A Nuffield Farming Scholarships Trust Report

Award sponsored by

AHDB Beef & Lamb

Improving beef calf survival: Understanding the human element is key to change

Dr Sophia Hepple

July 2016

NUFFIELD UK

NUFFIELD FARMING SCHOLARSHIPS TRUST (UK)

TRAVEL AWARDS

"Nuffield" travel awards give a unique opportunity to stand back from your day to day occupation and to study a subject of interest to you. Academic qualifications are not essential but you will need to persuade the Selection Committee that you have the qualities to make the best use of an opportunity that is given to only a few – approximately 20 each year.

Awards are open to those who work in farming, growing, forestry, or otherwise in the countryside, and sometimes to those working in ancillary industries, or are in a position to influence those who do. You must be resident in the UK. The normal age range is 25 to 45 but at least one younger candidate each year will receive an Award. You must have spent at least 2 years working in a relevant industry in the UK. Pre- and post-graduate students are not eligible for an Award to support their studies.

The Nuffield Arden Award is unique in that there is no age restriction and the subject is set by the Selection Committee. An Arden Award is offered every 2 years.

Full details of all Awards can be seen on the Trust's website: www.nuffieldscholar.org. Application forms can be downloaded and only online submission is accepted.

Closing date for completed applications is the 31st July each year.

A Nuffield (UK) Farming Scholarships Trust Report

Date of report: July 2016

"Leading positive change in agriculture. Inspiring passion and potential in people."

Title	Improving beef calf survival: Understanding the human element is key to change
Scholar	Dr Sophia Hepple
Sponsor	AHDB Beef & Lamb
Objectives of Study Tour	To find ways of improving calf survival in the beef sector through: • Understanding the attitudes of beef farmers to calf rearing practices and how they seek advice, including their approach to data recording. • Evaluating sources of information on calf survival for farms and in different countries. • Understanding the key influences on calf management practices and how this could be used to elicit change.
Countries Visited	England, Scotland, Serbia, Ireland, Northern Ireland, Australia (& Tasmania), New Zealand, Colombia
Messages	• The lack of quantitative data on calf events will continue to limit the ability to monitor & improve survival in the beef calf sector. If parameters are not being monitored and recorded it is far more difficult to provide evidence to demonstrate a problem. This in turn makes it difficult to encourage change when farmers neither recognise the need nor see the financial impact. • Active colostrum provision to the beef calf seems controversial. Influence on colostrum provision often depends on past 'experience' rather than specific advice from specialist advisers such as veterinarians. Improved knowledge transfer is needed. • Individual farmer attitude, coupled with cultural / country influences on monitoring calf health and welfare and how veterinary services are used, means that encouraging change across the beef sector will be a challenge.

CONTENTS

DISCLAIMER

The opinions expressed in this report are my own and not necessarily those of the Nuffield Farming Scholarships Trust, or of my sponsor, or of any other sponsoring body. Evaluation of data and further opinion supplied in this document does not represent the views of the Government(s), companies or people who supplied it, unless otherwise indicated. Further, the views expressed here do not represent those of my employer, the UK Government or its Agencies.

CONTACT DETAILS

Dr Sophia Hepple

5 The Wood Kilns

Yatton

North Somerset

BS494QF

Email: sophia.hepple@outlook.com

Twitter: @Sophia_NFST

Nuffield Farming Scholars are available to speak to NFU Branches, Agricultural Discussion Groups and similar organisations

Published by The Nuffield Farming Scholarships Trust
Southill Farmhouse, Staple Fitzpaine, Taunton TA3 5SH
Tel : 01460 234012
email : director@nuffieldscholar.org
www.nuffieldscholar.org

Chapter 1 – Executive summary

Information on calf survival in the beef sector is limited. DEFRA (UK) statistics (2008) indicated 7.7% of registered beef calves died within 6 months. USDA (APHIS 2010) reported 7% mortality with key contributing factors being dystocia and weather conditions.

Pilot interviews were carried out in England, Isle of Man, Serbia and Scotland. A questionnaire was developed to investigate farmer attitude to management and decision-making in their farming business; this included veterinary advice and the value farmers placed on keeping records, including calf events and colostrum provision.

Farmers were interviewed in Ireland, Northern Ireland, New Zealand, Australia (including Tasmania), Isle of Man and Colombia. They included: hobby (lifestyle block); commercial beef; pedigree studs; dual dairy/beef. Veterinarians and Government / industry representatives were interviewed for further information on industry structure and veterinary services typically provided to the beef sector.

Key findings

- Attitude to monitoring calf health and welfare, particularly at calving, appeared to be associated with individual attitude of the farmer; this could influence decisions on staff employment & allocation of responsibilities when the role included calf care.

- The value of the beef business to overall farm income did not necessarily influence attitude to care at the time of calving. Some farmers frequently referred to the "dollar" (or monetary equivalent) influencing cost / benefit decisions on resource input to calf care but did not have the data to inform how many dollars they were saving or losing as a result of this lack of investment.

- There was a cultural / country influence on attitudes to the need for additional care around the time of calving and in the use of veterinary advice in decision-making. This included accepted "norms" that would not be accepted in the UK. Country-specific issues such as endangered wild predator species & civil unrest influenced management practices and the provision of veterinary services.

- The use of records for most beef farmers was minimal, farmers often citing compliance with the minimum legal or meat contract / assurance scheme requirements rather than valuing it as a positive management tool to be used to aid their business.

- Most farmers recognised the importance of (and had supplemented) colostrum to beef calves in the past. However, knowledge on timing, amount and frequency was limited; some had never supplemented colostrum and would never think to do so. Influence on colostrum provision, type of supplement used and method of delivery for the majority of farmers depended on past 'experience' rather than specific instruction or advice from specialist advisers such as veterinarians.

- Beef farmers were more likely to consult their peers or rely on their own knowledge / experience than make use of veterinary or other specialists when considering changes to the beef business. At least one Government is actively encouraging the use of peer groups for knowledge dissemination.

Conclusions

- The lack of recorded data on beef calf events will continue to limit the ability to monitor & improve calf survival.
- If information is not being recorded it is more difficult to provide evidence to encourage changes in management practices when farmers do not recognise the need.

****

Lack of data from birth through to weaning, will limit our ability to monitor and improve calf survival

Chapter 2 – Personal Introduction

I am a veterinarian living in North Somerset with my husband Richard (a field epidemiology vet) and a few of my/our children: Laila, Amber, Zak, Sol, Islay, Campbell and Skye. Amber's partner Cam and the most recent arrival, my granddaughter Faye, complete the family. Another two children, Yasmin and Rhianna, live and work in Manchester & London respectively but don't seem to have quite fully left home yet!

After graduating from Bristol University with a vet degree and three young children, I started work locally in large animal practice and then mixed practice before returning to Bristol as the first Matthew Eyton scholar in preventive medicine and welfare.

I completed a PhD in neonatal pig nutrition and immunology, popping a few more children out along the way, followed by a lectureship in veterinary parasitology. I then joined the State Veterinary Service (SVS) mid-way through the lectureship, juggling two jobs (and had another child). I switched full time to the SVS, principally to follow my passion for farm animal welfare. Instead I was put in charge of poultry health and had to start learning all over again! Within a few years I was charged with animal welfare responsibilities across Dorset and Somerset and became a veterinary adviser for farmed animal welfare in the public sector.

I carried on studying in my spare time getting an RCVS certificate & diploma and I am now recognised as an RCVS Specialist in animal welfare science, ethics and law; this year (2016) I became a European diplomat in Animal Welfare, Science Ethics & Law. Since 2008 I have been recognized as a national expert in animal welfare for the Technical Assistance and Information Exchange (TAIEX) instrument managed by the Directorate-General Enlargement of the European Commission. I have trained vets in pig and calf welfare in both Romania and Serbia, laying hens welfare in Serbia, as well as delivering classroom and farm-based training to all European Member states on broiler welfare.

Chapter 3 – Background to my study subject

My interest in calf welfare and survival goes right back to dealing with calf welfare issues when supervising/teaching veterinary students in preventive medicine and welfare nearly 20 years ago. As part of a free university extension service at Bristol, we dealt with farm referrals from private veterinary practices and would spend a full week with the students, investigating how the farm business was run, what the specific problems were and recommending changes to solve or improve the problem(s). Calf-rearing issues were a regular occurrence, but more so in the dairy sector. My PhD focused on improving survival of neonatal piglets but the issues and diseases are very much the same across the species, including humans. Therefore, the key elements required to optimise survival of the neonatal terrestrial mammal are generic:

- A **"normal" birth**, and early intervention / action if things do not progress normally.
- **Early colostrum provision** of a sufficient quality and quantity, specifically to protect against enteric infections in the early weeks but colostrum also contains important growth factors key to animal development later in life.
- Providing the **appropriate environmental conditions** for rearing from birth onwards. The environment must be clean (with low infectious disease burdens), provides comfort, and avoids extremes of temperature. Neonates are particularly susceptible to hypothermia and so cold stress can be one of the most common causes of calf mortality in herds kept outdoors in temperate zones that have a winter season. Therefore, for beef calves kept with their dam outdoors for the first 5-8 months of their life, good mothering ability is essential for both providing nutrition and protection from predators/extreme weather conditions.
- Continued and **sufficient nutrition** for normal growth. Continued feeding by the dam confers extra protection due to the passive protective effect of antibodies found in the milk after gut closure. Colostral antibodies cannot be absorbed after about 24 hours of age. However, antibodies naturally present in both transitional and "normal" milk can act locally in the gut to protect against infections such as *Rotavirus* and *Escherichia Coli.*
- **Rapid detection & treatment / management of illness / disease**. Young calves deteriorate and dehydrate rapidly if infection is not detected early on. Appropriate action taken to treat the symptoms is key, even if the disease is viral in origin and cannot be usefully treated with antibiotics.
- **Biosecurity** and minimising animal movements between farms is essential in managing the diseases on an individual farm and recognising when to take preventive measures such as vaccination and parasite control programmes.

So, if I understand this, and indeed farmers have access to all this same information that I have, as do farmers' private vets, then what was I doing wanting to do a project on calf survival?

Surely we have all the answers?

However, all this good advice is not necessarily translating into practice within the various livestock industries. Considering the advances and knowledge in animal husbandry over the last 50 years there are still problems with neonatal survival across many livestock sectors. Some, of course, have been iatrogenic i.e. self-inflicted; for example, the drive to increase the number of piglets born per litter inevitably reduces the live-weight birth which is known to be associated with a higher risk of death.

Further, the increase in piglet numbers results in potentially producing more piglets than the sow has teats; the sow initiates the milk let-down process and there needs to be at least one functioning teat per piglet born to allow them to get sufficient milk in what is a very short feeding period of 10-20 seconds approximately every hour. These piglets have a high growth rate, they need a lot of milk, and by the time they are two weeks old the sow is struggling to meet their needs so competition at feeding time can mean some of the smaller pigs miss out. So, in improving the genetics of the sow for piglet numbers and the genetics of the piglet to grow fast, we have created some of these problems ourselves, which we then need to find solutions to overcome.

Changes in more developed countries with respect to farm size and increased use of technology means that fewer staff now have day to day care for a far larger number of animals than ever before. For most adult animals, a short delay to responding to animal health issues is unlikely to result in death. However, for young neonates the risks are higher if, for example, a cow is calving or a calf is off its feed or separated from the dam and the problem is not identified and/or acted upon quickly enough.

As technology, farm size & cattle numbers per staff member increases, recognition and response time to individual animal health issues may increase; for the neonatal calf, this time could be life-critical

My interest in calf survival was further stimulated through my current work as a veterinary adviser on animal welfare. I was involved in highlighting issues in the veterinary and farming press, such as inappropriate and illegal castration and tail-docking in calves in the UK, issues with the feeding of neonatal dairy calves and further the impact of stress of long distance transport of pregnant heifers in late pregnancy which had led to various problems around calving time or shortly after. With welfare problems continuing, despite mine and my colleagues' advice to both vets, farmers and industry partners, I wondered what I was doing wrong. The messages were failing to be communicated effectively to elicit change.

I was also the veterinary adviser providing support to the Farm Animal Welfare Committee (FAWC) who were working on a beef welfare report (not yet published) and in producing FAWC's opinion on

the welfare implications of nutritional management strategies for calves from birth to weaning (FAWC, 2015). As part of this process, from 2013 I reviewed over 200 papers on calf health, nutrition, survival, disease and mortality. I realised that we didn't just have problems with dairy calf survival, we had problems with beef calf survival too but the data was limited on what mortality levels we were dealing with, even for beef calves. I wanted to understand why the data was limited because there are so many countries producing beef from beef (suckler) dams as well as beef from the dairy sector. This therefore stimulated me to choose this subject area for my Nuffield Project.

Why don't we know enough about neonatal calf health and welfare issues, including true mortality rates, in the dam-reared beef (suckler) sector?

Chapter 4 - My Study Tour – Where I went & Why I chose those countries

4.1. How my project focus changed following reflection and advice about what I was trying to do

My original plan to visit certain countries, specifically North America, changed as the focus of my study developed, as I learnt more about where my study subject was going and what value I felt I, and those reading my project report, would get out of it. Furthermore, certain other Nuffield scholars also influenced my direction during the project.

Initially I had planned to visit developed countries with similar production systems to the UK and to also investigate some novel systems of rearing. However, I quickly realised that I already had considerable experience of these systems and visiting something I already knew a lot about was unlikely to serve much purpose. There were plenty of peer-reviewed articles on such systems in addition to reports produced by previous Nuffield scholars. I did not want to tread "old ground" and reiterate what scientific journals had already stated and many of my Nuffield peers had reported on.

Additionally, as my project focus turned to how we communicate to "normal" farmers on calf management, I wanted to target more of what I would describe as the "normal" farmers that we have in the beef sector for the different countries I visited; if I found a few progressive farmers along the way then fair enough, but this was not my primary focus.

I had already developed a specific interest in the challenge of island living through my day to day work. I wanted to explore this concept further, if possible, not only in relation to this issue but to sector or country specific challenges, and how these were being addressed. I didn't visit all the island communities I originally planned on, due to time constraints and costs, but I did look at other challenges faced in different communities including predators, climate and topography that influenced decision making around calf management practices. If you want to learn about "gravity poisoning" then read on!

Owen Atkinson (NSch 2010) advised me to reconsider all the places I planned to visit and reduce them. Furthermore, at the Nuffield Conference in November 2015 Alan Beckett (NSch 1957) made a strong statement about the latest scholars whizzing about on round-the-world trips and maybe not spending enough time embedding themselves within a country to better understand and reflect on the issues and challenges that various farming sectors faced (I didn't record exactly what he said but this is the message I took away from his comments). This made me think carefully about where I wanted to go and for how long and so a planned whistle stop tour through North America and South America covering 4-5 countries changed to a distinct focus on the country of Colombia. On reflection, this was a decision well-made and I don't regret it.

4.2. Visits in England & Scotland (2015) and why I developed a questionnaire

These farm visits were principally used for fact finding and to form the basis for developing my questionnaire and adapting it for use with both commercial and hobby farmers. Now, you will ask,

what has happened to my "5 key questions"? This is what we are encouraged to do, to maintain a focus on our subject area of choice when visiting diverse people and farming systems. There are a few reasons for this, and which I discovered in my pilot interviews:

1. **I had more than 5 questions** that I wanted an answer to, and despite my farmers being busy people, they liked to talk and generally enjoyed (or at least seemed willing) to answer my questions (I think!)
2. Despite the list of key questions that I was seeking the answers to**, I often found myself or the farmer distracted by other things**; these could be gadgets and the latest computer-guided tractor attachment that knew the needs of each square metre of soil or it could be some very cute lambs wanting attention. I was in danger of spending several hours on the farm, and not necessarily getting all the answers I intended to get because **farmers are interesting people** to have a conversation with!

Distractions to the focus of my study topic were frequent!

3. I was concerned about **unconsciously biasing my questions** based on assumptions about farmer responses. I had previously attended FAWC interviews and read consultation responses from Irish, Welsh and English beef farmers, from industry partners and cattle vets from the UK, about key welfare concerns for the beef industry and certain approaches to calf management. However, I did not want to assume these findings without conducting some more in depth interviews myself. For this reason, I found myself constructing a semi-structured questionnaire that **ensured I asked open rather than leading questions**, particularly regarding opinion and attitudes of the farmers I interviewed.
4. I knew I would need an interpreter for some of my visits. My experience in Serbia (see below) taught me that **prepared written questions helped the interpreter understand what I was asking** (with additional focus questions / examples where necessary to explain further), particularlywhen

the interpreter was not a vet or farmer, and ensured they asked the questions every time and in the right way.

5. Having a scientific background, I was naturally drawn to ensuring that I asked, as far as possible, **the same question, in the same way, to each farmer to enable a reasonable comparison**, where this was possible, of farmer responses.
6. My **rapid typing on a lap top was far easier to decipher than my fast hand written scrawl** in note books, and easier to translate into meaningful results many months later.

I also interviewed cattle vets based in the UK about how they felt their services were being used. I attended shows throughout 2015, where I engaged with companies marketing databases for commercial producers to understand their customer base and the different databases available to the cattle farming sectors. This helped develop some of the more specific questions in my questionnaire.

4.3. Visit to Serbia – the challenges of accession countries adapting to European laws and the challenge of getting lost in translation

Serbia, along with five other countries in the Western Balkans, was identified as a "candidate" country for entry into the EU as early as 2003 (source, European Commission). Progression was delayed until tribunals investigating war crimes within the former Yugoslav Republic concluded and in 2012 they were finally given candidate status. As an "accession" country, Serbia can receive support from other EU countries and this is how I became involved in training their Government vets. After previously training them in calf and pig welfare (on a classroom basis, no farm was seen!), I had been invited back to train them in laying hen welfare (again on classroom basis only).

To align with European Community laws, Serbia needs to keep comprehensive records on births, movement and deaths in cattle

I took the opportunity to extend my stay in Serbia to visit farms and farmers and to understand how the Serbian Government had progressed in assessing calf welfare at farm level as part of aligning their

national legislation with European laws. This is a necessary pre-requisite for accession to the European Union or to freely trade with the European Union. I also fitted in a visit to a new enriched cage laying hen unit along the way!

I not only learnt how Serbian Government had made use of welfare assessment expertise in the UK to improve their on-farm welfare assessments of calves, the experience helped me understand the challenges of using interpreters for interviewing farmers with no or little spoken English and was another driver to develop a clear questionnaire that I could send to interpreters ahead of my visits. I wrote about my experience for my sponsors AHDB Beef & Lamb, and this summary review which is published on AHDB Beef & Lamb's blog spot was shown to European Commission auditors when they next came to Serbia as positive evidence of their progression in regulating animal welfare laws.

(http://beefandlambmatters.blogspot.co.uk/2015/07/serbian-livestock-production-what-can.html)

4.4. Isle of Man– the challenge of island living and an opportunity to examine some Bigger Data

I carried out interviews on the Isle of Man in the first year for initial development of my questionnaire. After engagement with the Department for Environment, Food and Agriculture (DEFA,) Manx Government, they agreed to provide a full data set of cattle birth & death data, including stillbirths, which they had been collating since January 2014.

I returned in 2016 to download the full set of data for evaluation and complete initial analyses for this Nuffield report. I was also able to interview a beef farmer with ongoing calf mortality problems, making use of the central Government database to detail mortalities in his herd over the previous three years. This gave me the opportunity to evaluate how Government data generated from legal obligations under food safety laws for farmer reporting, could then be fed back to the farmer to provide useful farm-specific information about his mortality problems and any potential risks or associations found.

4.5. Northern Ireland & Ireland – Does offering subsidies in Ireland, in return for doing more recording and peer group work, affect the farmers' attitudes to keeping records and knowledge transfer?

This was my first opportunity to use the full questionnaire on a selection of willing farmers. Northern Ireland and Ireland have similar legislation to Great Britain on records requirements for comparison purposes, similar climates and similar market demands / assurance schemes.

I specifically wanted to understand how additional Irish subsidy requirements associated with obligations to attend peer group meetings and keep specific records (above minimum European laws) affected their attitudes and responses to my questions, specifically in relation to keeping records and how they valued them as an information source for decision-making in their farm business.

4.6. New Zealand and the challenge of calf survival on hill farms

With most beef herds intimately connected with sheep rearing and almost exclusively reared outdoors, I saw this sector as being comparable to Scottish and Welsh beef hill farming and wanted to understand the similarities and differences between the countries with respect to calf management practices and the data available in relation to this.

4.7. Tasmania (Australia) & mainland Australia (New South Wales) – How Tasmania adds value to "Tasmanian Beef"

After discussion with my Australian peers at the international scholar conference, and having read previous scholar reports, whilst the attraction of going to see huge ranches managed by helicopter in Western Australia was appealing, I had already been informed such visits would yield little extra regarding data and attitudes on calving or calf management prior to weaning.

For its size, Tasmania is responsible for over 5% of Australian beef production. Tasmania has developed a strong marketing image for grass-fed Tasmanian beef and has similar herd sizes to the UK. It therefore seemed sensible to focus on this, with less attention on mainland Australia. Farms targeted in New South Wales were smaller and on a par with beef production in the UK.

4.8. Colombia – the challenge of civil unrest, predator protection and supporting sustainable cattle farming

Colombia is the fourth largest beef producer in South America and is somewhere, depending on the source information, between the sixth and twelfth largest exporter of beef in the world. It is currently beginning to emerge from a period of civil war and unrest. My interest in this country was first drawn by Government-funded agroforestry projects and the impact of developing wildlife protection strategies on tensions between endangered predator protection and cattle farmers protecting calves.

Marandúa 7-4-43

The Colombian Air Force was provided with 61,500 ha of land in 1983 to build a new airbase yet were also charged to balance environmental and social needs of the area. The project was named after the human being's ability to survive - without air for 7 minutes, - without water for 4 days- without food for 43 days.

Projects include: re-planting 51,000 ha to return tropical rainforests to the areas and increase carbon sequestration; demonstration farms for integrated livestock & agroforestry operations that ensure a balanced ecosystem whilst supporting local communities.

The project also focussed on integrating employment of locals with retired/ injured professional soldiers and those injured through internal conflicts into local communities.

Chapter 5 - Methodology in approach to the subject and pilot farmer interviews – England, Scotland & Serbia

5.1. Background to developing questionnaire

Whilst I knew the specific and multiple questions I wanted to ask the farmers I interviewed, I also wanted some depth of detail about how the farm was run and managed. This was important in defining my study population, which was in the most part self-selecting (through availability and willingness to be interviewed) but could also easily be overlooked in the excitement of discussing my and the farmer's pet topics and taking photographs of animals in stunning vistas (yes even in the UK!).

With my veterinary hat on I also found I was distracted by other livestock farming (for example sheep and dairy) enterprises. I needed to understand how attitudes to certain aspects of beef management were influenced by other livestock enterprises, but maybe not to the detail I was discussing them in and it was making the time spent interviewing particularly long; no farmer complained about the amount of their time I had taken up, indeed they seemed to enjoy the interrogation about how they managed their farm, but I realised very quickly that I needed to organise and frame my questions very specifically.

I interviewed vets at the Edinburgh University Vet School first opinion farm practice and some vet peers in farm practice to understand the range of contact and advice they perceived they were giving to beef farmers.

I drew on my past experiences with industry retailers to ensure that I accounted for the differences between legislative requirements and assurance / retailer scheme compliance requirements when framing my questions.

5.2. Pilot findings

My initial findings from these pilot interviews demonstrated a wide range in approach to farm management and the use of records in decision-making by farmers in general, not just beef. For example, certain activities were influenced by accepted norms within a country: in Serbia the management of dairy cattle in tie-stalls, the immediate removal of the calf at birth and minimum use of records accelerated only by legislative needs for EU candidate status. However, there were always individuals who bucked the trend, keeping dairy cattle at pasture with 10 years of data kept on excel-based spreadsheets and detailing every cause of calf death including age at death.

5.3. Developing & refining the questionnaire

Interviews carried out between March and July 2015 in the UK, Isle of Man and Serbia were assimilated and used to develop key questions regarding farmer attitudes to:

- Advice & decision-making, including veterinary advice / services;
- Record-keeping across all cattle stock with additional questions focussed on calf records, if these were kept. Where possible, examples of records were evidenced, including paper and IT database sources;
- Ensuring colostrum provision to calves.

Two versions of the questionnaire were developed, one for direct interviewing containing detailed prompts for the interviewer and another for farmer completion and for certain vet practices to distribute; due to time constraints of the project and study report, and for universities' time needed for ethical review of projects (this is now a pre-requisite for all UK universities however small the contribution to a project), the second questionnaire has not yet been made use of, but is planned for circulation following completion of my study tour and report after some refinements to simplify it.

I sought feedback on the semi-structured questionnaire design from veterinary peers and from my Nuffield scholar peer, Aarun Naik, with experience in social science type questioning since this was a new venture for me compared with more technical-focussed surveys. Questions relating to farmer opinion/attitude were kept as open as possible to ensure I was not leading farmers into answers.

Wherever possible the interview was carried out prior to visiting the livestock, before the interviewee found out my occupation (a vet) and before asking any further questions that could have arisen during the farm tour. A copy of the questionnaire is at Chapter 13- Appendix 2. The interview took on average between 1 and 2 hours per farmer but sometimes took up to 3-4 hours. Average attendance time per farm including visiting stock was 3-4 hours.

Most responses were evaluated using a process of "thematic analysis", although some quantitative data was collected. This was achieved by evaluating a range of questions relating to a specific issue – let's say farmer attitude to the provision of veterinary advice and coding the response within a certain group of response types. Whilst some of the questions appear to be asking similar things, some were intended to confirm initial response, as a form of internal validation, whilst others were intended to further tease out any nuances in response type.

A total of 40 farmers were interviewed in Northern Ireland, Ireland, New Zealand, Tasmania, New South Wales, Isle of Man and Colombia. The findings are grouped into the three key themes identified above and described over the next 3 chapters.

Whilst this report is a little longer and wordier than some others, I felt it important to capture and report on everything that the farmers took their time to tell me

Chapter 6 - How farmers value veterinary advice & who influences them on decision-making?

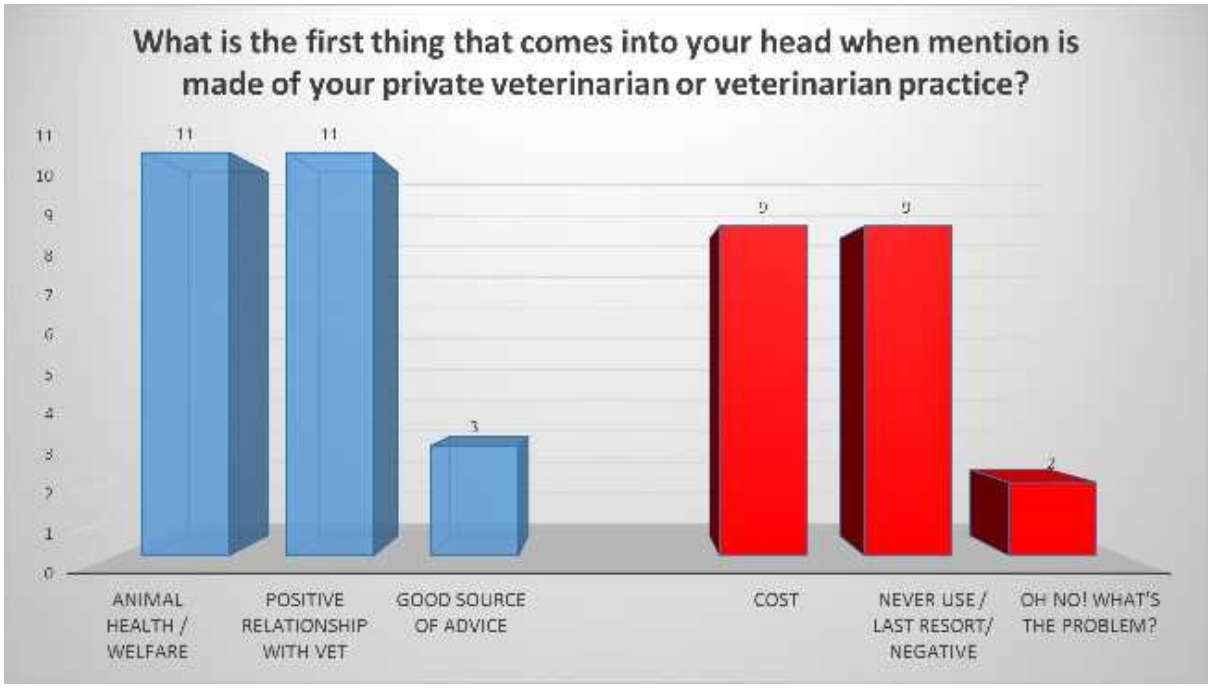
6.1. How Farmers view private vets

The first questions focused around the farmer's opinion and attitude on their private vet(s) used. Figure 1 summarises what farmers first think about when their vet is mentioned. There are more responses than farmer interviews as the "first" response given sometimes included more than one statement despite the question posed.

As can be expected animal health was a predominant focus, although two farmers mentioned welfare. What I found most interesting was the value placed on the relationship with the vet. More than a quarter of farmers mentioned their positive relationship with their vet before anything else:

"We get on well with our vet, he has a lot of input into this farm. All animal health is done with him. We see the relationship with him rather than with the practice itself" beef & sheep farmer

Figure 1. What a farmer first thinks of when the vet is mentioned



Not surprisingly, the cost of veterinary services were also the first thought for nearly a quarter of all farmers interviewed, with a cost focus predominating more in some countries than others:

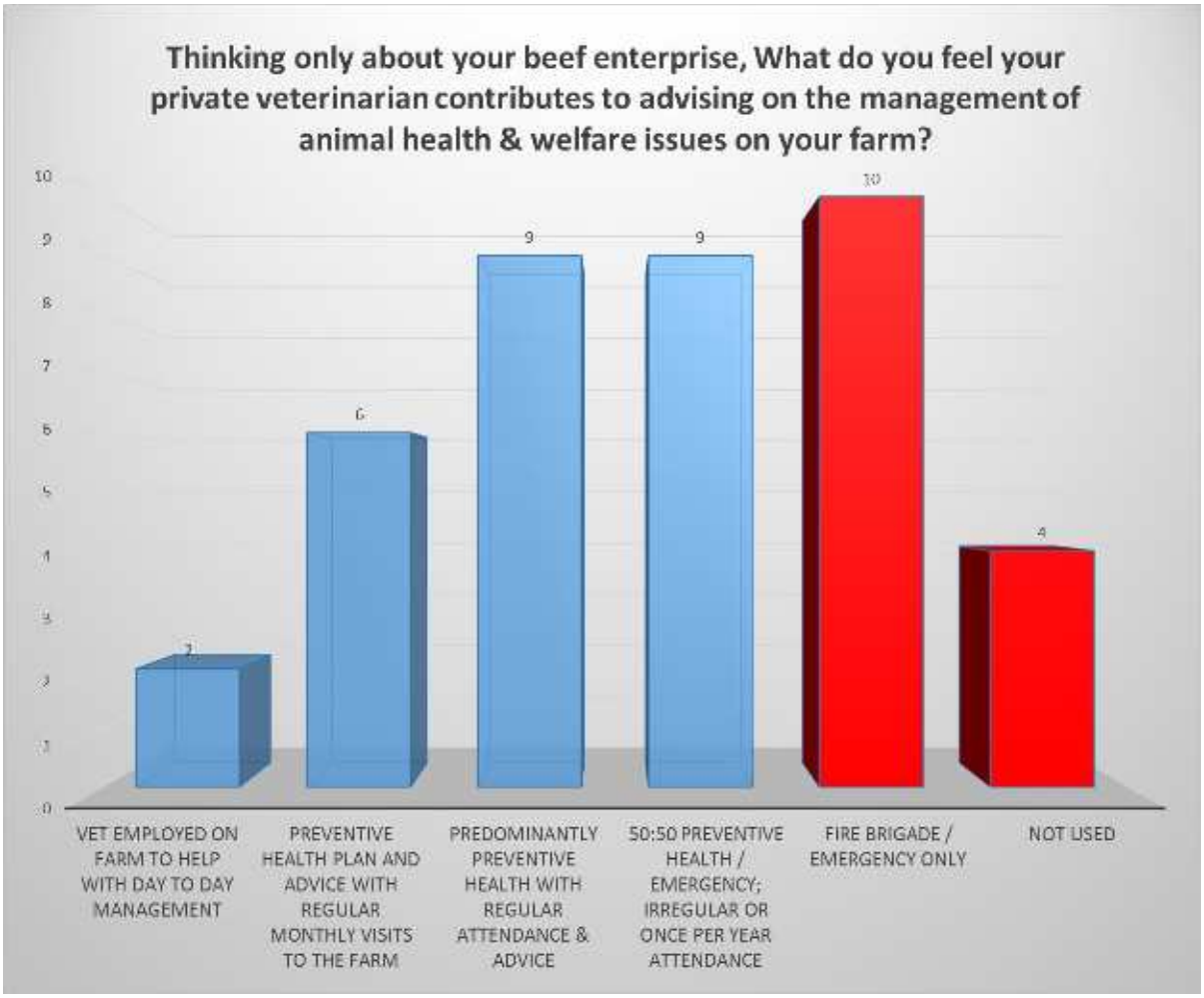
"We try and keep vets out because of costs of vet services. Cheaper to shoot cow than save her. I have a fair bit of experience with cattle and can get out of trouble myself" beef farmer

A further quarter of all farmers expressed a negative view of the vet or indicated that they never or rarely used a vet. This was similar across all countries:

"Hardly ever see them. Last time we had someone out was 2 years ago" arable & beef farmer

When asked for further details about what the vet was used for in the business regarding animal health and welfare, again a wide range of responses was given from no input at all to an integral part of the company's business. This is summarised in Figure 2.

Figure 2. How farmers use the private vet for their cattle enterprise



10% of farmers stated they made no use of veterinary advice at all, or certainly had not made use of or had the vet attend in the last year or two with respect to their beef enterprise. This did not appear associated with the size of the enterprise. One used a company vet for another livestock enterprise but she didn't consider a vet necessary for the beef animals. Another quoted economics and although had certain health programmes, such as pregnancy scanning, carried out this was not done by a vet. One claimed to know more than her vet and another felt that the vet was just out to sell medicines for a profit:

"They don't look out for problems; they just want to sell you something" beef farmer

A farm on which I was unable to gain access (and therefore not included in the results tabulated above) told me in no uncertain terms:

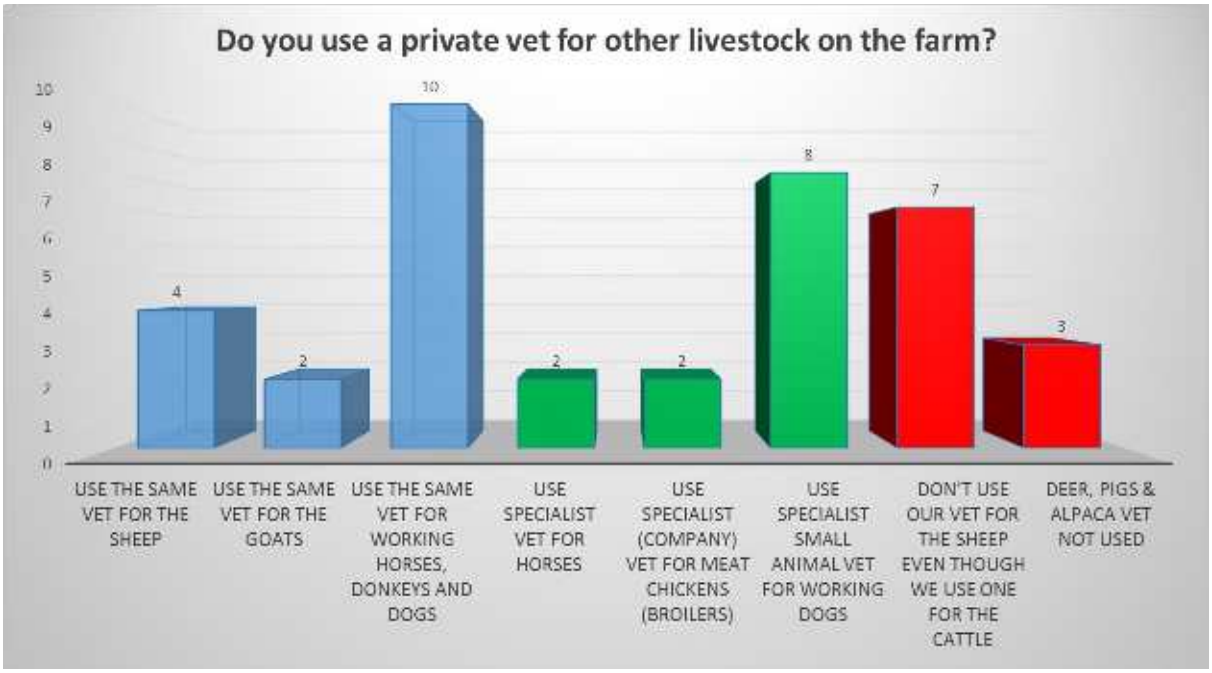
"We [farmers] know more than vets. We don't study but we have lots of knowledge because we have always done this our whole life" dairy/beef farmer

This claim to a better knowledge and understanding of their business, including animal health and welfare, than their vets was a common theme globally. Three of the four farmers who stated that they used no veterinary advice at all were from one continent:

"I wouldn't spend money on the cat and the cows. No point ringing vet for cows because they don't know as much as I do. If I cannot help them obstetrically then the animal is not worth keeping. The alpaca? – I would speak to other alpaca breeders" pedigree beef farmer

In relation to the use of a private vet for other livestock and companion animals, again the responses were varied. The most frequent finding was the lack of veterinary advice or attendance in relation to sheep, despite using the vet for their beef animals. This was a common theme across all countries. The size and value of the sheep operation had no bearing on this decision but cost was the principle reason for not making use of the vet for sheep and of course the assumption by some that no advice was needed. The findings are summarised in Figure 3.

Figure 3. How farmers use the private vet for other livestock on the farm



The use of the same vet for companion animals present on the farm was varied. Most would use the same veterinary practice, but not necessarily the same vet. Others used a different vet or did not use a vet at all. Cats were often not viewed as a responsibility if they were regarded as semi-feral "farm" cats. In Colombia there are Government-funded voluntary schemes to ensure that all dogs are vaccinated against rabies and most farmers took advantage of this if nothing else.

When asked who farmers consulted if they were considering changes to the way they managed their business, again there was a full range of responses from vets being integral to all major decision-making about the business to no role whatsoever in the process. One quarter of the farmers spontaneously mentioned the vet as somebody they would consult (Figure 4). On prompting regarding the vet's potential role, a further 14 farmers stated vets did have a role but tended to be very focussed on their role being specifically animal health related, for example a change in the use of vaccines or

disease treatments. 16 farmers believed the private vet had no role at all in decision making, however two of these mentioned that advice from Government advisers/vets may be sought in relation to specific changes if they were uncertain of the law or if it related to import / export requirements for example.

This pig, destined for local consumption, wouldn't get veterinary attention if it fell sick

Figure 4. How farmers consult the private vet on decisions regarding management changes to the beef business

So, how do farmers view the private vet's contribution to the economics and profitability of the beef enterprise? The findings are summarised in Figure 5. Nearly half of all farmers regarded the vet's contribution as not having a positive impact on economics and profitability:

"He costs a fortune. The vet is there to cure a problem, whereas vaccines etc are preventative to avoid disease and he sells it to me" beef farmer

"Don't think they qualified or have the expertise to deal with that. Just animal health and welfare" beef & sheep farmer

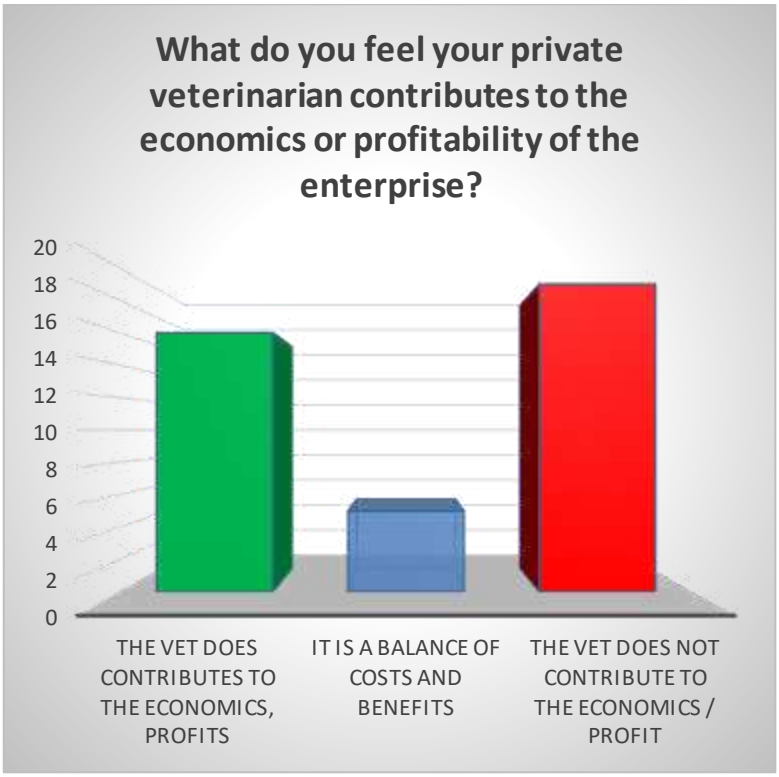
"Vet is a cost that has to be minimised……need to manage the rest yourself" beef farmer

Most negative responses were "no they don't" and did not expand much further. The reasons fell into two categories – those that just didn't see the vet's role as relevant to economics and profitability and those that had a prior bad experience when following veterinary advice:

"Been a cost last 4-5 years.. hoped we would get on top of [calf] mortality issue" beef & sheep farmer

"We tried once doing things the way the vet told us to do; that cost more money and decreased profits. Our experience was that vet was no help and what we were doing before worked better" beef & sylvopastoral farmer

Figure 5. How farmers feel the private vet contributes to economics or profitability of the beef business



Sixteen farmers did see the vets contributing positively to the economics and profitability and provided the following reasons: managing pneumonia, calving problems, subclinical health problems, performing caesareans to ensure survival of high value pedigree bull calves, foetal ageing for high

value embryo transfers, semen testing bulls, pregnancy testing females, increased milk production and milk quality, reduced mastitis and reducing the calving index.

"Vets contribute to first part of their life. Depend on my nutritionist after weaning at 6-8 months" beef & sheep farmer

"The four most important men [or women] are the vet, the feed merchant, the contractor and the bank manager. These the ones we prioritise to pay" beef & sheep farmer

Five farmers indicated that it was a careful balancing act of costs and benefits in order to get the best out of the animals by taking the appropriate advice and veterinary services that would have an overall positive impact on economics and therefore profitability. Interestingly one farmer described investment in the vet's services and advice as an "insurance policy", the amount you invest in theory protecting you against potential negative impacts on animal productivity and therefore profitability:

"Vets are there to minimise and take the risks out of it. I see the vet as an insurance policy and within that they put value / improve business, for example worm / egg counts also use vet for AI and therefore there are ways you can look at it from both sides." beef & sheep farmer

When asked if farmers had ever changed their veterinary practice, just over half (24/40) said no they had not. One farmer had moved vet practices to follow the same vet, another decided to employ his own vet on site with a full surgery and laboratory when it appeared more cost-effective and another had never used a vet. The main reason given for the 13 remaining farmers who had changed veterinary practices was dissatisfaction with the service being provided by the veterinary practice or vets. In summary:

- 9 - Dissatisfaction with service to the beef enterprise: lack of progression; just fire-fighting; lack of personal service; lack of specific services e.g. foetal ageing by ultrasound; lost confidence in inexperienced vets (lack of farm animal experience); trying to sell unwanted medicines
- 1- Dissatisfaction with service not associated with business e.g. pet dog death following treatment
- 1 - Cheaper
- 2 - Location or convenience for deliveries

There was a suggestion that many farmers just used the same veterinary practice that had always been used and hadn't thought about changing or even looking to see what other services were on offer.

6.2. Case study: Role of the private vet in improving health, welfare, productivity and profitability

6.2.1. Location: Villa Josefina, Valledupar, Departamento del Cesar, North East Colombia

Cesar is in the North East of Colombia. From a disease control point of view this area of the country borders with Venezuela, which is not considered free of Foot and Mouth Disease (FMD). The Colombian Government has set up surveillance areas inside specific sections of the Colombian/ Venezuelan border to provide assurance to the USDA regarding biosecurity and ongoing freedom from FMD. Surrounded by three mountain ranges, the plains are warm and dry, however in the last few years the area has been subject to desert like conditions with reduced rainfall and significant droughts. Up until the last six years or so significant areas were still under control of the Revolutionary Armed Forces of Colombia (FARC) and there has been significant loss of land and displacement of people by the civil unrest. Compared to further south (the mountainous areas north of Bogota) all crias (calves) are reared including the males due to large areas of available land for rearing, though not necessarily in good condition. The land is more suited to a dual purpose type animal that can manage the year-round warm, drought-prone climatic conditions.

6.2.2. Background

The farm we visited had been taken over by FARC rebels over 20 years ago, staff were attacked and driven from the farm, the cattle systematically killed and one of the rebel leaders had set up home on site. Eventually the owner, Juan Manuel Castro, regained the land and farm just over 6 years ago. He began to build his herds back up again, but had quite a relaxed approach to management of his 8 farms. Some of this attitude was maybe due to the background of having returned to find the farms in such a poor state and he had re-started with them in very poor condition. He had invested in a software system: “Elganadero”, a system very similar to “Interherd”, a well-known data management system used by dairy farmers in the UK and elsewhere, but it was only being used to 10% of its capability. Three years ago he knew he needed to start making improvements, wanted to improve how his staff were managing his farms, but wasn’t quite sure how he would achieve this.

6.2.3. Engagement of new vet to oversee new management of two farms

The owner and two other managers had been managing the 8 farms between them, using the vet only for emergencies and pregnancy diagnoses approximately once per month. They were each running their own farms and so there was little oversight of all the farms. Therefore, the owner made the decision to enlist a new vet, Ricardo Salazar, in December 2015 to oversee the veterinary management of two of his farms. He placed one of his managers in charge of monitoring all eight farms as Ricardo worked with the first two. The two farms have a total of 260 mixed dual/dairy type milking animals, with mixtures of Holstein and Zebu type crosses. Calves are taken immediately at birth and fed colostrum separately but are allowed to re-join the dam after milking. Calves and followers are kept to finish (or replacement for the heifers). The calves are weaned at 9-10 months old and move to just one of the farms for finishing. Six members of staff are employed to run the two farms and carry out hand milking.

As we discussed the owner’s motivations and time taken to make this decision since getting his farms back under his control, I asked what had eventually persuaded the farmer to make the change, and

take the calculated risk in heavy investment in the veterinary leadership of one quarter of his farming enterprises:

"The owner spoke to other ganaderos [cattle farmers] and he realised that he would see the benefit"

Key issues immediately identified by the vet were:

- poor staff engagement and unwillingness to follow protocols;
- failure to dry off cows before their next calf leading to poor body condition in many of the animals;
- mastitis, principally due to poor hygiene practice and poor calf management practices (if traditional management practices are used, where the calf is allowed to finish feeding from the dam after milking, then mastitis should be low in these systems);
- poor calf management leading to a minimum of 15% mortality (poor records mean the mortality was probably worse);
- failure to cull Brucella positive cows (Brucellosis herd health scheme in Colombia is a voluntary one);
- use of high percentage of Holstein/ other European dairy genetics that are not suited to the climate

High Holstein genetics does not suit the climatic condition in Cesar; these animals were more likely to be in poor condition and suffer from disease conditions such as mastitis

Actions:

- One of the first things that Ricardo, the vet, instigated was to bring a new member of staff, Paolo, to manage the farms and to produce specific protocols for farm management including for the milking, dairy hygiene, cria [calf] management and record keeping. One of the key problems in Colombia is staff engagement, particularly when changes are introduced. This is

a regular problem for owners who are not on-site in Colombia and was something I would see more of in the Departemento de Meta later in my travels. Ricardo and Paolo were quite ruthless in their approach and if the staff refused to comply with the new protocols, having been appropriately trained, then the staff were quickly replaced.

- The "Elganadero" software management system is now used to 100% of its full potential, with every disease and health incident recorded. All calves are weighed at birth and full records of births and deaths recorded.
- Recurrently mastitic cows are culled. Regular California Mastitis Tests are carried out cow-side and somatic cell counts are regularly monitored.
- Replacement of the high Holstein genetic types which really are poorly suited to the rearing environment and poor quality forages available. Breeding practices are being instigated to have higher zebu (*Bos indicus*) genetics.

The Zebu (Bos indicus) genetics are better suited to Cesar's plains' climate and is being used to reduce Holstein genetics in the herd. It will also produce a better beef animal, since all male crias are retained

- Staff trained by Ricardo to carry out artificial insemination
- Appropriate disease control practices including for Anaplasmosis which is a big problem in this area. Ricardo has had special training in effective control strategies for tropical diseases

The tick responsible for transmitting Anaplasma marginale to cattle, although iatrogenic spread by repeat use of hypodermic needles between multiple animals also plays a role in transmission from infected / carrier cattle to others in the herd

Results in just 6 months:

- Significantly reduced cria mortality
- reduced disease incidence, such as mastitis and anaplasmosis
- improved records facilitating appropriate management decisions
- Doubled daily milk production from 880 litres per day (250-260 cows) to 1700-1800l / day with the same number of animals (or in fact fewer because he has culled quite a lot!)

Milk production has doubled in 6 months

6.2.4. Conclusions

In just six months, the investment in a vet to do more than just the basics but influence the whole farm management, has been realised. The owner has recognised the value of his vet in having full oversight of management practices and putting in the right managers and trained staff such that it's not just improving health and survival of his animals, including the crias, but is having a direct impact

on profitability of the business. It is important however that the right vet is used, with the appropriate knowledge, leadership and drive to effect change. By discussing with his ganaderos friends and receiving recommendations, the owner clearly selected the right vet! Placing one of his managers with oversight of all eight farms will support the owner in making future decisions. There are current plans to install an automated milking system on the two farms that Ricardo has responsibility for.

The "dream team": Memo (oversees all eight farms), Ricardo (the vet) & Paulo (farm manager)

6.3. Farmer view of Government vets

The role of the Government and its vets and other advisers had a country-specific influence, both in terms of what was actually available to farmers and the farmers' knowledge regarding the veterinary support and advice available in these countries. Clearly in countries with specific disease control problems such as bovine tuberculosis and compulsory herd health programmes such as foot and mouth disease vaccination in Colombia, some knowledge of Government vets and regional departments was present, but principally on the basis of important disease control issues.

The level of Government veterinary advice and support ranged from what appeared to be nothing at all to direct support at farm level for those unable to afford a private veterinary consultation (for example in Colombia) to training, extension, workshop programmes and subsidised agri-environment schemes.

However, even in countries with a well-established Government veterinary department, with subsidised veterinary laboratory services and in some countries extension advice from Government funded academic / agricultural institutes, farmers were not fully aware of the roles of the vets in Government and the support available. In some instances farmers were aware of the available advice but did not see it as independent and so tended to avoid it.

Rabies control: Local people take advantage of the free rabies vaccinations for their dogs, Colombia

All farmers in Northern Ireland and Ireland had previous contact with Government vets and did not feel any differently towards them, although sometimes they felt slightly more nervous, specifically in relation to checking compliance with regulations:

"[I feel] probably a little bit more reserved because generally if the Department vet is coming it's to check a regulation", Beef suckler, finisher & arable farmer

"No difference [to how I view my private vet], sometimes a bit worried" pedigree bull producer & commercial beef suckler

One farmer questioned the practical abilities of Government vets:

"I don't think they have the grounding in [normal vet] practice, a lot of them" beef & sheep farmer

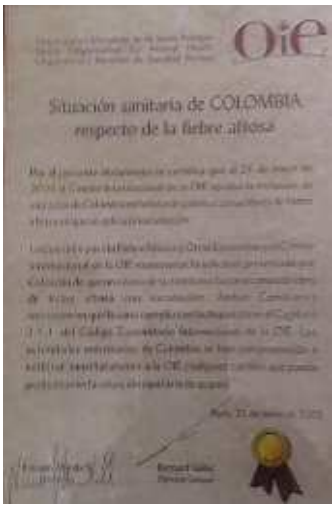
However, the majority recognised Government vets had a job to do like anybody else, just that they seemed to take forever doing TB tests compared to private vets!

In NZ there was limited contact with Government vets although some had received Animal Status Declaration (ASD) form checks by Ministry of Primary Industries (MPI) agricultural inspectors.

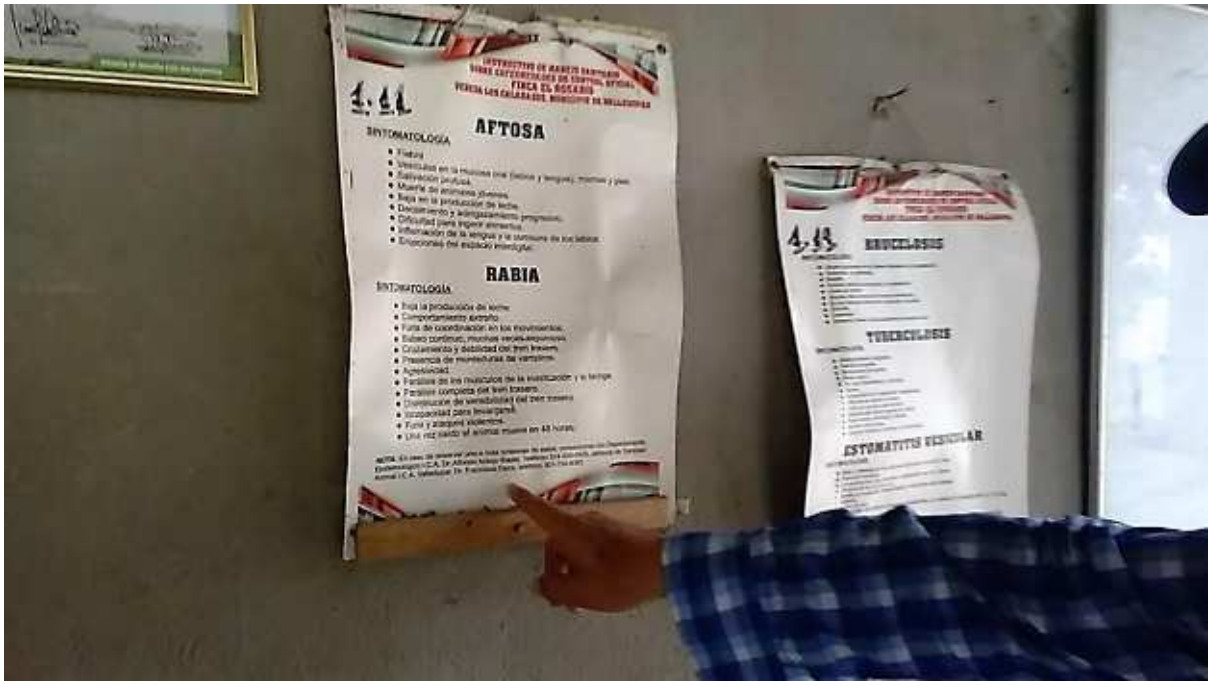
In Tasmania it was noted that the number of Government inspectors was massively reduced compared to 20-30 years ago. Instead there has been a move to industry standards based auditing and inspection assurance programmes, such as Cape Grim, Swift Assurance and USA's Global Assurance Partnership programme.

In mainland Australia only one farmer had experience of a government vet visit nearly 10 years earlier, when they had a suspected botulism outbreak. One of the farmers however stated she would seek advice from district vets who had more knowledge on disease control and herd health than her private vet.

Colombia has run a number of direct support programmes and agri-support schemes for farmers. The Government works closely with industry groups, for example Federacion Nacional De Ganaderos de Colombia (FEDEGAN) and with local farming community support groups; these local farmers work with the Government and the Instituto Colombiano Agropecuario to ensure the compulsory vaccination programmes for Foot and Mouth Disease and voluntary Brucellosis vaccination schemes are completed at a local level. They also organise training workshops and extension advice for the farmers.



The Instituto Colombiano Agropecuario (ICA), the Colombian Agricultural Institute is a partially privatised research institute which carries out some local functions for the Ministerio de Agricultura y de Desarrollo Rural (MADR), Colombia's Ministry of Agriculture and Rural Development. Colombia was first declared officially Free of Foot and Mouth Disease by vaccination in 2003. Its last outbreak was in 2008 and has since continued to maintain FMD-free status through vaccination.

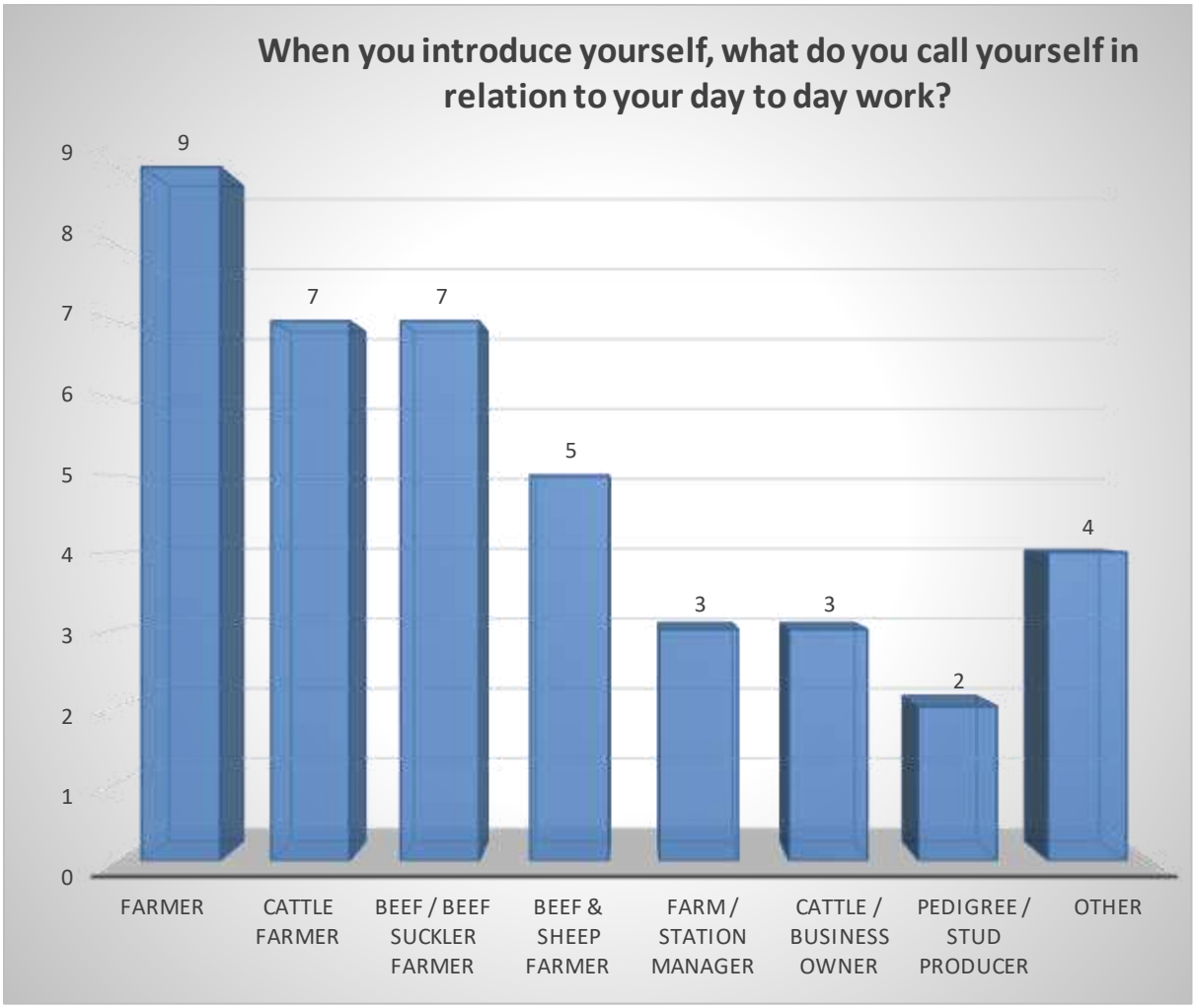


One of the farmers in Colombia shows us the guidance they have displayed that summarises the symptoms of notifiable diseases his staff need to be aware of

6.4. How do farmers view their role and who do they ask for advice?

I was interested to understand how the farmers I interviewed, viewed themselves within the business and how much control they had over decision-making in relation to the business. Figure 6. summarises how the farmers viewed their role / job.

Figure 6. How farmers view their role within the business



As can be expected most farmers would introduce themselves as a farmer, cattle farmer or beef/ suckler farmer. However, for more than half the beef and sheep farmers, the sheep tended to get forgotten in their descriptor, whilst the cattle or general farmer element was emphasised. For some this was explained by their preferred livestock type, the cattle, even though the sheep were often the main income generator or their main income was derived elsewhere:

"My passion is beef" sheep, beef & pedigree stud farmer

"Cattle farmer…. I would never tell anybody I was a doctor!" pedigree beef farmer

Interestingly, some Australasian farmers would change their job description depending on the audience and/or body language of the people they were talking to:

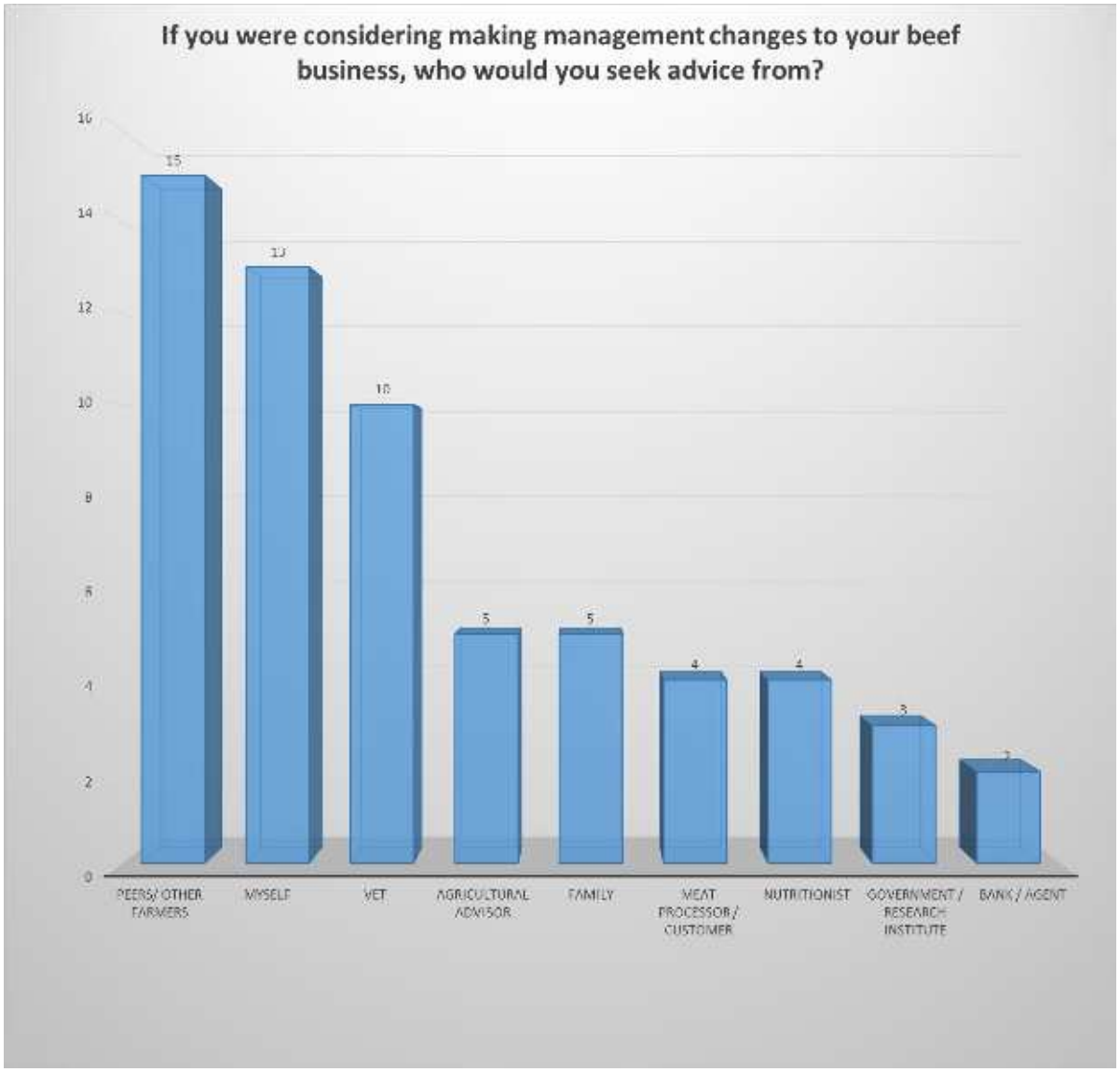
"If cynical or guarded say I am a manager and read body language. Try not to judge people by initial impressions. Proud to be a farmer but I don't throw it in someone's face" sheep, beef & pedigree stud farmer

"[My other] company first then Angus stud but depends on the party" pedigree stud farmer

"Depends on the person. If they appreciate what farmer is and does, I tell them I am a farmer. If from the city and disconnected from farming, then I am a food producer" beef & sheep farmer

So, when it came to taking advice on changes to the beef business, where were the farmers going for this? We already know that only a quarter would automatically consider asking their vet for advice and even when prompted about half would consider asking their vet. Who else would they ask? Figure 7 summarises the responses (prior to prompting)

Figure 7. Who farmers ask for advice if considering a management change



Farmers were more likely to consult their peers (other farmers or for example if running beef studs, other stud producers) or themselves than any other groups:

"I speak to myself and then I make my own decision" beef and sheep farmer

"Discussion group –Five of us in it and been running since 199", beef & arable farmer

"Probably peer groups. Just ask mates. Did have groups a few years ago …. but nothing stuck about" beef & arable farmer

Some mentioned peer discussion groups, farmer groups and bench-marking groups for floating ideas, as an extension to consulting their mates in passing. Ireland has a Government scheme that pays a subsidy to farmers to participate in such discussion groups, however one group of farmers felt the Government-funded groups sizes were too large and there was a sense of "Big Brother" control. They have remained in their own discussion group that they have been running for years independently.

Farmers emphasised the need for independent advice, so whilst one farmer mentioned speaking to the "feed rep", others were specific in referring to an independent nutritionist, similarly independent agricultural advisers not connected with the feed supplier or customer base. Another key factor of course was the customer / client base, including meat processors because it is pointless moving in a direction for which there may not be a profitable market or reliable demand. However, there were some tensions here as to whether the meat supplier could be genuinely independent. In one example a farmer felt that he was being pressured to give up the suckler cow beef and move into rearing dairy cross beef calves because of the processor's own retailer-contract obligations, rather than because it would be a more profitable venture in the long term for his business. Whilst vets were mentioned, as discussed earlier, independence was an issue where farmers felt that vets were making profits on the sale of vaccines for example.

Whilst family consultation figured in the discussion, it wasn't always a positive experience:

"Suggest to father what we should be doing. He fights the decision." beef & sheep farmer

"Me and then my father is about too, I consult but sometimes we argue" beef farmer

Family partnerships provided a source of support and advice but also disagreements

6.5. Decision-making and control of decisions relating to the business?

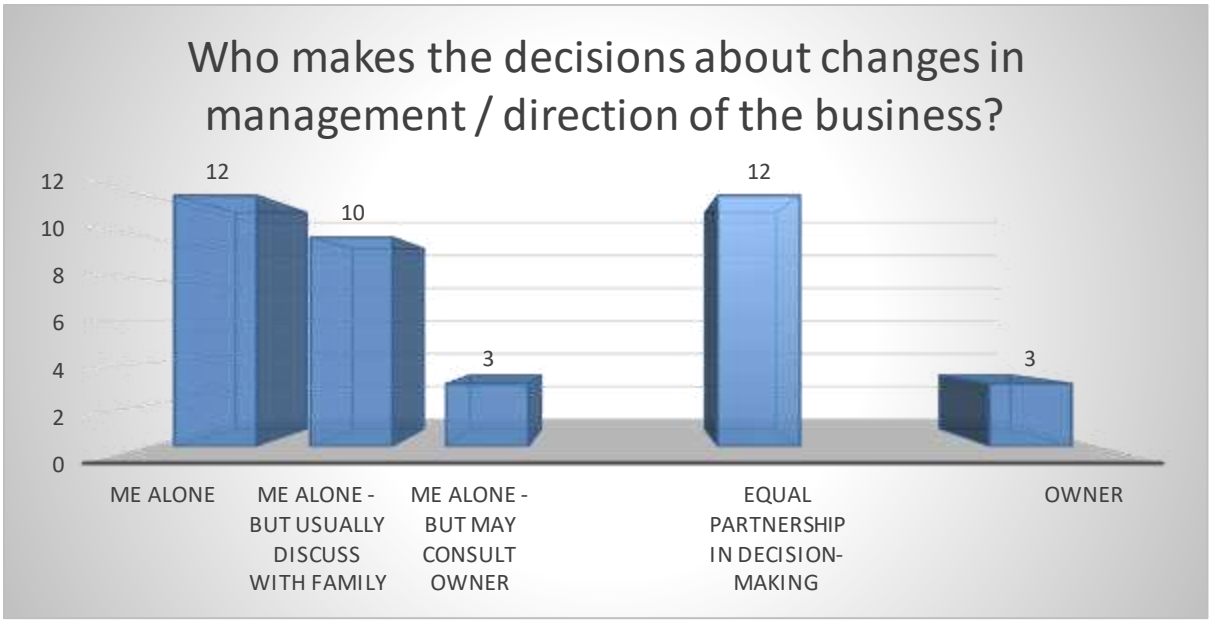
So whilst advice could be sought, who ultimately makes the decisions and how much control does the farmer feel he or she has? Figure 8. summarises who the farmer felt the decision-maker was in the beef business. Sole decision-making figured for 25 of the farmers interviewed on initial response, however these were then caveated with a discussion with family member(s) for ten and sometimes consultation with the owner for three of these:

"Myself – my father is 84 but still very active in doing what he wants, and telling me what I should do" beef & sheep farmer

"I do and [my wife] says whatever. She does input into some things. But this is [my] domain" beef farmer

"For most things – me, but say changing breeds I need to clear through my boss" beef & sheep farmer

Figure 8. Decision-makers in the business



Those that stated an equal partnership in decision-making were more likely to describe having regular weekly and monthly meetings, which would often be minuted:

"Partnership – 4 equal partners – we have a sit down meeting every Tuesday night, once a month a board meeting and monthly management meeting with manager here. All minuted. Governance plus managers." beef & sheep farmer

"We have regular meetings – brother mum and dad and I. We have Monday morning weekly task meeting and once per month monthly management meetings. Take minutes" beef, sheep and arable farmer

"I have a vet [daughter] in family, an agronomist [son] in the family and my wife is a secretary. We all have to agree but I think we've been quite conservative in decisions. A partnership of all family members. We have been having regular meetings since [son] came back. We take notes. (Before that we had a meeting when we had to have) – ensures all the people stay in the loop. Also other family members to keep in loop -like my mother" beef farmer

Those in equal partnerships were also more likely to have defined roles and responsibilities within the business:

"Me, three kids & partner but everyone has a role, me and [my partner] make day to day decisions" beef farmer
"Me and my wife – she does paper-work, I look at visual." beef stud farmer

An additional question focussed on how much control the farmers felt they had over the decisions that were being were made on how the business was run. This included factors beyond the farmers' control such as the impacts of certain diseases, climate and legislation. However, it was also relevant for control within partnerships or how much control that employees or farm managers felt they had. Figure 9 summarises the degree of control. 28 farmers were happy with the level of control they had, with 20 of them feeling they had 100%, complete control over decisions pertaining to the business and a further 3 felt the same as long as the bank manager was happy with the decision. The 5 farmers suggesting good / a lot / 80-95% control included those that were farm managers and were ultimately answerable to an owner. One farmer stated that you could only ever have 80% control over what happened to livestock but at least he had 100% control over where he spent his money!

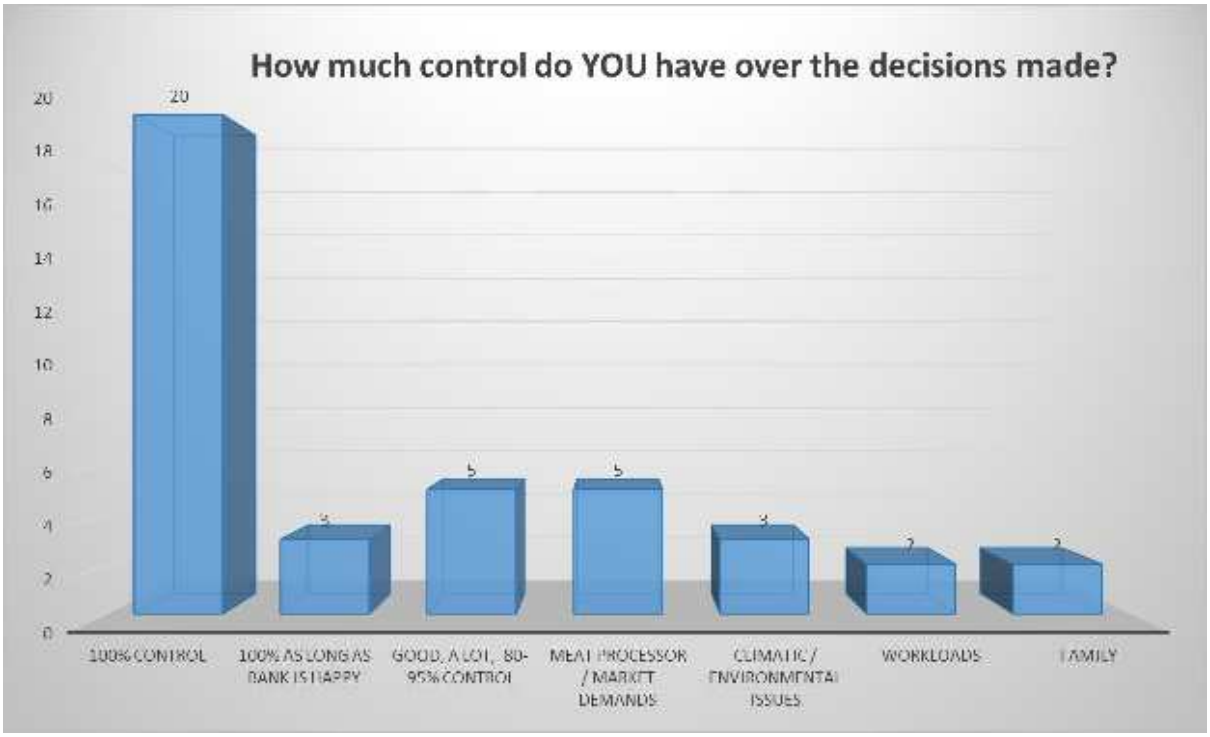
Whilst most staff felt they had a lot of control and influence on the decisions made by their employers, there was nearly always something that wasn't quite how they would have wanted:

"I don't feel I lack control, not really, because we [myself and the owner] reach an agreement…… although I would still really like us to have Jerseys!" farm manager

A Colombian farm manager dreams of owning his own cattle, preferably Jerseys!

In Colombia there appeared to be a consistent problem with getting staff to follow agreed protocols during the absence of the owner. Placing an effective manager to oversee staff activity whilst the owner was absent was key.

Figure 9. Degree of control the farmer/ manager feels he/she has over the decisions made



One farmer felt he had too much control, in a partnership with his brother he felt that he was always having to make the decisions, to be in control and the burden wasn't being shared equally:

"100% control between me and brother, but with decision making I am trying to change it and get brother to take more responsibility. I believe we should get rewarded for the effort we put in. Our difference in personalities should complement each other [in the way the business is run]" pedigree beef & sheep farmer

In countries such as Australia, New Zealand and certain parts of Colombia the climatic conditions – the impact of water shortages and drought on predominantly pasture-based feeding systems for beef were all mentioned as having an impact on decisions with regard to numbers of animals being reared. Lack of control caused by the impact of disease such as bovine tuberculosis and difficulties with pest control, such as wallabies in Tasmania, were additional concerns.

6.6. Summary

Beef farmers were more likely to consult peers or rely on their own knowledge / experience than use veterinary or other specialists when considering changes to the beef business. The use of veterinary services in an irregular manner was a common theme. Many farmers struggled to perceive investment in veterinary services as ultimately having a positive impact on economics and profitability.

Whilst there were examples of veterinary skills and support being effectively used on a regular basis with positive outcomes, there continues to be a disconnect between what the vets can offer in terms of skills and knowledge that go beyond treating animals, carrying out pregnancy diagnoses and selling vaccines.
One farmer only realised the value of veterinary input to his business after his daughter attended veterinary school:

"Before my daughter graduated, vets were only involved in pregnancy testing and calving issues, lab stuff. Since my daughter has been a cattle vet for 5 years, I ring daughter up every few days. Very forward thinking. Did animal health plan we use for internal and external audits. Programme been going for a while and well established in routine." beef farmer

Early on in my study in a discussion with a group farm vets I brought up an observation that I had, in the past, seen an association between poor standards of farming and the use of specific veterinary practices. Was this evidence that we, as vets (or some of us anyway) were failing our farmers? However, they suggested an alternate reason – that the poor farmers and vets choose each other:

"If we are refusing to give a bottle of long acting penicillin without investigating the problems first or without knowing what the medicines are for, the farmer quickly leaves our practice and moves on to find a vet that will give him the medicines he wants" group of cattle vets

Those making active use of vets and other experts recognised their own limitations:

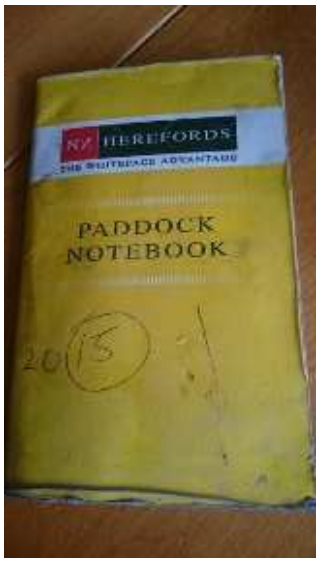
"Always employ someone better than yourself as it's the only way to get smarter. Ensure you have as many knowledgeable people in your immediate circle" beef & sheep farmer
"Surround yourself by good people, ask the experts and always consider advice given" beef farmer

The importance of the relationship between the vet and farmer has been described by Richens et al (2015) when interviewing British dairy farmers about the role of their vet in providing advice on vaccination. Considering farmers rarely changed vets in this study, but one reason described was the impersonality of a large practice and another changed to follow the vet, it would tend to support the concept of farmers preferring personalised services from "my vet", if of course they decide to use one.

Chapter 7. Record keeping – does it really matter?

7.1. How much value farmers place on record-keeping

Farmers were asked a series of questions about record-keeping, including how much they valued the use of records in decision-making and how they felt it impacted on economics / profits within the business. Figure 10. summarises the groups in a positive use of records, an ambivalent viewpoint and those that made no use of records in decisions on animals, either at an individual or herd level.



It's not necessarily how you keep your records but what you do with them that counts

The majority, nearly three-quarters, saw a positive value in keeping herd records to aid in decision-making with respect to the animals, at either an individual or herd level. However, the degree to which records were kept and how they were used was extremely variable:

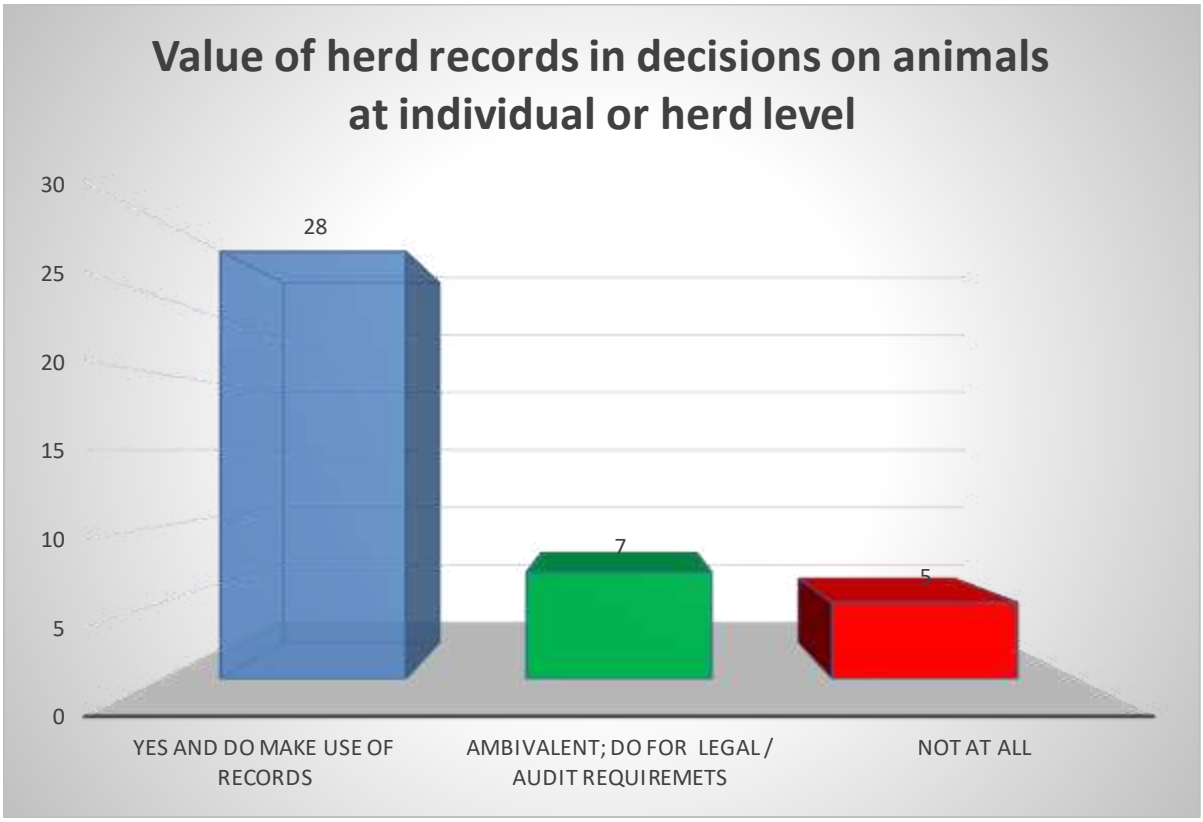
"Essential. If you don't keep records you don't know what you are doing, always kept records before there was a requirement" beef & arable farmer

"Hugely important without any doubt. Without the data you can get the feel of, an indication, but without factual data to back up what you are thinking, you are only guessing" beef & sheep farmer

"We do keep records, especially weight because we grow for beef, so constantly weighing every month and of course this helps keep track of profits and what they earn. Also, keeping records of those that don't gain 700g/day, those are sold" Sylvopastoral farmer

"Vital! Completely, absolutely vital. It's a mess if you don't" pedigree beef & stud farmer

Figure 10. How farmers value records in decision making at the herd or individual level



Those with an ambivalent view of record keeping, for decisions on animals, usually only kept records to meet legal or audit requirements:

"Ambivalent – in some respects valuable but no two seasons are same. Trends are valuable. Depends on what records." beef (inc pedigree) & sheep

Some saw no value in keeping records at all with respect to decision-making on their animals whilst others felt everything they needed they could remember and not write it down:

"it's all in my head" dual beef & dairy farmer

Interestingly one saw the importance of keeping records, but he didn't keep them, with no clear explanation of why he didn't.

Some commercial beef / pedigree farmers commented that they only kept records for the purposes of meeting the record-keeping requirements of the pedigree society rules, if they had commercial beef too they didn't record as much. So even within the same herd the detail of record-keeping was variable. Others kept the records, recognised the value but hadn't found the time to make best use of them:

"Do keep records but it's a job keeping on top. I know it's helpful for me in making decisions. …the records are there but I haven't looked. I know the records are there." dual beef/dairy, sheep, silvo-pastoral farmer

Keeping records can help in decision-making but only if they are looked at and interpreted!

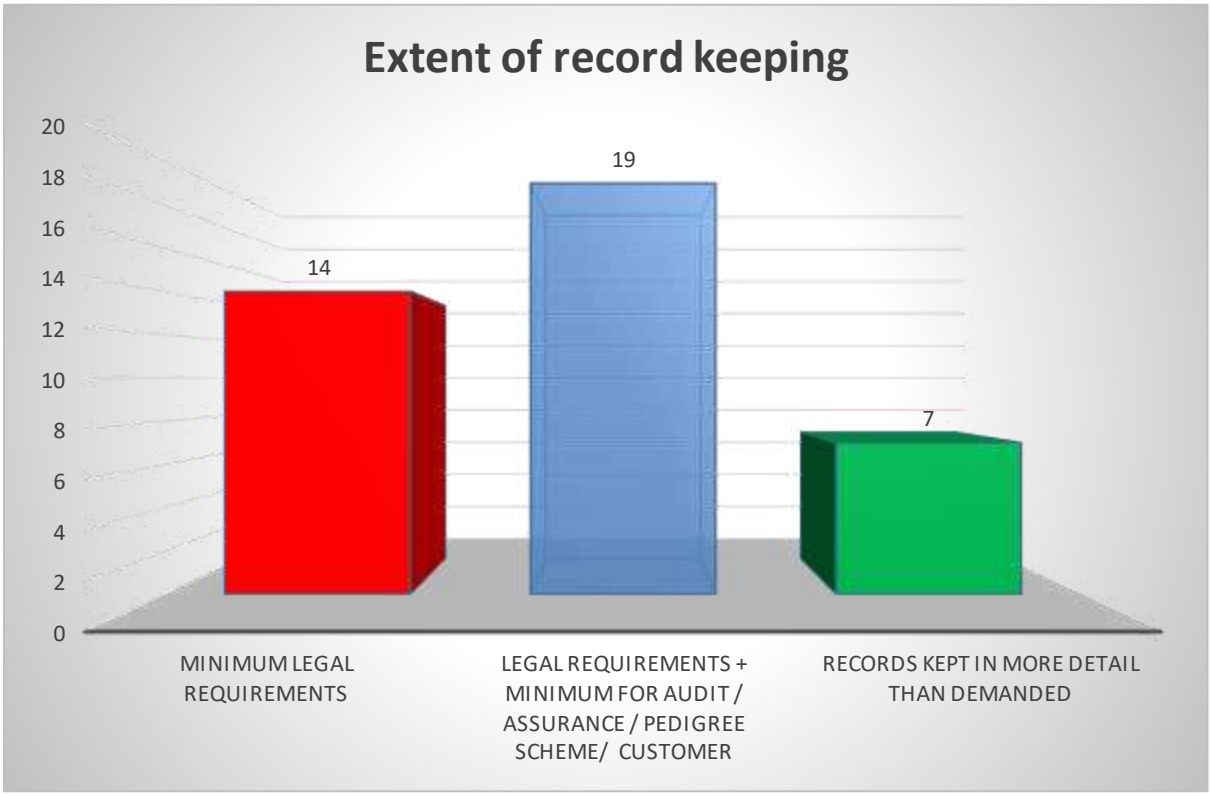
A young farmer shows us how he records all his data on his Mac but with studying full time at university during the week, four hours away at the capital Bogota, means it's hard for him to keep on top of the data and discuss it with his father to make best use of it

When farmers were asked how they felt the keeping of herd records contributed to the profitability of the beef business, 70% (28 out of 40) felt this was important. 25 of the same 28 who felt herd records were valuable for decisions on animals also stated a positive contribution to profitability. However, 30% (12 / 40) didn't see the records translating into profits. For one, a pedigree bull breeder, he found the whole experience frustrating after putting so much effort into recording data:

"If I was really honest I would say I don't believe my customers and clients appreciate the resource that goes into data collection and recording or the costs associated with it. Beef and dairy clients – top 20% understand and value the EBVs [Estimated Breeding Values] we produce for the bulls. But then you get the dairy farmers are classic - 'I want big bull but low birthweight' - others just say they want the biggest bull I've got, full stop. Other guys just want the cheapest bull." pedigree & commercial beef & sheep farmer

However, when we look more closely at what each farmer is recording, and why, we see that most farmers were only recording the minimum necessary, whether this was to meet minimum legal requirements or to meet the requirements of an assurance scheme / pedigree scheme or the customer (Figure 11.).

Figure 11. What the farmer actually records and why



These findings reflect and confirm earlier farmer responses, that they did what was necessary to comply with standards or requirements but they didn't necessarily agree with doing them or valued them in their business. However, some certainly saw the value in proving they were doing things correctly and those cheating the system needed to be accountable:

"It's for quality assurance, no Government legal requirements but with processing stock need QA with meat-works companies. They do sample meat for residues but then we are audited every year to check our records are up to date. No on the spot inspections. The agents that come out to procure stock are constantly looking but I say we should have more EID checks on residues – the more that people are living off the smell of an oily rag - that some enterprise not keeping up with proper records, then they probably would" beef and sheep farmer

In contrast those that were recording more than that stipulated by law or by the customer often pointed out they were doing this type of record keeping before minimum requirements were introduced by Governments or by customers / schemes.

The devil is in the detail. If the farmer / partners knew their sward height in every field they were also likely to be recording details about their animals from birth through to finishing

Interesting to note is that all but one farmer keeping more detailed records than the minimum required, also described an equal partnership with others in decision-making and having regular formal meetings with partners/family business. Further, those that admitted to keeping far more records were more likely to know about disease and other problems on their farm and would spontaneously offer this detail without me prompting them:

"Will record in diary. I have recorded mastitis four times in the time I have been here, basically if they get treated they are recorded. Lameness not issue but then I will cull anything that does not improve. I am careful with bulls re soundness. Less than 1% that ever get lame" beef farmer

If farmers said they were keeping records on lameness/soundness or mastitis for their beef animals, this seemed to be a good predictor that they would have detailed records on everything else in their business.

7.2. Key records kept by beef/ dual farmers

Farmers were asked whether they kept certain records. Where sufficient data was available to describe the basic statistics, an Anderson-Darling test was applied to the data to check for normality. (see Appendix 1 for a full description). Where appropriate, means or medians are described based on this test. Where data were not normally distributed medians with inter-quartile ranges are described rather than means.

7.2.1. Age at first calving (AFC)

The full statistics on age at first calving (AFC) can be found in Chapter 14- Appendix 2. The median (most frequent) age for first calving was 24 months of age (Figure 12.) with an inter-quartile range (IQR) of 24 to 30 months. There was no country variation, however there was an effect (non-significant trend p = 0.065) of breed type with *Bos taurus* mostly calving at two years old whilst farms with principally *Bos indicus* genetics tending to calve at 2.5 to 3 years (Figure 13.). This is a small data set but does tend to agree with wider written publications on this subject.

Figure 12. Age at first calving in months as reported by farmer

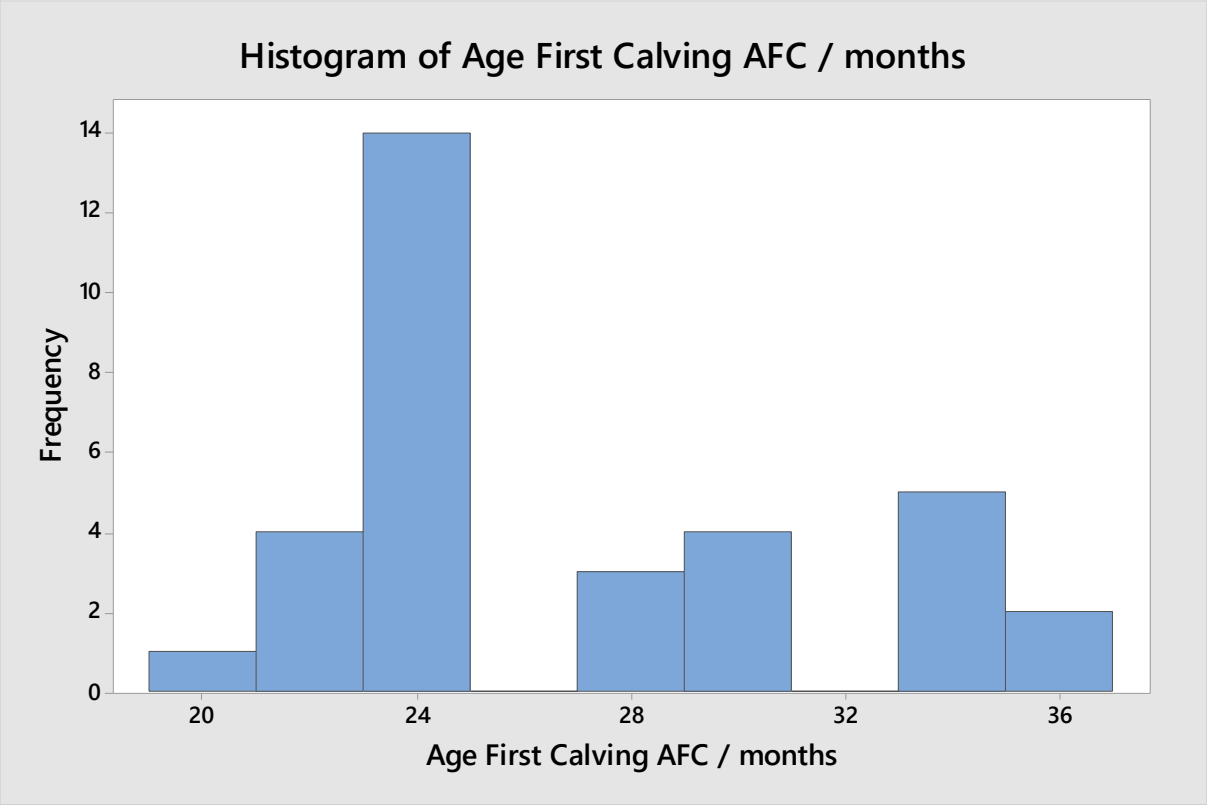
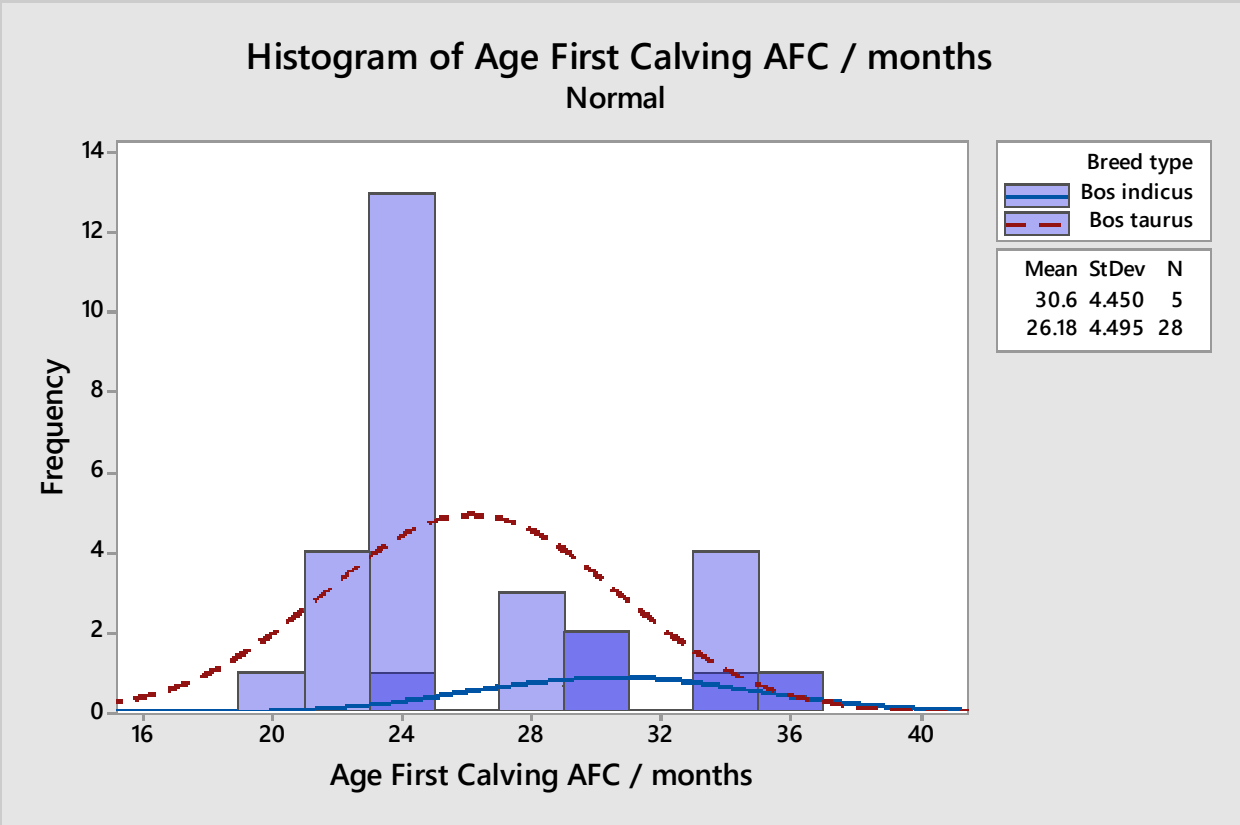


Figure 13. Comparing age at first calving for *Bos indicus* and *Bos taurus* genotypes



*note a normal distribution line has been presented graphically to highlight the two groups but the mean should not strictly be used for the *Bos taurus* distribution

High Bos indicus genetics tended to mature later, with AFC at 30m compared with 24m for Bos taurus

There was a tendency for those with mixed pedigree / commercial herds to breed the commercial animals at a younger age whilst pedigree animals were more likely to calve at 2.5 or 3 years of age resulting in an uneven distribution on calving age patterns. The youngest age for calving was reported as 18 months of age. Heifers were also more likely to be used at a young age as embryo transfer hosts.

Some farmers would not describe the age at calving, and provided no records for this, but focussed on weight at first service, irrespective of age. I would agree that this fits with the research on dairy

heifer growth, puberty and AFC, that the weight of the heifer as a proportion of her mature body weight at the time of first service seems more important than her age at the time of calving with respect to impacts on the heifer long term and her calf's health and welfare (Wathes et al 2014). For the *Bos indicus* type such as the Brahman target service weight was 400kg, higher than the European breeds and explained the difference in AFC.

However, data on impacts of age at first calving in beef cattle is limited. A 24 month AFC has been quoted for both the beef and dairy sectors as an optimum economically and productively for these sectors but there has been limited follow up in the beef sector on long term impacts. Early concerns in beef sectors in the mid-2000s were a concern of increased dystocia and long term impacts on mature body weight of the heifer with an early AFC (Hickson et al 2006). This has probably influenced the very narrow focus on ease of calving assessments in various beef breed sectors and, for example the Irish Government beef breeding programmes.

In the dairy sector, studies have shown that the heifer is grown well throughout rearing and achieves puberty six weeks prior to mating then there should not be adverse impacts (Wathes et al 2014) with respect to body frame size and dystocia as long as she is over 23 months old at AFC. Conversely it is suggested that AFC over 30 months could have a negative impact on long term survival of the heifer in the herd. The inter-quartile range for AFC in my study population of 24 months to 30 months indicated that 50% of the farms were certainly aiming for, if not achieving, this key age range for AFC.

Heifer replacement growth and disease incidents during rearing could have long term impacts

A critical point raised by Wathes and others however is that the heifer growth throughout its rearing period is key and that restrictions on growth and disease incidents can impact on the heifer's growth and ability to achieve puberty at 15-16 months old, as well as impact on fertility at the time of service and future milk production potential. The lack of data on the heifer replacement's calf rearing and growth history is addressed later in this chapter. Another area that lacks data, because of many farms approach to culling when not in calf, is an understanding of long term consequences on cow longevity i.e. how long she remains in the herd. Only one paper (Hickson et al 2012), based on data collected 10

years ago, indicated the most common reason for heifers leaving herd that had calved at 24 months, was failure to get in calf. However, the quoted 85% herd retention rate of early-calving heifers was considered acceptable and comparable to mixed age cows.

The issue of age at first calving and personal experience / preference was discussed by a number of farmers in influencing decision-making on AFC:

"I am calving them as two-year-olds because they have a calf younger, the calf will be smaller and if done successfully I feel gives them a good start and puts them in better light in the main herd. If you try calving a 3-year-old when fully grown it's either gonna be easy or…. It's not" pedigree bull, commercial beef & sheep farmer

One Hereford bull breeder felt he should be calving two-year-olds, which he does with some, but prefers to calve them at three

In contrast one farmer preferred calving at three years old, despite acknowledging the approach was less economical:

"Commercially I should be mating yearling heifers but a lot of work that needs to go into getting heifers back in calf in spring; recently springs are not consistent enough. Risk huge and by not putting in calf as yearlings I can treat them as grazing stock. I mated 25 this year based on weight (yearlings). But usually I like to mate as two-year-old and calve at three. Economically some wastage but under my system - definitely easier calving for 3 year olds… [discusses plans for sheep] ……As a commercial operation and breeder the best gold standard is I should be putting yearlings into calf" pedigree bull breeder, commercial beef & sheep farmer

Another farmer calved two year olds, but if they did not get in calf or the heifer lost a calf, he would grow them on and give them a second chance:

"Coming from a dairy background / how I was brought up, I wouldn't automatically cull. Look at the feet and start with that, then work your way up. [Problems with calving can be] more to do with sire than the dam. ….. I will re-mate them and give them another opportunity, you put time into breeding them and so should give them another opportunity." commercial beef farmer

What is clear however that these heifers must be fed for growth throughout pregnancy, including the third trimester. This is a mistake farmers described when they first started shifting AFC down; they failed to account for this need for "teenager" growth:

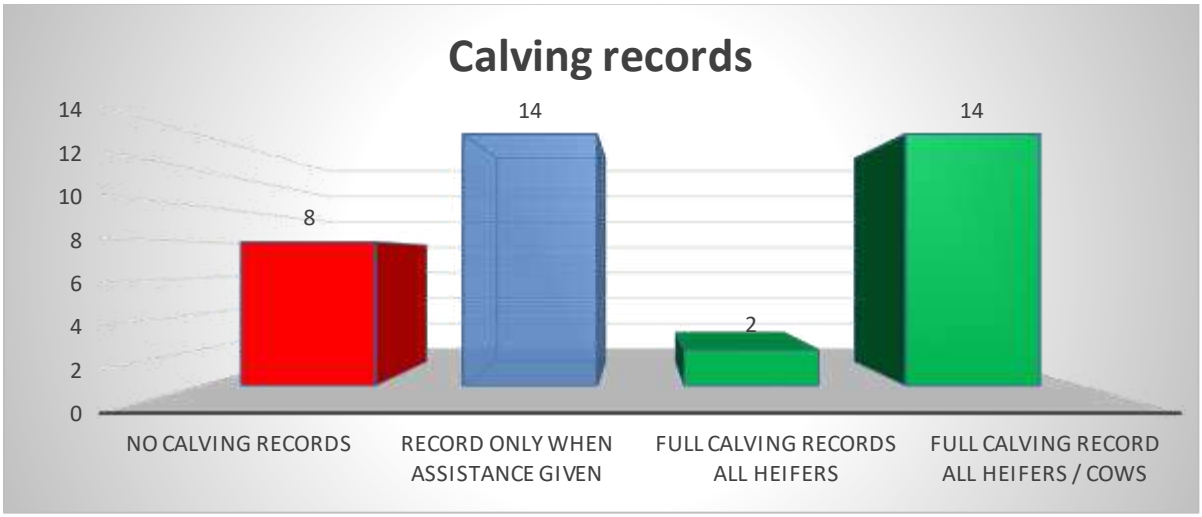
"We used to feed hard until 3rd trimester then pull back feed, were doing this for two or three years heifers lost condition, foetus growth down…..not enough energy at calving, we pulled 15% and most (two thirds) of those had calves small in birthweight and no shape …. subsequently hard to get back in calf. So now we have still grown hard to end second trimester, then third trimester still gaining one third kilo live weight gain [per day] so take to 540kg average live weight target. We are now down to a 4% assist rate and we probably assist more than we really should" beef farmer

One farmer runs both the heifer and three-year old groups separately, as some get back into calf so quickly, they will still be growing through most of their second pregnancy too.

7.2.2. Records kept at calving time

As described in the previous section record keeping at calving (Figure 14) was heavily influenced by minimum legal requirements and/or assurance scheme requirements from the customer base. Whether this was a pedigree requirement, slaughter house / assurance scheme requirement or part of a subsidy payment scheme requirement, the need to keep records on the ease of calving or the reporting of calving difficulties was one of the most common parameters required. However, in all instances the minimum requirement was to associate the record with the dam, not the calf affected. Only one farmer consistently recorded any problems associated with calving against the calf record. Most farmers when asked about this stated they would probably remember which calves they were. Lack of data on the calf record, including those destined as heifer replacements in both pedigree and commercial herds was to become a consistent finding throughout my project.

Figure 14. Calving records kept by farmers



A number of schemes require "calving ease" to be recorded against all beef cows.

In Ireland, under the terms of Council Regulation (EC) No. 1305/2013, the Beef Data and Genomics Programme (BDGP) runs what is essentially a suckler cow subsidy scheme, whereby all farmers claiming such subsidy are required to comply with certain requirements. This is defined by national legislation and includes the requirement for all beef calves to be tested for Bovine Viral Diarrhoea (BVD) virus and for calving ease to be recorded for each beef cow birth as well as other key events such as disease, reasons for culling and mortality. There are two aims of the BDGP. First, to reduce greenhouse gas (GHG) emissions in the beef industry by improving efficiency and quality of the Irish national beef herd. Secondly to improve the genetic merit of the Irish national beef herd through the collection of data on different genotypes within the beef herd which should ultimately support genomic selection within the national beef herd. Since the data programme was linked to the agri-environment scheme subsidies the uptake of farmers into the national programme has increased markedly. Whilst improved animal welfare is not a defined aim of the BDGP, the focus on calving ease and improving survival of the calf to optimise efficiency and reduce GHG emissions clearly has a positive impact on cow and calf health and welfare.

Calving ease has become a key factor in improving productivity and reducing labour input / costs around the time of calving in the beef sector

Nearly all pedigree beef EBVs now include calving ease as part of the evaluation. A focus on small birth weight calves from dams which calve easily has been a key parameter across most pedigree breeding programmes supplying bulls for the commercial beef cow sector.

The Global Animal Partnership (GAP) defines a 5-step animal welfare rating programme and, for example is required for certain assured beef exports from Australia to the USA, such as Cape Grim

Beef, Tasmania. Breeding programmes must incorporate positive welfare parameters which include calving ease:

"Breeding programs, whether on-ranch/farm or through introduced breeding stock, must be designed to promote the welfare of the animals in the production system rather than to select solely for production or economic outcomes. Breeding choices based solely on production outcomes that predispose the animals for reduced welfare in a system are prohibited. Welfare-enhancing traits that must be sought in breeding programs are: Breeds chosen to ensure heifers and cows can calve without assistance. Selective breeding program aimed toward polled animals if disbudding is practiced." GAP minimum standard requirements, USA

Calving ease descriptors are generally very similar: 1 = no assistance; 2 = assisted/easy pull; 3= hard pull 4= vet assistance / caesarean 5 = mal-presentation of calf

Most farmers would cull any cows that had received assistance, including heifers, from the herd once the calf was weaned or straight away if the calf had died:

"For the GAP programme – all mature cows would go if received assistance, unless doing it in a rush [easy assist due to being late at night for example]. Easy / hard – decision on whether leave herd or not. The electronic tags – history comes on screen and can make decision - pregnancy testing [results] will come up too" beef farmer

However, one farmer observed:

"If I have to pull a calf, I look at the reason why. I tend to forgive a heifer or an easy assist. But if obstructed labour – that's it – put through yards without registration. These cows must be low maintenance and do it [calve] on their own" pedigree beef producer and paddock to plate direct sales supplier

"easy calving" is regarded as an essential trait where beef cows have limited supervision during calving

The approach to leniency on decisions around culling heifers very much depended on how much the cows were expected to look after themselves as mixed age cows at future calvings:

"With the mixed age cows dystocia – a major calving problem- will take care of itself [Qu: the cow and calf die?] … Yes. Obviously, if we see a problem we are on it straight away but sometimes we are not there to assist as we only check the mixed age cows maybe once or twice per week. But we have few problems out there because as the heifers are calved behind wire [and therefore supervised], any problems [dystocia in heifers] are culled. Maybe three [cows with calving difficulty] in a year in the mixed age group – and I would always cull these after……for the AI heifers – I keep notes on calving. I have a crush [I can transport] …on front of Ute and pull it [calf] out. Most ones, of those I pull maybe lose two or three per year. For the heifer …. She's off [culled] unless it's not her fault. If breech – depends so will give second chance. Some instances just a really big calf. If I see a trend with one bull giving out really big calves this is an issue too, unless it's her [the heifer's] pelvis is too small. It's not one answer fits all. BUT I try and take out all the cows that won't calve properly …" pedigree, commercial beef and sheep farmer

Where cattle are used to optimise sheep productivity the cows are expected to look after themselves

When investigated further this appeared to be a common theme in pasture based hill grazing systems for combined beef and sheep enterprises. The beef cattle are used predominantly to graze and optimise pasture usage by the sheep and, unless beef prices are good, are more important as lawn mowers for the sheep than the beef value of a weaner calf or yearling. This was probably one of the hardest concepts for me to get my head around, especially as some of these same farmers professed a personal preference for their cattle over their sheep, even when they generated less income.

In the UK and Europe welfare legislation(98/58/EC) requires that:

"Member States shall make provision to ensure that the owners or keepers take all reasonable steps to ensure the welfare of animals under their care and to ensure that those animals are not caused any unnecessary pain, suffering or injury……All animals kept in husbandry systems in which their welfare depends on frequent human attention shall be inspected at least once a day. Animals in other systems

shall be inspected at intervals sufficient to avoid any suffering." COUNCIL DIRECTIVE 98/58/EC of 20 July 1998 concerning the protection of animals kept for farming purposes

Further Council of Europe recommendations which have been in place in Europe since 1988 state:

"All animals shall be thoroughly inspected at least once a day.....
The responsible stockman should be experienced and competent in the techniques of calving and should pay particular attention to hygiene especially at assisted calvings ....
Veterinary advice should be sought at an early stage of calving if difficulties are suspected .....
When breeding, especially from maiden heifers, sires and dams should be carefully selected, taking into account breed, size, age and previous record, so as to reduce calving difficulties." Council of Europe, 1988

It is difficult to consider infrequent inspections of cows during an expected period of calving being acceptable, irrespective of any EBV attached to calving ease or culling decisions made around more closely supervised heifers within the herd. In contrast, others, made an extra effort at calving time:

"We calve close by in two yards and check three times per day as we need to be getting them drafted out to stop mis-mothering" beef farmer

This decision, to supervise or not, was not necessarily associated with the size or accessibility of the farm. One farmer with a huge hectarage to cover, was so concerned about his cows during calving and bad weather, he had invested in a drone to inspect cattle even in the most difficult to access locations:

"6 week [calving spread] – from late July we use the drone– will be used mostly in the winter… [even] on wet rainy days you can take drone up, have had in 50-60km/h winds, and then take video and photos…. We will put drone up and have a look – for cattle." pedigree, commercial beef & sheep producer

A drone can be an effective tool for monitoring cattle during calving when resources are stretched and when calving locations are not ideal for regular monitoring

7.2.3. Calving intervals & fertility

A herd calving index was generally considered not useful by most beef farmers. There were two reasons for this. Firstly, most had a strict approach to culling if cattle did not become pregnant within the stipulated time period with bull and/or defined cycles of artificial insemination (AI). Therefore, only females achieving a 12-14 months calving interval would ever be retained by most beef farmers:

"we don't really measure this because if they're not pregnant they go to the paddock to finish after the calf is weaned, then sent on truck direct to the abattoir" pedigree beef farmer

Secondly donor cows used for embryo transfer could easily be producing (at least from a genetic perspective) many calves in one year, which also makes the calving index meaningless:

"A calving index is not really applicable as one cow might be having 25 calves in two or three years" pedigree bull breeder & commercial beef

For those farmers operating a dual beef/dairy business and in those businesses where a year-round calving pattern was operated, particularly in tropical areas with no seasonal pattern, the calving index was more relevant.

There was a mixed approach to the use of bulls and artificial insemination, with over half only or mostly using bulls with the other half mostly having a mixed approach of using AI and bulls (Figure 15.). Some had good reason for only / mostly using bulls:

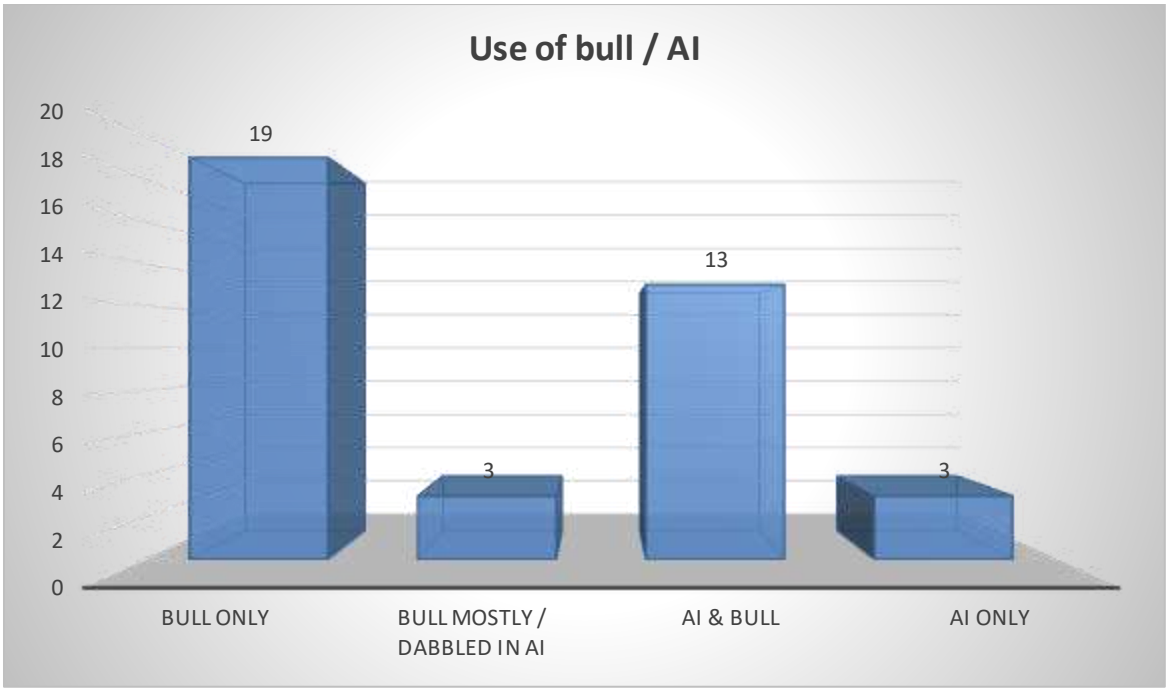
"The cattle are in distant hill country. Accessibility - we would have problems getting cows in so the bulls are most practical. Not done a lot of AI recent years" pedigree & commercial beef & sheep farmer

The same farmer also reared horses on these hills to acclimatise them to working in extreme hill country. Accessibility could only be achieved to some sections on horse-back, over two days to ride there and bring cattle and sheep home.

The attitude to artificial insemination was interesting, the approach for established farmers that would have used the bull only was to "try out" AI, usually on a small group of heifers. Some farmers using only the bull described having had "bad experiences" with AI in the past. It seems that once a farmer has had a negative experience, it is very difficult to persuade them that AI is a positive addition to the beef farmer's production cycle. That initial experience of the farmer with AI, positive or negative, then dictated their choices thereafter.

Some farmers used AI on everything; usually a fixed one or two cycles of AI, followed by the bull on both heifers and mixed age cows. Others used only AI on the heifers and the bull on mixed age cows. Pedigree breeders with both a pedigree and commercial beef herd were also more likely to split the use of AI, with AI and ET used in the pedigree herd, whilst using bulls in the commercial herd.

Figure 15. Use of the Bull and AI in the beef sector



Seven of those interviewed had used embryo transfer and five of these were using embryo transfer (ET) as a routine. These five were all pedigree bull producers. In Colombia a programme to improve genetic merit through subsidised AI and ET had been running for some years, this had resulted in both positive and negative experiences. One problem with this programme had been a focus on introducing *Bos taurus* genetics, such as the Holstein, which are not suited to drought survival, into drought-ridden areas of Colombia. In contrast in other areas of Colombia the programme had been successful in producing carefully produced crosses such as Simmental and Brahman.

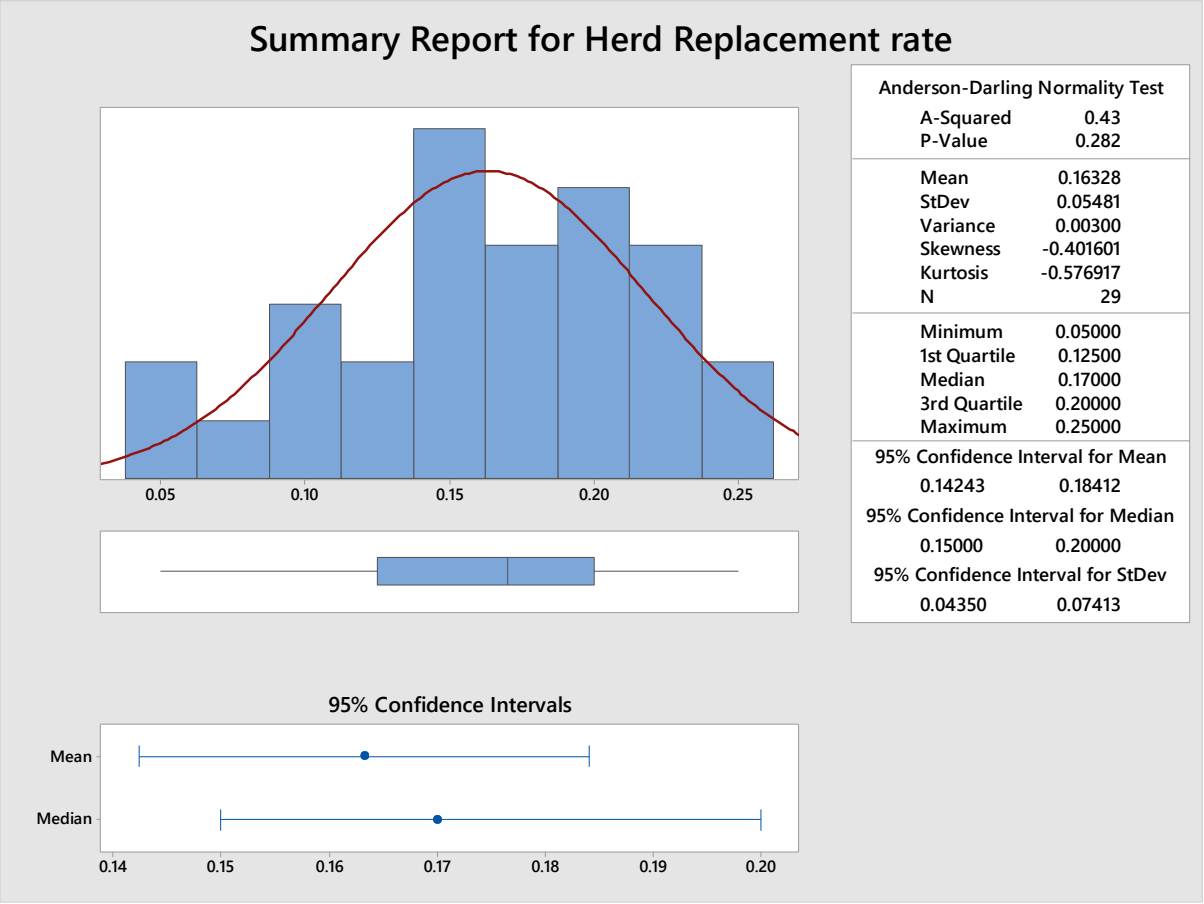
Embryo transfer is being used regularly in the pedigree bull sector in all countries

7.2.4. Herd replacement rate

A number of businesses were building up their herd size at the time of the interview and had not replaced any cattle in the previous few years. For those able to provide a figure there was a wide range in replacement rates from 5% to 25%, the mean at just over 16% (Figure 16.).

In some countries using principally pasture-based seasonal grazing and reliant on prevailing climatic conditions to determine feed availability, businesses operated herd replacements according to projected grass availability. Therefore decisions on whether home-grown heifers joined the beef herd or were sold / fattened for slaughter could be influenced by feed availability rather than the potential good genetics of a breeding female. Whilst positive beef prices had pushed some businesses to reduce sheep numbers and increase cattle stocks, many recognised the fluid nature of both the climate and beef prices such that more were considering buying in cattle for finishing rather than commit themselves to building up the beef herd. This of course inherently carries biosecurity risks by increasing the likelihood of importing disease into the herd, but did give more flexibility to the business in responding to the climate and market demands.

Figure 16. Herd replacement rate



Reproductive failure is higher in 2-4 year olds than 5-7 year olds. Increasing cow longevity and keeping herd replacements down contributes to improved reproductive efficiency within the herd (Roberts et al 2015). Roberts et al calculated that reducing replacement rate from 18% to 14% resulted in a 23% increase in weaned calf body weight and a 2% increase in cull cow body weight per pregnant

replacement heifer going into the herd. The issue of productive success in rearing a live weaned calf will be addressed further in the next two chapters.

7.2.5. Temperament records

Some farmers expressed concern about interventions with beef cows / heifers due to temperament. One farmer suggested intervention at birth such as during calving, colostrum supplementation and even tagging calves before weaning was not an option, for health and safety reasons.

However, four farmers were very clear that cow temperament was a priority and kept records relating to temperament, including for heifer replacements, prior to decisions as to which would remain in the herd and which would be culled:

"Obviously flow on effect, comes at cost with time and effort but because we EID everything, its much faster everything is seamless. For example, simple thing on temperament, we have attitude weighting on unit – gets a few chances on attitude levels, all gets recorded via EID" pedigree, commercial beef sheep farmer

"Females we have a database and my wife writes everything down – if cow done anything in life, if had twins or has been seen lame, if attitude is mad. We are making decisions at the end of year so attitude & temperament, everything is recorded. This is very good for the herd…. decision on whether leave herd or not. The electronic tags – history comes on screen and can make that decision" beef farmer

"Temperament. – no whips no dogs no horses - so need to be good temperament. We discourage family from coming with trail bikes" beef farmer

"We select on temperament, plus handle [the cattle] a lot" beef & sheep farmer

There is limited published work on cow temperament. Turner et al (2013) showed that temperament and defensiveness were unrelated to calving ease or the amount of maternal behaviour shown towards the calf. Cow pre-calving temperament and post-calving defensiveness were shown to be repeatable across parities for specific cows but were not related to one another. This suggests that by reducing both of these traits (which are undesirable for farmer health and safety) will not adversely impact on maternal care traits. Turner et al (2013) also reported that fearful cows could produce calves with low birth weight and growth but that this needed investigating further.

Cooke (2014) found that females with an "excitable" compared with "acceptable" temperament had reduced pregnancy rates in both *Bos indicus* and *Bos taurus* cows. Excitable *Bos taurus* had a significantly reduced calving rate, weaning rate and kilogrammes of calf weaned per cow bred when compared to cows with an acceptable temperament. *Bos indicus* excitable steers had reduced feed conversion with extended time to finishing. *Bos taurus* excitable cattle had a significantly reduced weight at weaning and reduced carcass weights. Clearly temperament has far wider economic implications across both main breeds of beef cattle than just farmer health and safety during handling and interventions at calving. The more data that farmers can collect relating to this, the more easily we can understand the relationships between temperament and various productivity parameters.

Cooke's study also showed that acclimatisation of *Bos taurus* or *Bos indicus* cross heifers to human handling led to significant improvement in temperament as well as advancing onset of puberty. This could not be achieved in adult cows or finishing cattle, therefore handling management to improve temperament must occur during the rearing phase for heifer replacements.

The only area where the loss of fearfulness / defensiveness activity could be perceived as a negative are where there are significant predator risks to the calf. However, it should be noted that I could find no published research on understanding how cow defensiveness against predators relates to cow temperament as defined by the relationship /interactions between humans and cattle during routine management procedures.

In Colombia there are tensions between predator preservation and calf protection in areas where predators such as the jaguar were seen a principal cause of cria (calf) mortality. Two approaches to reduce farmers killing endangered wild predators were described:

- Increasing defensiveness traits in beef cows. Certain cattle – criollo (or San Martinero) cattle are the descendants of genetics brought from bull-fighting regions of Spain and Portugal several hundred years ago to South America. It is conjectured that those fittest to survive and protect their young from predator attacks has encouraged over the centuries high levels of defensiveness traits in the dam. In contrast the Brahman type *Bos indicus* cow, introduced to South America more recently, will flee when predators approach, abandoning their calf in the process.

- Eco-tourism. Predators such as jaguars are territorial and therefore each farm will have a specific jaguar(s) attached to a farm. Camera traps are used to monitor jaguar activity and the farmer is introduced to the farm's "jaguar" and asked to name the farm jaguar. The farmer is taught the concept of responsibility for wildlife protection but also given support with methods to increase calf protection without shooting jaguars. Ecotourism income to the farm to see jaguar activity on the farm's camera traps is balanced against an accepted consequential loss of the occasional calf. The farmer still complains about his jaguar killing one of his calves but with no sense of wanting to kill the predator:

"Mick Jagger [the farmer's pet name for his farm's jaguar] killed another cria today, what else can you suggest to help protect the calves? See the farmer he still complains because this is what farmers do, but he's not wanting to kill Mick Jagger any more, he's looking for other solutions" Andres Felipe Garcia, Fundacion Bioethos recounts one of his farmer phone calls to the Foundation

These approaches, when coupled with other practices such as the use of electric fencing and gathering cattle at night, will not only reduce cria mortality but also help protect endangered predator species.

Clearly the value of having a database that can link random events such as cattle kicking in the crush, rather than rely on "what's in my head" as to whether that was the same cow that did it last time, can be very valuable in reaching a cumulative decision as to whether a heifer or cow stays in the herd or is culled. However, the ease of keeping these records and all staff / family members buying into the concept of recording as much as possible is key. The outputs are only as good as the effort made into the accuracy of the inputs.

7.3. Summary

Most farmers saw the value of keeping records to some extent but there was a huge variation in the detail with which this was achieved. This was not influenced by herd size, breed type, animal value or country except where there were minimum legal requirements or assurance / breed scheme and/or minimum retailer requirements that determined records to be kept.

Those farmers doing what had to be done to meet minimum requirements were not necessarily valuing or using the records they were creating. Others acknowledged they could have value but just didn't have the time to analyse them. In contrast farmers who kept very detailed records had been doing so for a long time and would point out they had been doing this ahead of any minimum requirements introduced in recent years.

For those farmers producing pedigree animals, specifically bulls, there would be significantly more records kept because of breed specific recording needs, such as calving ease, however the same records were not always kept by the same farmer for his non-pedigree herd.

There was a very individual attitude and approach to record-keeping and how it was valued in the beef business. Without the introduction of minimum standards (either through laws or schemes) some farmers would have no records at all and be quite content with that.

There was clearly an association between minimum input herds and minimum herd records together with an argument that putting more resource into monitoring and recording and acting on information would not save money.

One-off negative personal experiences, as described across all countries by farmers that had used or tried artificial insemination and/or embryo transfer techniques in their herd, had a huge influence on future use of such techniques.

There is still more to be learnt about how the age at first calving, cow temperament and herd replacement policies contribute to longevity of the beef cow and calf survival. Some of the national led schemes may help contribute to this evidence base but only if this is publicly available.

Whilst scheme based bench -marking may give an individual farmer a measure of his own herd against other scheme members (average, top third, top 10% for example) but it would be worthwhile having this published in peer-reviewed journals on a regular basis as this data becomes mainstream for national herds and having a more in depth independent evaluation of those herds in the top 10% and bottom 10% to understand what they are doing right or wrong, that sets them apart from the rest.

Chapter 8. Calf management practices & record keeping

The level of record keeping associated with calves was extremely varied. At the minimum end of the spectrum of record keeping, there would be a record of number of calves weaned from a group of cows that had been pregnancy diagnosed as in calf 14-16 months earlier, usually about a month after removal of the bull / artificial insemination. For farms running extensive minimum input beef herds with no legal requirements associated with notification of births and deaths on farm, there would be little knowledge of and certainly no data on abortions, stillbirths or early deaths. Even for those countries where legal requirements were in place, it was acknowledged by farmers, vets and industry representatives that data was missing on abortions, stillbirths and early mortalities. The only country which required the compulsory tagging and therefore recording / registering of dead calves, prior to their collection by a Government-contracted company, was the Isle of Man. The available data on these calves is looked at in more detail in the next chapter.

8.1. Calf weights

Two-thirds (25/37) of beef farmers indicated that weights of calves were measured at some point during rearing (Figure 17). Some of those that never weighed the calves stated they could estimate weights themselves, some suggesting weighing calves was not really necessary:

"Not really. I do by eye, I do some spot checking in the growing & finish phase" beef, sheep & arable farmer

"At calving I estimate – big will be 50 kgs medium 45 ks and small will be 40 kg or less" beef & sheep farmer

Figure 17. First weigh point for calves

"No, I watch them, if they look like they are not growing then I take action" beef/dairy dual & silvo-pastoral farmer

Others recognised that maybe weighing would be a good idea:

"No… I don't have scales… but it's my next purchase!" beef, meat chicken & fruit farmer

Of the 25 that indicated they did weigh the calves, only 10 weighed calves at birth, the rest weighed the calves for the first time close to weaning or at / after weaning or as yearlings at the point of sale.

This "Simbrah" calf – Simmental / Brahman is weighed from birth and every 20 days after that

Out of all farmers interviewed only two farmers were regularly weighing the calves from birth, every three or four weeks, both of these were farming in Colombia:

"At birth, and then every 20 days. After five weights we know how the calf is going to be and if it's likely to join the show / pedigree animals." dual pedigree & commercial beef/dairy

"Every month, when the vet comes" dual dairy/beef farmer

It's no surprise that there was limited monitoring of beef calf growth during the rearing period. Monitoring of calf growth by regular weighing in the dairy sector, where calves are removed close to or at birth, is not common either but has been highlighted by the Farm Animal Welfare Committee (FAWC) (2015) as key to monitoring growth and therefore health and welfare of the calf:

"Measurement of calf weights during the early rearing period to weaning is the key to ensuring appropriate growth and for monitoring the health of the young calf. This can be performed using a conventional scales (preferably) or by the use of girth measurement tapes. Feeding should be adjusted if performance and growth rates are not on target." FAWC, 2015

The beef cow or heifer is expected to provide for all her calves' needs. However, a number of factors can contribute to poor growth in beef calves:

- poor milk provision by the dam which can be influenced by her body condition score and ongoing low levels of nutrition in addition to any underlying genetics affecting milk production and impacts of disease or illness;
- for dual purpose animals, the calf may not have full access to the dam or feeding is restricted by devices to prevent access to the dam's teats – therefore the calf does not have ad libitum access to the dam resulting in restricted feeds; this will impact negatively on normal calf growth;
- multi-suckling – some farmers operated multi-suckling. For some this was to preserve udder integrity in show / pedigree dams and to reduce calving to conception / flushing (for donor cows for embryo transfer). After colostrum and transitional feeding the calf would be taken away and fostered to another dam with her own calf OR reared artificially with similar aged calves with mixed milk sources from the main herd. For others, and of greater disease risk, was the purchase of cross bred dairy calves used to multi-suckle with the dam's own calf. In all cases, some or all calves being multi-suckled / artificial rearing could be at risk of sub-optimal feeding and therefore impact on normal growth rates expected;
- illness, disease or painful interventions (such as castration) - The illness itself, for example an enteric disease such as that caused by *Cryptosporidia*, *Escherichia coli* or *Rotavirus* can directly reduce the ability of the gut to operate efficiently to digest and absorb milk constituents which are usually highly digestible. Separately, if the calf feels unwell it may feed less frequently in shorter bouts, milk intake by the calf will be reduced and therefore growth again can be negatively impacted;
- early weaning of the calf. Quoted weaning ages for beef calves globally ranged from 3 months to 12 months. There were no country differences but *Bos indicus* type calves were likely to be weaned later and were also more likely to have restricted access to the dams' milk from an early age. In Australasian countries the age at weaning was influenced significantly by climatic impacts on grass availability for the dam, rather than the calf's individual needs for milk feeding and growth.

This is certainly an area that could be focussed on for productive efficiency, health & welfare and economics. Whilst many farmers mentioned the final carcass weight and cents/pence/pesos per kilogramme achieved for measuring how well the calves ultimately grew and how much money they made, this is clearly a retrospective view with little opportunity to moderate / make changes whilst the calves are being reared. With the absence of absolute calf numbers and growth during the dam-rearing phase (including beef cow / heifer condition and growth where appropriate) it is difficult to understand how farmers can address productive efficiency (for example balancing weaning age against cow condition, herd replacement and calving interval) on a herd basis with so much data missing. Hopefully outputs from programmes such as Ireland's BDGP may help to address this.

8.2. Calf treatments / interventions through the early rearing phase

The potential impact of disease / illness on beef calf feeding, health, growth and long term productivity has already been highlighted. This section describes how much the beef farmer tended to directly intervene with the calf for both treatments of identified disease / illness and in preventative group /

herd treatments (such as anthelmintics) and how much of this was recorded against the calf's records with regard to decisions on heifer replacements. Similar to the section on supervision and records at calving this was reflected in both calf management and records on the whole. Those not supervising calving were not likely to observe problems in calves and intervene to treat them.

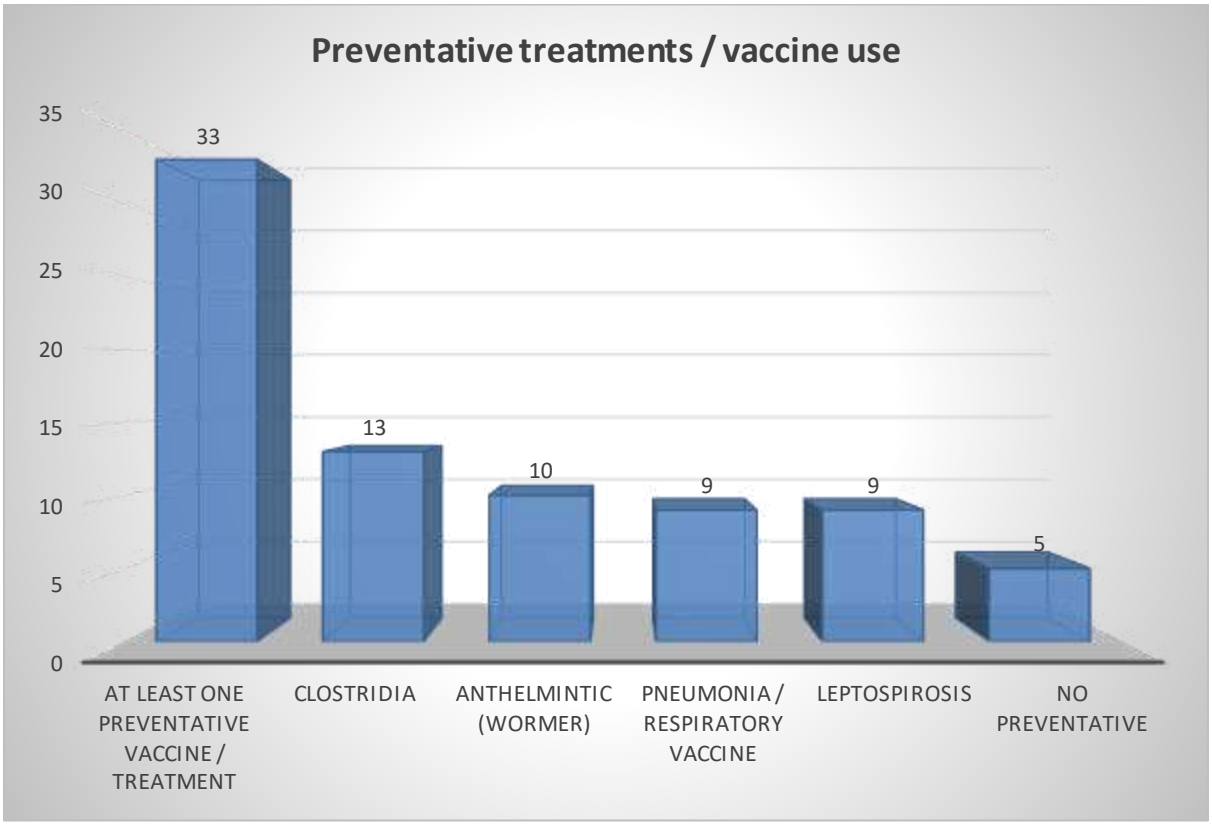
More than half of all farmers discussed intervening if calves became sick and one-third specifically described a managed approach to treating diarrhoea (scours), including electrolytes, intravenous fluids and where appropriate antibiotics:

"Scours are a big problem so record on calf. Usually October time and can have a few losses… for scours- oxytet LA [long acting oxytetracycline antibiotic] and very rarely antibiotics, keep [the calf] feeding on the cow [during treatment]" beef farmer

"Isolate cow and calf and monitor.Iif dehydrates use electrolyes and maybe get a shit sample to the vet. If not dehydrated monitor next 24 hours. Used to have scourban [this is a product containing antibiotics], right so I guess I would use [antibiotics] depending on severity of the case. If severe would consult [vet] … by phone" pedigree, commercial beef and sheep farmer

It was clear that for many, scour treatments could be used containing antibiotics, but the farmers were not always aware that the product contained antibiotics (see examples above). There was confusion over the place of probiotics such as "Provita protect" – this is a probiotic with proven efficacy against disease and therefore officially listed as a medicine for recording purposes (POM-VPS), therefore its use must be recorded where national/ European legislation or assurance protocols require this.

Figure 18. Preventative treatment / vaccine use in beef calves



Some farmers opted for very specific remedies when calves fell sick:

"I give them [sea] kelp first always. We did garlic cider vinegar for lots of years, and mixed this with vegetable oil" beef farmer

Autopsy (post mortem) and veterinary advice were more likely to be sought in relation to respiratory conditions, including pneumonia, than for diarrhoea. However, for all but a handful of farmers this would never be recorded against the calf record unless there was an obligation to do so i.e. a medical treatment was given and this was required for legal or audit / assurance purposes. One farmer showed us all the records against his calves but admitted he did nothing with it.

Pneumonia and diarrhoea are calf killers whatever part of the world the calf is reared but if diagnostic facilities / access to expertise is lacking then appropriate treatment is not always achieved

The lack of post mortem and laboratory facilities were an issue for some parts of countries and island communities; this was not just a problem in developing countries. This is an area of concern with regard to the beef farmer being able to access appropriate diagnostic facilities and expert advice when it is most needed, particularly when a contagious outbreak of disease occurs.

With regard to preventative measures, very few farmers did nothing at all, most mentioned vaccinating or treating the calves at some point: over one-third mentioned vaccinating against

Clostridia and one-quarter mentioned the use of anthelmintics (wormers), leptospirosis vaccine and pneumonia/ respiratory vaccines (Figure 18). However, for many this did not occur until weaning or very close to it. In Colombia, compulsory vaccination for foot and mouth disease is required after two months of age and Brucellosis vaccination is optional but for many contracts / pedigree societies this is also required. Farmers, in general, were unlikely to record any preventative treatments against calf records unless required for audit / legal purposes. As one farmer observed:

"Not necessarily recorded because there's no way of recording this, as they have no tags [because tags are inserted at weaning]" beef, sheep & arable farmer

If this was recorded anywhere it would be in a herd health plan / medicines book detailing "whole herd" treatment.

8.3. Colostrum provision at birth

Despite some self-professed minimum interventions with calves and cows around the time of calving, for those farmers that, at the time of interview, ran beef herds with calving occurring on site, 32 out of 38 (over 80%) stated that they had provided colostrum to a calf or calves after birth. However only one farmer kept records associated with this against the calf record.

Those that did not supplement colostrum cited human safety, lack of time or that they always managed to get the calf to suck from the cow:

"Not had to do it. Not lost a cow where calf lived. In commercial herd would give a calf away [rather than try to rear it]" pedigree beef farmer

"Angus cows have a strong maternal instinct. But managing them when just had calf can be dangerous… 90% are ok but…." pedigree, commercial beef & sheep farmer

In Colombia colostrum is regarded as a "speciality" human food in certain regions which can mean that a calf may get less colostrum due to the colostrum sale value for human consumption.

The reasons for intervention and colostrum supplementation / provision included:

- calf issues- "sleepy" calf / failure to get up and suck quickly;
- dam issues - death of dam, rejection by dam, extra-large teats;
- environmental issues – exposure / bad weather for outdoor calving herds;
- dystocia – sometimes or always after calf has required assistance to be delivered, including caesareans;
- full or partial artificial rearing – seen with some dual purpose herds, specifically in Colombia;
- herd policy – all calves receive colostrum or a supplement at birth.

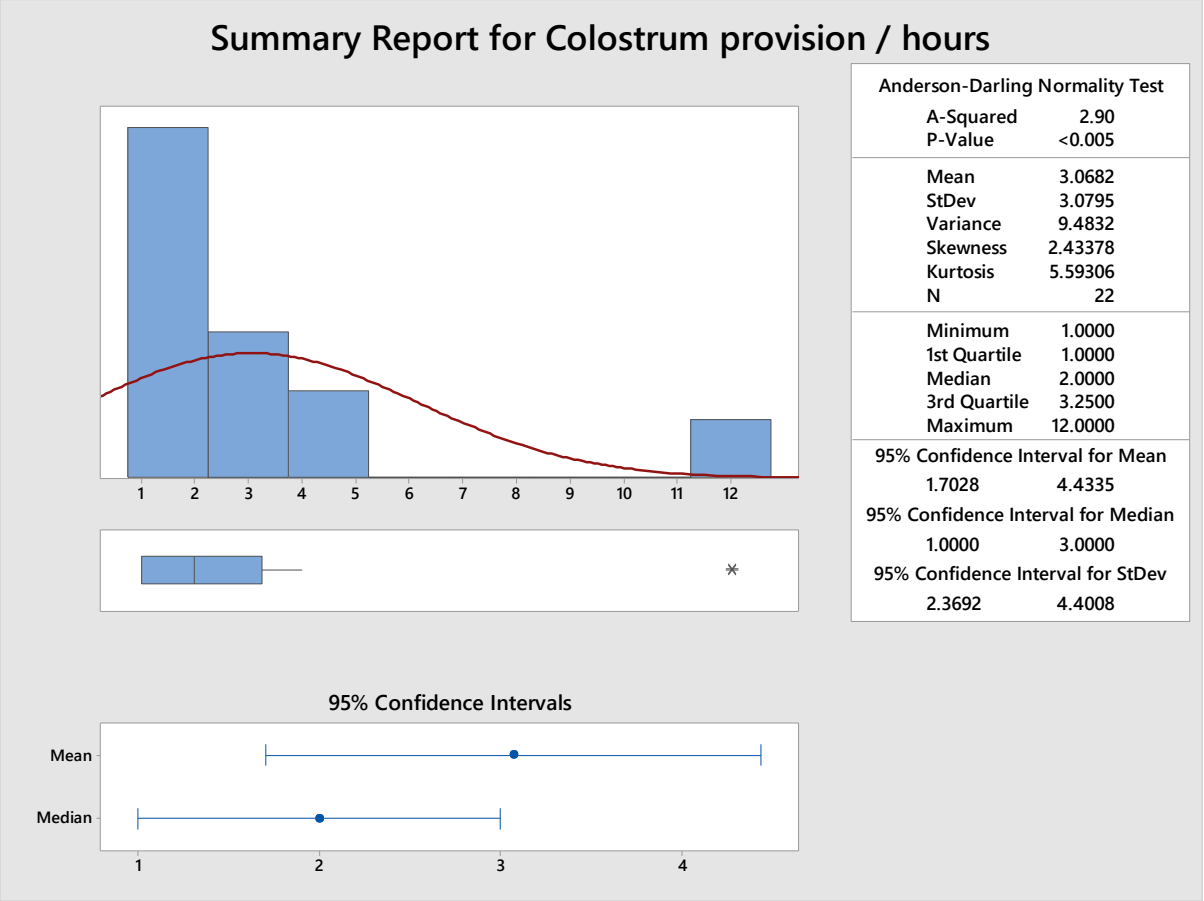
As previously stated regarding interventions at calving time, because some farmers had a different approach to heifer calving management, the offspring would be similarly managed, with calves from heifers more likely to receive intervention with colostrum supplements than calves from mixed age cows.

The median time that farmers left the calf before acting to supplement colostrum was 2 hours (Figure 19.) but this ranged from immediately after birth / within 20 minutes up to 12 hours after birth. All

farmers recognised the need for calves to get colostrum as quickly as possible and most recognised that this was best for the calves within the first few hours of birth. However, most also recognised the need for the cow and calf to bond and for the calf to suck naturally as far as possible:

"If the calf is hungry, I endeavour to get the cow in and the calf to suckle [from her]. Otherwise I get the calf back [to the farm] and give colostrum here. Also, if cold southerlies we take them home and put under a lamp." pedigree, commercial beef & sheep farmer

Figure 19. How quickly calves are supplemented with colostrum after birth



The median volume of colostrum provided at birth was 1.5 litres (Figure 20). Three farmers were not sure of the volume:

"Not sure, whatever the packet says" beef & sheep farmer

FAWC (2015) reviewed colostrum provision for dairy calves and concluded in their recommendations:

"Farmers should ensure calves receive at least 3L of high quality first drawn colostrum within the first six hours (ideally within the first two hours after birth). A further 3L should be given 6-12 hours after birth." Farm Animal Welfare Committee, 2015

Whilst the FAWC recommendations relate to dairy calves they are relevant for beef calves when the colostrum quality of the beef dam is not known. So, whilst most farmers recognised the need for speed in getting colostrum to calves they were less aware of minimum recommended volumes to ensure

good passive transfer. One farmer observed he struggled to get much more than a litre out of a beef cow and so the amount drawn could be a limiting factor for some farmers using dam's colostrum.

Colostrum provision ranged from nothing at all through to 100% direct provision to all beef calves.

Methods of provision ranged from improvised wine bottles (locally sourced) through to calf-specific colostrum bags delivered to "flat" calves by stomach tube

The preferred colostrum source when this had to be provided to the calf, was the dam's first drawn colostrum (Figure 21). However, some farmers did not feel confident about taking colostrum from a beef dam nor of getting sufficient amount; other choices included a dairy farm source and purchased colostrum replacer with convenience and ease of getting the colostrum being a key reason for this choice:

"Depends on the year ……..heifers with problem. So over protective. Have taken colostrum if milky cow… but better for health and safety and it's easy to get [colostrum] powder. Try and [get the calf to] suck first and this occurs most of the time….. this year used 2 tubs, 20 in a tub so maybe 40 calves" beef & sheep farmer

Figure 20. Volume of first feed colostrum after birth

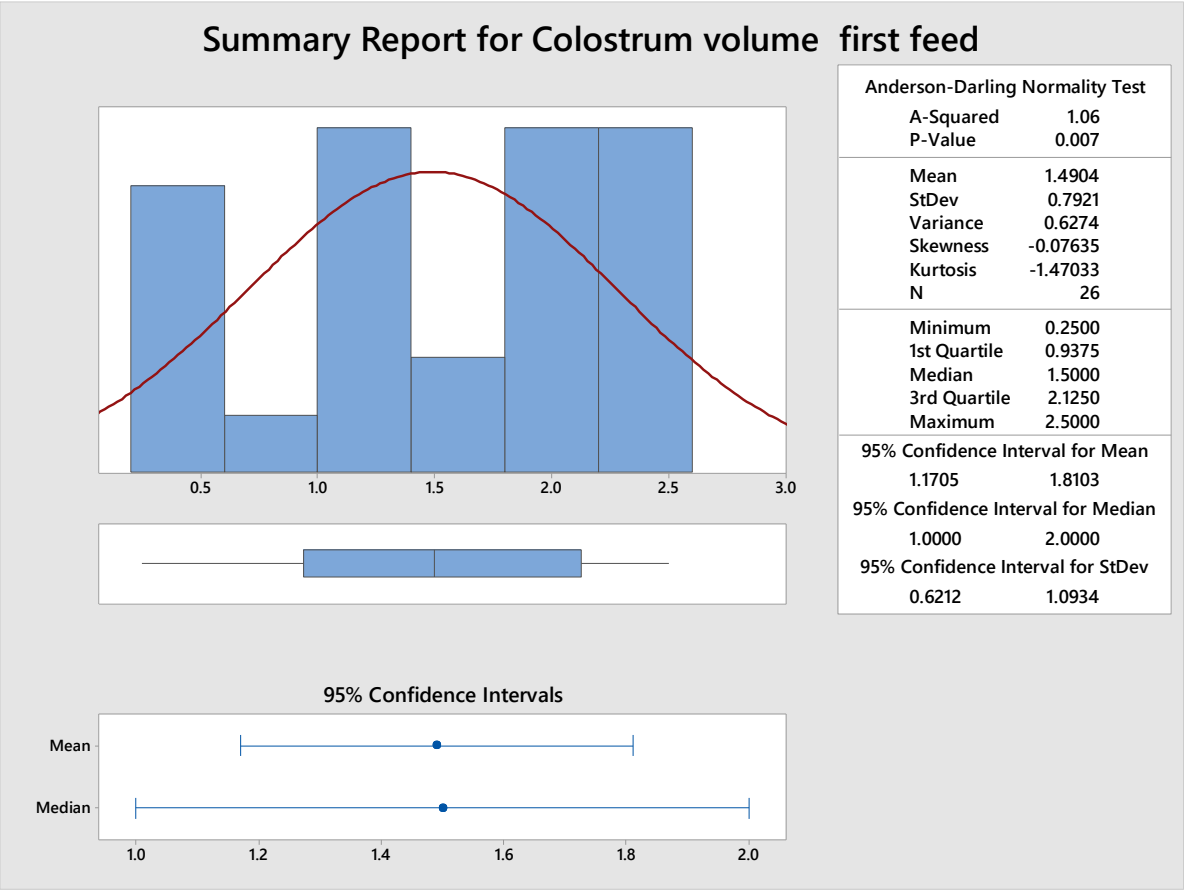
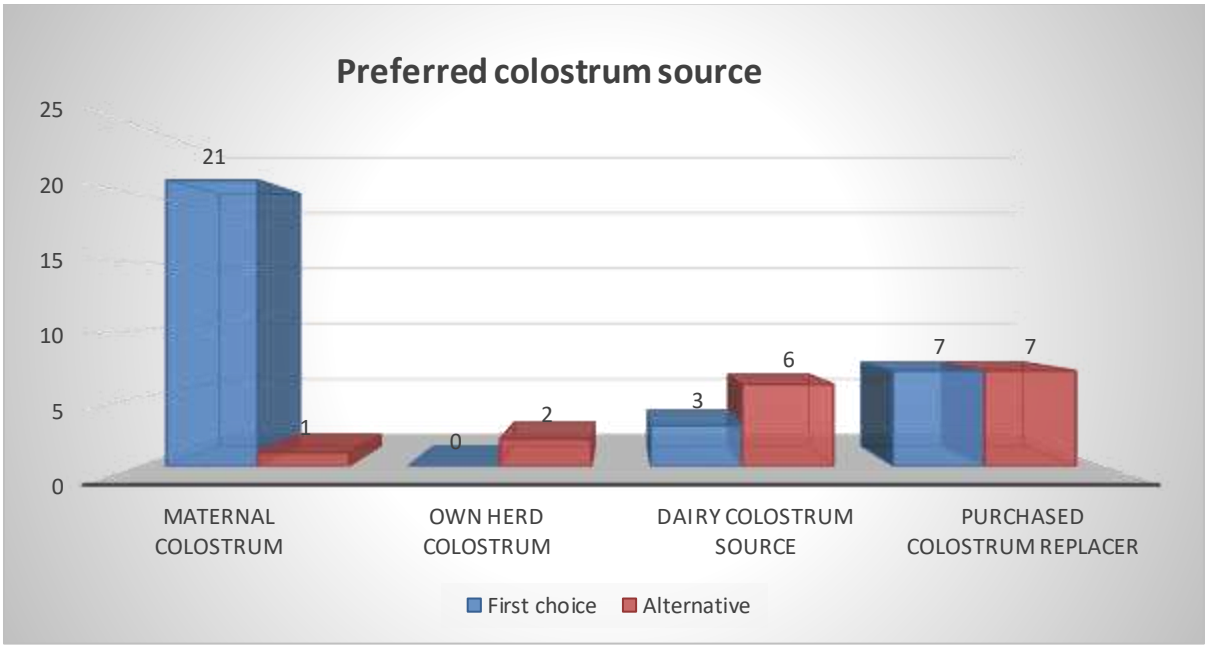


Figure 21. Preferred colostrum source provided to calves



A small number of farmers would draw additional colostrum from cows that were amenable to being milked and keep as second choice store of colostrum, rather than source from another farm or use purchased colostrum replacer. Those four farmers that opted to supplement ALL calves with colostrum as a default protocol were either using dam colostrum following removal of the calf from the dam (two farmers) or using an artificial colostrum replacer to supplement the dam (two farmers).

Only three farmers vaccinated their beef cows for *Escherichia coli* and *Rotavirus* prior to calving. When sourcing dairy colostrum, one ensured it was *Johnes*-free source, another ensured the dairy cow source was a farm that vaccinated for *Escherichia coli* and *Rotavirus.* One farmer supplemented all calves with a probiotic "Provita protect" after birth. The type of colostrum replacers used usually included a concentrated bovine colostrum source and would be assured as sourced from a herd free of *Johnes*, Infectious Bovine Rhinotracheitis (IBR) and Enzootic Bovine Leucosis (EBL).

Studies on how well colostrum replacers / substitutes can protect calves, compared with dam colostrum, have had varied results and have all focussed on dairy calves. Williams et al (2014) summarises the findings by suggesting that colostrum replacers containing an immunoglobulin G (IgG) concentration over 170g/litre provided sufficient immunoglobulins to achieve good passive transfer. However, whether this can protect the calf from disease events when the immunoglobulins are colostrum-derived is equivocal; these varied findings are most likely because, whilst the immunoglobulins in good quality colostrum replacers may be highly concentrated and should achieve a high serum concentration, they need to be targeted against specific diseases present on the farm. Whilst colostrum replacers are appearing to be getting better they are not ideal. The ideal is good quality (high IgG) colostrum from dams reared at the location where calves are going to be born. This ensures that the antibodies that are produced in the dam's colostrum relate to the diseases that the calf will be exposed to on that particular farm. Vaccination of dams against enteric disease-causing organisms such as *Escherichia coli* and *Rotavirus* is likely to improve colostrum quality and protect against common enteric diseases that the calf is likely to be exposed to in its first weeks of life.

Of the 32 farmers that indicated they had provided colostrum in the past to calves, 22 administered this by teat as first choice (Figure 22). The main reason for preferring this was to stimulate a normal feeding activity, however avoidance of using a tube was also stated. Reasons for using a tube were more likely associated with lack of time, especially with tight calving patterns, time of day (late at night) when it would be more convenient to use the tube or health and safety.

A common theme was that calves were unlikely to do very well if they could not get the calf to suck:

"Teat – if cannot get to suck then really probably won't do. Do have tubes e.g. for giving electrolytes but would not use for the colostrum" beef farmer

Some farmers stated that when fed by teat they would allow the calf to take as much as it wanted after ensuring each calf had a minimum amount, whereas when stomach-tubed farmers that used both methods stated less may be given (One farmer quoted 0.5 litres by tube compared to a minimum 1 litre by teat). However, when comparing the farmers' stated volumes overall by tube or teat, volumes were slightly higher for tube (Figure 23). It should be noted that for teat-fed volumes in Figure 23. only the minimum volumes quoted are provided and so this data may under-estimate volumes by teat compared to those for tube, which were more specific. Those that used the tube were confident in its use but some admitted to losing the "odd calf" to inhalation pneumonia, possibly due

to tubing the trachea rather than the oesophagus or from trying to tube too much colostrum too quickly.

Figure 22. How farmers prefer to administer colostrum to new-born calves

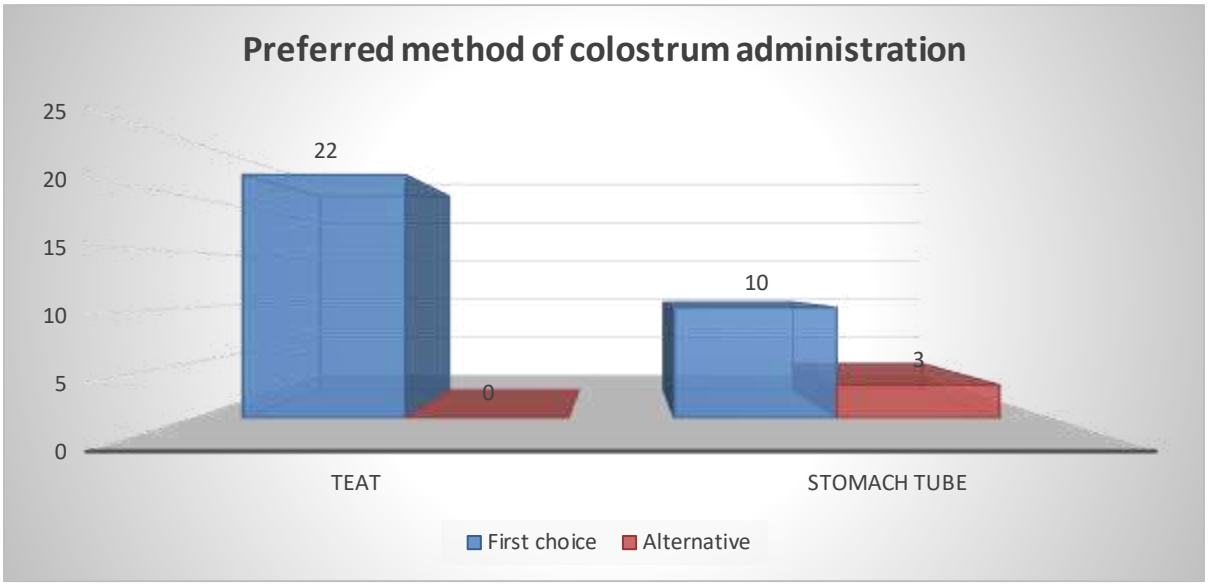
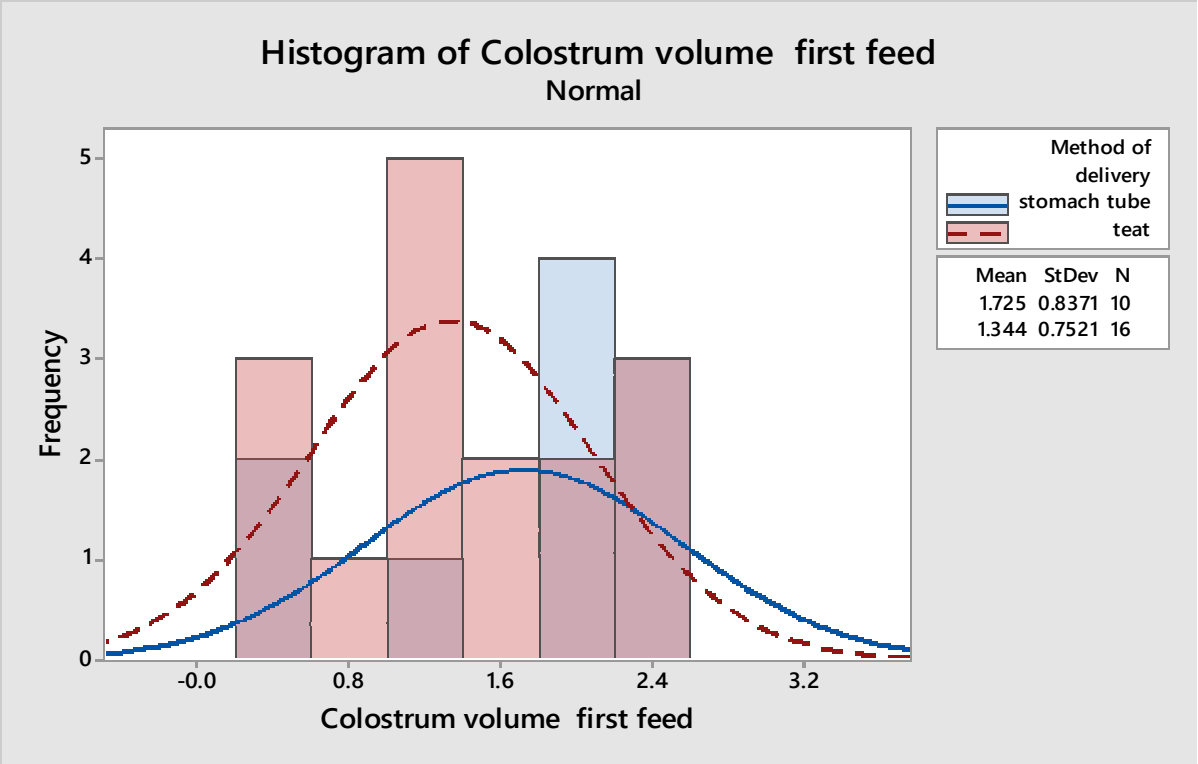


Figure 23. Difference in stated colostrum volumes provided for first feed by teat or stomach tube



Godden et al (2009) assessed immunoglobulin transfer in calves administered by tube or teat. They did not find any differences between methods of delivery but they did find that providing the colostrum in larger volumes (3 litres) improved uptake compared to a smaller volume (1.5 litres).

I would always advise providing colostrum by teat as the most risk-free way, for the calf, of ensuring maximum colostrum intake to appetite, as well as assessing a calf's vigour and its likely need for further intervention or not. However, if the farmer's time and resources are limited and mean that using the tube is the only way they can ensure adequate colostrum transfer to the calf then the benefit outweighs the risks.

Figure 24 describes the farmer response as to whether further colostrum feeds were given after the initial first feed. One third always gave further colostrum feed(s) whilst a further third waited to see how the calf responded to that first feed. The large number that opted to "wait and see" after that key initial feed reflects the aim to get the calf feeding from the dam as soon as possible and to ensure a good calf-dam bond develops. Three just followed the packet instructions for colostrum replacer whilst four of the farmers gave no follow up colostrum feed. When comparing the volumes given in the initial feed to this farmer response (Figure 25), larger volumes (2 litres) were given in the first colostrum feed by those farmers that never gave a follow-up feed compared with the other two groups (1.5 litres & 1.7 litres). This is a small sample size but probably does reflect reality; those opting to give colostrum only once give the calf a larger one-off feed, whereas those knowing they will give more, offer a smaller feed initially with further feed(s) later:

"Give half a litre first then two or three doses up to a few litres total" beef farmer

Another two litres 4-5 hours later" pedigree beef / dual dairy

"Another litre, 1.5 hours later" commercial beef / dual dairy

"Three times per day 'till can get back to cow. Sometimes can take up to 7 days, one went to 2 weeks" beef farmer

Figure 24. How farmers follow up on an initial colostrum feed

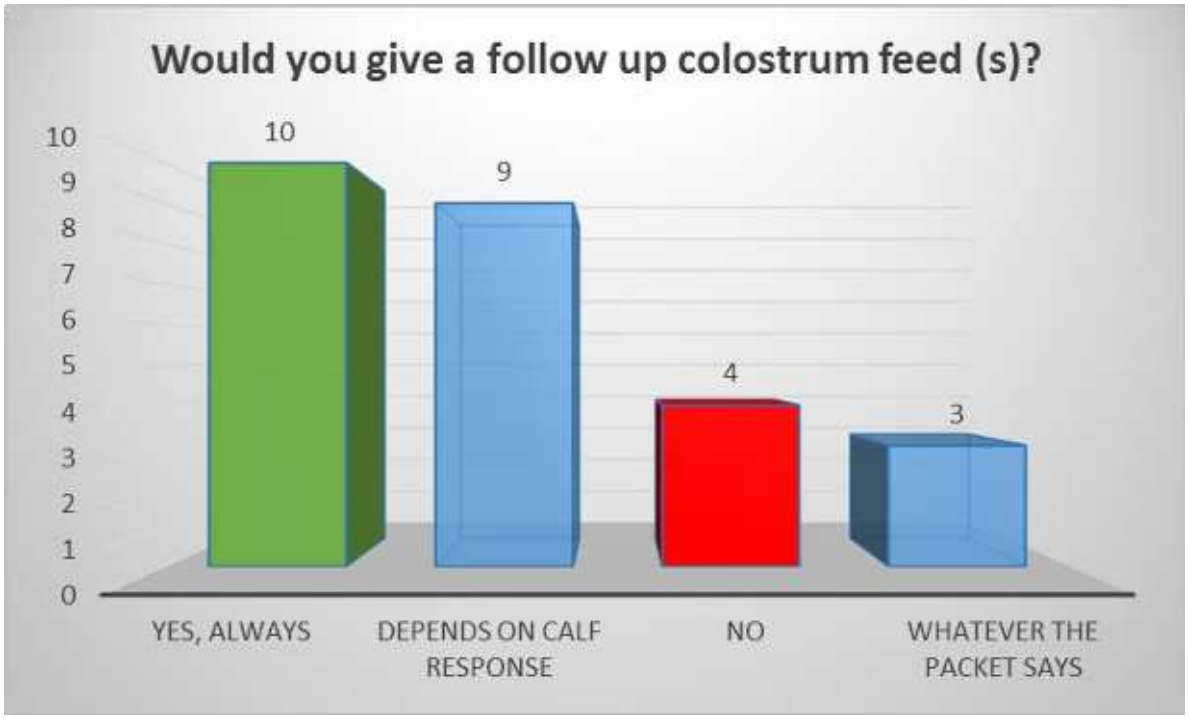


Figure 25. How follow-up colostrum feeds reflect initial colostrum volume fed

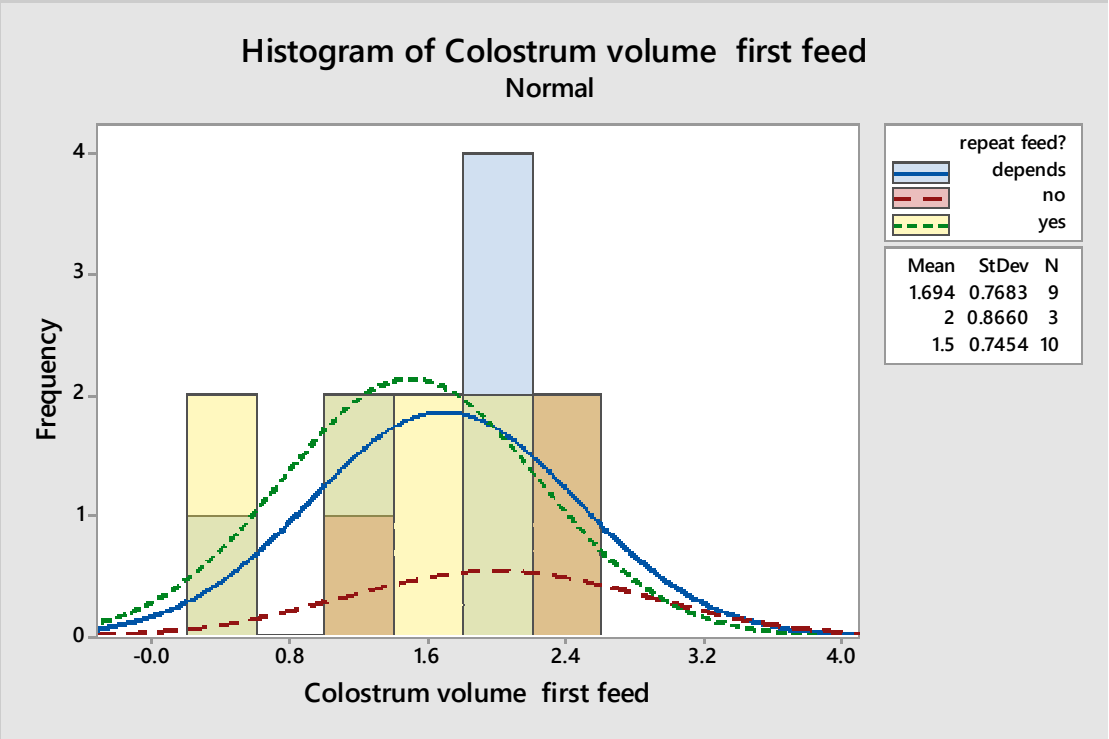
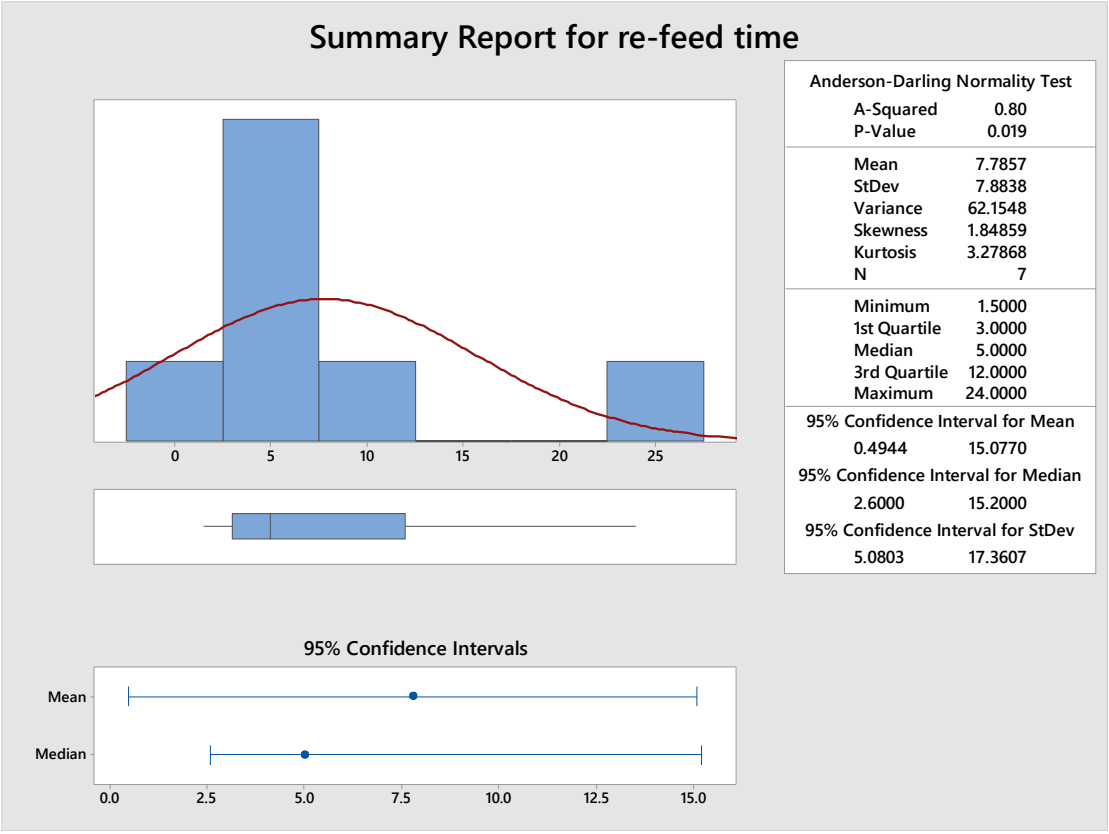


Figure 26. Timing of second colostrum feed after first feed



Those that re-fed colostrum did so two or three times per day. The median time to the second feed where this was given, was 5 hours (Figure 26.), with a range of 1.5 to 24 hours.

Therefore, when added to time to first feed, most farmers who could provide a time for a second feed indicated this was being given within the recommendations of 6-12 hours after birth. However, the volumes were not nearly enough to ensure sufficient colostrum antibody transfer, according to current recommendations. One farmer stated an aim of 8 litres of colostrum would be fed in the first 24 hours but this was not the norm.

A number of farmers recognised the value of feeding colostrum and transition milk to calves for as long as possible. One vet managing dual beef/dairy operations on two farms ensured management protocols were carefully followed so that first drawn colostrum was pooled and fed to the newest calves, second drawn colostrum to the next age group and so on, up to one week of age.

8.4. Fever monitoring in calves

Enteric diseases such as *Rotavirus* and *E.coli* will cause rapid dehydration in calves. One of the problems with neonatal calf illness is that calves will deteriorate rapidly without early intervention. Respiratory disease is another killer. Whilst colostrum can confer protection via the transfer of antibodies, overwhelming exposure to infectious disease, or exposure to a disease that the dam was not previously exposed to, can rapidly lead to morbidity and mortality in calves. One farmer, who reared calves from multiple sources and could not be guaranteed of their colostrum intake and therefore immune protection against infection, makes use of "FeverTags".

These 'Fever tags' flash when the calf's temperature elevates for a prolonged period of time (6 hours), allowing the farmer to detect early signs of infection and instigate early intervention / treatment

Simple monitoring devices such as these can positively impact on calf survival rates in early life.

8.5. Calf mortality rates

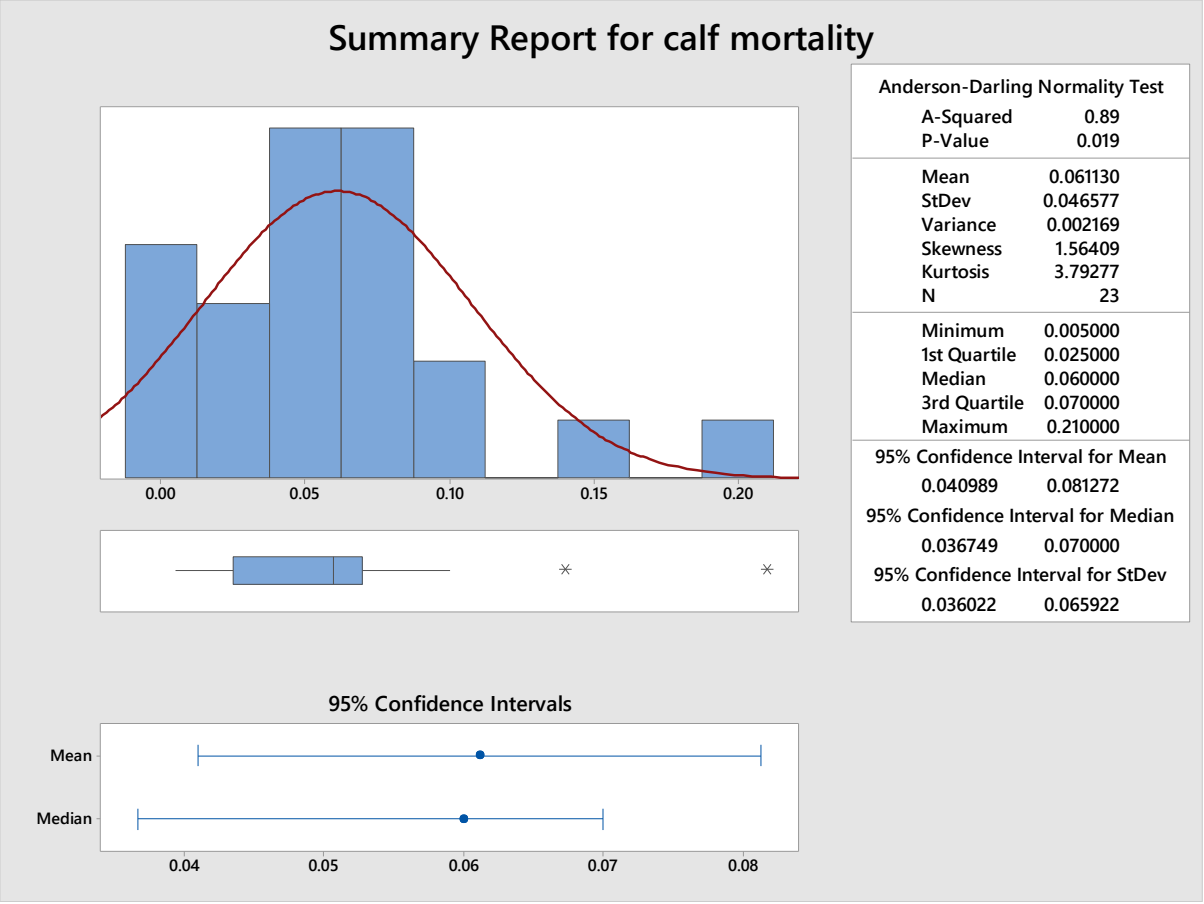
23 farmers provided a figure for calf mortality (Figure 27). The median value was 6%, with an inter-quartile range from 2.5% to 7%. However, for some the accuracy of the results was debatable. This is because of the lack of records for many regarding births including stillbirths, particularly for those farms that were not identifying calves until they were several months old or even at weaning:

"At marking – know numbers first - we do know with heifers more detail, but mixed age cows only mustering late January and by March really we know what has hasn't survived since the January" beef & sheep farmer

"We do an overall. How many cows should be in calf. And calving percentage weaning percentage want 95% to weaning but 90% more realistic, we will do actual counts at weaning" beef, sheep & arable farmer

These farmers were more likely to quote a percentage weaned from scanned in-calf and would not be able to give reasons for death other than misadventure. For those that provided colostrum there was no correlation with volume of colostrum given at first feed and no correlation with herd size.

Figure 27. Calf mortality rates quoted by farmers



Patterson et al (1987) quoted a figure of 6.7% between birth and weaning for recorded mortalities whereas in Murray et al (2016) quoted farmers' self-declared mortality rates of 4.7% before weaning.

Causes of death in calves were often not recorded but those with small herds could remember approximate numbers and likely causes:

"Yes we are, but not totally no. I know of 180 we had 38 died this year. 2 were down to dystocia. Others had disease between 4 days and 2 weeks" beef & sheep farmer

"Reason for death - honestly that I do not pay attention and think the problem is not serious." beef/dual farmer

"Gravity poisoning [misadventure by falling off steep escarpments]" beef & sheep farmer

"Trypanosmiasis is a problem for cattle and calf deaths, have a record of cria deaths for 2015….lost 7 out of 70 - 10% , Usually first 6-8 weeks – manager not look after them in way he should. Main problem is that farm close to town and manager spends more time in town than with cattle; sometimes die from snake bite – 4 noses – snake & another one, a spider that can kill them (tarantula); when bitten by snakes the skin sloughs, with spider the same but also eyes explode" beef/dual silvo-pastoral farmer

"Degree of loss with reabsorption etc. up to 2-3%. This year we calved 570 cows (2 didn't calve) out of 350 heifers 2 heifers not calve. Some born dead – So number born – to number now. Database is run now we had total 1201 calves born (alive and dead). 1158 weaned so 43 born dead or died to (weaning). If survive 24-48 hours maybe 6 or 8 that have died outside first 24 hours. This is consistent year in year out" beef & sheep farmer

In theory many databases demonstrated to me by both farmers and providers at livestock shows and cattle meetings had the ability to record cause of death, they just were not being used to their full extent. Absolute data on calf mortality and effect of parameters such as breed, sex, age of the dam, number of parities etc. are addressed in the next chapter.

Recording morbidity and mortality in calves at the time it occurs, including treatments given and cause of death, are key to understanding farm-specific health, welfare and mortality issues

8.6. Summary

Other than data assoicated with calving, which was usally only recorded against the dam records, many farms had sparse data associated with the calf in its early life. Whilst some legal or scheme requirements determined minimum records these were still deficient with respect to issues such as calf weight at birth and through the early rearing phase, recording of morbidity and mortality events at specific ages with causes. This meant that the morbidity and mortality data provided by farmers were not always exact and could not be pin-pointed to certain points in rearing. A lack of data on calf events meant that the value of colostrum provision could not be effectively evaluated.

I was surprised and pleased by the number of beef enterprises intervening with supplementary colostrum provision to beef calves, having previously been told this was not a regular or common occurrence in the beef-cow/suckler industry. Most farmers recognised the speed with which it was necessary to ensure colostrum was taken by the calf and would describe their procedures in deciding when a calf may need to be supported to take on colostrum or be given supplementary colostrum. Farmers were less knowledgeable on appropriate volumes and frequency of adminsitrations of colostrum and transition milk and few made use of ways in which immunoglobulin content of colostrum could be improved, for example by the use of vaccination in the dams prior to birth or measuring and collecting high immunoglobulin content colostrum.

A number of farmers admitted they had neither the time, resources nor money to manage problems associated with calves at calving or in their early life and there was an element of a "survival of the fittest" expectation for some beef businesses. This is more difficult for me to find acceptable in 21st century farming where many countries have acknowledged that animals are sentient beings, and have the capacity to suffer. This should mean a rapid response to a calf event, through more frequent monitoring during high risk events such as calving and rapid action through either appropriate treatment or humane euthanasia.

Chapter 9. Bigger Data evaluation

9.1. Introduction

Since commencing this project I've realised that the data sets I have been looking at may not even be classed as "Big Data" anymore, hence the "Bigger Data" concept.

Wikipedia (2016) describes Big Data in the following manner:

"Big data is a term for data sets that are so large or complex that traditional data processing applications are inadequate. Challenges include analysis, capture, data curation, search, sharing, storage, transfer, visualization, querying, updating and information privacy. The term often refers simply to the use of predictive analytics, user behaviour analytics, or certain other advanced data analytics methods that extract value from data" Wikipedia, 2016

I was looking for large data sets but data sets that I could manage with a modern lap top and basic statistical analysis software, from which I could take structured samples. This does not really fit the Big Data concept any longer, the definition of which seems to change as often as the increase in gigabytes of data analysed, regressed and predicted by Big Data processors per day.

I was not seeking to predict the next major notifiable disease in cattle but I was looking for a reliable and robust data source for informing me about calf mortality. This was far more difficult than I had realised. I found only one complete data set from a country which had what I considered the most reliable data source. This is because the country required all calves to be tagged even when stillborn, all dead stock were collected by a Government-contracted collector and there were no derogations to bury dead stock or dispose of them otherwise. Compared to other data sets, where it is acknowledged that the number of calves recorded as born bears no resemblance to the numbers of productive dairy cows and beef cows that have supposedly had calves, this appeared the most robust source from which to evaluate data. Further, the geographic and climatic conditions were similar across the country (by reason of its size) and being an island, the likelihood of illegal movements is considered very unlikely.

There are some difficulties with using national data sets for evaluating data such as that relating to calf mortality in specific sectors, for example separating dairy calf from beef calf mortality. This is partly because many national databases were originally designed for traceability reasons:

- to protect the food chain & human health, such as in the aftermath of Bovine Spongiform Encephalopathy (BSE) in the 1990s;
- to protect animal health in the aftermath of disease outbreaks, such as Foot & Mouth Disease in the UK in 2001;
- to provide assurance to the consumer about the provenance of food and food products for retail purposes.

Additionally, in many countries the business operated by a specific holding may not be clear (dual purpose use of animals or both sectors operating on the same holding) or may fluctuate according to market demands:

- breed purpose of the animal could be dairy / beef / both in both *Bos indicus* and *Bos taurus* breeds;
- the calf-rearing system was not a clear split of between beef & dairy: beef systems = dam reared vs dairy cattle = artificially -reared;
- a dairy farm last year could become a beef-cow/suckler unit this year and the database system may not require the sector type to be recorded, since traceability is the focus of data recording and collection.

The Isle of Man dataset was therefore large enough to provide meaningful data to analyse but small enough, and known in detail by the Government, that dairy units could be differentiated from beef units. This allowed beef mortality to be analysed specifically. When looking at an issue as specific as calf mortality, determining the denominator population (i.e. total calves born) is vital and knowing how the calf is being defined in age (under UK/European legislation for example, a calf is defined as any bovine under six months of age) and when the calf dies is important for comparison.

Bustin and Nolan (2015) discussed the issue of lack of repeatability in biomedical research and the need for transparent, complete and accurate materials and methods. This is no different to analysis of large data sets such as described here. The previous chapters have already underlined the issue with the huge variation in calf event data recorded in every country visited. It was certainly inter-herd specific and in some cases, intra-herd specific. With respect to the analysis of large data sets, the quality of data outputs and outcomes must be directly related to the quality of the inputs. This Chapter describes some preliminary analyses from beef herds on the Isle of Man.

9.2. Methods and materials

The Isle of Man Government has been collecting detailed data from 1st January 2014 on calf birth and mortality data, including stillbirths. A number of factors have created a robust data set through a number of requirements:

- the compulsory requirement to tag all calves that are born, including late abortions and still-births following the introduction of a compulsory BVD control strategy;
- collection by a Government contracted carcase collector for incineration and no derogations for burial on farm;
- detailed knowledge of the holding with regards to differentiating dairy or beef holdings.

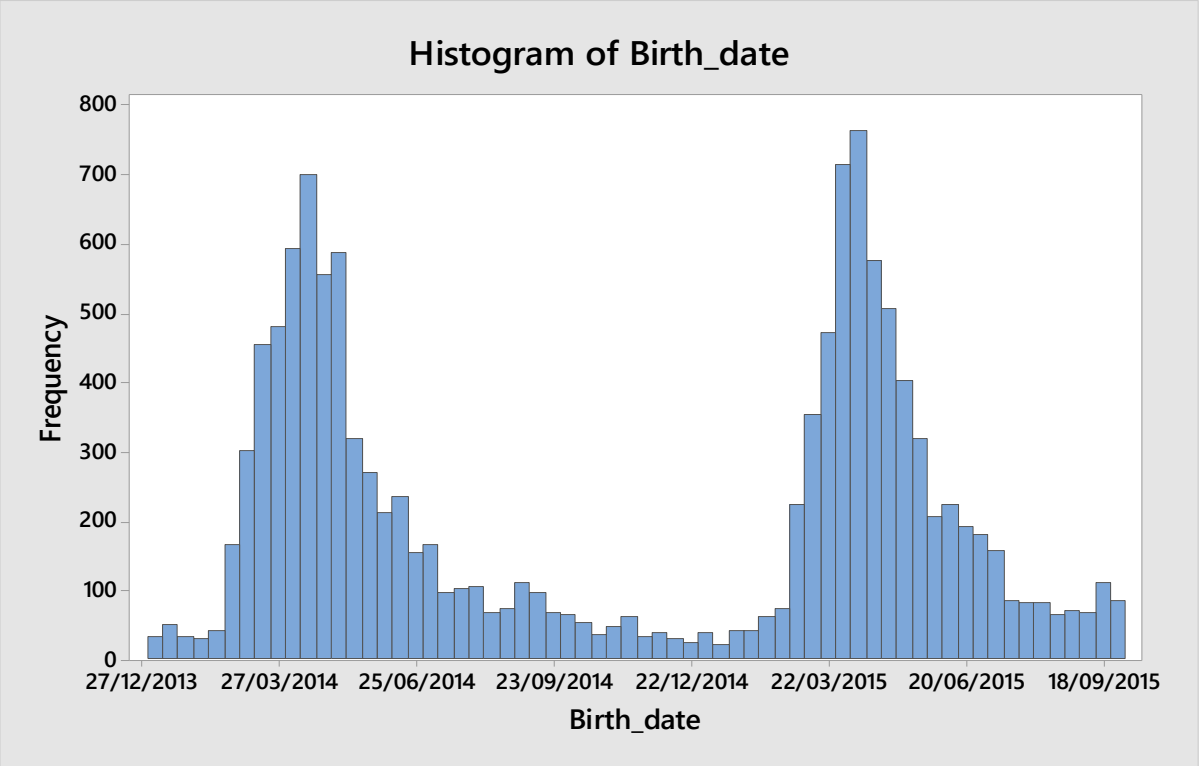
Data on cattle births and deaths from January 1st 2014 to March 31st 2016 were provided by Isle of Man's Department of the Environment, Food and Agriculture, Isle of Man Government (DEFA) in Microsoft® Excel format. All calves originally born to dairy females in categorised dairy herds were removed from the data set and any data relating to calves not born on the Isle of Man were also removed. This left only calves born in beef herds on the Isle of Man. To validate as beef herds each herd was visually checked with regard to calf and dam breed registered data to confirm only beef calves were captured. A calf was defined as any bovine aged 180 days and under. In order to capture full mortality data to 180 days for each calf, any calves born after September 30th 2015 were excluded. This allowed for full survival/mortality data to be captured for the last born calf on 30th September 2015 (Sep 30th 2015-March 31st 2016 = 183 days). Data provided included: calf identification, sex of

calf, dam identification, herd number, breed type, breed dam type, birth date, death date (if this had occurred), age of dam at time of birth, parity of dam at time of birth. Late abortions, stillbirths and deaths on the day of calving were recorded as a birth date and death date on the same day – age at death = 0 days. The calf survival data was then categorised into dead at 180 days = 0 and alive at 180 days = 1. The data was then imported into Minitab 17, Minitab® Statistical Software. Univariate and bivariate analyses were performed on the data. Where appropriate, checks for normality were completed using the Anderson-Darling test before choosing an appropriate statistical test according to whether data was normally or parametrically distributed. For the purposes of this report the data described is principally descriptive with some evaluation of individual variable effects (such as breed, dam age, dam parity, sex) on the categorical variables of calf being alive or dead at 180 days.

9.3. Results

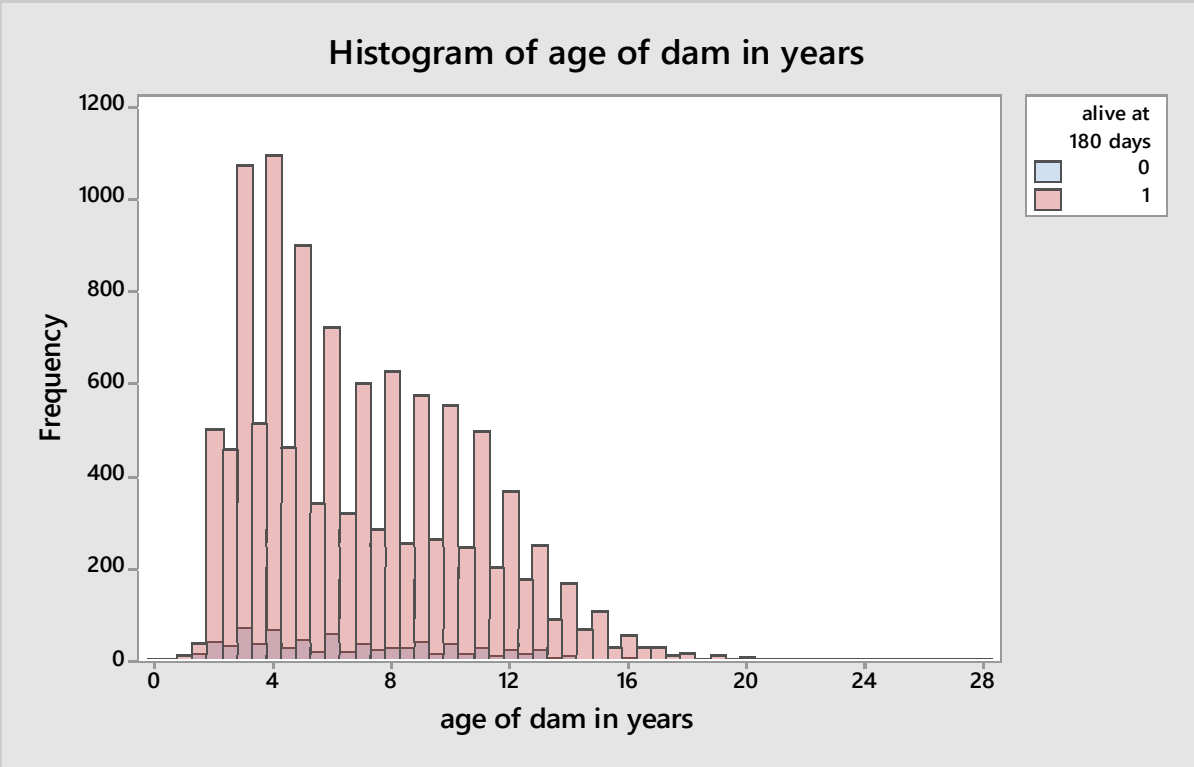
5,927 births on 22 dairy farms were removed from the dataset. 12,736 births (including live and stillborn) were recorded on 183 farms ranging between 1 and 439 births per holding between January 1st 2014 and September 30th 2015 (Figure 28). The calving pattern was principally seasonal with most calves born between March and May during 2014 and 2015. 792 of these calves were dead by 180 days, a mortality rate of 6.21% including stillbirths.

Figure 28. Birth date of all beef calves on the Isle of Man between 1st January 2014 and September 30th 2015



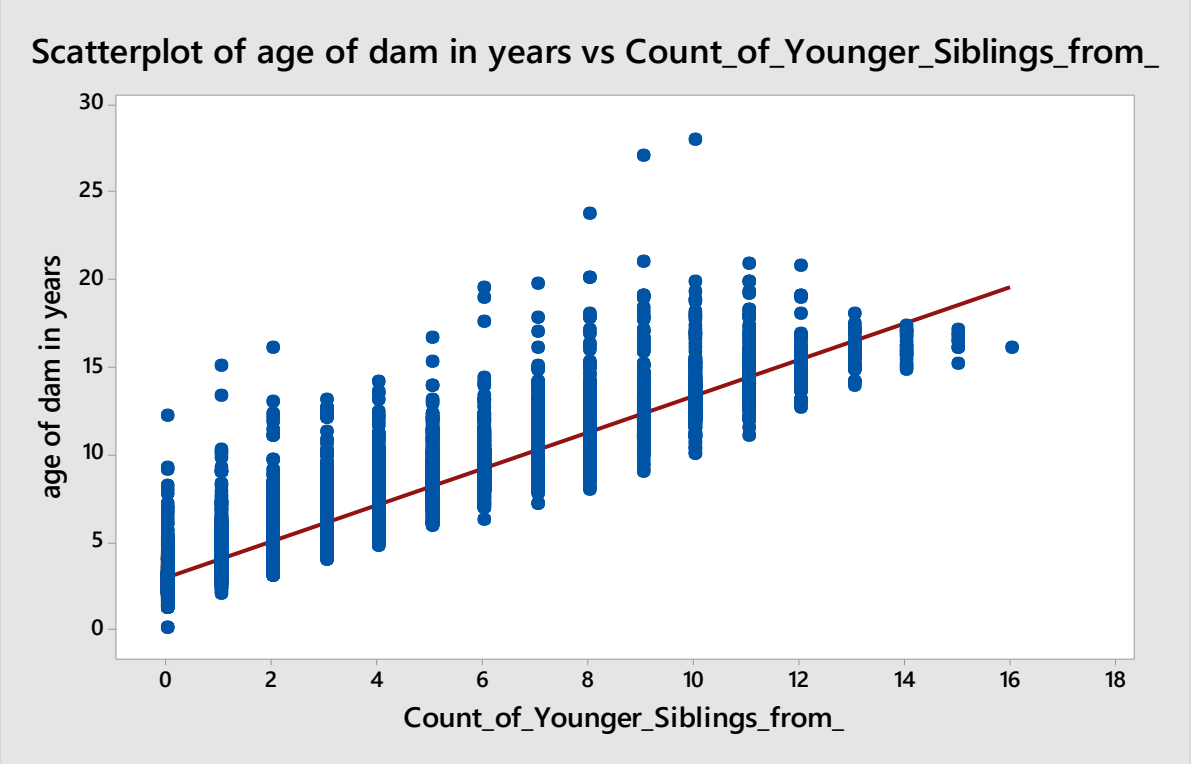
The data for age of dam at birth (in years) was not normally distributed. Median age of dam at the time of calf birth was 6 and 6.1 years for a calf dead or alive at 180 days respectively (Figure 29). The inter-quartile range of all dams at the time of calf birth was just under four years old to just over nine and a half years. This did not differ significantly between groups (p = 0.198).

Figure 29. Age of dam in years and effect on calf survival to 180 days



As expected, parity at the time of the calf's birth was non-parametrically distributed and positively correlated to age of dam (Pearson correlation = 0.947, p <0.001) (Figure 30).

Figure 29. Correlation of dam age to parity (or count of younger siblings)



Due to the wide number of parities at the time of the calf's birth this was categorised into parity 1, parity 2 and parity 3 + (Table 1). Whilst mortality was higher in parity 1 and 2 compared with cows of parity 3 and above this was not significantly different when compared by chi square analysis (p =0.095, Table 2)

Table 1. Mortality rates in calves by 6 months of age in first and second parity beef cows compared with greater parities

Parity	Calf dead at 180 days	Calf alive at 180 days	Mortality by 180 days
1	149	2026	6.85%
2	128	1809	6.60%
3 +	515	8109	5.97%

Table 2. Chi square analysis for mortality in calves from parity 1 and 2 vs all other parities

	Calf dead at 180 days	Calf alive at 180 days	*Totals*
Parity 1 & 2	277	3835	*4112*
Parity 3+	515	8109	*8624*
Totals	*792*	*11944*	*12736*

Chi square = 2.79, p = 0.0947

The only significant risk factor found for death by 180 days in the beef calves was sex, with male beef calves more likely to be dead by 6 months (6.94%) than females (5.48%) (p <0.001) (Table 3 & more detailed data in Appendix 13.2.5.)

Table 3. Chi square analysis for mortality by 180 days and sex of calf

	Calf dead at 180 days	Calf alive at 180 days	*Totals*
male	447	5992	*6439*
female	305	5952	*6297*
Totals	*792*	*11944*	*12736*

Chi square = 11.69, p = 0.0006

There were 46 calf breed and breed crosses represented across the 183 farms, with a range of mortalities by the age of 6 months (breeds are listed at 13.2.6. in the Appendices). Due to some small

numbers representing single farms and in some instances small numbers of animal births by breed or breed cross, not all of this data can be presented due to data protection issues.

The most common beef calf type born on the Isle of Man, with more than one-third of all births represented, was a Limousin cross beef calf (Table 4). The mortality is provided where there were at least 200 births spread across multiple farms. Extreme care should be taken with extrapolation of these basic statistics to a breed effect on mortality, due to relatively small numbers of calves and farms involved.

Table 4. The top 20 beef calf types born on Isle of Man (1st January 2015 and 30th September 2015) and mortality by 6 months

Breed type	Number of births	Mortality % at 180 days*
LIMOUSIN CROSS	4727	5.88%
CHAROLAIS CROSS	1458	6.65%
BELGIAN BLUE CROSS	1145	6.90%
ABERDEEN ANGUS CROSS	905	6.85%
LIMOUSIN	844	6.87%
SIMMENTAL CROSS	815	7.85%
SHORTHORN BEEF CROSS	351	2.85%
HEREFORD CROSS	338	6.21%
HEREFORD	223	4.04%
SIMMENTAL	221	4.52%
ABERDEEN ANGUS	219	5.94%
GALLOWAY	179	-
STABILISER CROSS	165	-
BEEF CROSS	164	-
CHAROLAIS	159	-
SOUTH DEVON CROSS	153	-
BELGIAN BLUE	106	-
BLONDE D'AQUITAINE CROSS	86	-
PARTHENAIS CROSS	86	-
SOUTH DEVON	64	-

*mortality data cannot be presented for all breed/ cross types due to small cattle numbers or individual herd data

9.4. Discussion

Whilst calf mortality in dairy herds is well described, there is limited peer-reviewed published work describing beef calf mortality data. Basic information that has been presented here is important to support bench-marking processes for farmers. The figure of 6.21% mortality for the Isle of Man data is more close to the 1987 data of 6.7% quoted by Patterson et al than Murray et al (2016) farmer-declared mortality rates of 4.7%, although it should be born in mind that the Isle of Man data included stillbirths and late abortions. Furthermore, the data reported for the Isle of Man does reflect the farmer self-declared figures from the farmer interviews conducted and reported on earlier in this study.

Gates (2013) reported on beef calf mortality data in Great Britain for calves born during 2007, quoting a level of 2.47%. This seems very low. However, the use of a dataset which does not require tagging of the beef calf until 20 days of age nor registration until 27 days, and no requirement to tag

unregistered dead calves prior to collection means that there will be calves not registered on the database. Despite welfare legislation in the UK which requires all mortalities to be recorded at every inspection and further the cattle identification and registration rules also do require the recording of ALL births and deaths, the data associated with stillbirths and early calf mortality is not being captured by the UK's cattle tracing system. The Gates' 2.47% figure is therefore likely to be an underestimate of true total mortality from birth, which Gates acknowledges in his paper. The requirements for the tagging and registration of dead bovine stock on the Isle of Man mean there is better traceability and understanding of early calf deaths.

The significantly higher likelihood of death occurring in males than females in the beef sector has been previously reported, including by Gates (2013) and Nix et al (1998). Male calves are usually heavier than female calves at birth and thus the risk of dystocia is likely higher and can impact not only on perinatal death but on future viability due to consequences of lack of colostrum and/or injuries sustained during birth.

The lack of significant parity impact on beef calf mortality contrasts with Gates (2013). As understanding about heifer management has grown, focus on the use of breeding stock with calving ease as a major factor (and for some retailer schemes an absolute requirement), the use of more appropriate bulls on what are now quite immature cattle when first bred and calved may account for this difference. However, the fact that stillbirths and late abortions are included in the Isle of Man data may also have influenced these findings and needs more investigation.

Gates (2013) quotes a cost of between £140 and £310 per calf death, although it is difficult to translate the costings from the evidence base used in real terms for beef farmers on the Isle of Man, where they have additional costs associated with importing breeding stock and other resources. In addition, their market for finished beef is limited. In effect for both the dairy and beef sectors on the Isle of Man the cost of a calf loss is likely to be higher than compared with mainland, which makes it all the more important to improve survival. From the farmer interviews it is clear that good dam potential with longevity may be lost in a number of countries purely because she loses a calf. This was less likely on the Isle of Man, with more cows given second chances and, if the data is to be believed a cow that was still productive at nearly 30 years of age!

There is further evaluation of this data to be performed which is out of the scope and time limitations of this present study, including multivariate analyses and a closer look at age and month at time of calf death; in addition the dairy data is of similar interest, although only 22 farms are represented - some data is provided in the Appendix at 13.2.6. and needs closer evaluation. However, this initial analysis demonstrates the value of ensuring complete recording and traceability of all calves, including dead young stock.

9.5. Putting the data into context – Case study Isle of Man

9.5.1. Introduction

Whilst the scientists and epidemiologists amongst us can get excited about the potential of Bigger Data and what it can tell us, what does this mean and how can it help the beef farmer at a practical level? I had the opportunity meet with farmers on the Isle of Man during my study. I visited the largest beef unit on the island as part of my preliminary pilot. I met some brothers with no succession plans in the family, who had decided to close their dairy and move into beef in their retirement years, but still retaining a few of their older dairy cows on their beef unit. On my return to the Isle to collect the calf data, I was asked if I would like to visit a farmer who had suffered from consistently high mortality over previous ears and who had requested further advice from the Isle of Man Government's DEFA veterinary team.

The Isle of Man, as a relatively small island community, has disadvantages with respect to increased costs associated with running the farm business, including obtaining expertise from specialist vets, scientists and surveillance laboratories. Similar to issues found in Colombia, the Isle of Man has no accessible post mortem facilities so whilst blood and tissue samples can be collected and sent to the UK mainland, full post mortems are not routinely available. This means that surveillance laboratories are reliant wholly on the quality of the clinical history supplied with those tissues and samples.

9.5.2. Case details

The 1400 ha farm, with 400ha just below the mountain line and the remainder hill moorland means that beef are the main income generators, although some pedigree Blue Faced Leicester sheep are also kept. There are 220 productive beef suckler cows with a total of 550 head of cattle on the farm. All beef cattle are finished on the farm at 18 months to 2 years of age.

The Isle of Man Government DEFA data for the case farm was accessed to understand the pattern of mortality described by the farmer. The farm was visited, an interview completed and farm buildings / land and animals observed over a two-hour period.

9.5.3. Farmer interview

Veterinary advice

The farmer made use of veterinary expertise on the island and had a good relationship with his vet. He was using the vet mostly in a fire brigade manner at the time of the interview, not by choice; he had preventative health planning in place but the high calf mortalities were resulting in constant attendance and contact with the vet over his ongoing problems. The sheep required very little veterinary support although he had been having a few problems with twin lamb disease. He felt he had a good relationship with his private vet, he was recording information but not always finding enough time to look at the data. Some laboratory diagnoses had been carried out in mainland UK by the Animal and Plant Health Agency (APHA).

Known disease status

Past disease issues diagnosed included Bovine Viral Diarrhoea (BVD), Leptospirosis and Infectious Bovine Rhinotracheitis (IBR). Vaccination for leptospirosis had been carried out for the past 12-13 years. Vaccination for IBR had been carried out after calf losses started escalating four years previously. However, more recently *Cryptosporidium* had been isolated in the calves.

Cattle Management

The beef cattle were kept outdoors for most of the year but calved "indoors". Calving spread was March to June. Most calving areas were shared open-fronted buildings.

Open fronted buildings used initially for finishing cattle and later into winter/spring pregnant cows

A commercial colostrum supplement was used where necessary for calves. So far in 2016 out of 180 calvings, maybe 40 calves had received the colostrum supplement. Records were not kept for those receiving supplements. They would be kept indoors for three months at the most, dictated principally by the weather. Calves suffering from scours would stay with the dam but also receive electrolytes and sometimes antibiotics and a non-steroidal anti-inflammatory injection.

The cattle close to finishing were housed in late autumn/ winter prior to being sent to slaughter. The aim was to have finished cattle out of the housing which would then be used for calving from principally March to May. Cows are scanned and culled if not in calf. Heifers are given another opportunity.

Calving issues in recent years

Calving ease had only been a problem in a group of Angus heifers when using a particular Limousin bull. Several caesareans had been required. On the whole however most cattle had calved easily with only two dying this year associated with dystocia.

Key changes

The farmer had been building up the herd in recent years. As a consequence of this he had inadvertently introduced BVD and IBR into the herd. He had started a little autumn calving in 2015 and planned for 30 heifer replacements to calve in autumn 2016 to create two distinct calving seasons and to spread the workload. The buildings would be empty in September to allow calving indoors.

As soon as the climate permits cows and calves are turned out after calving

Once calves are past the first few weeks few problems occur

9.5.4. DEFA data evaluation

At the time of investigation, the 2016 calving season was still in progress and absolute data on survival to 180 days for the 2016 cohort are not yet known. However, a dot plot was produced for 512 calf events since January 1st 2014 (Figure 30). The blue points represent a birth event and the red points are the date of death. Those born in 2014 and consigned towards the end of 2015 / early 2016 are the expected finished beef and show age at time of slaughter. The remainder of the red points are those calves that have died or had to be killed on farm. This graph also demonstrates the seasonal pattern in births and shows that the farmer has tightened the spring calving pattern since 2014.

The data also shows that the time between finished cattle leaving the farm (and therefore the farm buildings) and calvings occurring is tight and in the early part of 2016, overlapping.

Figure 30. All calf birth / death events in Herd X since January 2014

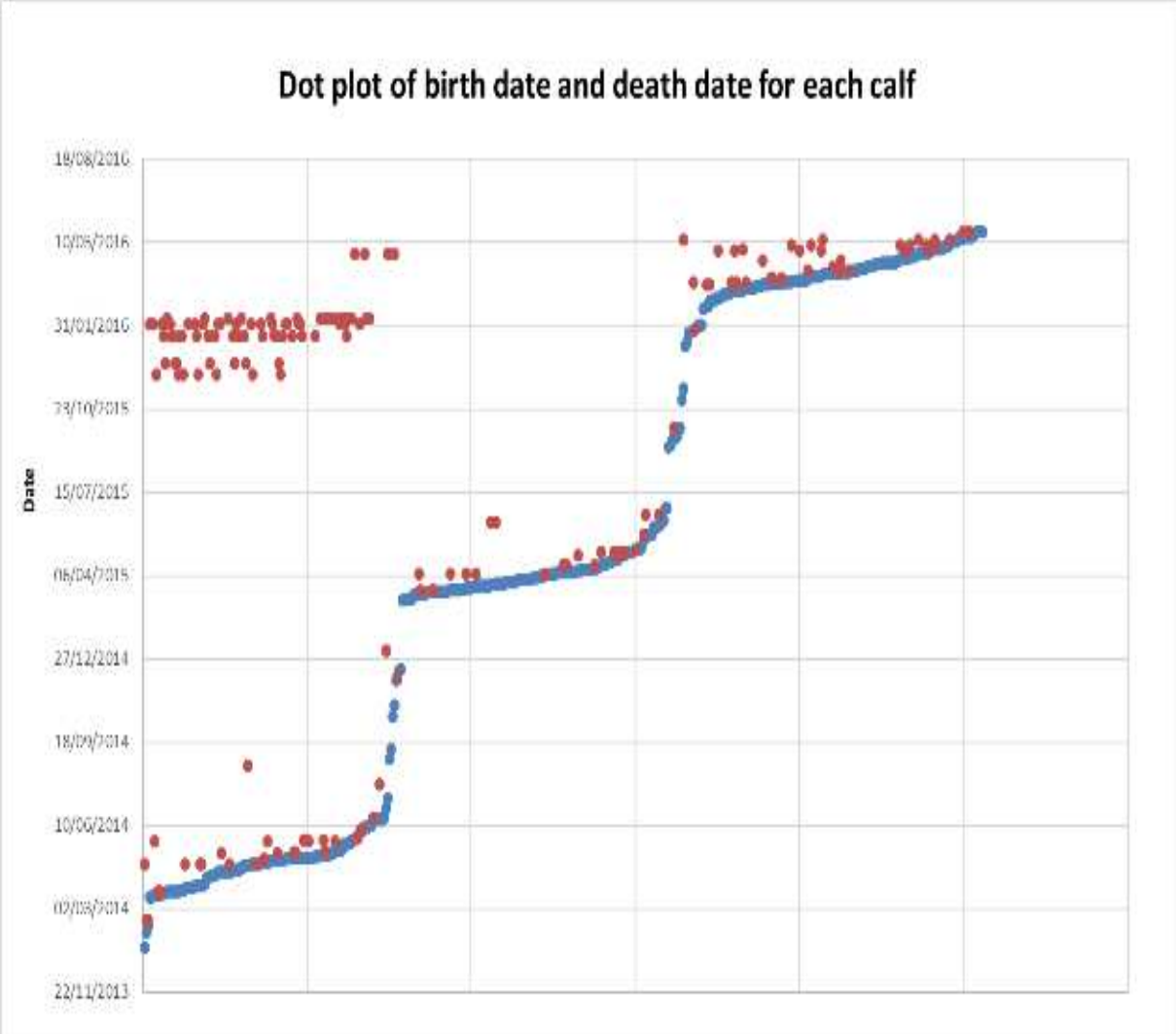
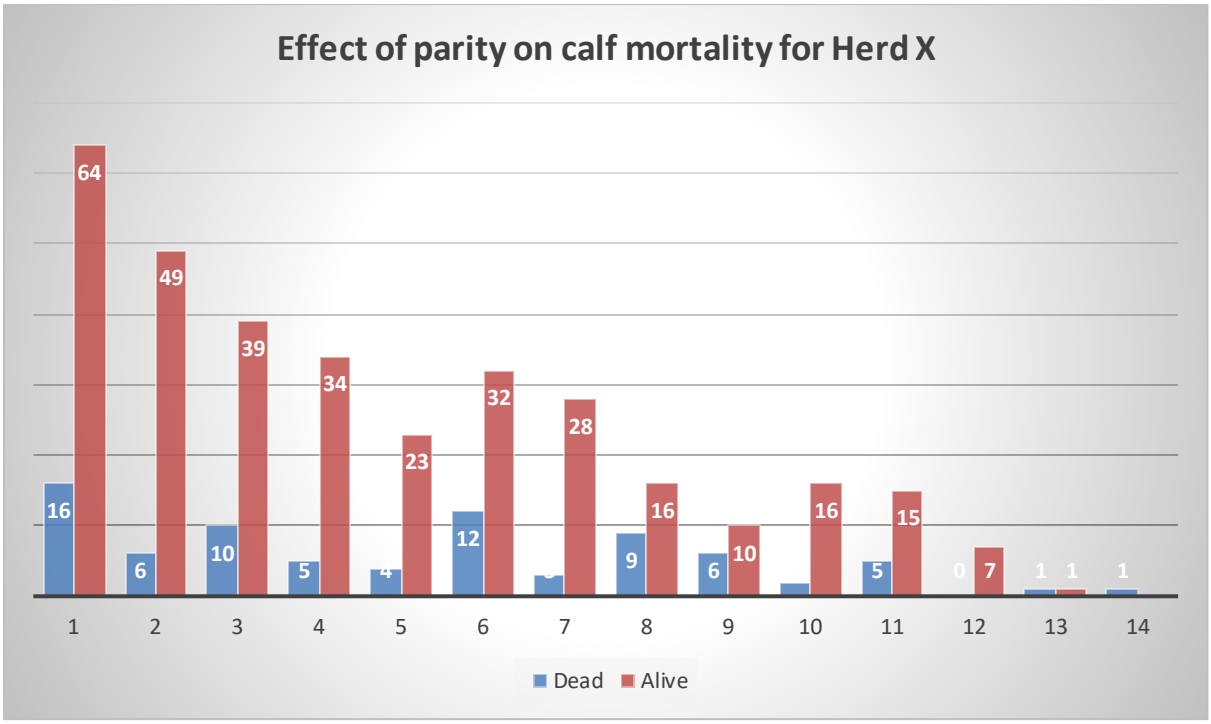


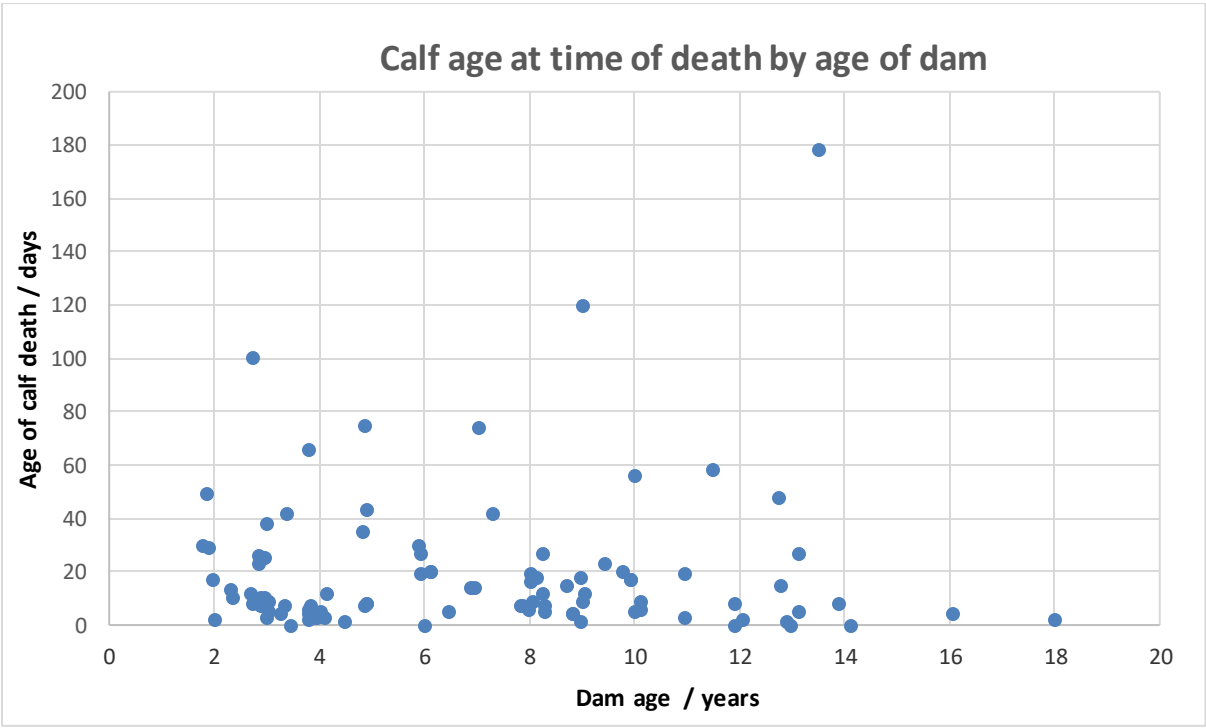
Figure 31. shows the impact of parity with regards to whether calves were alive or dead by 180 days of age. Parity 12, 8 and 6 had the highest proportion of dead calves by 180 days. However, parity 1 and 3 were also high. There was no clear parity effect.

Figure 31. Parity effect on calf mortality by 180 days of age



Similarly, the age of the dam in years bore no association with the timing of calf death (Figure 32).

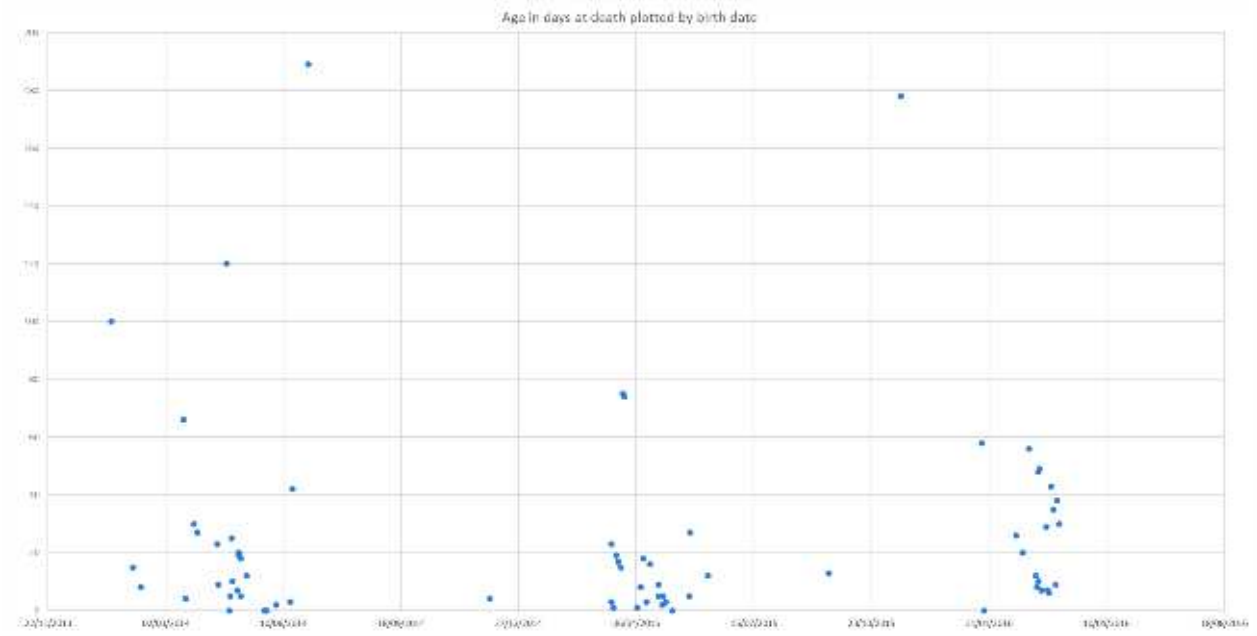
Figure 32. Age of calf at death by dam age at time of birth



The data was looked at over time and the age of death in days plotted against birth date (Figure 33.) Some work suggests that as the end of the calving season is reached in housed calving systems,

mortality increases. However, the data shown in Figures 30 and 33 showed a fairly even spread of loss throughout the calving period.

Figure 33. Age of calf death in days in relation to birth date 2014-2016



Data on 330 births in 2014 and 2015, where calves would have achieved 180 days of age at the time of analysis showed no sex effect (Table 5) for the 59 calves that died over the two years. The farmer reported no major issues with bulls affecting calving ease, one would expect more problems with larger male calves and higher mortality if this had been the case. and the data supported the farmer's observations.

Table 5. Sex effect on calf mortality by 180 days for Herd X

	Sex effect on calf mortality (Herd X)		
	dead	**alive**	
male	33 *31.47* (0.07)	143 *144.53* (0.02)	**176**
female	26 *27.53* (0.09)	128 *126.47* (0.02)	**154**
	59	**271**	**330**

χ^2 = 0.195, df = 1, χ^2/df = 0.19 , P(χ^2 > 0.195) = 0.6588

expected values are displayed in *italics*
individual χ^2values are displayed in (parentheses)

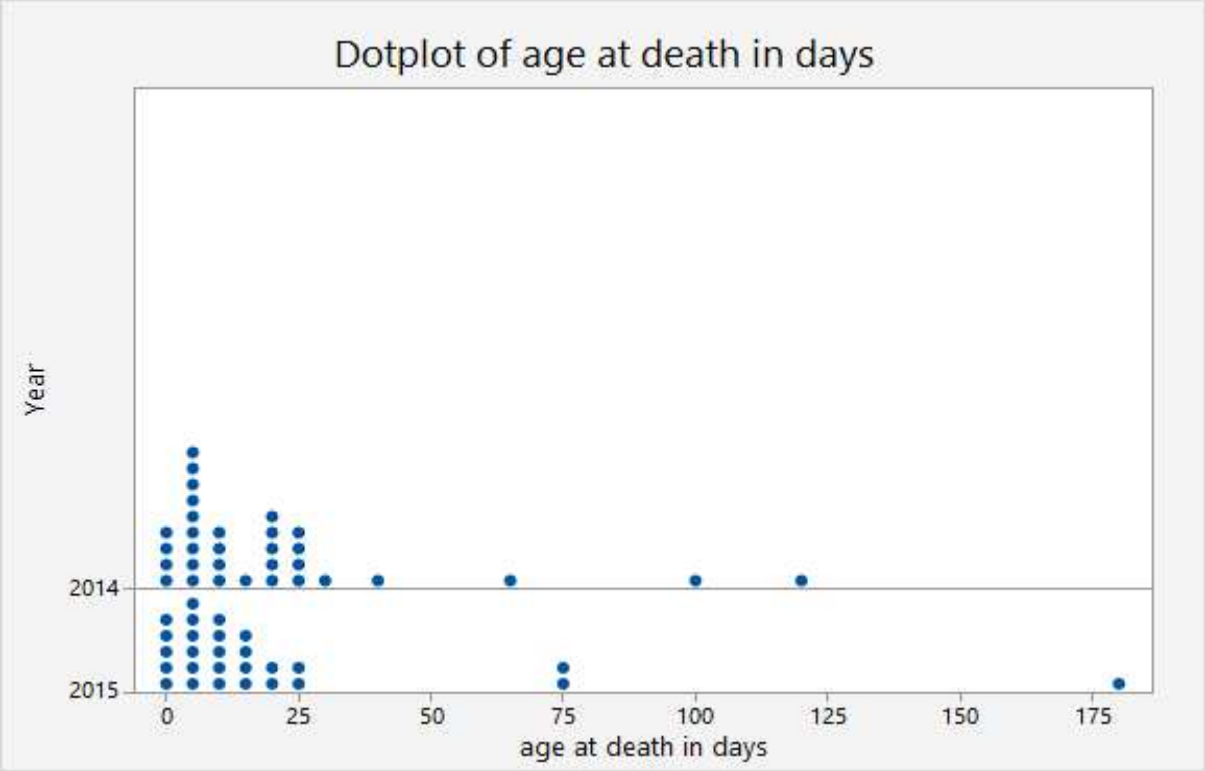
Age at death, as expected, was not normally distributed, median age of death at 9 days and an inter quartile range of 4-20 days (Table 6, Figure 34). Most calves were dying within the first two to three weeks of life. Despite interventions by the farmer after problems with calf mortality in 2014, calves were dying even earlier through 2015 although this was not significantly different between the two years

Table 6. Age at time of death for herd X – all calves 2014 & 2015

Variable	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
age at death in days	59	271	20.407	4.129	31.715	0.000	4.000	9.000	20.000	178.000

Variable	Year	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
age at death in days	2014	32	126	20.469	4.847	27.421	0.000	4.000	11.000	24.500	120.000
	2015	27	145	20.333	7.064	36.706	0.000	3.000	8.000	18.000	178.000

Figure 34. Age at death in days for calves in Herd X



The mortality rates for 2014, 2015 and 2016 to date for Herd X are all much higher than the 6.21% for the national Isle of Man beef herd (Table 7). Stillbirths / late abortions/ death on day 0 amounting to 1% were low. The farmer interview reported he had only lost two calves that he could remember in recent years during the calving process and the data reflected this.

There were a variety of breed types of calves born on the farm, the predominant crosses being Charolais, followed by Limousin and Simmental crosses (Table 8). There appeared to be no breed effect on the outcome of whether calves survived to 180 days or not.

Table 7. Mortality rates 2014- 2016 to date for Herd X

Year	Number born	Number dead	% mortality of total births	Day 0 deaths (includes stillbirths / late abortion)
2014	158	32	20.30%	3
2015	172	27	15.70%	2
2016	182 (to date)	37	20.30%	0
Total (to date)	512	96	18.75%	5

Table 8. Breed type of calves born in Herd X (2014-2015)

Survival to 180 days	Charolais	Charolais cross	Limousin cross	Saler cross	Shorthorn Beef cross	Simmental	Simmental cross
dead	0	38	10	1	0	2	8
alive	2	165	63	1	1	0	40
% death	-	19%	14%	-	-	-	17%

- % not reported if numbers too small

9.5.5. Conclusions

The data presented suggested no specific bull / dam issues. The data indicated there was tight timing between the buildings being emptied by finishing cattle and then being used for calving. Conversations with the farmer indicated that the increase in herd numbers in recent years had put pressure on space and that hygiene at calving had been raised previously by the private vet in addition to issues with IBR. Cryptosporidiosis in calves can be associated with the build-up of disease in constantly used buildings. Hygiene at calving in buildings is key to ensure healthy viable calves. Whilst colostrum is key to conferring protection against infections in early weeks, overwhelming exposure to disease will result in morbidity and mortality. Buildings should be thoroughly cleaned out, disinfected and freshly bedded between finished cattle leaving and cows coming indoors prior to calving.

Where possible individual calving pens can be set up in one building and would lend itself to regular cleaning out and disinfection between calvings as well as supporting appropriate dam/calf bonding and early monitoring of the calf in the first few days. However, by looking at the data for 2015 and 2016 births, the increase in herd size and tightening of spring calving means that this building is unlikely to have sufficient pen areas for the calvings occurring at this time.

The farmer could consider location of the finishing cattle and calving cows. The buildings are very close together and essentially calving cows and newborn calves could be sharing old bedding and air space if there has been no time to clean out the buildings and cattle that have not gone to slaughter are still present in the vicinity. The options for marketing the beef cattle which generate the main income were either selling on in the mart, sending to a single slaughterhouse at finishing or export. Therefore, financially the farmer felt that finishing all livestock himself was the best option. However, with the pressure on buildings and the high calf mortalities being seen he may need to consider an alternative

location for finishing cattle or consider selling as stores. This was all discussed at the time with the farmer. The move to calving the heifers in autumn when buildings had been cleaned out and empty for a number of months could have a positive impact on calf viability in early weeks and it will be interesting to see what happens later in 2016.

The buildings used for finishing and calving (middle left of picture). Cows & calves turned out nearby

This calf has survived but has had a severe growth check

The health status of the herd should be carefully considered by the farmer with advice from his vet, and where appropriate DEFA. DEFA initiated a voluntary BVD control strategy in 2013 and made it

compulsory in 2014. This means all calves, including those born dead and stillborn, have to be tested at birth and live calves can only move from farm after they have been confirmed as negative for PI (persistently infected) status. All PI positive animals cannot leave the farm other than for slaughter and dams of PI positive calves are required to be tested. This is a great initiative by DEFA and a good opportunity to remove a disease previously identified on the farm. IBR positive cattle will be a constant risk and will perpetuate IBR problems on farm irrespective of the use of vaccines; again close consultation with the private vet and other surveillance expertise is necessary.

The lack of post mortem facilities and laboratory extension services made available to farmers elsewhere (for example APHA laboratory surveillance and veterinary advice visits to farms in mainland GB) is an area of concern which does not lend itself to providing the full support that this farmer could benefit from. This may be an opportunity for DEFA / private vets to explore opportunities for enabling / seeking training in basic post-mortems and tissue/fluid sampling for more thorough investigations where problems appear to be persisting.

This case demonstrates the importance of both reviewing the historic data (farmer recollection can only provide so much information) available and in visiting the farm and understanding the resources available and pressure points in the management of the business when trying to understand persistent issues with calf morbidity and mortality.

9.6. Summary

The data provided by Isle of Man Government demonstrates the value of what can be done with national data sets and potentially how it can support farmers in bench-marking performance in areas such as calf mortality. Whilst the initial driver for compulsory tagging of aborted and stillborn calves was the compulsory BVD control strategy introduced on January 1st 2014, this has provided a unique data set for the calves born on the Isle of Man since 2014.

The data confirms previously reported work including the increased risk of male death in the beef sector before the age of 6 months. However, it also reports findings at odds with other reports; the slight increase in risk of calf mortality from heifer and second parity births is not significant when compared with other multiparous cows on the Isle of Man. It is possible that closer attention to heifer management, appropriate bull use and calving management of heifers and young cows can and has improved calf survival to 6 months.

The case study demonstrates the value of being able to review the records associated with compulsory record and registration requirements. These records, intended initially for food traceabiltity and more recently for a compulsory BVD control strategy, can be turned into a positive tool to support the farmer. The future challenge is facilitating the process of turning the raw data available on Government databases into meaningful outputs for provision to the farmer and the advising private vet.

From a UK data perspective, there needs to be better ability to identify holdings which produce and rear dairy and beef calves. Breed identification as a beef or dairy type does not always predict the animal use and means a certain lack of plausibility with data sets or means setting exclusion criteria to the national data set when evaluated which will exclude a high proportion of farms.

Chapter 10. Conclusions & Recommendations

10.1. Conclusions

- Beef farmers are more likely to consult peers or rely on their own knowledge / experience than use veterinary or other specialists when considering changes to the beef business.

- Whilst there were examples of veterinary skills and support being effectively used on a regular basis by some businesses, with positive outcomes, there continues to be a disconnect between what the vets can offer in terms of skills and knowledge and what the farmer makes use of.

- There was a very individual attitude and approach to record-keeping and how it was valued in the beef business. Without the introduction of minimum standards (either through laws or schemes) some farmers would have no records at all and be quite content with that. In contrast farmers who kept very detailed records had been doing so for a long period of time and ahead of any minimum requirements introduced in recent years.

- Some of the national led data recording schemes may help contribute to the wider evidence base but only if its value is acknowledged and this is made easily accessible for the farmer, vets, government advisers and industry bodies.

- Other than calving ease data, which was usually only recorded against the dam records, many farms had sparse data associated with the calf in its early life up to weaning.

- A lack of data on calf events meant that the value of colostrum provision could not be completely evaluated at farm level and relied solely on farmer recollection / opinion.

- Most farmers recognised the speed with which it was necessary to ensure colostrum was taken by the calf and would describe their procedures in deciding when a calf may need to be supported to take on colostrum or be given supplementary colostrum. Farmers were less knowledgeable on appropriate volumes and frequency of administration.

- Some farmers admitted they had neither the time, resources nor money to manage problems associated with calves at calving or in their early life and there was an element of a "survival of the fittest" expectation for some beef businesses.

- The data provided by Isle of Man Government demonstrates the value and potential of what can be achieved with national data sets and how it can support individual farmers in bench-marking and evaluating performance in areas such as calf mortality.

- Data outputs are only as good as the data inputs and the quality of and the manner in which the data is collected and recorded impacts on its usefulness to the farmer, Governments and wider industry.

10.2. Recommendations

- Vets and other specialist expertise should be exploited further at farm level to support decision-making on changes to the farm business. Vets need to positively demonstrate how they can add value to a farm's productivity as well as improving health and welfare of the herd.

- Government / Assurance / Retailer schemes should demand minimum requirements on data recording if the wider / global industry wants to see the complete picture and evaluate the economic benefits / drawbacks of changes in management procedures at farm level.

- Mandatory record requirements may be necessary in areas of market failure i.e. where there is an identified need from an animal protection (animal health / welfare) perspective but the requirements may add cost or in situations where the profit / value / underlying benefits to the farmer are not immediately evident.

- Governments and Assurance / Retailer schemes should facilitate the process of turning minimum recording requirements into meaningful outputs for the farmer, the advising private vet and the wider industry.

- Farmers need to record more detail on calf events to add to the current limited evidence base used for justifying calf management decisions.

- Farmers, vets, Government & herd / health / assurance scheme owners need to work together to improve the quality and accuracy of how data can be recorded, evaluated & then reported on if they want that data to support the wider evidence base on cattle health and welfare.

Chapter 11. After my study tour – the carrot or the stick?

Since returning from my Nuffield Farming Scholarship study tour I have reflected on what is done by farmers and vets in the UK and it has helped me appreciate some things we do have in the UK:

- minimum data records we expect farmers to collect and record, which can add value for the wider evidence base, but only if we make effective use of them;
- accessible laboratory and post mortem surveillance services for farmers and vets for most farmers;
- excellent academic and research institutes that support and add value with regards to the global evidence base for cattle health and welfare and can support the wider global surveillance and One Health programmes;
- legislation that ensures animal welfare needs despite the costs associated with required minimum practices;
- country stability that allows farmers to farm as they want (within the law) without risks to their lives or livelihoods.

However, it also made me realise that there is much we can do to improve our knowledge and evidence base, both in terms of existing data being collected and with future-proofing data quality to meet the wider One Health concept, which also includes animal welfare issues such as calf mortality and herd longevity.

- Simple actions such as the compulsory BVD control strategy on the Isle of Man will not only focus the country on achieving BVD freedom but has led to a complete data set that included information on abortions and still births;
- The Irish genomics programme has gone some way to incorporating welfare issues, such as calving ease, but there are further opportunities within various scheme databases to record, evaluate and promote the improvement of animal welfare related issues such as calf mortality.

The study tour has also massively reinforced a concept strongly promoted by the Farm Animal Welfare Committee and the UK Government: that good stockmanship is key to promoting and improving farm animal health and welfare. However, just as knowledge in other areas is constantly evolving and improving, it is the same with cattle health and welfare.

- As new knowledge and information becomes available, vets and the wider industry need to have the skills in place to be able to impart that knowledge to farmers in a way that it will be accepted and positively adopted.

Farmers are all individuals and this means that sometimes you can only ensure change occurs across the board by defining minimum standards or requirements. This is because whatever evidence you present them, some refuse to change what they consider traditional practices and therefore, in their eyes, acceptable.

The experience has focussed me very much on promoting the wider use of Government data, this is timely considering the current promotion of Open Data sharing promoted in the UK. It has also made me think more about how I can share my own knowledge positively so that it actively translates into

practice rather than using my knowledge in the courts in an adversarial manner after things have gone wrong.

I presented some of my findings in poster format at the First International Conference on Human Behaviour Change for Animal Welfare in September 2016. Some of the excellent presentations on achieving human behaviour change have made me rethink how we currently try to encourage welfare compliance in the UK.

Chapter 12. Acknowledgement & Thanks

I would like to acknowledge the opportunity that the Nuffield Farming Scholarships Trust (NFST) has given me by awarding me this scholarship. The path to starting the scholarship, once awarded, was not an easy one and it has also ended with more difficulty than I had expected. I thank the NFST, and in particular Mike and Poey Vacher and Anne Beckett, for their support and encouragement, particularly during these times.

Without sponsorship by AHDB Beef and Lamb the study project would have been impossible. I particularly extend my thanks to Clive Brown who was not only my sponsor contact during the study, but also was responsible for getting the first AHDB Beef & Lamb sponsorship agreed by AHDB at a time when the industry body was undergoing significant change. It would have been easy to say no and I thank AHDB for saying yes.

With a veterinary background and no family farming background to speak of, the NFST programme has not only given me the opportunity to study a subject close to my heart, it has educated me on the wider farming and agricultural industry in a way I had never been exposed to before. I actually got excited about soil biology and feel I am slightly better able to hold a sensible conversation with an arable farmer. However, my knowledge of tractors and various attachments to large shiny machines has not improved. I still have a lot to learn!

There are a huge number of individuals for me to thank for various levels of help, from sourcing me country contacts to giving me bed and board to telling me all the details about how they ran their farm. This list below is not complete, some people I never learnt their name, one in particular who would not let me on his farm, but I still learnt a lot from the experience and his comments about vets are in this report! Some didn't choose to disclose their name. For others their herds are just a number and I only personally met a handful of them but have presented the outputs of their sometimes reluctantly entered data inputs into some real outcomes. I thank them for making that effort and hope it encourages them to value the data they are supplying to their Government.

GB	**Northern Ireland**	**Ireland**	**Serbia**
NFST AHDB Beef & Lamb Clive Brown (AHDB) Mike & Poey Vacher Lindsay Woods Aarun Naik NSch Dr Mike Appleby Prospect Edinburgh (Dick) Vet farm practice Martin Tomlinson James Patrick Crilly Dr Alex Corbishley James Oswald Siobhan Mullan Tim Farrow	Trevor Alcorn NSch Barbara Alcorn DAERA (formerly DARD) Linden Foods & farmers supplying Linden foods Siobhan Kyle (DAERA) Sam Chesney (demo farm for CAFRE) Trevor Sommerville Arthur Kelly Larry Nugent Kevin MacGarvey	Joe Burke NSch Tim Meagher James Greer Mr Wise Robin & Anne Talbot Ardlea Pedigree Limousin / Dan Tynan Joe Brennan	Министарство пољопривреде и заштите животне средине Danijela Kozomora Snezana Bjelica Sinisa Milic Miroljub Marjanovic

Isle of Man	New Zealand	Australia & Tasmania	Colombia
DEFA & all the beef/dairy farmers on the island Stuart Jacques Richard Ashworth Andrew Willoughby Costain & Son	MPI NZ Will Morrison Beef & Sheep NZ James Rogers Mark Chrystall Phil & Lynn Barnett Paul Olsen NSCh Tautane Station manager	Bernadette Mortensen NSch Andrea Galea Thomas Snare NSch John Bruce, Western Plains Farm Killara Redpa Farm Shanford Park Angus Landfall Farms Wisedale Farm Riverwood Farm Matt Urban, Urban Angus Silver Valley Estate – Square Meater Josie Archer PL & DF Saward	USDA Conrad Estrada Roberto Guzman Fundacion Bioethos Colombian Journey German Castro Rancho Alegra Rosario La Reforma Iraca Rafael Lopez Ramirez Hacienda la portada del sol Ruben Londono La Cristralina and Villa lorena

There are a number of Nuffield Farming Scholars who went beyond the normal peer support: Bernadette Mortensen and her lovely family (Australia) providing bed, board and farms for me to visit, including your sister's cattle; Tom Snare (Tasmania) who set up all my visits, provided a roof over our head and drove me and husband to all the farms; Trevor and Barbara Alcorn (Northern Ireland) who gave me a roof and fed me;

I need to give special thanks to my parents who helped with childcare in my absence including my Mum and step-Dad (Elly & Alan King) and my Dad and step-Mum (Ray and Lin Baish). In particular for trips around New Zealand, Australia and Tasmania, I left my three youngest children with my brother and sister-in-law in Bulls, New Zealand for the best part of five weeks. I thank them heartily for a particularly big chunk of child care as well as thrilling them with 'gator rides on the farm.

I couldn't have done it without the family support in New Zealand!

Finally, I could not have done any of this without the support of my long-suffering husband Rich for taking on the bulk of the child care, emotional support and household chores in my absence. Rich you have also had to deal with my frustrations and problems at the start and end of the project, as well as being primary project editor before submission to the official editors, when we both have extremely demanding jobs. I hope I can give you the same level of support with your Epidemiology MSc over the next few years.

The close family support includes my older children Laila, Amber, Zak, Yasmin, Rhianna and Sol (and partners Josh, Cameron, Georgia and Rich coerced when necessary) and my not so little sister Georgie-Anna who have similarly helped with childcare, shopping, cooking, cleaning, entertainment, day trips and outings with the younger children when I haven't been there or I have been tied up with data analysis or project writing.

To all my children: Yasmin, Rhianna, Laila, Amber, Zak, Sol, Islay, Campbell and Skye, and since my Nuffield started, my first grandchild Faye, I apologise for not always being there in the last 18 months. Most of you missed out on a proper holiday away in the last two summers although the three youngest benefited from a trip to New Zealand and experienced family dogs, chickens, cattle, goats, horses, a single sheep, rescuing a baby hedgehog, spending time with your Kiwi cousins and a farm life for 5 weeks. So, I hope you saw some positives as well as learning to swim. I promise I will have more time and we will have a proper holiday in 2017!

Chapter 13 – Appendices

13.1. - Glossary

AFC – Age at First Calving

AI – artificial insemination

Anderson-Darling test – this is a statistical test to check whether a group of data follows a particular distribution or not. It is typically used to check for a "normal" distribution which determines which descriptive or further statistics can be used on the data collected. For basics statistical descriptors we would use the "mean" for normally distributed data and the "median" for other distributions

APHA – Animal and Plant Health Agency, UK

APHIS – Animal & Plant Health Inspection Service, USDA, United States

BDGP – Beef Data Genomics Programme – beef farmers claiming an Irish suckler (beef) cow subsidy are required to record specific data under this programme

Calving index – the herd average calving interval

calving interval – the time between successive calvings

DAERA – Department of Agriculture, Environment & Rural Affairs, Northern Ireland (formerly DARD)

DEFA – Department of the Environment, Food and Agriculture, Isle of Man Government

DEFRA – Department for the Environment, Food & Rural Affairs

EBV – Estimated Breeding Value

ET – Embryo Transfer

FAWC – Farm Animal Welfare Committee (Council prior to 2011)

FEDEGAN - Federación Colombiana de Ganaderos (Colombian Federation of Cattle Farmers)

IQR - "Inter-quartile range" - a measure of the spread of a group of values equal to the difference between the upper limit for the lower quarter and the lower limit for the upper quarter

Mood's Median Test - this is a non-parametric statistical test which compares two or more data samples. It can be used when comparing samples which may have different distributions, for example in this project the AFC for *Bost taurus* was not normally distributed whilst *Bos indicus* was. This test compares the median values of the samples, which allows for the different distributions.

OIE – World Organisation for Animal Health

PI – persistently infected animal with Bovine Viral Diarrhoea (BVD) virus

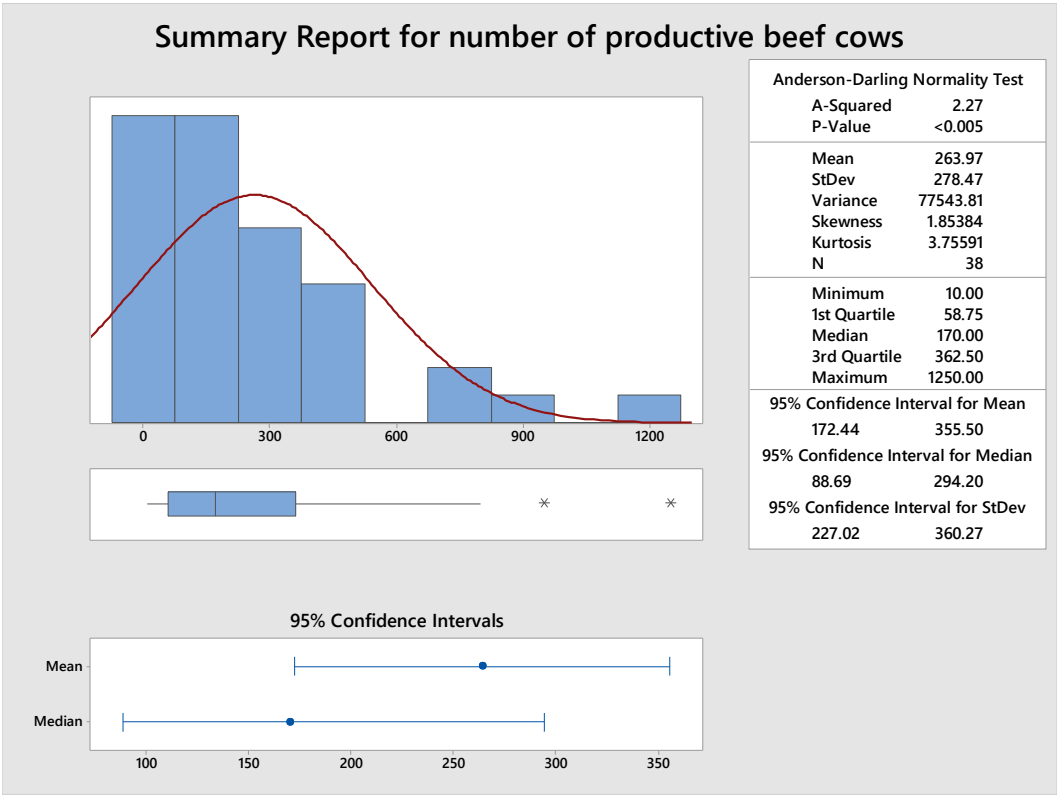
POM-VPS – this is prescription-only medicine – however it can be prescribed by a veterinarian, pharmacist or suitably qualified person e.g. at agricultural supplies. Its use must still be recorded. Examples include anthelmintics (wormers) such as ivermectin and probiotics such as Provita protect

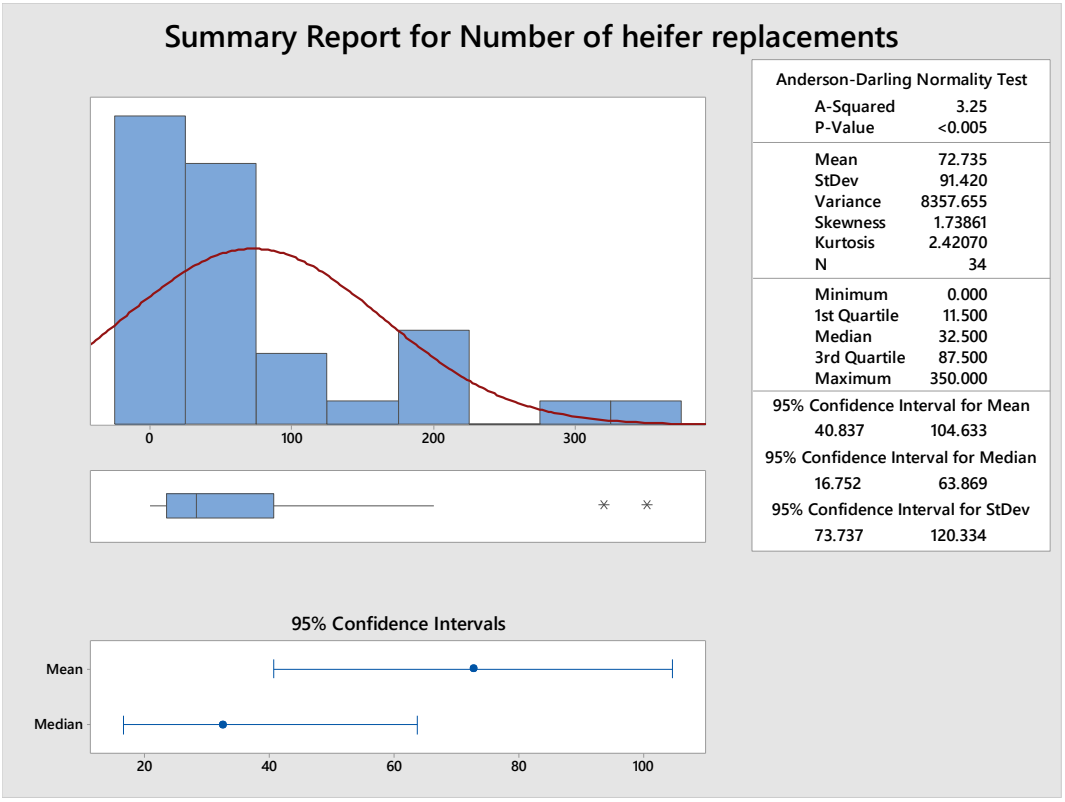
Thematic Analysis – is a way of identifying themes and patterns from qualitative data sets. This allows the "messy" reality of quite individual responses to questions to be organised into groups of similar responses. This should only be done with a full understanding of the context of the questions and answers.

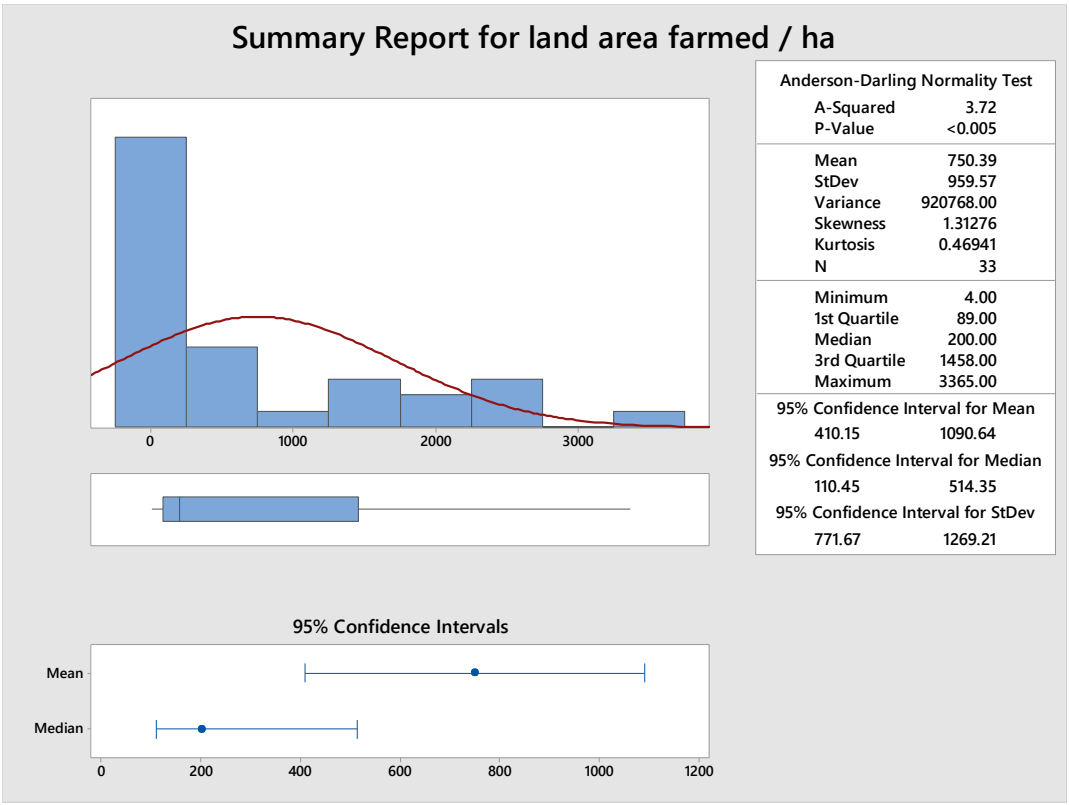
USDA – United States Department of Agriculture

13.2. Appendix 2 - Detailed data

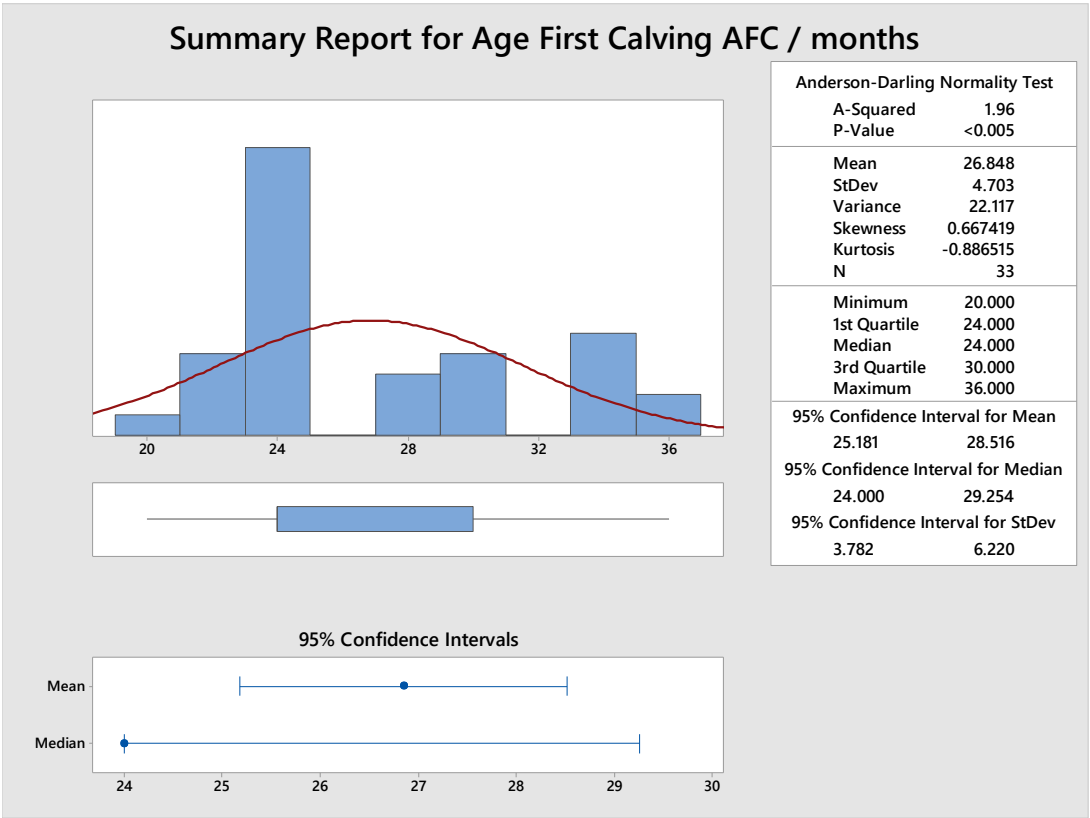
13.2.1. Base line data on beef farms







13.2.2. Age at first calving



Where a farmer provided a range of age at first calving, for example 22-24 months, the mid-point. (23 months) would be taken for the purposes of this analysis. Note that this is farmer-quoted data and not raw data.

As expected the data was not normally distributed. There was some variation within herds if they ran a commercial and pedigree herd. The pedigree animals would be left to nearer three years of age whereas commercial animals more likely to be calved at 24 months of age. This would explain the non-normal distribution.

The median (most frequently) reported aged for age at first calving was 24 months.

This data represents both *Bos taurus* and *Bos indicus* types. When each group was checked using Anderson-Darling method, it suggested they had different distributions. Therefore, the data could only be compared using a Mood's median non parametric test:

```
Mood's median test for Age First Calving AFC / months
Chi-Square = 3.41    DF = 1    P = 0.065

                                      Individual 95.0% CIs
Breed type    N≤  N>  Median  Q3-Q1    -+---------+---------+---------+-----
Bos indicus    1   4    30.0    7.5     (----------------*----------------)
Bos taurus    18  10    24.0    6.0     *---------)
                                        -+---------+---------+---------+-----
                                       24.5      28.0      31.5      35.0

Overall median = 24.0
* NOTE * Levels with < 6 observations have confidence < 95.0%


A 95.0% CI for median(Bos indicus) - median(Bos taurus): (0.0,12.0)
```

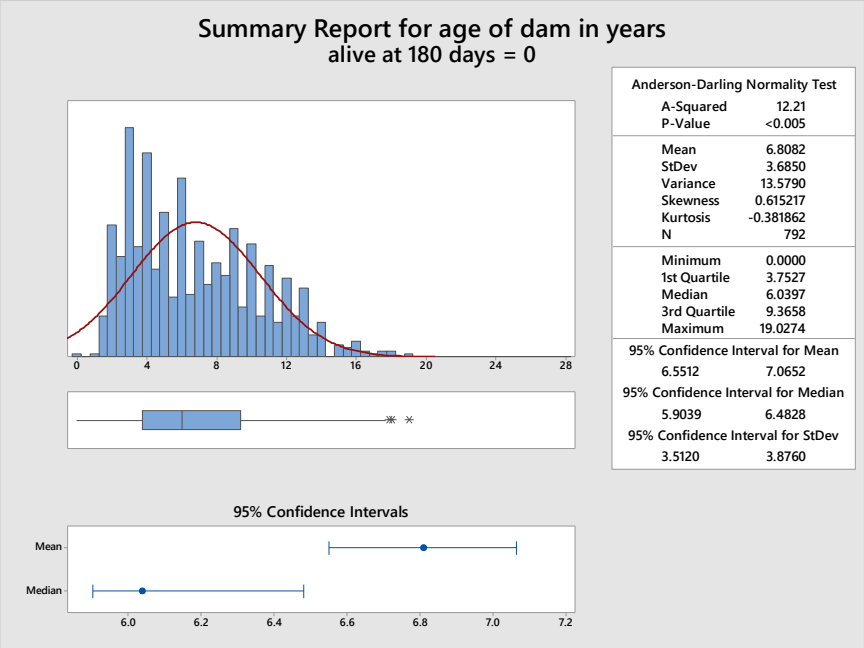
Despite dealing with a much smaller number for farms there was a clear difference (non-significant trend) between *Bos indicus* and *Bos taurus* types for AFC.

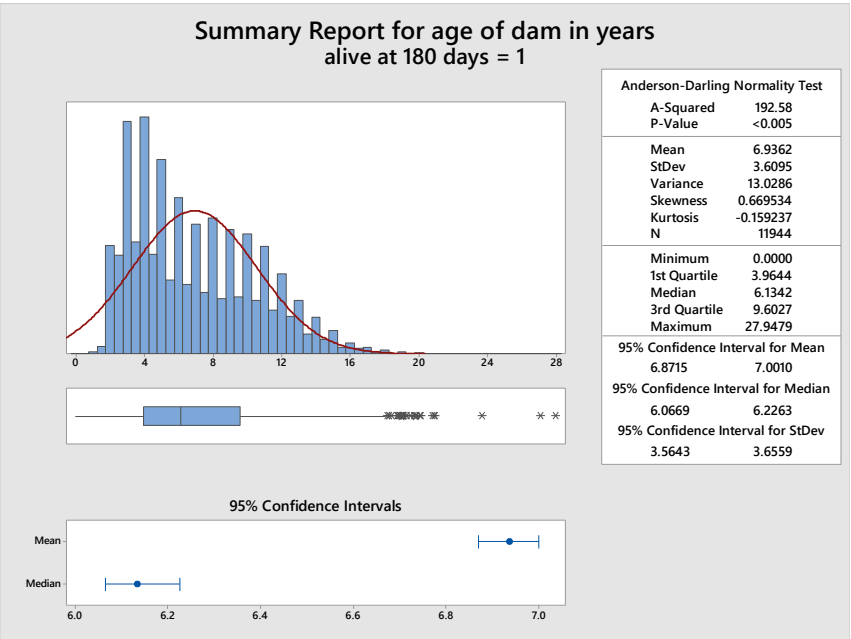
13.2.3. Colostrum volume at first feed vs whether repeats feed

```
Variable                  repeat feed?           N  N*   Mean  SE Mean  StDev
Minimum     Q1
Colostrum volume  first                          4   7  0.625    0.161  0.323
0.250  0.313
                          depends                9   0  1.694    0.256  0.768
0.250  1.000
                          no                     3   0  2.000    0.500  0.866
1.000  1.000
                          whatever packet says   0   3      *        *      *
*      *
                          yes                   10   2  1.500    0.236  0.745
0.500  0.875

Variable                  repeat feed?         Median     Q3  Maximum
Colostrum volume  first                         0.625  0.938    1.000
                          depends                2.000  2.250    2.500
                          no                     2.500  2.500    2.500
                          whatever packet says       *      *        *
                          yes                    1.500  2.125    2.500
```

13.2.4. Age of dam and calf survival

```
Kruskal-Wallis Test on age of dam in years

alive at
180 days      N  Median  Ave Rank      Z
0           792   6.040    6205.7  -1.29
1         11944   6.134    6379.3   1.29
Overall   12736            6368.5

H = 1.66  DF = 1  P = 0.198
H = 1.66  DF = 1  P = 0.198  (adjusted for ties)
```





13.2.5. Sex effect and calf survival

Beef (all Isle of Man births Jan 1st 2014 – 30th September 2015)

	sex effect on beef calf survival to 6 months		
	dead	**alive**	
male	447 *400.42* (5.42)	5992 *6038.58* (0.36)	**6439**
female	345 *391.58* (5.54)	5952 *5905.42* (0.37)	**6297**
	792	**11944**	**12736**

χ^2 = 11.689, df = 1, χ^2/df = 11.69 , P(χ^2 > 11.689) = 0.0006

expected values are displayed in *italics*
individual χ^2values are displayed in (parentheses)

Dairy (all Isle of Man births Jan 1st 2014 – 30th September 2015)

	sex effect on calf survival to 6 months		
	dead	**alive**	
male	1089 *689.36* (231.69)	1842 *2241.64* (71.25)	**2931**
female	305 *704.64* (226.66)	2691 *2291.36* (69.70)	**2996**
	1394	**4533**	**5927**

χ^2 = 599.301, df = 1, χ^2/df = 599.30 , P(χ^2 > 599.301) = 0.0000

expected values are displayed in *italics*
individual χ^2values are displayed in (parentheses)

13.2.6. Calf breeds represented on Isle of Man

ABERDEEN ANGUS
ABERDEEN ANGUS CROSS
BEEF CROSS
BELGIAN BLUE
BELGIAN BLUE CROSS
BELTED GALLOWAY
BELTED GALLOWAY CROSS
BLONDE D'AQUITAINE
BLONDE D'AQUITAINE CROSS
CHAROLAIS
CHAROLAIS CROSS
CHIANINA CROSS
DEVON
DEXTER
GALLOWAY
GALLOWAY CROSS
HEREFORD
HEREFORD CROSS
HIGHLAND
HIGHLAND CROSS
HOLSTEIN
HOLSTEIN BRITISH
HOLSTEIN CROSS
HOLSTEIN FRIESIAN
HOLSTEIN FRIESIAN CROSS
KERRY
LIMOUSIN
LIMOUSIN CROSS
LOWLINE
NORTHERN DAIRY SHORTHORN
PARTHENAIS
PARTHENAIS CROSS
PIEMONTESE
PIEMONTESE CROSS
SALER CROSS
SHETLAND
SHORTHORN BEEF
SHORTHORN BEEF CROSS
SHORTHORN DAIRY
SIMMENTAL
SIMMENTAL CROSS
SOUTH DEVON
SOUTH DEVON CROSS
STABILISER
STABILISER CROSS
WHITE PARK

A very small number of dairy types or crosses were recorded as present on beef farms (less than 20 of all 12,736 "beef farm" births recorded). This specific data has not been verified as correct as to whether these were a few dairy types being used as beef dams for example, the odd house cow being retained or erroneous data entry but the numbers were considered too small to impact on the overall data set and were left in the evaluation since the farms were listed as beef.

13.2.7. Interview document for farmers

Farmer questionnaire (national /international)

Explanatory notes

The first table - - open questions

Second table - detailed questions about records kept about beef sucklers / calves.

Third table – colostrum provision

Fourth table – mortality & disease monitoring in pre-weaning calves

Fifth table – details on the farmer, farm , location (GPS if possible), herd size, hectares, private vet etc permission to contact private vet

The questions must follow this order

	Question	Response
1.	What is the first thing that comes into your head when mention is made of your private veterinarian or veterinarian practice?	
2.	Can you tell me for this country / county are any visits to your farm carried out by Government veterinarians or inspectors OR does your private veterinarian carry out all official inspections on the Government's behalf? (examples notifiable disease / pre-export checks / compulsory endemic disease control programmes)	
3.	Do you feel any differently towards a Government veterinarian undertaking these checks in comparison to your own private veterinarian doing this official work)?	
4.	Thinking only about your beef enterprise, What do you feel your private veterinarian contributes to advising on the management of animal health & welfare issues on your farm? e.g. are you using your vet mostly for emergency treatments or do you have pre-planned herd health / fertility visits	
5.	If you have any other farmed livestock enterprise on the farm, do you view your vet's role any differently for other livestock species? e.g. difference in planned / herd health visits if applicable	

6.	Do you use a vet for pets/ companion animals? Is this fairly common practice in your country? If yes, Do you use the same veterinarian / veterinary practice (mixed practice) or do you use a different veterinarian for your companion animals & why? Do you feel any differently towards your companion animal veterinarian when compared to your farm animal veterinarian?	
7.	When you introduce yourself to somebody what do you call yourself in relation to your day to day work? e.g. beef farmer, an arable/broadacre farmer with a beef side line, small holder, hobby farmer etc	
8.	Can you explain how the beef enterprise contributes to the overall farm business and its profitability? e.g. main business, part of multi-livestock, small part of business, hobby	
9.	Thinking only about your beef enterprise what do you feel your private veterinarian contributes to the economics or profitability of the enterprise?	
7.	Thinking only about your beef enterprise who makes the decisions about changes in management / direction of the business?	
8.	Thinking only about your beef enterprise, how much control do you feel you have over decisions made regarding changes to how you manage / run your beef cattle enterprise?	
9.	If you were considering making management changes to your beef business, who would you seek advice from? If you are intending to make changes in the near / mid-term future can you please briefly describe as an example of what you have done so far and who you have sought advice from	
9 a)	*(only if <u>not</u> mentioned at 9)* Would you ever include your private vet or an official Government vet / inspector in this decision-making process?	

	If so, in what types of circumstances?	
10.	Have you ever made changes that you did not want to make / did not feel would be beneficial to the business? If so, what were these and why did you go ahead with them? What happened as a result of the changes & how do you feel now about this change / these changes?	
11.	Have you ever changed your private veterinarian or veterinary practice. If yes, Are there any particular reasons you made this change?	
12.	How do you feel the keeping of herd records can contribute to decisions on making changes in business either at an individual animal or herd level?	
13.	How do you feel the keeping of herd records can contribute to the profitability of the beef business?	

We are now considering more specific questions around the management of your beef enterprise

14. Record keeping

	Please tick/indicate yes to all that apply				
Record type	Do not record / not applicable	Record because it's a law / official requirement	Record because it is a retailer / assurance / contract requirement	Record because you feel it is beneficial for your business	Please comment on whether you actively use the records for decision-making regarding individual animal(s) / groups or herds / procedures / changes to business / animal management activities. Please comment in box or on additional comments page any targets you

					may use for specific records
14 a All animals					
Individual animal identification					
Births					
Deaths					
Movements on to farm					
Movements off farm					
Requirement to notify or send certain records officially to Government / region					
Whole group / herd treatment e.g. vaccines, anthelmintics (wormers)					
Individual animal treatment					
14b cow records					
Record type	Do not record / not applicable	Record because it's a law / official requirement	Record because it is a retailer / assurance / contract requirement	Record because you feel it is beneficial for your business	Please comment on whether you actively use the records for decision-making regarding individual animal(s) / groups or herds / procedures / changes to business / animal

					management activities. Please comment in box or on additional comments page any targets you may use for specific records
Lameness					
Mastitis					
Other disease / health events					
Suckler cow dystocia (difficult calving) – cow record					
Assisted calving for reasons other than dystocia					
age at 1st calving (if rearing own replacements)					
Calving interval (cow)					
Calving index (whole herd average calving interval)					
Calving spread (time from 1st to last calf born within season)					
Service records (AI / natural)					
Herd replacement rate					

14c Calf records					
Record type	Do not record / not applicable	Record because it's a law / official requirement	Record because it is a retailer / assurance / contract requirement	Record because you feel it is beneficial for your business	
Calf dystocia (difficult calving) – calf record					
Colostrum supplementation					
Disease records eg diarrhoea, respiratory					
Weights (indicate age if done)					
Mortality rates (include age ranges for which this is done)					

Please ignore question 15 if you do not practice colostrum supplementation in your beef suckler herd

15. If you supplement colostrum to beef calves can you explain in more detail:		
Question	Prompt	Response Yes / No / Detail as necessary
a. When do you decide you need to provide supplementary colostrum?		
	Difficulty standing within….. hours?	
	Failing to suck within ….. hours?	

	Cow rejection of calf or other suckler cow issues?	
	other	
b. What colostrum do you provide?	dam's?	
	colostrum from own dairy or local dairy farm?	
	colostrum from dairy cow vaccinated against neonatal calf disease e.g. Rotavirus / E.coli?	
	whether it is first drawn colostrum?	
	or colostrum taken within certain time of calving?	
c. Volumes of colostrum provided and in what time frame	Number of litres? Within how many hours of birth? Repeated?	
d. How do you deliver supplementary colostrum?	Teat ? Stomach tube?	
e. Do you keep records of the calves receiving supplementary colostrum? If so are you able to monitor disease / mortality / growth in these animals separately to the rest of the calves? Do you notice any difference in performance?		

16. Monitoring disease & mortality in calves & treatments		
Question	Prompt	Response Yes/ No / Comment
a. How do you monitor mortality rates in pre-weaning calves	Don't really keep these record	
	Recording total number that die / found dead before weaning and calculating from expected number of calves in group /herd	
	Records kept from birth. Record total number of those that die between birth & weaning (not recording stillbirths)	
	All records including stillbirths are kept	
	All records kept (with or without stillbirths) are monitored and reviewed at distinct age ranges eg peripartum (around the time of birth) / 6 weeks / 3 months / 6 months	
b. Do you set targets for mortality in your calves at specific ages including weaning		
c. How do you monitor and act on disease in your calves, including any preventive interventions e.g. vaccination / worming?	Respond to specific disease eg diarrhoea / pneumonia and treat reactively	

	Actively give prophylactic / preventive treatments / vaccines etc according to specific need / climatic impacts / known disease presence (give details)	
	Keep records of calf problems and monitor incidence / have targets	

Farm Information

Farm information	**Response**	**Further comment**
Country		
Farm name / address / region		
GPS Location or Google map link		
Farmer / stockperson interviewed during visit or completing questionnaire & role in business eg stockman / owner etc		
Number of productive beef suckler cattle (approx.)		
Number of heifer replacement sucklers (approx.) (if present)		
Number of beef growers / finishers (if present)		
Farm size (hectares or acres)		
Principle farm enterprises indicating the most important to least important from a profitability perspective		

Private vet name and address		
Vet contact details (only if you are willing to provide this contact to allow me to ask them some general questions about how they believe they approach giving veterinary advice / support to beef enterprises – they will not be aware of your responses to this questionnaire)		
Please indicate if you are willing for me to ask specific questions about how you / this farm specifically responds to veterinary advice. (again neither party will see the responses of one another answers to the questionnaire)		
Please indicate if you are willing for me to agree to access to any private vet practice records that may be held in association with this farm in relation to cattle records including numbers births / deaths / treatments		
Please indicate if you are willing to agree for me to access to any national / Government records that may be held in association with this farm in relation to cattle records including numbers births / deaths		

Chapter 14 – Bibliography & other information sources

(where internet links are provided these were last checked in July 2016)

Beef2Live: http://beef2live.com/story-colombia-beef-cattle-information-0-106693

Bustin SA, Nolan T. Improving the reliability of peer-reviewed publications: We are all in it together. Biomol Detect Quantif. 2015 Dec 28;7:A1-5.

Cooke RF. Bill E. Kunkle Interdisciplinary Beef Symposium: Temperament and acclimation to human handling influence growth, health, and reproductive responses in Bos taurus and Bos indicus cattle. Anim Sci. 2014 Dec;92(12):5325-33.

COUNCIL DIRECTIVE 98/58/EC of 20 July 1998 concerning the protection of animals kept for farming purposes http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31998L0058

Council of Europe RECOMMENDATION CONCERNING CATTLE 1988
http://www.coe.int/t/e/legal_affairs/legal_co-operation/biological_safety_and_use_of_animals/farming/Rec%20cattle%20E.asp#TopOfPage

DEFRA, UK (statistics), 2008

European Commission; EU neighbourhood policy; EU enlargement policy: Serbia
http://ec.europa.eu/enlargement/countries/detailed-country-information/serbia/index_en.htm

FAO – statistical data on Colombia http://faostat3.fao.org/browse/area/44/en

FAWC (Farm Animal Welfare Committee); Opinion on the welfare implications of nutritional management strategies for artificially-reared calves from birth to weaning 2015
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/478584/Opinion_on_calf_nutrition.pdf

Gates MC. Evaluating the reproductive performance of British beef and dairy herds using national cattle movement records. Vet Rec. 2013 Nov 23;173(20):499.

Godden SM, Haines DM, Konkol K, Peterson J. Improving passive transfer of immunoglobulins in calves. II: interaction between feeding method and volume of colostrum fed. J Dairy Sci. 2009 Apr;92(4):1758-64

Global Animal Partnership. 5-step animal welfare rating programme
http://www.globalanimalpartnership.org/5-step-animal-welfare-rating-program/standards

Hickson RE, Morris ST, Kenyon PR, Lopez-Villalobos N. Dystocia in beef heifers: a review of genetic and nutritional influences. N Z Vet J. 2006 Dec;54(6):256-64.

Hickson RE, Anderson WJ, Kenyon PR, Lopez-Villalobos N, Morris ST. A survey detailing the calving performance of primiparous 2-year-old beef heifers and outcomes of assisted calving N Z Vet J. 2012 Jan;60(1):35-41

Murray CF, Fick LJ, Pajor EA, Barkema HW, Jelinski MD, Windeyer MC. Calf management practices and associations with herd-level morbidity and mortality on beef cow-calf operations. Animal. 2016 Mar;10(3):468-77.

Nix JM1, Spitzer JC, Grimes LW, Burns GL, Plyler BB. A retrospective analysis of factors contributing to calf mortality and dystocia in beef cattle. Theriogenology. 1998 Jun;49(8):1515-23.

Patterson DJ, Bellows RA, Burfening PJ, Carr JB. Occurrence of neonatal and postnatal mortality in range beef cattle. I. Claf loss incidence from birth to weaning, backwards and breech presentations and effects of calf loss on subsequent pregnancy rate of dams. Theriogenology 1987 Vol 2;5: 557-571

USDA, APHIS (statistics), 2010. Mortality of Calves and Cattle on U.S. Beef Cow-calf Operations https://www.aphis.usda.gov/animal_health/nahms/beefcowcalf/downloads/beef0708/Beef0708_is_Mortality.pdf

Roberts AJ, Petersen MK, Funston RN. BEEF SPECIES SYMPOSIUM: Can we build the cowherd by increasing longevity of females? J Anim Sci. 2015 Sep;93(9):4235-43

Richens, I F; Hobson-West, P; Brennan, M L; Lowton R; Kaler J; Wapenaar W Farmers' perception of the role of veterinary surgeons in vaccination strategies on British dairy farms. Veterinary Record 2015; 177: 465

Turner SP, Jack MC, Lawrence AB. Precalving temperament and maternal defensiveness are independent traits but precalving fear may impact calf growth. J Anim Sci. 2013 Sep;91(9):4417-25.

Vera, R R : FAO 2006 http://www.fao.org/ag/AGP/AGPC/doc/Counprof/Columbia/Colombia.htm

Wathes DC1, Pollott GE, Johnson KF1, Richardson H, Cooke JS. Heifer fertility and carry over consequences for life time production in dairy and beef cattle. Animal. 2014 May;8 Suppl 1:91-104.

Wikipedia, Big Data 2016, Wikipedia the Free Encyclopedia. https://en.wikipedia.org/wiki/Big_data

Williams DR, Pithua P, Garcia A, Champagne J, Haines DM, Aly SS. Effect of Three Colostrum Diets on Passive Transfer of Immunity and Preweaning Health in Calves on a California Dairy following Colostrum Management Training. Vet Med Int. 2014;2014:698741