A Cow Centred Approach to a Modern Dairy Industry

A report for

NUFFIELD IRELAND
Farming Scholarships

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Executive Summary

This report examines how by moving the dairy cow to the centre of the industry creates a sustainable path forward for the cow the farmer and the industry

- To understand and highlight the biological needs of the dairy cow
- To explore the human influence on her biological needs and behaviours
- To use this knowledge to help educate farmers
- Looking at ways portray this positive story and improve the dairy consumers perceptions and create a strong social license.

"Social license in simple terms is the trust the general public place in any industry to continue to perform its activities"

The objectives of the study were met through a series of interviews and case studies with, farmers, industry personnel, veterinarians and animal health professionals during an international study trip that included travelling to Europe, USA and Asia.

Key Findings

- Based on the cows ideal day some bottlenecks were identified for the cow in the Irish grazing system, mainly around transitioning indoors
- The biggest factor in cow happiness and performance is human interaction
- Alongside main stream agricultural education, vets can play a key role in coaching farmers in cow health, welfare and cow performance
- Current perceptions are affecting farmer's mental health and also threaten our social license
- Technology will play a key role in monitoring animal health and behaviour in farms of the future.
- The need to set a benchmark for Irish dairy cow welfare supported by on farm monitoring at key times of the year.

Recommendations

- Create a standardised animal health auditing system for the grass based Irish dairy cow based around her biological needs using a traffic light system
- The use of cow wearable technology to help monitor the biological needs of the cow in real time
- Educating vets around adopting and delivering a coaching based approach to help the cow and their clients
- Set a National Welfare Benchmark or score boarding system from cow and herd performance metrics, using data currently available through ICBF and Coop reports, which should be supported by regular veterinary visits throughout the year.

- Develop psychometric testing for people working with livestock to identify weaknesses or training needs around better stockmanship
- The dairy industry to help promote this cow centred approach to consumers using the real stories of dairy farmers and their happy cows
- More research is needed to make clear links between improved cow welfare leading to lowered use of antibiotics
- Teagasc to ensure Cow behaviour is a key component of future agriculture curriculum, training around what the cow wants
- Teagasc to research the measurement of cortisol in milk to identify stress levels in the herd
- All stakeholders need to continuously work together to create the positive messages around Irish agriculture.

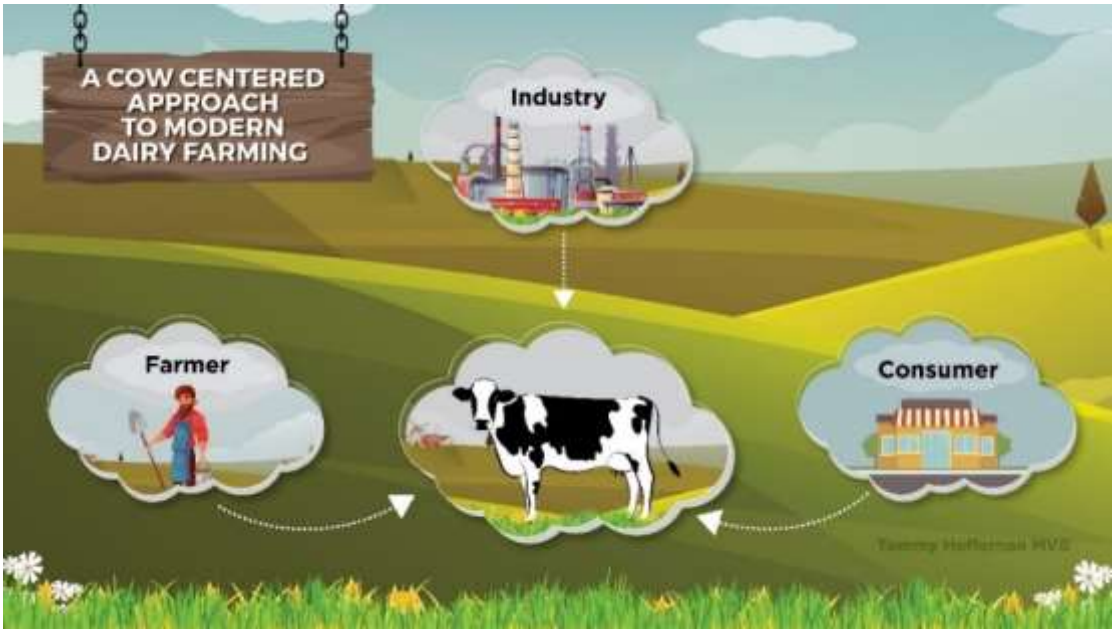

Figure 1: A cow centred approach to the future of dairy farming

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Personal Background

I spent my youth working on a small suckler and sheep farm in Co Kerry where I developed a love for farming and the animals. It set me up to pursue a career in veterinary. I qualified from UCD with an Honours Degree in Veterinary Medicine in 2002.

I spent 15 years working in mixed practice in Co Wicklow. From 2010 I spent most of my time working with farm animals.

Ten of those years I was the practice owner employing six vets and 15 lay staff.

I became a Master Cowsignals trainer in 2011 and also completed a Graduate Certificate in Dairy Health in UCD in 2014.

In veterinary practice I had seen where by moving away from treating diseases to asking the question why disease occurred, we could have a massively positive impact on cow health.

"An ounce of prevention is worth a pound of cure." - Benjamin Franklin

I left general practice and sold the business in 2017 to work as a private veterinary consultant working with industry, vets and farmers. Along this path I became very interested in farmer education and in my current role as animal health specialist with the Irish Farmers Journal I am exploring this passion.

Knowing our "why" is important, I have a clear why which is "to help make farming better".

"My vision of wanting to make farming better"

Living in a busy household with five young children under six, my hobbies include hill walking and reading. Over the last decade I have become a huge advocate for the power of personal development.

It has been one of my highest honours to have been awarded this Nuffield scholarship.

Introduction

Dairy farming has changed considerably over the last 100 years, with ever increasing efficiency and intensification, the cow has been genetically adapted to suit these new demands and systems.

The volume of milk per cow has increased six fold globally in 100 years, and the herd size has also dramatically increased in that time. The Irish national herd stands at 1.48 million cows currently in 2018.

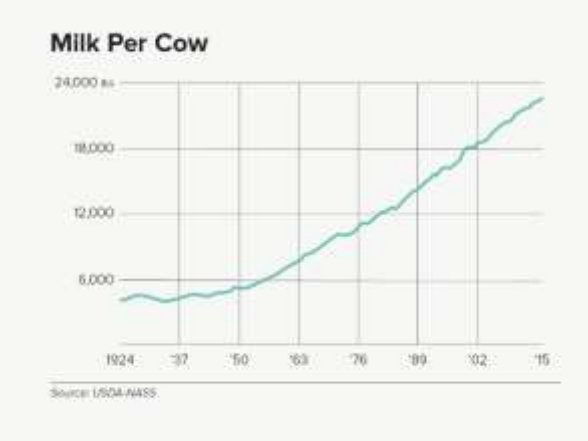

Figure 2: An example of how the American dairy cow yield has changed over 100 years

Source: Journal of Dairy Science 89(4):1280-91 · May 2006

With these rapid changes we still must ensure we understand and care for the cow's biological needs and behaviours. In this study I was trying to understand the cow better myself, by understanding the cows biological needs farmers can have more productive cows and consumers will see happier cows.

"What does the cow want?"

Having worked for 17 years in veterinary practice, I firmly believe that the biggest influence on animal health and happiness are people, and I wanted to further explore people's influence on cow health and performance.

As I travelled, I quickly realised the perceptions of farming were rapidly becoming more negative. In my opinion, this appeared to be affecting the mental health of farmers and threatening the sustainability of the industry. This led me to think about the part the consumer is playing in the future of the dairy cow and industry.

I was also influenced by how my role as a vet had changed and I saw where I was now coaching and educating farmers. This is something I wanted to explore more as I travelled, to find if this coaching approach could be systemised or program based.

"The impact of the burping bovine, the need to reduce antibiotics and importantly the welfare of the cow in the modern system".

Social license has changed so much over the last twenty years in most developing countries.

Anthropomorphism, instead of seeing animals as private property, animal rights ideologues view animals as equal persons to human beings.

Dairy farmers and cows are caught in the middle of this battle between anti-dairy and the consumer.

"Anthropomorphism seems to be a growing problem in developing countries".

To give the cow what she wants might cost more money? Is the consumer willing to pay for maximum cow comfort?

There are two opportunities ahead for the cow and the farmer. One to fight back in the welfare debate and tell the cow's story in metrics and words people can't dispute. For certain farmers and countries like Ireland, this may even mean developing a high welfare milk brand for the ethical consumer. Or maybe this is just the milk brand of the future anyway. It cannot be a bad thing for anyone to build a brand about the story of giving the dairy cow what she wants.

I also began to ask myself some hard questions, what makes me uncomfortable about the dairy industry.

"So I started by going back to basics and asking what does the dairy cow want?"

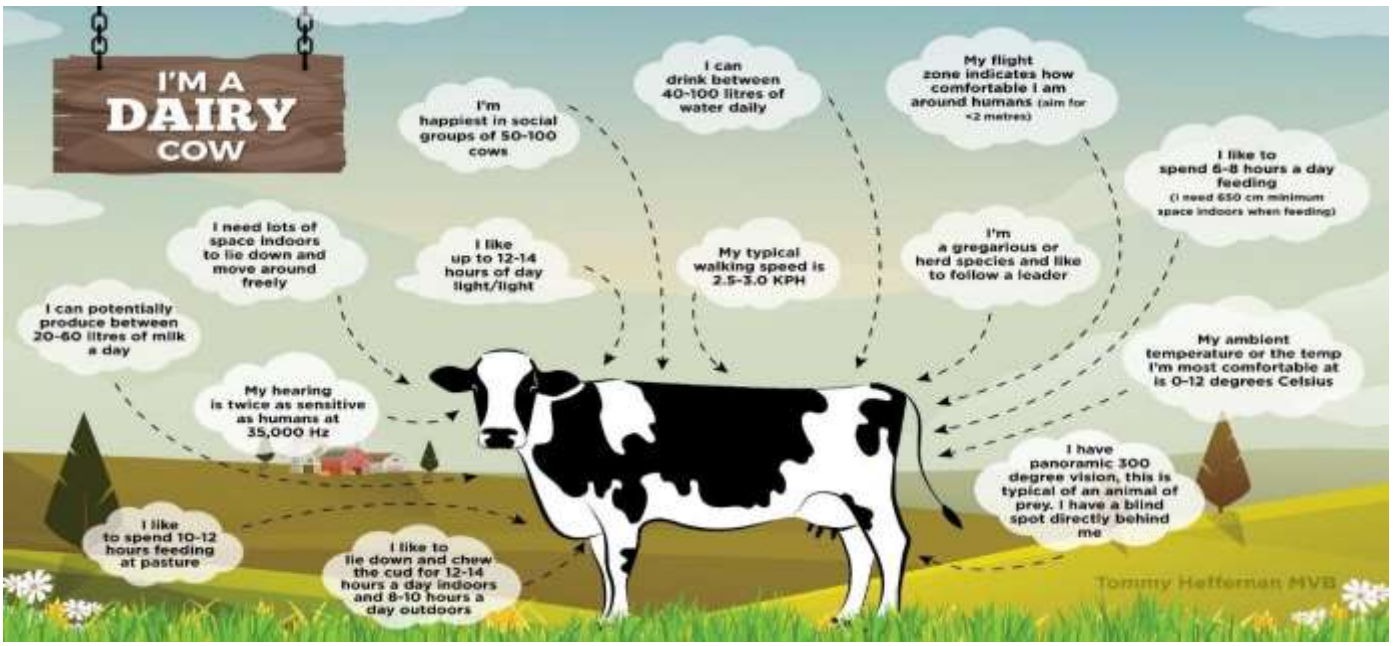

Figure 3: Schematic diagram to what the cow wants chart understanding her biological needs animation.

Acknowledgements

To my wife Julie thank you for your love and support. To my children who sacrificed time with their daddy, I hope that sacrifice will have a positive impact on the world you grow up in.

To Nuffield Ireland and Chairman Geoff Dooley for giving me this amazing opportunity. To Joe Leonard who was a great mentor and kept me on track. To John Tyrrell thanks for all the support. To my fellow scholars Karol, Joe, Colm and Klaus your support and friendship was brilliant throughout

To my employers the Irish Farmer's Journal who employed me after I commence my Nuffield scholarship, and allowed me time to complete my studies while developing my new role as their Animal Health specialist.

To all the people I met on my travels who gave of their time and their knowledge to help me answer many questions and leave me with some more.

The personal growth and leadership skills I learned along the way have been life changing

Lessons of leadership can be found in Appendix 6.

"What we fear doing most is usually what we most need to do" - Ralph Waldo Emerson

Objectives

As I travelled I foresaw many challenges for the dairy industry, farmer and the dairy cow. My topic became about finding solutions or a path forward for the modern dairy farming system and cow.

Some questions I set out to look at?

- What are the biological needs of the seasonal grazing cow and how do human interactions positively or negatively impact that?
- How can we avoid the wrong people working with dairy cows and what does good stockmanship training look like? How can we take this knowledge and help make the next generation of farmers even better stock people.
- What does the consumer want and how do we tell them about the good science behind dairy farming, helping to retain a strong social license?
- Can we measure good welfare on farm, set an Irish welfare standard everyone is happy with?
- What role does wearable technology have in the future to ensuring we have a happy cow?
- Can farmers take control back of the welfare story, by creating a cow centred approach to dairy farming?
- Can we make a clear link between lower antibiotic usage and better welfare?

1. My Travels Global Focus Program

Figure 4: My global focus program gave me a window to global agriculture.
Iowa State, July 2018

1.1 Impressions of Global Dairying during my Global Focus Program

I travelled to Germany, China, Philippines, UK, Singapore, Hong Kong and the USA

In Asia I got different perspectives of the cow and the growing need for animal protein and dairy. When supply becomes the main driving force sometimes the cow herself may be not be the highest priority.

In Germany, with smaller herds, labour was a big challenge. Social license and public opinion are heavily influencing farming. One farmer we met had tears in his eyes because the profession he so dearly loved was seen in such a poor light. How have German farmers become such pariahs?

In China and the Philippines it could be argued welfare and the environment got less attention. The important things were setting up a safe dairy supply chain to begin with.

In 2017, China's total imports of dairy products was 2.45 million tonnes, 4.5 times that of 2008.

In a lot of Asian countries we visited there is a need for training around stockmanship and animal welfare.

Even with European fluid milk consumption dropping, global consumption is sure to rise due to the phenomenal demand of these developing countries. There is also huge inefficiencies in their systems but I still see the massive investment in China overcoming some inefficiencies.

It was interesting to observe the cow in different climates and the challenges this brings. In China and Israel the cows and their dairy systems faced the big challenge of heat stress.

Global warming will definitely move milk production north in the globe, as producing milk in hot countries is neither efficient nor good for cow happiness.

"I also realized the cow's future was influenced by people, the farmers who care for her and the people who consume the fruits of her labour".

For me, Ireland created a balance with pasture based systems and a mild climate. The most profitable systems encountered were efficient grass-based systems in Ireland, we need to make sure these systems are robust and continue to support the cow and her needs. The dairy cows biological needs would mean she would chose more temperate climates to work in.

Also with our grazing system the environmental conditions can be unpredictable and we must ensure we do everything we can to maximize the comfort of the cow. In our seasonal spring based system the dairy cow often spends a very important part of her transition at calving time indoors. Maximizing her biological needs at this peak risk time is critical.

Travelling gave me an insight into the dairy industry of the future. As my journey continued the threat and challenge of social license around dairy farming became hugely important. One of the key things coming out of this will be our welfare message. I also realized the cow's future was influenced by people, the farmers who care for her and the people who consume the fruits of her labour.

"Essentially we have a very strong social license in Ireland but the tide might be changing?"

This is an opportunity to showcase and lead the way around animal welfare. This led me to the problem I kept coming up against particularly when faced with the anti-dairying lobby. What is good cow welfare and how do we measure it?

What could I learn from other dairy nations that were leading the way in this field?

There is no doubt the power of a good story especially successful food brands all had terrific stories. A cow centred approach is the story we need to be telling our modern dairy consumers.

We must also face up to and accept the negative stories, we must combat them with good science and importantly as an industry recognize when we are wrong and change certain practices.

1.2 Germany: "the consumer and social license"

With over 4 million dairy cows, Germany has the highest milk production in Europe. Social license is declining and the perceptions of modern livestock farming are changing, which is a big problem for German dairy farmers. Consumer pressure is forcing more farmers to have their cows out grazing for larger parts of the year.

It was interesting to watch how the consumer was having such an impact on farming, which made me think about who will tell the story of the dairy cow of the future.

It would be easier for farmers to take control of the cow's destiny and tell the farming story.

"Anthropomorphism creates a huge challenge because it creates a gap between the realities of good welfare friendly dairy farming and some unrealistic biases you see where people treat animals like humans".

For German farmers my clear impression is that the "horse has bolted" and social license in German farming is in decline. Fluid milk consumption is declining also and it is a key time for German farmers to start re-engaging with consumers.

Germany was about recognizing the consumer, we need to put human faces to the farming stories and have the right story. A cow centred approach to dairy farming sends the right message out but we need help from industry about how we deliver this message.

Figure 5: Dairy farm visit Hendrik Lubben in Nordenham Germany

1.3 Singapore, Hong Kong and China: "it's a numbers game"

Asia, and particularly China, has the fastest growing dairy markets in the world.

"Dairy in Asia-Pacific." Euro monitor International, 2017.

There is a huge growing middle class in Chinese cities which amounts to perhaps 1 million people in Shanghai, for example. Companies we visited like "FreshFresh" in Shanghai, that operated a food retail platform delivering fresh high quality produce to over half a million customers. Quick easy meals with dairy and meat consumption growing rapidly, this is something that is prevalent with the more affluent middle class across Asia.

The Chinese consumer is interested in clean label products with safety and health being key decision drivers.

In Hong Kong we visited the vet school were we discussed animal welfare regulations in China and lack of them? The professor we met suggested that poor welfare may just be poor knowledge about welfare. This underpins the need for continual training, rather than making assumptions about what people should know.

We met with the senior professor researching antibiotic resistance issues and she was terrified about the potential scale of this problem. She encouraged me to ensure my message of improving welfare for dairy cows also came with the potential to reduce the usage of antibiotics.

"The Grazing cow with high welfare and low antibiotic usage could be a very powerful brand and story for the Asian market over the coming decade".

Growth in these regions is being driven by modern trade development, changing consumer habits and dynamic product development, which makes them ripe for growth potential in the dairy segment.

1.4 United Kingdom: "the consumers rule"?

Supermarkets have a big influence on cow welfare and antibiotic usage on British farms. The role out of 'Red Tractor' has seen very positive changes improving cow health and welfare. The Dairy Cattle Welfare Strategy 2018-2020, which is a cross body approach to animal welfare looking at the cow's physical health and mental wellbeing is also very interesting.

These schemes although not perfect create better animal welfare standards and a good life for the dairy cow

RUMA (responsible use of medicines in agriculture alliance) is a task force leading the way nationally in the UK around antibiotic usage and tackling antibiotic resistance.

Both RUMA and particularly Red Tractor have a strong veterinary involvement. Both of these initiatives have also a strong focus on the reduction of antibiotic usage.

"Antibiotic resistance is where the antibiotics we use to treat the bugs and bacteria, stop working because bacteria adapt to overcome the mechanisms which antibiotics use to kill them".

With the consumer talking a lot about animal welfare we must also remember that they still want cheap food.

Figure 6: Rob Drysdale of straightline beef from farm to fork beef business.

1.5 America: "it was always going to be different"

The American dairy cow is interesting, while her numbers are declining to around 9 million, her production potential is rapidly increasing. Most casual labour on dairy farms is owner operator. Big farms employ a lot of Hispanic labour. There are some challenges with training, as Spanish the most commonly spoken language.

The American dairy market is different to ours and we must continue to use these differences to our competitive advantage. While visiting a farm in Iowa, the question was raised about the shortage of labour and ensuring that the right people work with cows. I began to question **"how do you avoid the wrong people working with cows?"**

Figure 7: My traveling companions allowed me to bounce my theories as we traveled. Des Moines, Iowa in July 2018

2. My Individual Travels

2.1 Introduction

The countries for my personal travels were chosen because they were all doing excellent work around cow health and behaviour

In France, I visited a French vet to look at a herd based approach and monitoring system.

In Denmark, I was interested in how they have eradicated diseases nationally and leading the way in reducing antibiotic usage in their dairy cows.

In Holland, I went back to look at my cowsignals, I also met with a farmer who heavily influenced my thinking and also the importance of putting the cow at the Centre of the dairy industry.

While in Canada, I was lucky to look at a proactive industry and what they are doing around consumer engagement and good animal health standards. The Canadian proAction program focused strongly on looking at the cow and seeing where they could make her life better, the farmer more profitable and the consumer more engaged.

In Israel I also looked how modern technology can measure cow behaviours and maybe give us a reading of cow happiness. Sensor driven data can make for happier cows!

2.2 Case Study 1: France “a farmer and his vet”

In January 2018 I began my travels to France to look at how the French dairy cow was managed. I looked at the relationship between vet and farmer, and how welfare was being measured. One of my visits was with Olivier Creen, a French vet, who did routine health visits to his clients and dairy cows.

His “global visits “involved monthly vet visits, measuring all stages of the dairy cycle on the farm. It was working very well with strong farmer buy in, as their production had gone up by between 10-25% on most farms over the first 3 years. This is without a change of cow numbers or big infrastructural changes.

A lot of cow side tests (rapid tests) were used which gave readings quickly for faster decision making.

"On farm diagnostics will have a key role in the future"

This was a private scheme designed to increase dairy cow production and performance, it was indirectly a welfare programme because by helping achieve healthy cows it improves welfare. Olivier was also beginning to focus his program on longevity (lactations achieved).

To tell the consumer the story we must also however ensure all data is kept and correlated into our measurements of cow performance.

This like many other programmes was successful but I was looking at how it could be adapted improved and maybe tell the big welfare story. Every health monitoring scheme I saw focused on production Key Performance Indicators (KPIs), which are very valuable, but indirectly I felt Olivier was doing even more for the cow. It was interesting also to see the vet playing a central role in managing and monitoring welfare on farms.

Oliver was also training his clients to carry out simple animal husbandry and nursing techniques like delivering oral fluids by stomach pump to cows. This on-farm technique alone was reducing the need for antibiotic medications first and improving treatment successes. As part of future stockmanship education Olivier felt there must be a focus on basic skills training around fluid therapy and pain management of stock.

2.2.1 Appendix 1: Fluid Therapy Pain Killers Explained

The KPIs that were being measured and the impact of cow side production data being generated was having a positive impact on cow health. The model was also interesting as vet and farmer had entered a contract arrangement where a % of milk price was being paid to the vet.

This got good buy-in from vets which made it profitable for both parties through improved performance, and also the cow was happier.

This is a challenge for Ireland as we need to have a viable veterinary service particularly when trying to deliver a service and also the important job of certification and monitoring cow welfare. The veterinary practitioner is a key cog in the welfare story.

2.2.2 Appendix 2: Example of Dairy Visit Assessment

"This showed me that regular vet visits with a strong emphasis on cowsignals and cow behaviour linked with production data could create a good model for the Irish system".

2.3 Case Study 2: Denmark "antibiotic reduction"

In Denmark, I studied the impact on animal welfare of reducing antibiotic usage (target 20% reduction from 2012 to 2020 in the dairy industry). How were national programmes affecting cow health and welfare? It was hard to get measurements across everything but Somatic Cell Count (SCC) and calf mortality had significantly reduced even after the restrictions

I travelled to a 14 vet practice in Ribe to look at how they were monitoring animal health. I also wanted to see how their yellow card system was working.

In 1995 they decided to reduce the profit on animal medicines made by the vet. The vet now only makes a handling charge on any antibiotics, the veterinary business model is based around routine visits and herd health monitoring. A lot of this has come from a decision in July 2010 for all herds over 100 to have regular obligatory herd health visits. These also involved checklist with some emphasis on measuring welfare parameters.

There was some cow parameters and group parameters. There was also disease monitoring and measuring and tracking farm KPIs like cell count. The target for the vet practice was keeping their dairy clients below 150,000 SCC for their annual average bulk tank reading

The amount of antibiotics being used in dairy farms was reduced by >20% in the last 5 years. I felt this was aided by

- National eradication programs for BVD, IBR, Salmonella and Johnes
- Reducing the choice of antibiotic families used by farmers to penicillin, oxytetracylines and sulphonamides
- Cutting out the use of CIAs (critically important antibiotics used in front line human medicine)
- Regular vet visits, with most farmers over 150 cows averaging 20 plus routine vet visits a year
- Focusing on improving cow welfare *(visits had cow based metrics that measured welfare)
- Specific treatment protocols for farms enabled better use of medicines and the ability to assess treatments
- The strong emphasis on cowsignals in all freshly calved cows, like body condition, milk ketones, faecal consistency, vaginal discharges are all recorded.

- Practical training for farmers around routine medicines and administration
- The yellow card system introduced in September 2012, meaning Danish farmers cannot use antibiotics over a certain level. If they do this they will get warnings and then penalties and restrictions on supply.

2.3.1 Appendix 3: Antibiotic Reduction and Good Cow Welfare

Danish farmers have increased practical training with their vets in general animal husbandry and the use of medicines. The vet in Denmark was moving from a primarily clinical role to that of coach and mentor to their clients. Regular routine vet visits were having a positive impact on animal health, performance and welfare. Over 80% of the farmers had more visits each year than required by law which shows the value and buy in from farmers.

The paper trail was long however, and use could be made of the data which is created to illustrate to consumers the positive aspects of the system.

Arla (Danish dairy processor) is looking to communicate the right messages to the consumer. Research carried out by Arla showed that millennials in particular are drawn towards food trends. These trends can help them form an identity and be part of a group which is why veganism as a cultural movement seems to be growing so rapidly.

The dairy story must indeed meet these strong and ever changing habits particularly of the young consumers.

"This is where I started to believe the power of building the story of the modern dairy industry around the cow"

2.4 Case Study 3: Holland "the signals for success in dairy farming"

Cows indicate their health and comfort through behaviour, posture and by displaying physical traits (cowsignals). When recognised and understood, these signals will help you to optimise the health and productivity of your cows and therefore the profitability of your business.

During several farm visits monitoring cowsignals, we visited one farm where there was a cow centred approach to the business.

The farmer had the story right and the dairy cow was the Centre of his business model. His farm was set up to maximize her comfort and welfare. He loved his cows and also was able to

articulate this, his passion was infectious. This story was exactly what a modern dairy industry should be aiming to promote and sell.

The farmer was clear about the fact this was a commercial business but being cow focused meant he was more profitable.

"The images of Cows lying on waterbeds calmly chewing their cud were somewhat therapeutic to the eye"

At the Cowsignals Training Centre, we discussed methods for cowsignals to become main stream for all farm workers with cows. We discussed the Dutch dairy sector who sell their image and products globally but seem to be losing social license at home. The global issues of social license and dairy farming was consistent everywhere I went. New approaches are required to tackle this problem.

The Cowsignals Company was working with a milk brand, where all their farmers and suppliers had undertaken the cowsignals training.

At the Training Centre we discussed the key requirements for the dairy cow indoors. Looking at the cow signals diamond and cow based approach of looking at the cow and asking why?

Figure 8: What are the cows telling us about the farm and their environment? Cowsignals diamond

Source: Cowsignals training company

"Grazing cows have a strong story and we must continually maximize this, we also must reflect on getting our indoor transition right".

Looking at the indoor cow signals training modules, these can be adapted for seasonal grazing dairy systems like Ireland. With cowsignals playing such an important role for cow, farmer and

potentially consumer, they must play a key role in the training an education of the young dairy farmers of the future.

2.5 Case Study 4 Canada

At Guelph University, which provides a one week rotation (course) for final vet students on 'Dairy Cattle Welfare', we were informed of the challenges of the Canadian cow, farmers and what their consumer was saying.

Canada's national dairy proAction programme was industry lead and involved going onto farm to look at cows to measure how welfare friendly the system was. This programme was very strong on cow metrics which look at cow wellbeing not just her productive performance.

The vision for the programme was

"Through proAction Canadian dairy farmers collectively demonstrate responsible stewardship of their animals and the environment, sustainably producing high-quality, safe, and nutritious food for consumers".

It was an interesting 10 days work a national programme with the young vet students from Guelph University. Meeting the professors in the vet school, they gave many insights into the programme and some of the challenges the Canadian dairy industry faced. This is a rotation, and should be added to every veterinary university where cow based metrics and cow welfare is discussed in detail.

The large animal vet of the future will increasingly need knowledge on cow behaviour and be able to articulate and be involved in welfare certification.

Figure 9: The team from Guelph University on their welfare rotation in December 2018

This form of certification will be part of many national dairy schemes of the future. The veterinary profession has now a chance to embrace this and get involved. In Canada, just like Denmark, there has been strong buy-in from dairy farmers, with 68% of farms taking advantage of (and pay for) classifying service, which includes measures of animal health and well-being

"The large animal vet of the future will increasingly need knowledge on cow behaviour and be able to articulate and be involved in certification".

Meeting Canadian dairy farmer Tim May, a very strong advocate (promoting and advocating for agriculture), I saw how some very strong honest messages were resonating with consumers through social media. Tim's discussion made me reflect on the power of the farmer telling the story of a cow centred approach to dairy farmer.

Unlike America, the Canadian consumer is more mindful of social license and where their milk comes from.

There is a lot of consumer facing literature and campaigns but I felt the cow and the science are strong behind proAction. This programme also was using a lot of cowsignals like hock-scoring and hygiene scoring.

"Under proAction, all farms are undergoing an animal welfare assessment programme, based on the requirements in the Code of Practice for the Care and Handling of Dairy Cattle"

There is a strong emphasis to look at the cow and see what she is telling us about her environment. These again are cowsignals, so when a cow's environment particularly her lying conditions are wrong she will exhibit symptoms of system failure. By assessing groups of cows we can assess welfare at herd level. This programme, and previous visits to Holland and Denmark, allowed be identify the key metrics around the biological needs of the cow. My mind began to wander to precision life stock tools that would measure these metrics on cow behaviour and give famers early warning signals.

This could play into future assessments that we could carry out again based on routine visits using a checklist.

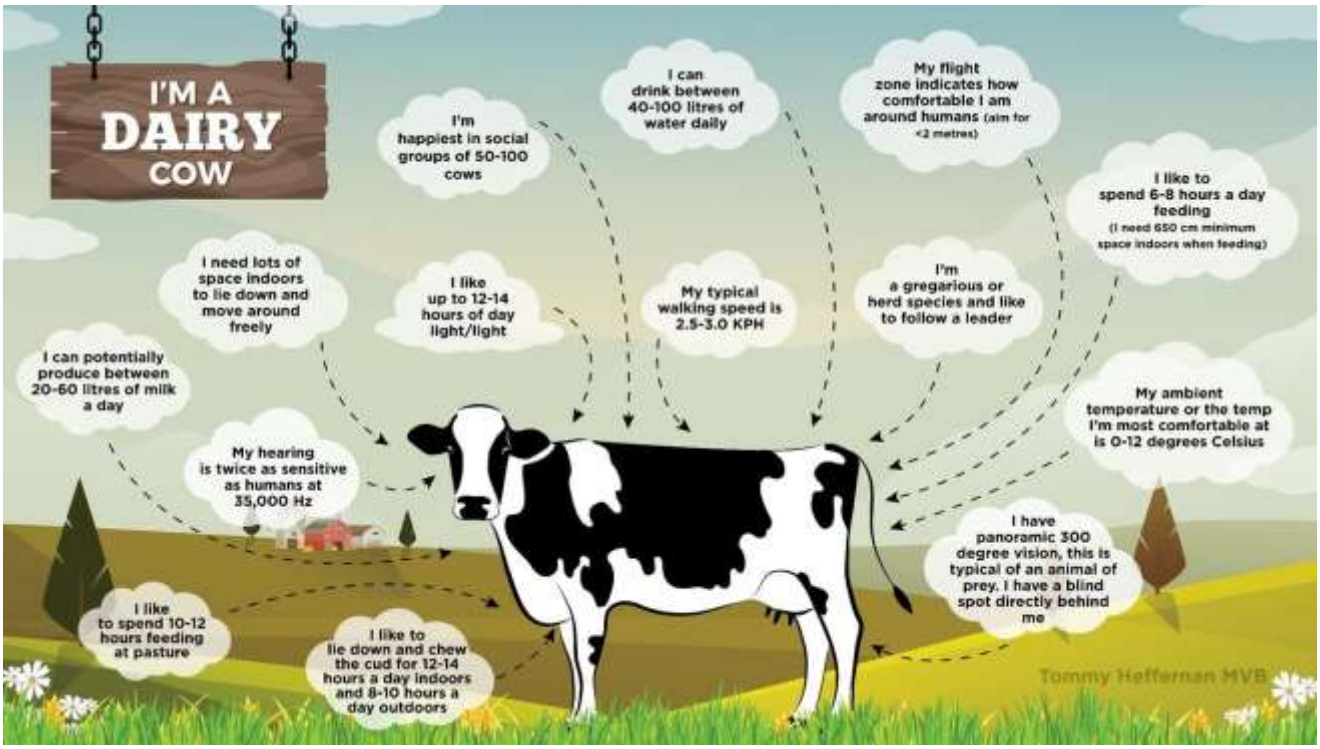

Figure 10: Dairy Cow Checklist

2.6 Case Study 5: Israel

Israel is leading the way in dairy technology and output per cow in unfavourable (very warm summer temperatures) farming conditions.

"We know how a cow likes to spend 24 hours, if technology was telling us when she wasn't having a good day we good always ask why?"

In Israel the dairy industry is about maintaining a local supply of dairy in a country which is politically isolated in the region.

There is no doubt they have phenomenal cow based data feeding into maximize efficiencies within their system. But is the dairy cow suited to the searing heat of the Middle East? For example, is there a cost benefit to sprinkler systems watering cows every 2 hours in countries where water is already at a premium? Again a strong advantage we have in Ireland is the cow likes our climate

The wearable cow technology also being developed was looking at measuring respiration rate and temperature as indications for heat stress. These could be linked into cooling systems making them more reactive and provide better cow comfort at times of high heat.

"Israel was all about the integration of technology to measure cow parameters to make her more productive and healthier".

There is an opportunity for this data to be used to show the consumer real time information about the cow and their food. Like all data it is useless unless it is used, it also needs to be made into usable metrics that the relevant audience understand.

It was interesting to hear about infrared thermographies and facial recognitions in picking up animal health issues. We discussed the use of wearable technology to monitor lameness, this may be valuable as an industry wide tool to alert for and measure lame cows. Defining a lame cow with technology might be better than the human eye. Technology has two roles in helping cow health and welfare but also in telling that story is important. This data is interpreted from the perspective of health and performance, and may be useful for the consumer to tell them then story of the cow happiness.

"This is the idea that precision livestock farming might play a key role in the cow of the future".

2.7 An Irish Perspective

Having met researchers, processors, vets and farmers in Ireland, it is clear that they were concerned about cow welfare. However, at the time of writing my we still had not developed a strategy or benchmarking system for our dairy farms. Talking to Irish farmers they were concerned about the impact of welfare, animal rights activists and vegans. Irish farmers now realize social license is a challenge we must tackle.

Welfare is something that probably scares a lot of farmers. The word makes them question themselves and what they are doing. **However we need to take back the welfare story**.

In Germany, Holland and Denmark consumers wanted their cows to be grazing as they believed this was normal! Ireland has a huge advantage, being a pasture based system, as it allows us maximise the biology of the cow.

When travelling I saw some fantastic indoor systems, but some struggled with cow comfort and maximizing the needs of the cow. This was not carte blanche for our industry to say we had the perfect system. Remember we house cows at the most critical time around calving, poor roadways and lack of attention to cow flow can leave cows lame and sore.

On my Irish farm assessments I found housing, space, roadways and poor cow flow to be real bottlenecks for our grazing system. Every cow who works on an Irish farm should have a bed, we need to move farms to 1 cow 1 cubicle at winter time.

However there is no doubt that the consumer wants a cow outdoors. If we could get this story right with good welfare behind it, I think we have a premium product.

With rapid expansion we crowded some houses and put cows under pressure we didn't always go for better before bigger. Our grazing system is now very weather dependent with droughts and heavy snows or rains impacting cows ability to get fed.

We need to build capacity into our system to ensure this doesn't happen again to the cow. Capacity of course comes at a cost!

Figure 11: ideal day for the grazing cow

We are at a critical point where we cannot risk failure on cow welfare as the knock-on effects would be devastating to our industry. In my discussions at home the Irish dairy industry which relies heavily on exports is now very concerned about our image.

"With dairy calf exports and live exports under some pressure we must really take notice of criticism because it may influence heavily our social license".

Our housing rates poorly during the transition period on some farms with our obsession with grass we must not forget key times in the cows yearly cycle. We need to take a balanced view of all of these things. The argument is that such allowances in space and cow comfort are cost prohibitive. My view is that to future proof our industry, they are not.

We make the most impact on most farms cow health my improving her short time indoors particularly around calving. The checklist of high priority areas again worked well at identifying some keys risks.

2.7.1 Appendix 2: Example of Dairy Visit Assessment pre-calving.

Also for the young baby calf we really can improve housing as this is the beginning of the welfare story. While activists kick up about the perceptions of separation at birth, the housing and husbandry are much bigger needs for calf welfare in reality.

So I reflected on what I had learned on my travels about the "best bits" in other countries, I looked at the challenges within the Irish dairy industry and where some potential recommendations could be made.

Figure 12: The grazing dairy cow has some big advantages

The grazing dairy cow has a bright future, but we need a strong focus towards solutions to challenges like an evolving young consumer.

Moving the dairy cow to the centre of the industry, giving the cow what she wants helping an industry grow!

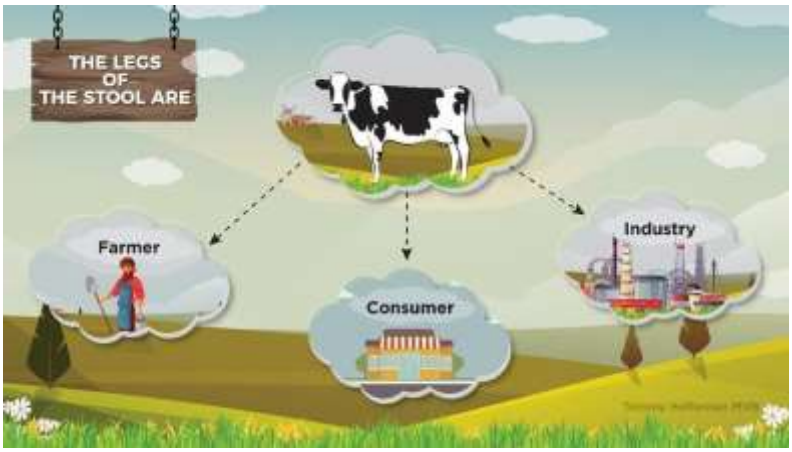

Figure 13: Moving the dairy cow to the center of the industry

3 The Cow

3.1 What The Cow Wants? Assessing the Stress Gap

As a baseline we must establish a dairy cow which suits (correct genetics) the type of outputs expected from her within the system. This is where farms will decide their genetics first or cow type. Then we need to maximize that cows needs within the system to maximize her potential.

Her genetics will create the potential and then management will help achieve it. By having a cow centered approach and maximizing the cows biological needs within the system will allow the cow perform optimally. Where the cows needs aren't being met this is where a stress gap is created.

By carefully evaluating the cow and her environment we can identify the possible reasons for a stress gap.

This was one of my more interesting discoveries. This is where I learnt about what the cow wants if she was designing her best 24 hours on a farm. What are her needs and normal behaviors?

This meant by setting out what the best case scenario for each of the following

- Cow flow (particularly around milking time)
- Lying time (cow comfort)
- Feed space (indoors)
- Available feed suited to energy requirements
- Cow hygiene (related to the environmental hygiene)
- Air quality (indoors)
- Roadways
- Bed (cubicle) size and numbers indoors
- Water

Figure 14: Cowsignals diamond

Source: The Cowsignals Training Company Holland

3.2 Looking at the cow

We need to carefully assess the individual cow and the herd. They will leave clues around where the environment is wrong. This is fundamental training all stock people should have before working with cows.

- % standing waiting cows indoors
- Lesions on cows from injuries from poor housing
- Hygiene of cows particularly around their udders
- Flight zones & cow behaviour

Then we need to look at the environment of the cow that helps her maximize her biological needs particularly indoors.

3.3 Feeding Space and Water

Clean available water can be a big limiting factor on many farms. Having good clean source of drinking water with plenty of drinkers is crucial. Feeds vary massively across the dairy farms. Keeping things as simple as possible should be the objective. When cows are indoors, maximizing feed intakes by good feed space, getting the timing right (105% feed before lunch) and always pushing feed up. In a grass system, cheap natural feed is an advantage but we need to have robustness to combat supply issues and not be afraid to supplement where necessary. The length of the grass, the amount and length of rotation must be factored in to make sure bullying does not occur.

"Keeping things as simple as possible should be the objective for both cow and farmer."

3.4 The Environment

Ireland could be entering a scenario we must try get more with less cows. Putting more cows on a farm, does not automatically make you more profitable especially where existing infrastructure does not change. An important metric is longevity or average number of lactations achieved in a cow centered approach.

Joep Drisen of the Cowsignals Company is very clear that cows hit peak lactation between 4-6 lactations. By keeping cows longer in the system you have more milk, reduced replacement costs. For this, the environment for the cow must be right. The grazed cow has an advantage because this suits her natural biological needs once feed (grass) is available and no severe adverse weather conditions.

With a changing weather pattern we need to build robust housing that allows us to maximize cow's health and welfare indoors. Looking at the biological needs of the cow this means space, shelter and comfort to lie down. In a simple system this means enough comfortable beds (1 per cow), a roof for shelter and space for cows to move around feed and display their natural behaviours.

This just makes sense from the view of the natural biology of the cow.

There should be no bad smell inside the house, the temperature inside the house should not be more than 5 °C above the outside, the relative humidity in the house should be between 50-80% and there should be no draught or dead spaces. Dust and cobwebs indicates poor ventilation

Good work has been done in the University of Florida by professor Albert des Vires on longevity in the dairy cow. By manipulating and managing the environment of the cow we can help her live a longer, more productive life. The environment influences the emotional state and this is an important component of welfare.

3.5 Cow Flow

Every farm should do a cow flow assessment walking through normal day of the cow. Look at surfaces, look at feed space, look at water, and look at cow traffic. How easy are we making the cows life? This is not about rapping her in cotton wool but allowing no reason for her not to be

at her peak productive capabilities. Cows are like metabolic athletes, and need time to rest to be at their best.

They need space and time for the hierarchy to establish itself and minimize bullying in younger animals like heifers.

3.6 Using Flight Zone Scoring As Welfare Measurement

Any dairy farm whose cows flight zone is greater than 2 meters, needs to look at cow handling.

In Holland we looked at, and talked about, the use of flight zones as part of cow signals assessments.

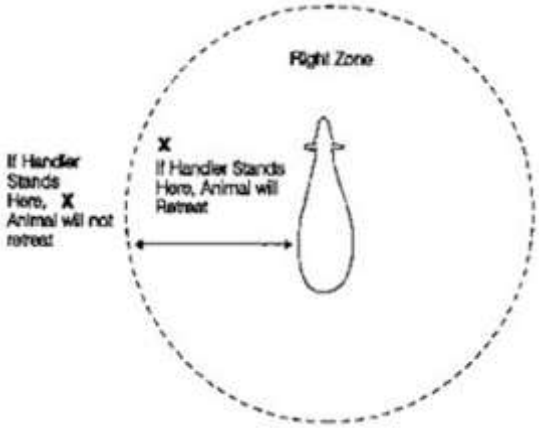

Figure 15: Flight zone when entered a cow will move away, a short flight zone less than 2 meters indicates calm cows

3.7 The Hygiene Challenge

Improving biosecurity and farm hygiene (and mastitis and lameness) could dramatically improve welfare on farms.

On an Israeli farm I visited, they had a very simple cleaning Standard Operating Procedure (SOP) around calf feeding equipment done daily. This supports a recommendation that every farm should have SOPs for every dairy farm.

"Grant and Albright hygiene scoring cards 1995"

On all routine assessments cow hygiene should be scored and if it rates poorly then efforts must be made to reduce it.

"There is huge value in a hygiene scoring card for cows and the environment".

3.8 Robotics and Automation

It is very interesting when watching cows around robots how calm and quiet they are. The flight zone as a measure of how frightened a cow is seems to be dramatically improved.

My research about the cow tells me this comes from the fact the robots provide the one thing every cow looks for, i.e. consistency in routine. Therefore more automation, once it works with the needs of the cow, can be an addition to welfare on our farms. Robot farms we visited in Holland all had really low flight zones in cows.

With labour now one of the biggest limiting factors on farm, I am glad to see that robotics will probably have a positive impact on cow welfare, but it should never replace the need for good stockmanship also.

3.9 Genetics and Welfare

It can be argued that few more advances can be made on production. With the cows genome mapped we know our limitations. However we could look at improving the health metrics to breed a healthier happier cow.

Some of indexes that could do this are infectious disease resistance like TB. Also looking at lameness incidence and clinical mastitis incidence. Currently, we have no record of these, I envisage any future programmes would measure these feeding into welfare audits but also long term healthy genetics.

EBI the (economic breeding index) is actually a high welfare genetic index. We can increasingly use genetics to improve cow health which can directly improve animal welfare.

"One sick cow takes up the same amount of time as 40 healthy ones."

3.10 Ideal Cow Day Indoors

In an indoor system, this is 2 hours total milking time in the day being the optimum.

Six hours feeding, most of this will be done in the morning early and evening. Most of the rest of the day is spent lying down and ruminating. Space and good bedding become critical in these

systems as well as fresh air. In the Irish system indoors transition management may be a short window, but it is a bottleneck in our grazing system.

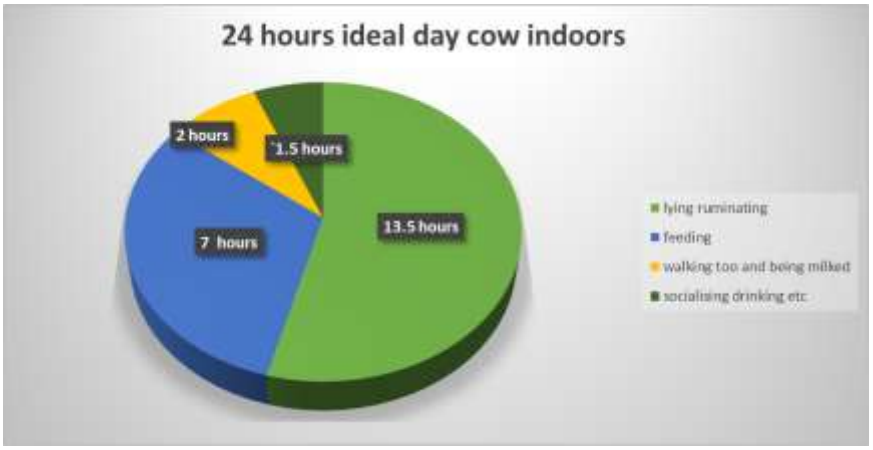

Figure 16: 24 hours ideal day cow indoors

"The stress gap is where the cow wants to be biologically compared to where the system allows her achieve."

Identifying risk areas that when improved would reduce the stress gap and also make better welfare and production. A stress gap can have an impact if severe for a short period but even with a marginal stress gap for a long period can negatively impact performance and cow welfare.

Also my experience on farms for the last three years by zoning in on this area of stress can have a big impact on cow health, performance and happiness. It was about looking to see can these skills be trained and are they transferable.

These skills are more farm based, can be trained but are not as easy to show on paper to the consumer. I believe these softer Stockmanship skills are some of the most important on farm. When I looked at where these are being thought in current agriculture curriculum I found they need more attention.

These are the cowsignals that I learned from Joep Drissen in Holland they have a real role to play in reducing the stress gap. Reading the work of Temple Grandin around cow behaviour added clarity. If we give the cow what she wants, would she live longer and be more productive? These biological needs can be easily attained in a grass based system and of course they must be balanced with her genetic potential.

By auditing them on farm, we are able to identify problems with human cow interaction, particularly around cow flow.

In a grass based system the limiting factors can be available feed, walking distances, roadway yard design, cow flow, negative human interactions and prolonged milking times.

"So there are lots of advantages to reducing the stress gap on dairy farms".

This is why lameness becomes a very good measurement of welfare and giving the cow the ideal day she wants. Lame cows have been walking too long, standing too long or standing on bad surfaces, walking under pressure or standing in more slurry (wet dirty conditions). The biggest factor though is often pushing a cow faster than her optimal speed of 3.0km/h, changing her gait and ability to place her steps.

The research of New Zealand vet Neil Chesterton really made me think about how important roadway quality is for the grazed cow. Combine walking distances, road surfaces, cow flow and mobility scoring and you have a comprehensive way of looking at lame cows.

Certain problems like lameness can be indicators of an increased stress gap. In Canada in the indoor system they looked at hock lesions on cows. Mobility scoring and lesions in dairy cows might need to be categorized on Irish farms.

So with a clear understanding of an ideal day and environment for the cow we can build a very good picture of what she needs and maybe even what she wants?

Wearable technology will also greatly help in our ability to monitor the needs of the cow in a grass based system. By knowing how a cow wants to spend her day, when the cow or herd deviate from the normal, an early alert system will allow us assess the stress gap and why it might be happening.

"We must recognize the huge opportunity of wearable technology tracking the ideal cow day. If we can track lying times, standing time, walking time, ruminating time etc we can have automatic alerts for the stress gap in individual cows and even the herd.

Is cow's milk from calm cows healthier is there other angles? I tried to research this idea but this might be for someone else to discover. There are more cortisol releases in the milk of stressed cows.

Figure 17: Wearable technology monitoring cowsignals

4 The Farmer

4.1 What The Farmer Wants?

4.1.1 Appendix farmer online poll

https://www.surveymonkey.com/results/SM-NLVVN2RJ7/

"One of agriculture's greatest global challenges is farmer sustainability, having enough primary producers engaged and profitable."

Farmers generally want to be profitable with a good quality of life. With many looking to pass their farms to the next generation, sustainable practices are important also.

The challenges for the cow is when what the farmer wants is not compatible for good welfare. In my opinion this is very rare. Even those large commercial dairies that sometimes get the raw end of the stick realize that good welfare is an essential element of a profitable and productive farm.

A study by Professor Dan Weary at the University of British Columbia looked at this and found no evidence that larger farmers had reduced welfare. There is a strong argument that with 800 cow plus farms you allow better system management and specific roles

The volatility of milk price also can leave pressure on the farmer and the system with the cow feeling the effects.

"By building a business model more closely linked to what the cow wants, the farmer is future proofing their business".

We must not underestimate the negative effect where farmers were deemed in poor light by consumers. This destroys moral and makes dairy farming a less appealing profession.

Work by Dr David Fraser of British Columbia University found where more professionalism might be required in farming. People (consumers) ultimately trust professionals more, so training and certification of farmers and stockpeople makes a huge amount of sense.

"The dairy profession can and must be engaged and proud of what they do"?

Farmers should never be ashamed of being profitable by working with the cow to help her achieve her full production potential.

4.2 Changing Mind-sets of Farmers

Why you need to move the cow to the centre of the farm business?

Give the cow what she needs, monitor some parameters over time in a health program. Watch the areas that need most improving and start telling consumers about what we are doing to create a positive image of dairy farming. Possibly train farmers to tell their story or find ways to show the truth.

This of course is never that simple and we must be able to change behaviours on farm which is never an easy task.

Farmers sometimes look for products to fix problems while a lot of farm problems do not have solutions in bottles. Managing the system and looking at the environment, feeding and peoples interaction with the cow is a more sustainable approach to problem solving. We now need to change mind-sets and take a longer view on the dairy industry.

We need farmers to start seeing where their product is going, could go and might stop going. We must fill farmers with positive energy to drive this process. This needs to be a movement lead by farmers especially when impacting consumers about what they are doing. Tim May the Canadian dairy farmer I met was a good example of a proactive farmer.

Farmers need to tell the story of their dairy cows and what they do, backed by the relevant professionals who are overseeing them and helping them achieve what they want.

I spent a considerable amount of research time and discussion around how we can affect change at farm level?

We need also to look at how we train people, practically explain about cowsignals and the power of good and positive interaction with cows.

Virtual reality can have some exciting opportunities when it comes to off-farm training.

There is sometimes a macho element to livestock farming and welfare can be seen as fluffy. This fluffy stuff is going to be important because the consumer is heavily influenced not by solids per hectare, but the cow's happiness. Farmers love their cows and we must show this bond to consumers.

It is this love we may need to bring to life to change a generation and win the hearts of dairy consumers.

Any welfare programs must be simple. Get farmer buy in need to be regulated and we must show that they are economically viable. It will be key to show that good welfare also means good profitability.

"I urge farmers to take back the animal welfare story and make it our story".

4.3 People's Influence on The Cow

Firstly for people to have a positive influence on cows' behaviour we must understand the needs of the cow as we said previously. A gregarious species of prey requires certain characteristics to match her requirements.

In my studies meeting cow behaviourists like when I was at Guelph, people like Professor Derek Hadley and from my own experience I listed some key traits that people require when working with cows on a daily basis.

These traits may slightly differ from shrewd business acumen required to run the business end of your dairy. This creates the challenge in smaller one person units around skill sets. Thankfully in Ireland this training is done naturally by being with stock and also passed through generations.

"However as we bring potentially unskilled labour onto farms this could be a challenge for the cow, and industry".

With dairy farming becoming less attractive through negative press could this in fact be a big bottleneck.

We need to look at training for understanding cowsignals and how by knowing what the cow wants we can get better results.

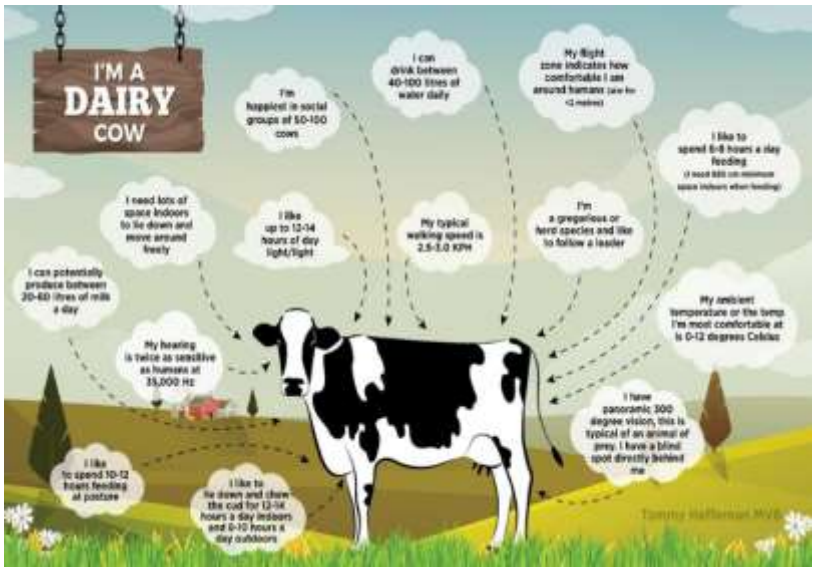

Figure 18: I'm A Dairy Cow

All farm labour need some degree of professionalism brought into it.

We must not for example underestimate when people rush cows?

If you push a cow past 3.0 km per hour then she is more prone to lameness and will be stressed. Chronic stress in cows lowers immunity leading to much more issues with infectious problems like mastitis.

Just like humans chronic stress is a big factor in animal health and disease.

Cows also have sensitive hearing and respond poorly to loud noises, they have hierarchies within groups and when this is ignored can stress them particularly heifers.

Again the use of wearable technology will probably signal the future for this type of monitoring.

While we can provide a lot of training skills around cow behaviour it is key to influence the attitudes of stock people to change their behaviours.

5 The Industry

5.1 Setting an Irish benchmarks for welfare

It was interesting to travel the world and look at dairy products and different opportunities. Sometimes influenced by growing demand, as in Asia, but also by changing needs and wants of consumers in Europe. The industry will decide the products and packaging for the different markets.

There is no doubt we need to have the right story behind these products, as fancy aesthetics and packaging will not overcome cow problems. So for the industry putting the cow first is an answer to many of the challenges they face and being transparent.

We also need to set a benchmark for dairy welfare at a national level, this must be veterinary led and as in the countries I visited but must get farmer buy-in.

5.2 What Is Good Welfare Putting Some Metrics on a Grass Based Dairy System

It is so important when we are measuring welfare that we also measure profitability. Improved welfare on farm can be directly linked in to better cow performance. This is back to giving the cow maximum comfort and minimum stress when genetics and feed are right she will produce.

So I devised a working model which isn't currently available to measure welfare using existing metrics available to put some measure on welfare.

These metrics are largely subjective figures that everyone can assess.

"The dairy industry needs to take back own and tell the welfare story of the cow"

5.3 Creating a National Welfare Benchmark from Current KPIs

What could a welfare metric chart might look like for the grass based dairy system? This is using exiting available KPIs from Co-op reports and ICBF databases, linked with on farm and cow based assessments.

So measure with a benchmark then begin measuring (KPI and cowsignals) at key times over the year. Then re-measure and focus on areas of weakness.

These KPIs I have chosen really positively correlate with good welfare when correct. The debate will be about do production measures go far enough to talk about the wellbeing of cows and how do we assess the emotional state of the cows. This is why a more subjective biology and behavior question was put in at the end.

We need to put clear metrics in place around welfare and profitability and linking the two together.

Example of Dairy Visit Assessment pre-calving can be found in Appendix 2.

Table 1: Suggestions around what a welfare metric chart might look like for the grass based dairy system.(The references for the figures in this Table can be found in Appendix 3).

METRIC	Poor Welfare higher risk	Welfare medium risk	Optimum welfare targets
SCC	>350k rolling cell count	350-150k rolling cell count	<150k rolling cell count
Calf mortality (16 weeks)	>8%	8-2%	<2% calf mortality
Longevity (mature herd 6 + years)	<2.5 lactations achieved	2.5-4.5 lactations achieved	4.5 or more average lactations achieved
Antibiotic usage per kg PCU	>60mg/PCU	60-22mg/PCU	<22mg/PCU
FPT year 1 30% calves tested Test use serum protein	>15% of calves less than 5.5mg/ml (failure of passive transfer)	Between 5-15% of calves have below 5.5mg/ml (failure of passive transfer)	95% of all tested above 5.5mg/ml
Culling target	>35%	35-18% culling rate	<18% culling
Lameness target at routine visit Measured using mobility scoring	>20% Mobility scores greater than 2 or more	20-5% lameness Mobility scores greater than 2 or more	<5% lame cows Mobility scores greater than 2 or more
Involuntary culling Made up of empty rate <8%	16%	16-10%	<10%
Cow mortality (died on farm)	>5%	5-1%	<1%
Production metric (spring based grass system) MS/KG/LiveWeight	<0.7 kg/ms/LW	0.7-.0.9 kg/ms/LW	0.9-1.1 kg/ms/LW
Behaviour Assessment (looking to cow signals to assess overall herd performance) 3 routine visits a year.	Using cowsignals assessment on routine visit >20% of cows showing negative signals	20-5% of cows showing negative signals Example lesions, standing waiting cows	At regular assessments >95% herd are exhibiting normal behaviours

5.4 Picking the Right People for a Dairy Psychometric Testing

As I discovered how important people were on good cow performance I started to realize the impact of having the wrong people involved. I could find no guideline or tool for assessing people who wanted to go milking or working with cows. So after identifying the key characteristics of good stockmanship from conversations in Holland and in the University of Guelph. I set about looking at creating a psychometric test for these.

This would be a way of some early warning signs for someone who failed this test. It also may identify some need for training.

My experience most people can work with cows but the most important thing is to understand the cow first. This might not just have an application on farms but people working with livestock right across the sector as each area are potential bottlenecks for welfare and provide challenges for the industry. Some of the traits identified

- Calm
- Consistent
- Detailed
- Quiet
- Predictable
- Gentle
- Motivated
- Patient
- Focused
- Self-discipline

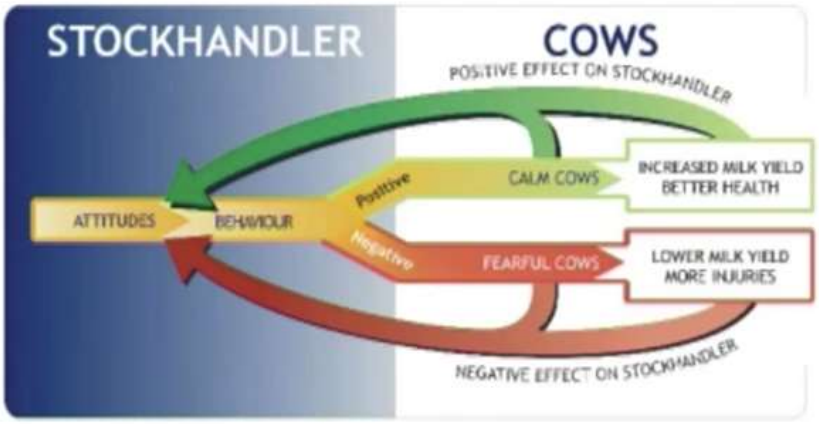

Figure 19: Stockhandler

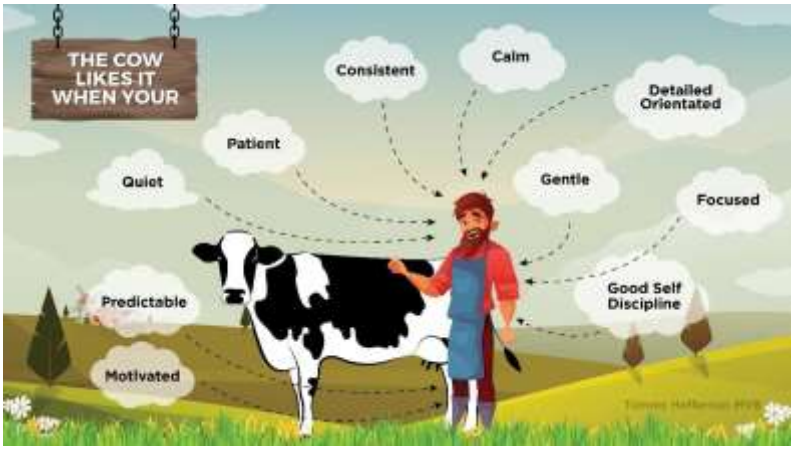

Figure 20: The Cow Likes

5.5 Reducing Antibiotics and Better Welfare - The Links

One of the other huge challenges the industry faces is reducing antibiotic usage. Although dairy farming is not a huge user there is room improvement around prophylaxis such as at drying off. Poor welfare and high overall herd antibiotic usage seems to be correlated. I surveyed over 60 cattle veterinarians in three countries and asked if improving animal welfare will reduce antibiotic usage. They all agreed it would, however some were not sure whether improved welfare could be directly linked to better production and profitability.

While we need to keep antibiotics and have them at our disposal they can often mask poorer issues around management on farm. This is one area by maximizing welfare where you can also

see a very positive correlation with antibiotic usage. New EU regulations will dramatically impact our usage so being proactive now is essential.

So what could you do on farm?

- Look at drugs records identify risk areas, for example what diseases are you treating most frequently. Look at these areas and also look at key performance indicators.
- Look at welfare metrics and identify weaknesses
- Look at more detailed environment feeding production audit if needed.
- Go after the first bottleneck, make changes and review over a given time frame.
- Use a 3 year time period with the program. Each dairy program should have some general must dos as well over time.
- Keep it as simple as possible.

So reducing antibiotics and welfare are closely linked and should be tackled together and not separately.

6 The Consumer

Figure 21: Dairy is scary"Cult anti-dairy" film on YouTube

Source: YouTube

Social license in Ireland is becoming increasingly important, and internationally there has also been a lot of negative sentiments about the dairy industry, with documentaries like dairy is scary getting over 5.6 million views on YouTube.

6.1 Dairy Consumption Patterns around the World

While global dairy demands seem to be on the increase. It is clear not everyone is willing to pay a premium. Dairy still can be a very good way of producing cheap animal protein. Can we ignore calls for higher welfare, lower antibiotics, reducing GHGs and still be profitable, with increasing global demands arguably we could just focus on production and still be profitable. This is not where we want to be however and to be in a premium market we must change our focus slightly. What I find with Irish farmers that story of understanding the cow is there already on many farms. We might just need to bring it to life, as any scandals in our industry could severely impact on our social license.

This may damage our ability to even compete in the middle of the road markets with a low cost system. This will make dairying an unpopular career choice also.

We need to act now to change the national direction of brand Ireland and start incorporating welfare and antibiotics into the mixture. It will be argued we already are however I think we must do more with concrete definitions and new targets.

"As any scandals in our industry could severely impact on our social license".

New labels or fancy marketing spin will not solve the problems or challenges we currently face and I believe we must go deeper to farm level right down to the cow for the sustainable answers we need.

The undeniable challenge is the fact consumers want the highest of standards and the cheapest of food. Breaking this cheap food cycle has to be part of the solution especially with up to 40% dairy food waste in developed countries.

According to Rabobank's Raboresearch report "Making Milk Cool Again" which was released in August 2019, the opportunities for the milk sector lie in offering milks produced under various production systems that address animal welfare and sustainability concerns.

6.2 What The Consumer Wants?

As I travelled to different countries I paid particular attention to dairy consumers and what they were saying. Like in Ireland, global trends in developed countries showed that millennials in particular are choosing less dairy. With some decisions being made around diet and health choices. More and more it was based on ethical decisions such as animal welfare or environmental impact.

There is a focus even in Asia around "clean label" foods that are both healthy, safe and not impacting the environment.

Deloitte published a global dairy sector trends in 2018, it is clear there is an opportunity for the industry to focus on areas like welfare with transparency being very important.

"Dare I say it has almost become uncool to consume animal products"?

Consumers were being influenced by influencers and vegan propaganda. With the dairy industry slow at times to defend certain practices and maybe not admit that some were wrong.

Most animal welfare violations, when you dig deeper, are the wrong people are working with cows. It highlighted for me the importance of good stockman ship training as a pillar of the next generation of farmers.

I had to ask the question about does the consumer know what they even want? In Ireland our dairy industry is strongly driven by exports, our national brand becomes important. While individual farms can chose to dive deeper into marketing directly and pasture to plate stories, at a national level we must set some standards.

Two big consumer dairy issues were calf separation at birth and the male calf becoming a by-product of production. A calf centred approach to young stock can combat these negative perceptions.

"The bigger issue I found on my travels for the consumer was why we remove the calf from the cow at birth".

6.2.1 Appendix 4: The Dairy Calf Issues

6.3 Changing Mind-sets of Consumers

The consumer will keep any business honest. They are our market and they drive demand, we must remember to build businesses based on their feedback. There are significant opportunities by looking at consumer trends around health and well-being. Dairy can fill these niches with specialties like geriatric products, sports nutrition and high quality baby formulas.

Food trust is a new space where you bring your consumers with you on a journey. Yes people need to eat and we can fall back on demand as a driver but there is an opportunity to not be focused on demand alone. Building the food trust and emotional connection with the positive nature of modern dairy farming with a cow centred approach.

When I was in China I could not help but think with recent pork shortages they must now look quickly to other alternatives. Synthetic biology could replace animal protein so our battle will be to promote the sustainability of biological farming. We can only do this by influencing their thinking. **"Dairy is good for you"** just doesn't cut it anymore in my opinion. Dairy farming must make an emotional connection with its consumer. The best way to do this is the art of storytelling and the farmers and their cows are best placed to do that.

Can block chain provide an answer letting consumers follow their animal proteins journey from the calf that received pain killers to the longevity of the herd?

Turning the issues that are of concern into opportunities.

"We must embrace transparency, tackling issues like calves being separated and the use of AI".

Why are calves removed from cows is a question I was asked the world over? We must now answer these hard questions and honesty and science must be to the fore. We must apply a calf centred approach to the young dairy animal also.

We need to sell more realistic images of cows and farming. There should never be a mind-set of keeping people in the dark, "what they don't know won't worry them". Modern technology means everyone knows a lot, but often little of what is important. We need to explain to them the cow is the Centre of our industry and why we do what we do.

"We should never underestimate the power of the story we tell and the truth behind it"

6.3.1 Appendix 5: The Power of a Story

Conclusions

By having a cow centred approach to modern dairy farming we could make farms more profitable and have more trust from the consumer. As I developed my Nuffield idea I saw three links in the chain the cow, the farmer and the consumer. There is no doubt in developed countries that consumers may be eating less animal protein but there will be a need for the highest quality product possible. There is a real challenge also that protein sources may change so that animal protein must continue to show why it is such a valuable product versus synthetic biology or lab grown protein.

I initially set off to develop a plan for the cow, without the consumer though we have no need for the cow.

They are all linked together with any of them missing the system falls apart.

The consumer needs the cow as she offers a nutritious healthy food source. The farmer needs the consumer and they want to have a good quality life and be profitable.

We may need to farm less cows, so we might need more value from them. The environment will create a new quota in Ireland I have no doubt. So we may need to add value to our herd. Social license will also be really important, if we are to look at other countries like New Zealand there are lessons to be learned.

We must harness the good will to dairy farming by creating a dairy industry with the highest animal welfare standards in the world. As I have said, a high welfare dairy herd will also have less disease and use less antibiotics.

The modern consumer will drive our markets, they will influence the direction of our industry. There is no doubt animal welfare will be one area where this will become more important.

We have completely lost our relationship with food it is now convenience. We have forgotten the value of milk, a glass of milk is two years in the making.

Using animals is a privilege so we should not waste them or their produce, we must place value in the product we produce and those who consume it must respect it and not waste it. A consumer who respects the cow may want to pay more to see this happening.

"A consumer who respects the cow may want to pay more to see this happening".

From my travels and lots of thinking time, I am sure there is a bright vibrant future for the dairy industry. Our markets will drive demand and especially in Ireland where we aim to have access to the premium markets. Healthy, safe food are all going to be key drivers but also the fact that the cow is central and key to our dairy story.

By putting the cow first we can answer so many questions and solve many problems. A healthy happy cow produces good quality milk with very low antibiotic usage and high standards of welfare. A happy healthy cow is a profitable one for the farmer and gives the consumer peace of mind when they enjoy dairy. A healthy cow lives longer and has a smaller environmental footprint.

The farm vet can play a central role working with farms and their cows to ensure that standards are met from a regulation point of view. The bigger opportunity lies in the fact that more proactive engagement will show better results.

"It may well be that technology may help come to our aid to monitor the needs of the cow but her faith will also remain in the hands of her keepers".

Post Nuffield

"I continue to use what I have learned to help make farming better".

I have rolled out welfare programs not just in the dairy industry but replicated the model and ideas for sheep and beef. These programs have been running in my role as Farmers Journal Animal Health specialist. I have also built and designed a large antibiotic reduction program which has strong welfare and cow biology measurements in it.

Appendix 6: Lessons of Leadership

"We probably already know what we need to do improve animal welfare, the greatest challenge will always be around how we change people's behaviours"

Recommendations

- Ireland can lead the way in welfare on a grass based system, by adopting and setting a scientific target for welfare based metrics outlined in this paper.
- Develop a more proactive based veterinary service in Ireland with regular farm visits to optimise farm performance. Regular vet visits three times yearly to dairy farms to look at dairy cow welfare metrics, make recommendations and regularly review cow signals.
- Cowsignals and welfare management become part of main stream veterinary education in universities. Also develop future vets in coaching roles to help their clients work towards farm and animal health goals together.
- Cleary look at what 24 hours looks like for the dairy cow in the grazing system at different stages of the cycle. Use wearable technology to help them track these ideal days and look at an alert system or early warning when cows are not having an ideal day. Proper ideal daily time budgets for the grass based dairy cow.
- Set up a veterinary led welfare scheme to support Irish dairy farmers, three visits a year at quiet times to assess cowsignals proactively, to improve animal welfare, performance feeding into a welfare and performance monitoring tool.
- Use psychometric testing for all new employees working with cows, especially at processing levels off farm, marts, factories lairages etc.
- Nationally every spring based dairy farm could do with a dry cow audit to assess and maximize welfare based on what the cow wants? This can have massive impact on cow and profit if done correctly.
- The dairy industry to help promote the cow centred approach to consumers using real farming stories of dairy farmers and their happy cows. Farmers who have signed up to programs, get formal media training on how to promote and show best practice around the brand.
- Set up a new Irish based milk brand on a cow centred approach/idea as a five year trial.
- Cow behaviour needs to be a key component of future agriculture curriculum, training around what the cow wants.
- More research should be done on low cortisol milk from happy cows **"story"**
- Ireland should have a designated stakeholders or group to tackle Anti-Microbial Resistance.

Appendices

Appendix 1: Pain Free, Using Fluids and Alternative Nutritional Supports

We need as a dairy industry to fundamentally understand pain in our animals.

Farmers need to be have very clear checklists and understanding of the pain signals of a cow. The wearable cow technology also provides a useful tool that might automatically pick up these signals from cow. Talking to SCR in Israel these are some of the technologies they are pursuing around cow happiness and health. We definitely could be using less antibiotics on most dairy farms and more anti-inflammatories as a general rule.

Anti-inflammatories can play a key role to alleviate pain and return normal function in animals.

The cost benefit of using anti-inflammatory medication isn't always transparent but as part of a system it works. It is just the right thing to do.

We need to utilize vaccines and immunomodulators to help the dairy cow reduce her stress

We need to look at things like more aggressive fluid therapy on farm delivered by farm staff. Oral fluid rehydration is a simple tool and technique that can be trained to farm staff like French vet Olivier was doing.

Both oral hydration (fluid therapy) and basic medicine usage must form a key part of animal health training for farmers and farm workers. Vaccinations also play a role in animal welfare by reducing disease pressure on our farms.

Figure 22: Administering oral fluids to cows and calves greatly improves treatment outcomes and animal welfare.

Appendix 2: Sample Dairy Welfare Assessment Chart for Spring Based Grass System

Dairy Visit Pre Drying Off Autumn

Farmer Name: _____

This is a risk scale which allows the vet a way of identifying housing risk areas on farm. Please place tick into box that most suits that question. This is the more detailed breakdown of this risk analysis.

- **Green** low risk
- **Amber** medium risk
- **Red** high risk

1.	BCS of cows	☐	☐	☐
2.	Lameness	☐	☐	☐
3.	Adequate feedspace	☐	☐	☐
4.	Cow comfort stocking densities (SPC)	☐	☐	☐
5.	Fresh air moisture shed assessment	☐	☐	☐
6.	20% cows individual signals assessment	☐	☐	☐
7.	Supplementation/ Mineral analysis	☐	☐	☐
8.	Cow flow/flight zones	☐	☐	☐
9.	Vaccines and treatment plans	☐	☐	☐
10.	SCC	☐	☐	☐
11.	Cow hygiene	☐	☐	☐
12.	Liver fluke Parasites	☐	☐	☐
13.	Diagnostics	☐	☐	☐
14.	Faecal consistency	☐	☐	☐

Report Date: _____

Farmer Name: _____

Vets Name: _____

Three areas farmer doing really well

1. _____
2. _____
3. _____

Three risk areas priority for improvement

1. _____
2. _____
3. _____

Three actions (minimum of one, max 3)

1. _____
2. _____
3. _____

Review date decided for next visit. _____ **Date**

Appendix 3 references for welfare audit tool

The welfare audit tool must be used in conjunction with 3-4 yearly visits based on risk assessments to have the maximum impact.

SCC AHI cell check guidelines and also traveling through Holland, Denmark and talking to mastitis expert Peter Edmondson

Calf mortality based on research from UCD herd health group reference Conor MacAloon.

Lameness from work done by Teagasc and also international research from lameness consultant Neil Chesterton. Requires regular visits to measure this using mobility scoring. The use of technology may help this by creating a standard that takes out human error and biases.

Longevity 5+lactations based from research carried out in Holland by Joep Drisen and the cow signals training company

Antibiotic target based as reference below by RUMA alliance in the UK who have set target for national herd. Antibiotic usage can be measured as a factor for good welfare. There total absence also could be marked as poor welfare at global level. This is why measuring them as part of the welfare audit is really important.

Culling targets for grass based herd based on research by Teagasc in Ireland, it is very important to include longevity as this creates the balance as high culling rates could create a false biases.

I would use this approach of creating some welfare metrics as a way of benchmarking farms. Regular visits and reviewing cow metrics, behavior metrics, environmental metrics and also looking at some KPIs to target what are the on farm risk areas.

I also discovered a very useful metric LDY or lifetime daily yield used in the UK.

Lifetime daily yield (LDY) It means yield per day from birth to culling, and can be used as an overall indicator of technical performance at the farm, as it averages out total milk production over every day a cow has been alive. It is a very good indicator of performance and puts the cow's health and fertility in the center. It embeds age at first calving, longevity and milk yield.

It is important that this measurement scale isn't used negatively against farmers but more in a positive light. The objective is to show farmers good production and good welfare are actually symbiotic.

These KPIs I have chosen really positively correlate with good welfare when correct. The debate will be about do production measures go far enough to talk about the wellbeing of cows and how do we assess the emotional state of the cows. This is why a more subjective biology and behavior question was put in at the end.

We need to put clear metrics in place around welfare and profitability and linking the two together.

This is a general overall audit but individual programs are available to farmers. Training is a key part of this improvement?

Longevity could be a key metric but is important to look at mean. Lots of young cows and old cows gives a high mean. However this can be accounted for with low lameness and low SCC would indicate good consistent longevity.

Lameness becomes a very important metric in animal welfare. It can be complex to measure it though, we could never eliminate lameness but a reduction below 10% for me is acceptable. The question remains about farming size around welfare and whether grazing is better for animal welfare than indoors. I think with my welfare scale both rules apply. Interestingly, if I had my choice of which system is better for welfare, I would say grazing will win when the cow's needs are met.

However there are times the Irish system is weak particularly around housing and housing facilities. This could be improved and mostly with calf housing.

Dairy Sector Targets the PCU reference comes from RUMA task force

Figure

Targets

2020 % Change

1. HP-CIA injectables (mg/PCU) 1.075* 0.538 -50%
2. HP-CIA intra-mammary use (DCDVet) 0.332* 0.166 -50%
3. Intra-mammary tubes – dry cow (DCDVet) 0.842* 0.674 -20%
4. Intra-mammary tubes – lactating cow (DCDVet) 0.808* 0.727 -10%
5. Sealant tube usage (average number of courses per dairy cow) 0.5* 0.7 +40%
6. Total usage (mg/PCU) 26.2** 21.0 -20%

**** Measured using 2015 UK sales data ** Measured using Farm Vet Systems survey***

Appendix 4: The Dairy Calf Issues

Many systems have been focused on milk for many years. With efficiency being key for the Irish system a small cow with good solids makes sense. Unfortunately though the male offspring then become smaller with poor economic value. Essentially in the extreme they can become a by-product. For me personally this is not where I want us to go at a national level.

The question I asked was what the answers to this problem were. I think this could affect calf mortality and reflect poorly on what our industry is doing.

It is important for health and welfare as I feel strongly every calf counts. It is also important we adopt sexed semen and breed to beef when our quota of replacements is met.

As we look to improve farm efficiencies and environmental impact dairy and beef industries must be more aligned with a dairy cow with some beef genetics. I wonder do we need to move a proportion (through incentives) to seasonal autumn calving herds to spread the market of calves.

The reality in writing this report is that the use of jersey genetics seems to be less in favour for the future of our dairy industry. However our big challenge is the number of calves we have and not just the jersey cross. We must never compromise on the biology of any calf in the dairy system. Having a calf centred approach like with cows can make a huge difference and create the positive story we need,

"The bigger issue I found on my travels for the consumer was why we remove the calf from the cow at birth".

In both the UK and Germany this was a big issue. While options are there to keep calves with cows, with calf disease management and large milk volumes make this a very difficult system to control. It can be done and should not be ruled out as a path forward for some dairy farms. It does ask the question around Johnes control and the potential for smaller farms.

In most commercial dairies right now this simply can't work, while it may only provide a niche businesses for some farms currently. We need to explain to the consumer why it's ok to separate the calf in a modern commercial dairy farm. This transparency backed by a calf centred approach to raising claves is the path forward currently.

This problem came up time and time again on my travels. No one seemed to have a definitive answer for this problem. For me the answer is the story is all about the calf. Also a cow's instinct is to hide her calf somewhere quiet and secluded so she can go and eat after birth, while the calf safely sleeps. This means early calf separation works before maternal bonds are formed and then pay attention to the new-born calf.

We know what the modern dairy calf wants so we can give them this.

"This is the answer, a calf centred approach to youngstock management"

- Colostrum
- Biological feeding
- Comfort and warmth
- Fresh air
- Space
- Housing in pairs and groups to allow proper socialisation

On my welfare audit of the modern dairy farm, measuring passive transfer becomes a very important scientific metric we need to measure

Showing consumers that any calves having routine procedures (like mutilations) done we make sedation and pain relief mandatory. Farmers might bemoan the extra cost but there is significant cost benefit to not getting sore stressed sick calves.

Appendix 5: The Power of a Good Story

In Ireland we have 18000 dairy farmers. We have <2% vegans this is 60k vegans.

The people who consume dairy are 90% or more of the general population on a regular basis. So it is these people we need to mobilize and reach out too.

What story do we need to tell?

Breakfast around the table?

Family farm and the cow at the Centre of it, we need to let our consumers know what our dairy strategy is and that the vision of producing dairy is to move the cow to the centre of the industry.

Should we allow consumers to be more actively involved in our farms? Own a cow how a cow gets to the parlour new experiences that engage dairy consumers and farming.

From my global travels I have no doubt the modern consumer is so heavily influenced by everything around them. In a noisy world, people believe people and they believe the stories of these people. These stories must touch them emotionally for them to buy into them. Sitting around family farm tables across the world I have seen and felt this emotion and dedication. The consumer must see this.

"The words we use can be powerful"

Appendix 6: Lessons of Leadership along the Way

As I travelled around the world and met more and more people lots of things started happening my thought process. Nuffield has thought me not to be afraid to have different ideas and probably most importantly have my own ideas. To focus on bigger goals and always seek to find solutions to problems. It showed me the unstoppable power and energy of people. In fact because it is a leadership program I developed a list of my leadership goals that helped guide me along the way.

1. Listen to people
2. Be passionate about my topic
3. Focus on what I'm trying to achieve, focus on good solutions to the questions I was asking
4. Keep it simple
5. It's ok to have fun with it
6. Don't be afraid to articulate my own thinking
7. Take some risks with my topic
8. Remember who I'm doing it for my family, farming and to help global agriculture be more impactful

These lessons gave me the resilience to keep going. They became by guiding principles along the way to help me stick to my vision of helping to make farming better. They also gave me unique insights into human behaviour and affecting change. These will be important lessons for me as I try an influence the Irish dairy industry with my recommendations and findings.

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