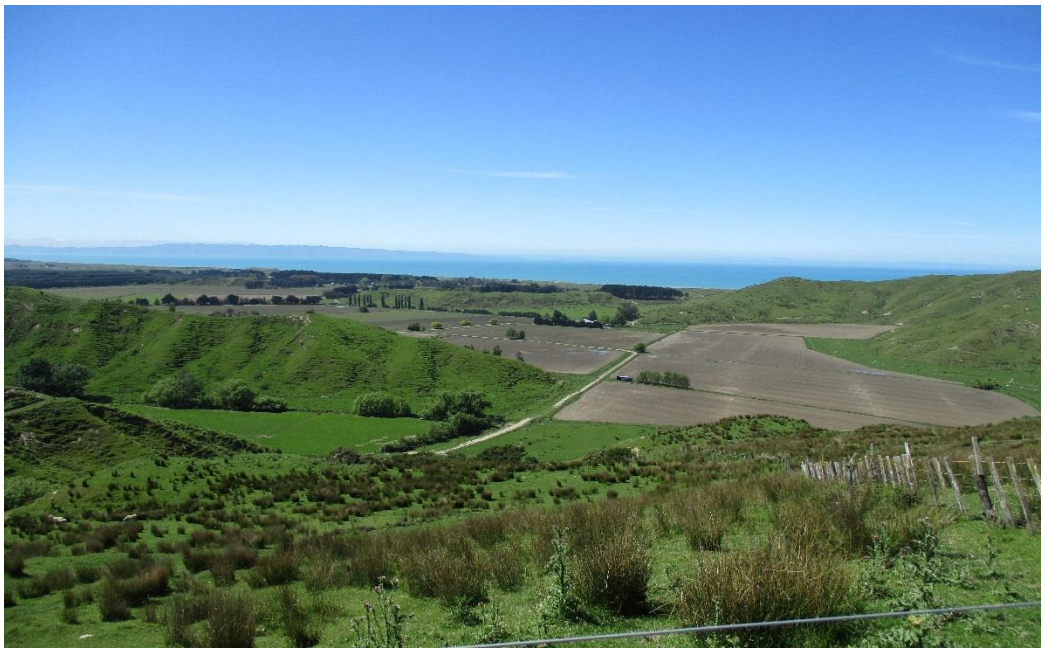
100 Hectares of Maize grown, 100 Hectares of flats for finishing sheep and cattle, 400 Hectares of hill country.

1500 Highlander ewes and Primera rams

220 Stabilizer cows (including some Angus and Hereford cross)

Calves sold deadweight 220Kg+

Some calves also bought in from local breeders to finish.



9th November Focus Office with triplet management meeting

Triplet ewes rearing 220-230%, target being 260-270%.

Most losses at birth, older ewes more likely to die.

Nutrition is a bigger factor than weather.

Lambed outdoors. Triplets is seen as an opportunity not a problem….

10th November Focus Office

Discussion with Marius van Niekerk (Genetics Information & database administrator)

Shepherd plus allows Genetic Breeding Partners to multi sire mate, don't have to interfere at birth saving labour costs at this point, recording done at a later date when lambs are brought in anyway such as docking.

95+% accuracy of match ups. Some confusion can be made with ewes and lambs from the same family, although these are usually mated to different sires.

More accurate breeding values are obtained.

Pressure to get all the data back in time for ram hogget mating and sales. Timescale of data being analysed could be improved?!

$20 per sample plus $3 for vial. Samples must be frozen so transport can become an issue.

Discussions with Richard Lee about DNA Shepherd. Mentioned about studies that have been taking place to check the reliability of tagging at birth versus the results obtained from assigning parentage through DNA testing. Results varied showing some with huge errors having taken place with the tagging at birth process. Increased stocking density at lambing increases the chance of mix ups. University study monitoring the lambing process showed that up to 25% can be miss mothered if left un-assisted.

11th November Romney Stud Tour

All performance recorded breeders, many of which would be tagging at birth.

Some breeders liked the ability to score the ewes for maternal ability whilst tagging the lambs.

Couldn't justify spending extra cost on sampling even though money was spent on doing 50k SNP and labour units used at lambing.

12th November Simon Wilson, Mount Herbert

Runs 5800 Romney ewes, ewes sold as full mouth to maintain a young flock.

Involved with Data Drives Dollars trial with Focus Genetics and Massey University.

Buys performance recorded rams but doesn't record his own commercial ewe flock.

Trusts the info given and work done by breeding companies to supply the best genetics to him.

If EID and performance work was taken up an extra labour unit would be needed or loose family time.

Keeps twin born ewe lambs and best growing and believes that's enough info for him.

13th November Simon Beamish, Awapai

Spoke with the Shepherd, Shane, who said that they would not be able to breed rams without the use of DNA Shepherd.

Easy to use with accordance of other routine work and a high success rate.

Ram breeding is no extra work in reality when done in this way, and you get a true reflection as to how they perform in normal commercial environments.

Elite rams used from recorded flock in the commercial enterprise but flock not recorded.

16th November Grant Massie

Multiplier breeder using Elite rams over his ewes.

High mob and selection pressure.

4000 ewes, 2200 to Highlander rams and remainder to Primera.

2300 Hoggets retained, 2000 in lamb scanned half singles and half twins.

Best hoggets kept and other sold to breeder running terminal flocks.

Selecting for consistent phenotype with good looking rams to sell that are well turned out.

100% success rate of client visiting and buying.

Highlander yearling rams to sell

Primera yearling rams to sell

16th November John Heald

Nucleus flock of Highlander ewes.

DNA Shepherd works well for multi sire mating. Also can gain other info from tests done.

High performing ewes with huge gains due to increased accuracy and reliability of data.

Wouldn't be able to go back to single sire mating ewes and recording at birth. Labour saving.

17th Donald and Liz Poulson

Ram selling in progress. DNA Shepherd has made their life easier. No need to interfere on hills at lambing. Places can be inaccessible due to steep terrain. Breeding Highlander rams to sell for Focus Genetics Breeding Company.

A selection of requested rams are brought into a ring for clients to have a look at. They will pick through the rams and select those that they wish to buy. Those that are rejected will return to a field and put aside until a later point. The size of the selection depends on the number of rams that they are purchasing but it is all relative to having a percentage above what's required.

18th Derek Daniel, Wairere

Runs 20,000 Romney ewes plus a further 5,000 composites.

Sells around 2,200 Romney rams each year. 3,000 in total with composites.

Tags at birth, cheaper option although labour units involved.

Good to be able to monitor mothering ability of the ewes, much improved over the years. Ewes don't run off anymore and are a lot more protective and stay closer to the lambs. Ewes and lambs mother back up after docking etc a lot better with less lambs losing their mothers at times like this.

Simon Buckley would say there is an error of 5-10% in recordings.

Rams do cross over and mating marks can be misleading sometimes. If known problems are detected then mobs are noted and lambs will enter the food chain.

Inaccurate parentage means inaccurate EBV's.

Mothering up 400 ewes can be done in one day with 3 members of staff. Total of 30 work hours. Some lambs left at the end unallocated.

At lambing, 35 days of 4 hours for tagging at birth gives 140 hours work for a mob size of 400 ewes.

20th Holmes and Mike Warren

5,000 recorded ewes

Tag at birth, think it's really accurate.

Improved the breed significantly in his time. Concentrate on improving one trait at a time but don't go backwards with any of the other traits.

Believes wool will be worthless in the future and a possible market for wool shedding sheep as long as they can give performance!!

23rd November Robert Peackock Orari Gorge

Tagged at birth, better ability to quantify mothering ability. Undertaking worm resistance and resilience testing.

Control group of fat lambs drenched, others not drenched, have to be within 8% of growth gain for a given time of control group. Repeated 3 times to gain results for those that could last the longest without drenching and keep growing.

$50,000 saved from not using DNA Shepherd can be put to good uses in other areas. Or would have to sell 50+ rams extra to cover the extra costs.

Raised walkway used to check feet on the rams.

24th November Avalon Genetics

Producing sheep which peel the belly with no wool on tails and surrounding area to ease management and not have to dock lambs etc.

Organic system so lambs on a 1 drench only policy at around weaning when lambs under biggest challenge.

Tag at birth to look at mothering ability, if DNA Shepherd was half the cost then the option may be considered. Or if more info could be given at the same price.

25th November Travis Leslie, Kepler

Landcorp property, breeding the Lamb Supreme.

Tagging at birth, breeding terminal sires. Enough info received. SNP chip stock sires. Expense of Shepherd too much for company.

25th November Tim Smith, Freestone

Lancorp property breeding the Landmark Maternals.

Tagging at birth, cost too much for Shepherd. SNP chip stock sires to check parentage and other info.

Triplet management trials in progress. Feed budgeting important for this and other ewes. Commercial ewes plus commercial cattle also run as well as Deer terminal sires.

26th November Mount Linton

45,000 ewes

3,000 Angus cattle

DNA shepherd hoggets plus some ewes, older ewes are tagged at birth to save some cost as well as assessing mothering ability of ewes. Not tagging at birth of younger ewes to avoid interference as well as lack of staff.

Good info given back from Shepherd although is costly. Should sheep be interrupted at birth?

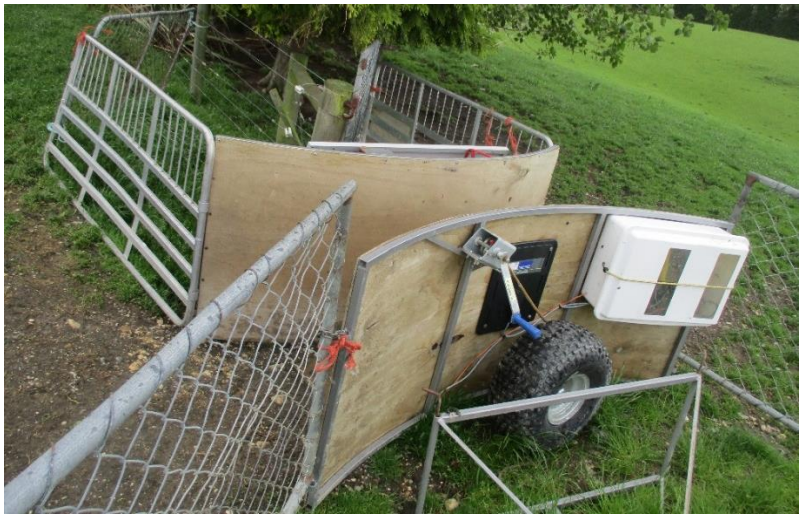
27th November Barry & Julie Crawford, Rosebank

Breeding Primera rams for Focus Genetics.

Bred in a commercial environment, wouldn't breed them any other way. Have to be performance recorded and multi sire mated and not tagged at birth. Breeding programme with Focus Genetics meets the criteria.

Allows pedigree stock to be bred in a commercial environment where it is expected to work.

Currently using some EID Tracking technology, as shown below, to assign parentage on the commercial flock to be able to obtain some performance figures on individual ewes monitoring her output year on year. Usually around 90% of lambs assigned to a mother.



28th November Twin Farm

Breed Tefrom and Sufftex rams.

Tag at birth, Shepherd too expensive. Allows a maternal score and teat placement scores to be given to ewes during lamb tagging.

SNP chip stock sires for extra info.

Ultimate would be for DNA to be used and also give SNP chip info for a cheap rate….

1st December AgResearch Dunedin

Met up with John McEwan and had a look around the lambs and was informed about new technology being developed to give genomic values and parentage etc for the price of shepherd. This would possibly have a higher uptake than current technology allowing more information to be obtained from the DNA sample taken.

2nd December Abacusbio & Beef and Lamb Genetics

Had a meeting with Tim Byrne and Peter Fennesy about recording parentage and the accuracy in doing it, some research work taking place to find out accuracy on tagging at birth versus DNA Shepherd. I was able to have some research papers passed onto me which were based on recording parentage and their accuracies.

Use Animate to select breeding groups to prevent inbreeding and also to maximise genetic gain.

3rd December Zoetis, Sharl Liebergreen

Current cost $20 (£8) plus $3 for TSU (£1.50) for parentage, test to include MyoMax, Inverdae and LoinMax will be around £12-13 per sample.

Accuracy improved significantly since 2012, if info for all ewes and sires are taken then all lambs can usually be allocated.

Genomics are making good progress, must use sires within flock to quantify them, selling the sires don't allow you to follow up on accuracies.

Takes 4 weeks to turn samples around with parentage. High demand, quiet season is also picking up to have a constant supply.

Australia

8th December. Gates Performance Genetics Field day

Interesting field day discussing the use of breeding values to make informed decisions and to have increased performance.

Gates family tagging at birth to quantify a mothering ability score for the ewes, want the ewes to stick tightly to their lambs and then to rear them well.

Met Lu Hogan from CRC, some trial work into MatchMaker showing that 88% of lambs tagged are assigned a dam.

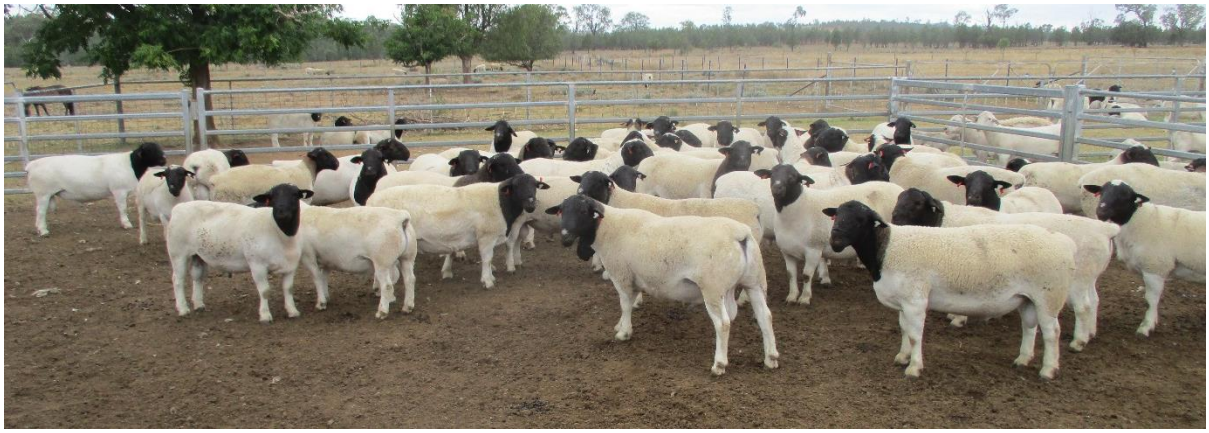
9th December. Justin and Lorroi Kirkby, Amarula

Farming Dorper ewes in Gravesend, near Moree.

Climate can become very dry which the dorpers do well out of.

Tagging at birth, the ewes will be put to the rams throughout the year, lambing down three times in two years. Tagging at birth is easier as there is a lower risk of cross mothering with a more steady lambing period with no high peaks.

They sell rams in society sales as well as an on farm sale using Auction plus to sell rams with buyers present on farm and online bidding.



10th December Lamplan and CRC visits Armidale.

Met Hamish Chandler from Lamplan. Had a discussion into accuracy of Matchaker, some trials 80% accurate and above. Had a discussion as to how the industry is changing etc and uptake of performance recording.

Laura Kemmis from CRC is involved with trials into MatchMaker. Seen a simple set up in the field. Training work has to take place before the ewes and lambs freely walk through it together. The longer this takes and the later you tag the less reliable the results are due to the lower tendancy for the lambs to follow as closely with the mother. From recent trials with four mobs of ewes and lambs 84.5-93.3% of lambs were assigned a dam with the accuracy of these being 96-97% by using DNA analysis.

16th and 17th December Nathan Scott, AgAchieve

Travelled with Nathan to a few farms looking at a few set ups for both cattle and sheep. Cattle set ups have been working between paddocks and by water troughs. Best sheep set ups work with them set up going to a water trough or near shelter.

Farmer perceptions of the technology is very positive, Commercial enterprises now able to analyse how well ewes are performing on farm. Although only 80-90% of lambs being assigned parentage, this still gives you a good insight to a large proportion of the ewes performance.

Cost of the Sapien Pedigreescan reader box to record the tags as they walk through the race is around $3000 plus extra cost will go into forming a race and battery packs etc to keep the

system running. There is also an additional cost to analyse the data sets through specific software to give parentage results.

Findings

After a very interesting visit to New Zealand and Australia, meeting some very forward thinking people, making some huge advancements in the industry it brings me here to sum up what I have learnt.

Each system that I have looked at has seen a variety of advantages and disadvantages. Many of those systems that are tagging at birth really value the information that can be recorded about the mothering ability of the ewes and selecting those ewes that don't run away from the lambs whilst tagging them. However is this selecting defensive mothers that will protect the lambs from predatory animals or is it selecting ewes to be tame? Should we have to select for this or the fact that they have reared lambs up against the environment and wildlife present be enough? There are however some very strong feelings that this selection pressure of ewes to stay with their lambs has improved the ability of ewes and lambs to mother back up quickly and successfully after being split during moves and handling, which has to be a strong plus point.

Tagging at birth may be time consuming to undertake but by having the extra staff on hand then any problems that may take place at lambing can be sorted quicker and easier. With British Lowland systems that have to house the sheep to lamb then tagging at birth is easily done, accuracies could be debatable depending on the quickness of the shepherd to the lambs being born and making sure that no miss mothering takes place. However they would still have to single sire mate these ewes to determine the sire of the lambs. With a number of small paddocks being available then this is doable. Moving more to an outdoor extensive system that hill farmers would be familiar with, then the challenges increase. In many cases they may be unable to afford the extra lambing labour and more so unable to single sire a large number of rams to enable them to record sire parentage. In all honesty, who wants to create more work? And with many farmers now moving towards some rotational grazing patterns then this all goes out the window with single sire mating.

DNA Shepherding has to be said to be the most valuable method of recording parentage, it allows you to run the farm as you need to, stocking areas of land as needed and it limits the need for intervention and labour at lambing. All going well with an outdoor, easy lambing system then its only needed to check stock routinely and maintain high animal welfare standards. This, as mentioned on many farm visits in New Zealand allows farms to be run commercially with the added value of selling rams at the end point. Taking a DNA sample at lamb marking is only a small extra job to undertake. The main downside to this system would be the cost associated with it being around £10/sample. But in a 200 ewe flock rearing 350 lambs total cost for lambs sampled would be £3,500. If only the top 10% or so rams were sold, being about 20 say, then with a value of £500/ram totalling £10,000 then it leaves some margin to be taken from a fat lamb value to a ram selling option. Don't get me wrong there would be other costs to incorporate but if you're targeting to sell recorded rams at value then the outlay for DNA sampling can be regained.

DNA sampling allows you to gain parentage information on lambs as well as even looking for gene markers etc for an added cost. But more importantly it can guarantee that the correct EBV's can be assigned to lambs as this is linked to actual parentage, although errors may be made if a different ewe has reared the lamb which may skew the actual performance of the lamb. There can sometimes be some cross over in the results if genetic sisters are put to the same ram, but usually software known as Animate can be used to distribute ewes into tupping groups to lower the probability of this.

Advancements in flock performance depends on accurate breeding values being obtained and passed forward, as shown in studies undertaken in New Zealand looking into the improvements made in performance. This is why DNA Shepherd, I believe, has to be the best method of recording parentage, it may be costly to set up but with samples taken from the initial flock and thereafter full parentage can be determined. This should especially be used in flocks that would be higher in the pyramid with a greater influence on the industry.

EID Tracking in the form of MatchMaker has some real potential to offer the industry. This can be used in a number of ways, between the field and water trough, or between the field and shelter or even between fields. With the environment in Australia it can be easily used with plenty of movement between the field and water troughs due to the low rainfall and

limited water supply in the fields. However in the heavy rainfall areas of Wales, like at home then it may not work as effectively as it may not get as much throughput the EID scanner meaning a lower number of recordings going through and possibly a lower reliability on results or less matches. The data is analysed in a way that it monitors the tag number of lambs that directly follow the ewe or just in front. With the greater number of times the lamb is associated with the ewe the higher the reliability and parentage assigned.

Even though in different trials that between 85 and 93% are assigned parentage, the correctness of the assignment of parentage is very good so could be used as a cheaper method to get the majority of lambs assigned to a dam. Yes it is useful and reliable for stud flocks but the biggest future that I see for it is within the commercial flocks. This would allow you to be able to identify the better performing ewes within a flock. Taking in account rearing percentages and how the lambs perform etc. Knowing this information in a commercial flock would allow you to make better culling decisions, deciding to keep ewes that have performed consistently well over a number of years instead of a younger ewe that has failed the system before her time is done. This would help people to get away from the mindset of 'the biggest and fattest ewe is the best' as it is sometimes quite likely that she hasn't reared or has produced lesser quality lambs as she concentrated more of her efforts on herself opposed to her lambs.

Below is a table to work out the cost basis to assign parentage to a flock of 800 breeding ewes rearing 150% with a brief description of how the figures were obtained below.

System	DNA Shepherd	EID Tracking	Tagging at Birth	Mothering up
Cost per lamb	£10	£2.08	£2.33	£0.50

DNA Shepherd: This does not take into account the initial flock sampling, just typical cost per sample for each lamb.

EID Tracking: Takes into account cost of tag recorder at £1,500 plus £1,000 spent on additional materials and cost of data analysis. This could vary depending on system in place. But once the system is bought then yearly costs would only be repairs and data analysis.

Tagging at Birth: A Shepherd managing 400 ewes, tagging twice daily consisting of 4 hours per day for 35 days. Two Shepherds working 140 hours each at £10/hour.

Mothering up: 400 ewes can be done in one day with 3 members of staff. Total of 30 work hours per day. Two days required. Information based on hoggs with mainly single lambs.

The unquantifiable saving that DNA Shepherd will give is the ability to multi sire mate and be running mobs on rotational grazing systems resulting in better grass utilisation.

Where I go next?

After my visits throughout New Zealand and Australia and taking into account what they are doing there, I'm looking to keep my farming as simple as possible and record the productivity of the ewes going forward, putting more emphasis on the ewe's ability to rear lambs successfully year on year. The aim is to breed a productive white faced ewe that is able to perform in a low input but high output system, with the target to be able to wean her tupping bodyweight. For example a 65Kg ewe at tupping weaning two 32.5Kg lambs at 12-14 weeks of age. To achieve an efficiency score of 1:1 this would rely on a large number of twins, and to be reared well. The flock would need to be self-replacing so then I will be able to keep full control on breeding decisions and have full history of how they have performed. I will initially record by tagging at birth as this will allow me to select those best ewes for mothering ability and ease of lambing and then record the lambs from birth to see how the ewes perform. Once I have managed to identify my best performing ewes for my needs then I will look to use DNA Shepherd to record from then on as I would expect lambs from these ewes to be more likely be kept for breeding replacements and then in the future, when I'm confident of knowing I have something to offer the industry, then I would look to sell some rams that would help give me a return for my investments but also give someone else something that would give them a return into the investment of a ram.

I believe that for the industry to move forward here in the UK and to be self sufficient then farmers have to be a lot more accountable of what they are doing and knowing how they perform. When you look into the way certain farms have turned things around from a traditional system of what worked a couple of decades ago to a recorded and efficient

enterprise then surely it leaves some targets for others to follow. For an efficient enterprise to work then you have to know what you are doing, where your costs are and what you're getting out of it.

The most basic recording that could take place is to use an ear notcher. This can be used to identify problem sheep, such as those that have lost lambs or had difficulty at lambing etc. It is all well and good to mark the ewe with a spray but once that has come off then she returns into the flock as a normal ewe again. To go more advanced as I'm doing then it will be to record the ewe weight at tupping, scanning results, lambing ease and mothering ability. Rearing percentage and weights of lambs and weaning efficiency. As mentioned previously, recording these traits will allow me to select the best performing and easiest managed ewes to breed my replacements in future years. The way the ewe looks will become less important, whilst trying to maintain a standardised type. But correctness of the ewes will maintain a priority.

Acknowledgements

I would like to take this opportunity to thank HCC for awarding me this scholarship which has enabled me to travel to New Zealand and Australia gaining invaluable first hand experience of their farming systems.

I would also like to thank Innovis and Focus Genetics for helping me set up so many informative and thought provoking visits and meetings.

I would like to thank everyone for the kind hospitality and time given to me that allowed me to gain so much from my time abroad.

And finally I would like to thank my family for allowing me time away from home to undertake this scholarship.