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Cattle health schemes: what does success look like?

Liz Cresswell

June 2023

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ISBN: 978-1-916850-10-1

Published by The Nuffield Farming Scholarships Trust
West Wing Earnshill House, Hambridge, Langport,
Somerset TA10 0AX
email : office@nuffieldscholar.org

A Nuffield (UK) Farming Scholarships Trust Report

Date of report: June 2023

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

Title	Cattle health schemes: what does success look like?
Scholar	Liz Cresswell
Sponsor	Central Region Farmers Trust
Objectives of Study Tour	1. Understand how cattle health schemes are used to control and eradicate livestock diseases in other countries, and why some diseases are prioritised over others. 2. Identify factors which have contributed to successful cattle health schemes and which ingredients we could apply to achieve the same success in the UK. 3. Examine disease control in other species to establish what the cattle industry can learn.
Countries Visited	Scotland, Holland, France, Belgium, Denmark, Zimbabwe, South Africa, Ireland, New Zealand, Norway.
Messages	1. There are many reasons for participation in cattle health schemes, reaching beyond the primary aim of improving cattle health. 2. Cattle health schemes play a pivotal role in driving up animal health standards but are only part of the picture of achieving high herd health. 3. 'Success' looks different depending on the perspective of the stakeholder; identifying cost-benefits to different stakeholders helps to facilitate overall success. 4. Regular communication of clear frameworks which identify the aims, milestones and responsibilities of the scheme help with any adaptation which may be needed along the way. 5. Regulation associated with cattle health schemes can be burdensome. Data and technology can help to provide transparency and streamline processes.

EXECUTIVE SUMMARY

At a time when the livestock industry is under huge pressure to be sustainable and efficient, preventing disease is of critical importance to ensure that cattle are as healthy and productive as possible.

There are a wide variety of cattle health schemes used throughout the world to prevent, control and eradicate disease in beef and dairy operations, and to identify herd disease status which have been applied with varying degrees of success. The UK is no exception; there are many different schemes and yet several preventable cattle diseases remain endemic. This study was undertaken to explore cattle health schemes in different countries and in different livestock systems. It aims to identify the key ingredients which underpin success and could be applied to the UK situation.

Cattle health schemes should not be relied upon as the only means by which to determine herd health status. Success in controlling livestock health has also been achieved where formal programmes are lacking. A cohesive strategy is required in order to achieve disease control nationally but good status of health and welfare can be achieved at a farm level in the absence of wider support. Ensuring that the basics of animal health – suitable environment, adequate nutrition, the right animals for the system and preventative disease measures – are done well goes a long way towards reducing the impact of cattle disease.

Controlling disease in a herd is only one of many pressures faced by the farming industry. Understanding the cost-benefits of cattle health scheme participation as part of a bigger picture can help to identify what 'success' looks like from different stakeholder's perspectives; there are financial, commercial, personal, social and environmental factors involved in making decisions around animal health. Incorporating them into decision-making around cattle health schemes can help to embed animal health into holistic solutions for farm businesses.

Frameworks can help to provide roadmaps for controlling disease but an adaptive, flexible process will help to facilitate successful outcomes; 'one size' does not always 'fit all' and excessive bureaucracy can be counter-productive. Regular communication can help to expedite success and collaboration is aided where partnerships exist: this is more readily achieved in smaller, more consolidated cattle industries, so collaboration towards shared goals is even more essential for the UK.

Technology and data are creating solutions for animal health at a rapid pace and cattle health schemes will need to evolve to reflect this. They also provide excellent opportunities to reduce administrative burdens as well as both improve and demonstrate improvements to cattle health, building transparency and trust in protein production which is needed for farming's societal acceptance and public approval.

We are privileged to have the resources and expertise to implement cattle health schemes in the UK, and to reap the benefits. The ingredients for success are available to us, but we cannot rest on our laurels. A concerted effort is needed to push forward in implementing robust, successful cattle health schemes as a key strategic driver for achieving some of the world's best cattle health and welfare and profitable farming businesses.

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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.

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Chapter 1: Personal introduction

Whilst I grew up in rural Essex, I did not come from a farming background and it wasn't until my twenties that I discovered my passion for agriculture. After completing a Zoology degree at the University of London I took the decision to take the graduate route into Veterinary Medicine.

It was during vet school that I first started working on farms and I am forever grateful to the farm department at the University of Nottingham for their infectious enthusiasm and support in pursuing my career as a farm vet. After completing a postgraduate internship I moved to Australia to consolidate my practical skills and spent three years at Kyabram Veterinary Clinic in Victoria, Australia where I also met my now husband.

I had always enjoyed research and returned to the UK to undertake a PhD – however, I soon realised that this was not quite the right fit and I returned to clinical practice as a locum. After considerable career exploration I applied for a role as veterinary advisor for MSD Animal Health and four years later I continue to use my veterinary skills to engage with vets and farmers at local, regional and global levels through my work.

It is this drive for purpose and practical solutions to animal health and a passion for travel and learning through other people which led me to apply for a Nuffield scholarship.



Figure 1: The author, Liz Cresswell in veterinary practice at Kyabram Veterinary Clinic. *Source: author's own.*

Chapter 2: Background to my study subject

The World Organisation for Animal Health (WOAH) estimates that every year 20% of livestock production is lost due to animal disease (OIE, 2015). This represents an annual loss of USD$358.4 billion and the meat consumption needs of 1.6 billion people (Oxford Analytica, 2023). Improving the disease status of livestock provides an opportunity to sustainably feed 9 billion people by 2050.

As a livestock veterinarian I have always been interested in the control and eradication of population level disease. When working in Australia, I found many farmers to be particularly concerned about Johne's Disease but less worried about other infectious diseases which were having more of an impact on their herd. In the UK there are cattle health schemes (CHSs) for several endemic diseases, but I was still encountering these diseases on a regular basis. This made me wonder how we prioritise disease control and whether a more concerted effort could help us to improve the health status of the national herd. The science has existed for many years to control and even eradicate some of these diseases. Germany – a country landlocked by nine other countries - has eradicated BVD; why aren't we there yet?

I started my study tour considering voluntary schemes (e.g. BVDFree England and private laboratory-run schemes) and how we could improve participation rates and compliance. However, I soon realised that voluntary CHSs simply do not exist in other parts of the world. The UK is in a privileged position to have the expertise and resources to be able to take a structured approach to disease control and leverage this to demonstrate high standards of health and welfare. But there are other ways in which to achieve disease prevention, control and eradication - ultimately these are all schemes to improve cattle health. I became more interested in the underlying principles for controlling livestock diseases and trying to identify the ingredients for success which can be applied to CHSs.

Global society faces huge challenges - climate change and sustainability, food security, labour availability, one health, mass migration, supply chain continuity, political instability and many more. Agriculture sits at the centre of these issues and high standards of livestock production, with effective disease control and good health and welfare can be part of the solution. As our world changes at an increasingly rapid pace, I am positive for the future of cattle health - but we need to be bold and brave in our approach to meeting these challenges.

Chapter 3: My study tour

I visited the following countries during my study tour:

Where	Comments
Scotland, UK May 2022	Before leaving for my international travels I gained a better understanding of how CHSs work in the UK.
Netherlands September 2022	The Netherlands has an enviable cattle disease control reputation. I spent time with a range of stakeholders to understand the ways in which CHSs have contributed to this and perceptions within and of the industry.
France September 2022	I visited the World Organisation for Animal Health headquarters to understand how animal disease is controlled at a global level.
Belgium September 2022	I attended a stakeholder event at European Parliament about the transition to precision livestock farming.
Denmark October 2022	Danish farmers are known for being proactive about animal health and engaging with their industry. I visited public-private partnership organisations to see how they have worked together and to understand the capability of their national database.
Zimbabwe October 2022	This opportunity arose via Nuffield Zimbabwe. I experienced animal health outside of my normal frames of reference and identified common themes which underpin cattle disease control.
South Africa October 2022	I met with veterinary colleagues who have a good overview of animal health in southern Africa to expand on my learnings from Zimbabwe.
Ireland March 2023	Ireland has a strong and consolidated dairy industry with a recent history of active BVD control in a climate similar to the UK. I met stakeholders to help me understand the similarities with the UK and what we could apply here.
New Zealand March 2023	The Mycoplasma bovis eradication has been a major cattle health scheme in NZ. I met with government and private stakeholders and attended the Nuffield triennial conference.
Norway April 2023	Norway has eradicated many cattle diseases and is now working on more epidemiologically challenging diseases. I met with industry leaders to understand how they were successful and identify their next steps.

I also undertook a Global Focus Programme (GFP) in March and April 2023 to New Zealand, Brazil, USA, the UK and Belgium. The GFP is an intensive four-week study tour with 8-12 international Nuffield scholars and aims to develop scholars' understanding of agriculture at a global level.

Chapter 4: Governance

*'A fragmented approach leaves room for inconsistencies, overlaps and gaps. There is a need to simplify bureaucratic systems and streamline approaches to ensure consistency within and between different levels.' – Gabrielle Chan, Why You Should Give a F*ck About Farming*

There is no single definition of what constitutes a cattle health scheme. For the purposes of this report I am defining CHSs as 'frameworks to guide the control and/or eradication of infectious disease within cattle population/s'. These could cover a wide range of production systems with varying structures and may be:

- Statutory or voluntary
- Local, regional, national or international
- Paid, subsidised, incentivised or unpaid
- Single agent (e.g. BVD, Johne's Disease) or multifactorial (e.g. mastitis, respiratory disease)
- For disease prevention, control or eradication
- Standalone or part of contracts, membership (e.g. breed societies) or assurance schemes.

There are several, potentially overlapping stakeholders with an interest in CHSs:

- Farmers and cattle
- Veterinary professionals
- Laboratories – many private laboratories run their own schemes. Government laboratories have an additional remit of disease surveillance
- Processors, standards and assurance bodies
- Industry organisations e.g. breed societies, levy boards, unions and other representative associations
- General public
- CHeCS - the overarching body in the UK and Ireland which certifies and quality-controls cattle health schemes to the same set of technical standards.

4.1 The purpose of cattle health schemes

Cattle health schemes 'represent an opportunity for health, welfare and economic improvements in the industry by facilitating the process of farm health planning' (Statham, 2011). Whilst the aim of CHSs is usually prevention, control or eradication of disease, improving animal health and the benefits that these bring, they may not be the only reason for participation: a 2019 survey found that 45% joined a CHS for accreditation purposes and 45% joined for herd health reasons (CHeCS, 2019).

In Scotland I met Neil McGowan NSch who is one of many pedigree beef producers for whom CHSs are an integral part of their business. Participation in CHeCS-accredited CHSs is a compulsory part of many breed society memberships. This has led to high health status being achieved for pedigree breeds including Neil's Simmental, Angus and Luing cattle. CHSs for pedigree breeders are an

essential trading tool, providing protection for the seller and reassurance to the buyer through certification of disease status.

For commercial and/or cross-bred herds, CHeCS accreditation is not usually a requirement; buyers can benefit from the disease-free/controlled status of the animals they are purchasing, but these animals may not always attract higher premiums as for some diseases (such as BVD in Scotland), particularly as, for some diseases, control is now considered baseline – an assumed 'given'. However, it can be risky to assume disease free status without certification or testing, particularly if bringing animals into a naïve (i.e. not immune through previous disease exposure or vaccination) herd.

4.2 Regulatory frameworks

With so many different possible combinations of CHS types and stakeholders, I wanted to explore the various structures that exist and where the challenges and opportunities lie.

4.2.1 Top-down vs bottom-up

To explore top-down vs bottom-up approaches I started at the top - I visited the headquarters of the World Organisation for Animal Health (WOAH, formerly OIE) in Paris to try to understand how disease control is prioritised and organised at a global level. WOAH sets international standards for animal health and welfare. Through a variety of committees it provides facilitation, coordination and education on animal health, as well as conducting research.

The scale of the challenge of managing animal diseases at a global level is enormous and WOAH engages stakeholders at different levels rather than setting 'one size fits all' regulations which are pushed downwards. Member countries have autonomy over their disease control approaches and WOAH provides a neutral ground for facilitating stakeholder discussion and regional responses. I asked Alexandre Fediaevsky, GF-TADs (Global Framework for the Progressive Control of Transboundary Animal Diseases) Global Secretariat how successful transboundary animal disease control has been; he advised that progress can be difficult to see and that some diseases are increasing rather than decreasing. Néo Mapitse, Head of Regional Activities added, 'if a farmer is concerned about mastitis then they're not going to be focused on foot-and-mouth disease (FMD)'.

This led me to reconsider what we mean by 'success' and the scale at which we measure it. WOAH has 117 listed diseases, one of which (rinderpest) has been globally eradicated – incidentally, equal to the number of human diseases eradicated (one - smallpox). However, in the context of the challenges facing global agriculture the social, economic and environmental benefits of the work that WOAH carries out is immeasurable. Eradication and control of diseases at herd, regional and national levels have been achieved through WOAH's activities and the strategy is constantly evolving in response to member's requirements.

The visit emphasised the complexity of cattle disease control and that, while it is important to have a goal and a plan, this does not always need to be an 'all or nothing' conversation; progress in itself can be 'success'. Focusing on the process - identifying clear milestones and allocating responsibility – is as important as the end-goal. With such 'wicked' problems (problems which are difficult or impossible to solve because of their complex, interconnected and ever-changing nature), flexibility

and adaptation are important as are understanding the issues from ground up. This can only be achieved by communication and collaboration between all stakeholders at different levels.



Figure 2: Néo Mapitse (top left), Alexandre Fediaevsky (top right), author (bottom left) and Edna Kallon (bottom right) at WOAH headquarters in Paris: discussions of disease control priorities and organisation at a global level.

Source: author's own.

On my travels I encountered few true 'bottom-up', grassroots schemes, and in my experience from working with veterinary practices on smaller health schemes grassroots schemes can lose momentum without wider support. Some of the countries which have been most successful with their cattle disease control are those where schemes have come from farmers themselves, but support has been provided by a wider network, organisation, funding and/or government. One such example is Denmark where levies are applied typically at high rates and used to fund organisations, such as SEGES Innovation, which lead development and implementation of CHSs based on feedback

from the livestock sector. However, health schemes and projects must still gain government support and therefore align with government priorities: this is a challenge for improving cattle health purely based on the needs of the industry.

4.2.2 From voluntary to mandatory

The cattle health team at SEGES Innovation described to me the general approach towards Danish CHSs:



Figure 3: Danish approach to cattle health schemes according to SEGES Innovation.
Source: adapted from presentation delivered during visit.

Using this approach Denmark has eradicated several non-statutory infectious diseases such as BVD, IBR and EBL. It emphasised how a framework with a clear end-goal is important, but the milestone aims will vary at different stages of the process. Beginning with voluntary action is a common approach for industry-wide CHSs which have an end-goal of reduction or eradication of single-agent diseases. Such an industry-led approach can significantly reduce the impact of a disease on the national herd whilst paving the way for compulsory actions to be introduced by processors, farm assurance or legislation. The latter 'stick' approach is required for participation of the minority of farmers who will not or cannot participate in preventative health strategies until this point.

4.2.3 Carrot vs stick

Going into my study tour I had conflated 'top-down' with 'stick' approaches – in some CHSs top-down schemes punishment is carried out for non-compliance e.g. milk companies refusing to pick up milk if disease testing requirements are not met. This 'top-down stick' tends to be effective. However, there are also 'top-down carrot' approaches such as subsidies and incentivisation for participation.

Where CHSs are associated with incentivisation, improved animal health can add value throughout the whole chain. I did not experience any single-agent CHSs which provide financial 'carrots' directly to the producer – some receive indirect incentivisation through achieving 'high health status' prices, but as national disease prevalence decreases these higher-level market prices become the norm. Tiered welfare systems such as the Dutch 'Beter Leven' model financially reward farmers for improving animal welfare, allocating a one to three-star rating. Robert Nijkamp NSch told me how from January 2023 every Dutch broiler producer needs to have achieved at least a one-star rating, but to achieve the required lower stocking density for that rating means a 40% reduction in birds or significant expansion in housing area. In such cases the 'carrot' does not offset the financial cost to

achieve the minimum standards. 'Carrots' then become 'sticks' as the lowest level becomes the baseline.

Smaller, bottom-up schemes are rarely positioned with the resources to provide tangible 'carrots' by way of financial rewards or 'sticks' such as penalisation. Instead, they provide more intangible benefits, such as improved consumer perception of good welfare or overall animal health. These can be difficult to demonstrate and associated profits may be 'invisible', but understanding the motivation for participation can be a strong driver of success over and above purely financial carrots and sticks.

4.2.4 Industry fragmentation

Animal Health Ireland (AHI) oversee cattle health and disease in the Irish livestock sector. As a public-private partnership they undertake stakeholder engagement under a board of directors, management team, technical working groups and implementation groups. They can be called on by government to direct CHSs as needed: this public mandate is important to help maintain a consolidated approach to cattle health. CEO David Graham told me that he considered fragmentation to be the biggest challenge for animal health in the UK: he observed that we have a very large variety of organisations, processors, distributors, producers often with differing standards, requirements and priorities. Whilst this creates healthy competition, it can also hinder the implementation of a uniform approach to improving animal health, as there are many different groups striving for different goals and employing different strategies to achieve them. This decentralisation can impact on coordination of animal health strategies.

On my travels and through my work I have found that health schemes are more likely to achieve success in their goals where the industry is consolidated – for example, vertical integration in pig, poultry and fish farming mean that fewer companies control a larger proportion of supply chain, through breeding, production, processing and distribution. This enables a more consistent approach to the application of health and welfare standards. I experienced the extreme end of this spectrum at Padenga Holdings in Zimbabwe, a large crocodile leather farm. Here I learnt how the International Crocodilian Farmers Association have implemented a comprehensive scheme for the humane care of crocodilians, disease control as well as environmental and sustainability goals, social responsibility and best labour practices. As one of a very small number of niche producers of luxury items there is significant pressure from manufacturers and consumers to adhere to exceptionally high standards and this has driven uptake of the scheme.

Solving the issues that arise from fragmentation - particularly of the UK cattle industry where there are many different breeders, producers, processors and distributors - is a challenge so that consolidation may not be fast or even possible. However, collaboration amongst all stakeholders allow common goals to be identified and approached in a unified way. One group which is now doing this in the UK is the Ruminant Health and Welfare Group, which brings together key stakeholders from across the industry to 'identify priorities and build the collaborative energy to generate change'.

4.3 At what cost? Costs of disease control and schemes

4.3.1 Financial costs

Many CHSs involve some financial cost to the farmer, usually through disease testing and/or professional veterinary time. Farmers can opt to do testing without a CHS but usually participants have benefits such as subsidised testing, access to advisory services and sometimes higher prices. Disease in a herd inevitably causes financial losses but these are often 'hidden' e.g. reduced growth rates, milk yield, fertility etc and will vary depending on the system, size and disease incurred.

The decision on which diseases to focus on and whether to participate in a CHS is therefore an individual farm risk assessment. Given the cost:benefit decisions involved it may be helpful for CHS providers to provide information and support around these discussions for farmers and advisors, and so help them make a purposeful decision on whether to participate or not based on priorities and cost:benefit analysis. Different levels of membership involving different levels of resource input are sometimes available which can help decide on the best course of action for each farm and provide options as the situation and risk-level changes.

There is also a cost of CHSs to both private companies and public organisations. Private laboratories run CHSs as part of a business model which must be profitable to survive. In the UK, animal health has been recognised as a 'public good' and therefore taxpayer money contributes funding to support animal health initiatives.

4.3.2 Trade and commercial costs

Whilst CHSs can provide access to some markets, the cost can be that they cut off other markets. One Scottish farmer expressed to me his frustration that as a pedigree breeder and member of a smaller breed society, CHS membership restricts the growth of his herd as it limits his choice of animals to buy in, even for his non-pedigree animals.

At meetings at the European Parliament in Brussels, I heard from MEPs how the EU prides itself on the highest standards of animal health and welfare in the world. In order to maintain these they are keen to enforce 'mirror clauses', whereby imported animal products (e.g. South American beef) must be produced under the same health and welfare conditions as in the EU. Whilst this may raise baseline standards of health, welfare and disease control of imported goods, for exporting countries these may not be realistically achievable for socioeconomic, geographical, climatic and regulatory reasons. Overcoming these challenges in exporting countries comes with a cost and increased regulation for the EU, which pushes imported food prices up – something which neither governments nor consumers want, but is an unavoidable trade-off if maintaining equality of health and welfare standards of livestock-derived goods on our shelves.

4.3.3 Regulatory burden

Throughout my travels I met many farmers who are frustrated by unnecessarily burdensome regulations and paperwork. Cattle health schemes can add to this burden, particularly where there is overlap with audit requirements from processors, government and other regulators.

In the Netherlands I attended a KoeKompas dairy health review with vet Jan Dijkhuizen and one of his clients. As a milk producer for Friesland Campina the farmer is required to submit a vet-led annual health and welfare review as well as quarterly health plans to the government. KoeKompas is a cattle welfare scheme based on the 2004 EU Welfare Quality Project and can be used to meet both processor and government requirements. It takes approximately three hours to complete and

produces a web diagram (figure 4) with strengths and priorities for improvement. However, this farmer made clear that he did not consider this a useful exercise, as much of the data that it asks for is already checked/monitored via other systems (e.g. milk yield, somatic cell count, antibiotic usage).

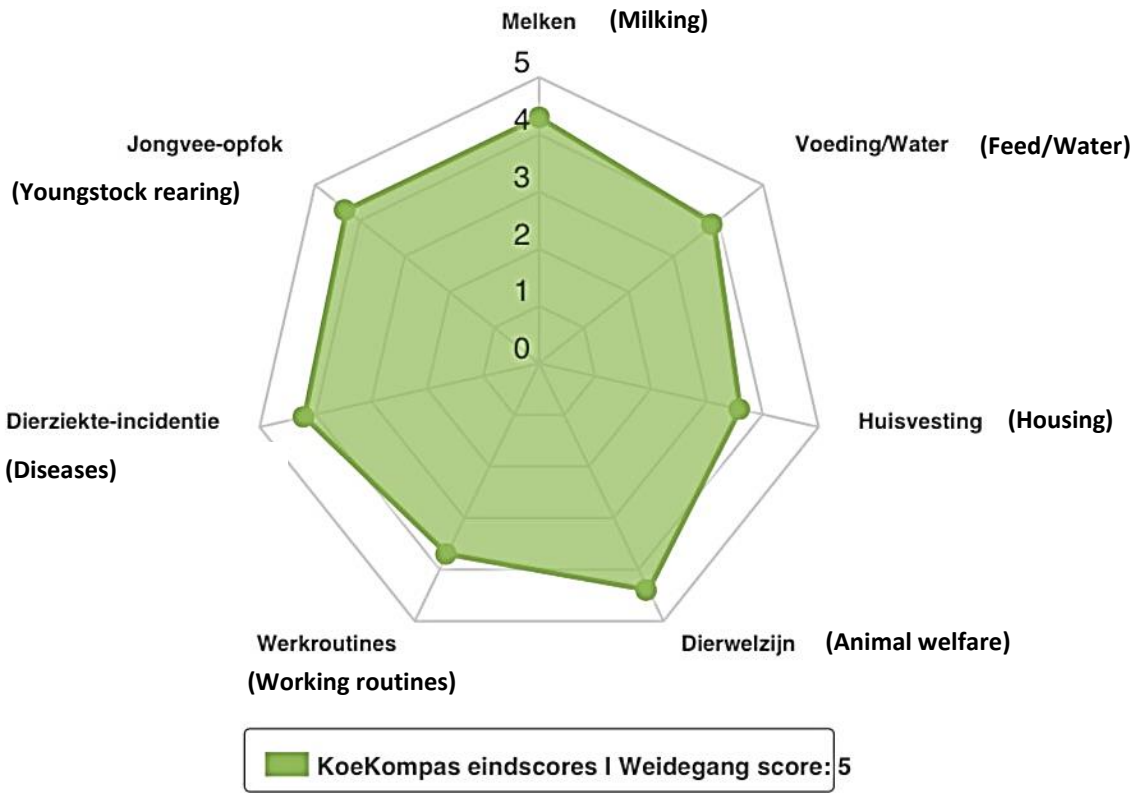


Figure 4: Outcome diagram for KoeKompas health program. *Source: Carina van de Beek NSch*

Lack of interoperability between data systems can necessitate additional time spent duplicating information, adding an onerous paperwork burden which hinders engagement with animal health. This is something that I have observed with milk processor audits in the UK, where the same data are required to be additionally submitted for CHSs. The administrative burden can be minimised by automating processes that utilise existing data and accepting data from multiple sources – otherwise the burden of external system inefficiencies is placed back on the farmer.

4.3.4 Social and psychological costs

Adhering to the requirements of CHSs however can pose social challenges – regulation and changes that impact the day-to-day workings and infrastructure of farming businesses may not be easy, especially if imposed and not voluntary. A common example is the impact of bTB control measures on farmers in the UK, which is widely acknowledged to have a significant impact on farmer mental health.

New Zealand offers an interesting case study with its stringent response to the 2017 incursion of Mycoplasma bovis (M. bovis). Being an exotic disease to New Zealand, the Ministry for Primary Industries (MPI) embarked on an $880million eradication scheme, involving the culling of over

170,000 animals. The scheme has been successful in targeting its aim of being the first country in the world to eradicate this epidemiologically challenging disease. It has however been heavily criticised for its cost, poor communication and impact on the mental health and wellbeing of farming communities who risked losing herds and livelihoods.

An independent review of the M Bovis scheme was commissioned to identify areas for improvement of future biosecurity incursions and minimise the impacts on farmers and their communities. The main recommendations were around communication, allocating responsibilities, testing plans for engaging early with industry stakeholders as well as aligning communication to outbreak milestones.

4.4 Chapter summary

- The aims of CHSs usually focus on control and eradication of disease, but motivations for participation vary. Understanding the wider cost:benefits for different stakeholders is necessary to identify what 'success' looks like from different perspectives.
- Clarifying the process – identifying aims, milestones and allocating responsibilities is as important as the overall end-goal for the scheme.
- CHSs can be used to demonstrate adherence to standards but the associated paperwork can be overly burdensome. Processes should be streamlined where possible, particularly where duplication of information is required.
- The UK has a diverse range of livestock systems, leading to fragmentation of animal health priorities and control strategies. This is a challenge which can be overcome by industry collaboration, consolidation and communication of disease control strategies, such as that provided by the Ruminant Health and Welfare Group.

Chapter 5: People, people, people

'He aha te mea nui o te ao? He tangata, he tangata, he tangata' – 'What is the most important thing in the world? It is the people, it is the people, it is the people'. Maori proverb.

5.1 Social licence

Irish farmer and Deputy President of the Irish Farmers Association, Brian Rushe NSch carried out his scholarship in 2015 on the 'social licence' of farming; that is, societal acceptance of farming practices which gain public approval and industry acceptability. Brian talked to me about 'the power of shared values' which allows trust to be built.

Social licence is key for farmers to be able to function in society. In the Netherlands Heleen Prinsen, Animal Health Specialist at LTO described to me how there is a strong public, pro-animal health and welfare voice in the Netherlands; livestock production is scrutinised, and farming's social licence is hard-earned. She attributed some of this to the 2007 Q-fever outbreak which attracted public attention and led to the introduction of a mandatory disease control scheme. This shows how CHSs have a potential role to play in building public trust, demonstrating progress towards achieving shared societal values of improved cattle health and welfare.

5.1.1 Transparency

The social licence of livestock production is constantly challenged by the need to produce protein as sustainably as possible. The reduction of disease is at the core of CHSs but the link with sustainability is not always communicated. 'Silver bullet' solutions are marketed to improve livestock production efficiency but reducing disease levels may have the most significant impact of all on sustainability of protein production. The 2023 Oxford Analytica report estimates that a decrease from 20% to 10% in global livestock disease is associated with an 800 million tonne decrease in global GHG emissions (Oxford Analytica, 2023). Cattle health schemes create data on disease statuses which could be used to communicate the positive sustainability impacts of improved animal health.

I asked Professor Jude Capper, Livestock Sustainability Consultant, whether incorporating labelling into CHSs could provide transparency for cattle disease statuses. She explained to me that research shows consumers typically pay little attention to food labelling; adding more could potentially be confusing and expensive. She says the public generally assume that their animal products come from disease-free animals – disease status labelling could undermine confidence in the industry and risk losing nuance and conflating issues around animal welfare and food safety.

5.2 The vet-farmer relationship

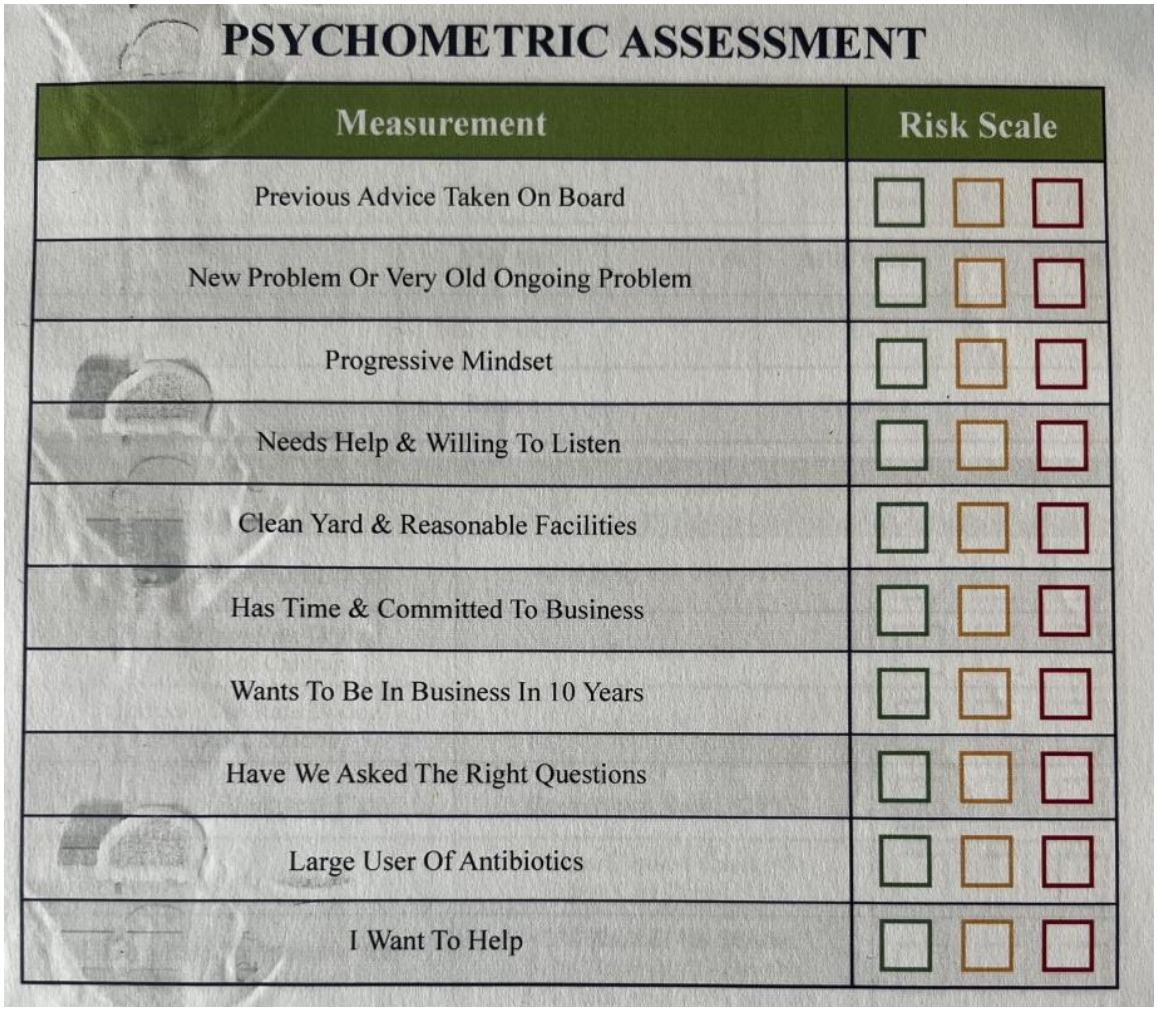
Brian Rushe told me that vets are trusted advisors with social licence, putting them in a good position to help drive the success of CHSs, and this is reflected in academic research where the vet is most often identified as the most trusted source of animal health advice on farms. However, continuity of the vet-farmer relationship is important to sustaining progress, but can be affected by vet retention in the profession. In the UK the 2019 RCVS 'Survey of the Veterinary Profession' identified factors such as poor work-life balance, feeling undervalued and chronic stress as some of the top issues for poor retention in veterinary workplaces. These are not unique to the UK veterinary

industry but can impede progress with animal health where there is a lack of continuity of veterinary involvement.

5.2.1 Herd health planning

Building good vet-farmer partnerships can create win-win solutions for cattle health. I saw this in practice when I spent the day with Danish vet Nils Hansen. He emphasised how veterinary practices need to leverage profit from veterinary time, not medicine sales, which are decoupled from prescription in Denmark. His practice, Dyrlægeteamet Optivet, aims to provide one vet per herd (barring emergencies) to maintain a good relationship and continuity of service. Nils knows his herds well and as part of his veterinary umbrella group, 'Dyrlæger & Ko' ('vet and cow'), produces quarterly animal health reports for each farm, incorporating CHS requirements. The farm visits I attended were efficient and the vet-farmer relationship felt amicable but professional. The vets at Dyrlægeteamet Optivet have time for herd data analysis incorporated into their day, providing a good work-life balance which is reflected in good staff retention.

In Ireland I met with Tommy Heffernan, a vet and 2018 Nuffield Scholar, who identified that many CHSs are set up to be successful from a technical perspective, but not from a human one. He observed that vets and farmers tend to perceive problems differently and therefore focus on different issues, hampering progress. He has produced a herd health plan to be used by vets with farmers which begins with a psychometric assessment, enabling both parties to understand the underlying motivations for implementing the plan (figure 5). Such an approach could be incorporated into CHSs to understand the farmer's motivations and implement a tailored approach to achieve successful outcomes.



PSYCHOMETRIC ASSESSMENT

Measurement	Risk Scale
Previous Advice Taken On Board	☐ ☐ ☐
New Problem Or Very Old Ongoing Problem	☐ ☐ ☐
Progressive Mindset	☐ ☐ ☐
Needs Help & Willing To Listen	☐ ☐ ☐
Clean Yard & Reasonable Facilities	☐ ☐ ☐
Has Time & Committed To Business	☐ ☐ ☐
Wants To Be In Business In 10 Years	☐ ☐ ☐
Have We Asked The Right Questions	☐ ☐ ☐
Large User Of Antibiotics	☐ ☐ ☐
I Want To Help	☐ ☐ ☐

Figure 5: Psychometric assessment to be used as the starting point for a herd health plan.

Source: TommyTheVet

5.2.2 Veterinary consultancy

SLF is a Danish, farmer-owned consulting and advising company which provides a range of services to agricultural businesses as well as providing representation and advice to government. Its cattle health branch, Syddansk Kvæg, provides veterinary consultancy to small and medium-sized farms. Advisors do not provide clinical or emergency services but advise on a range of herd issues such as nutrition, milk quality and fertility in conjunction with the herd's regular vet (who tends to deal with CHSs) where required. I spent a day with advisor Søren Moesgård Knudsen and was impressed at the level of responsibility he took for the herds he deals with. The veterinary profession has long discussed the role of the vet transitioning from 'fire brigade' work to a more preventative consultancy role and I could see this in action here. The development of these levy-funded veterinary roles has strengthened collaboration in the Danish cattle industry as it allows farmer and veterinary representation in bodies which present contemporary animal health issues to government. It made me wonder whether more incorporation of veterinary consultancy services into CHSs could be beneficial for the service received by the farmer as well as help address veterinary retention and vet-farmer relationship continuity as addressed above.



Figure 6: Farm visit, focussing on advice rather than clinical and emergency services, with veterinary consultancy group, Syddansk Kvæg. *Source: author's own.*

In Ireland, veterinary consultant Martin Kavanagh introduced me to the concept of a 'system review' approach to herd health:

- Profit – where is the farmer's priority?
- Cow type – is it the right cow for the system? Is it healthy?
- Environment – is it right for the cows?
- Feed and water – is it fit for purpose to get the right cows right?
- Skills and attitude – can they support the system?

Using this approach he quickly identifies bottlenecks in a herd's system. He quoted Gordie Jones, an independent veterinary consultant in the USA who said, tongue-in-cheek, 'every problem has a first and last name!'. Martin considers that for his clients, single-agent disease control (e.g. BVD, IBR) should already be under control in the 'cow type' section and that CHSs provide a basic 'tick box' level of disease control. I believe that this systems-based approach can help to identify where a farm might succeed or struggle with CHSs.

5.3 Maintaining momentum until a programme is completed

There is a risk that CHSs lose momentum over time. This is particularly risky where CHSs exist for the purpose of eradication, where in the latter stages of the programme there are a greater proportion

of animals without immune memory against the disease ('immunologically naïve'), leaving a large population vulnerable. This has been the case for –

- bTB in the UK which was nearly eradicated in the late 1960's
- BVD incidence in Ireland which is currently in the 'tail phase' of eradication
- Salmonella Dublin prevalence in Denmark (see 5.3.2)
- Rinderpest eradication which nearly failed due to pockets of outbreaks in eastern Africa.

Kerushini Govender, Principal Adviser for Animal Health Endemic Diseases at the New Zealand MPI put this down to a profit:risk ratio. When the perceived risk and industry interest drops, resources are often removed from the system. Priorities move on and therefore at the most difficult and crucial point for eradication our foot is taken off the pedal. Long-term planning including resource allocation is required for the end of the outbreak and surveillance thereafter if success is to be maintained.

5.3.1 'Cutting the tail end' of a disease outbreak

Norway is one of the most successful countries in the world when it comes to livestock disease eradication. Having eradicated some major diseases it has now turned its focus towards pathogens which are much more challenging from an epidemiological perspective, such as BRSV and BCoV. Dag Lindheim, Head of Emergency Response and Disease Surveillance at Tine SA (Norway's largest milk company) referred to the principle of 'cutting the tail' – i.e. reducing the length of time that the 'tail end' of a disease outbreak continues for. Dag has been instrumental in many of the Norwegian disease eradication programmes and described two key aspects to a successful CHS:

1) Collaboration between the right people – in Norway this consists of collaboration mainly between Tine SA (Norway's major milk processor), the Veterinary Institute (government veterinary body), Animalia (cross-sector body providing research and promotion of and for Norwegian livestock production) and the veterinary school. He agreed that industry fragmentation and the multitude of bodies in the UK is a huge challenge.
2) A different approach for 'the tail' – one approach to disease control does not work for everybody and flexibility is required to achieve the desired outcome. It is not necessarily recalcitrance on behalf of the farmer or vet (although this can be a problem) that makes this 'tail' difficult to address – it could also be social, financial, environmental or geographical issues which mean that the final few cases are difficult to identify or there are farmers who are harder to reach. These need coaxing in and the issues addressing differently.

5.3.2 A people-orientated approach

Denmark has implemented a compulsory Salmonella Dublin control scheme in its dairy herds which was successful in reducing herd prevalence from 25% in 2003 to 6% in 2015 (Nielsen et al, 2021). Since 2015 prevalence has risen again to around 10%. SEGES Innovation run a voluntary, levy-funded 'farmvisit' scheme which takes a people-orientated approach to understanding the farmer's situation, knowledge and motivation. Together with the farmer's vet they create an action plan based on specific, simple solutions identified during the process (figure 7). Approximately half of Denmark's Salmonella positive herds participated in the three-year project, with 18% subsequently

achieving the highest 'level one' ('likely Salmonella free') status, and a large proportion very close to achieving this.

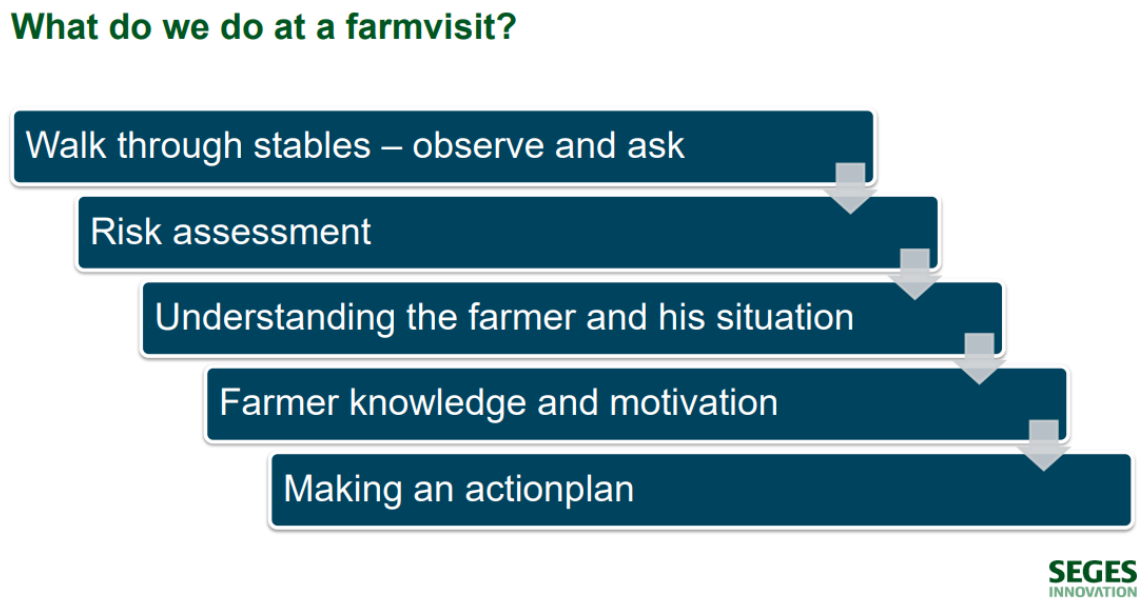


Figure 7: Framework for SEGES Innovation's 'farmvisit' scheme as part of the Danish Salmonella eradication programme. Source: SEGES Innovation.

It has been demonstrated that incorporating people-orientated approaches such as Motivational Interviewing into herd health management can improve outcomes (Svensson, 2020), but these techniques are not yet commonplace in CHSs.

5.4 Partnerships

As discussed in Chapter 4, collaboration up and down the chain allows for a unified approach and this works more smoothly where partnerships are in place. In New Zealand I met Karen Williams, farmer and former Vice President of Federated Farmers. She was appointed to lead the response to the Pea Weevil incursion which was having a significant impact on the pea industry in NZ. Karen accredited the success of the scheme to several factors (figure 8) which ultimately come down to partnerships – between industry, farmers, government and media. The aims of the scheme were made clear from the start and where responsibilities evolved, leaders stepped up to the challenge. It was a collaborative effort and regarded as a highly successful disease control scheme.



Figure 8: Reasons for success for the pea weevil eradication scheme in New Zealand. *Source: Karen Williams*

5.5 Chapter summary –

- Cattle health schemes can create trust and demonstrate transparency which is required for cattle production's social licence.
- Partnerships and particularly the vet-farmer relationship are powerful drivers of success in CHSs.
- People-orientated approaches should be considered when developing CHSs, and when assessing the overall system.
- 'One size' solutions are unlikely to fit all. Flexibility is needed to address 'the tail'.

Chapter 6: Good basics

'The big stuff becomes easier to handle when you deliberately put something small alongside it' – Michelle Obama, The Light We Carry

During my travels it became clear to me that CHSs would benefit from a wider approach, incorporating basic health considerations rather than disease control alone.

6.1 Health vs welfare

The World Health Organization (WHO) define health as 'a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity'. Freedom from pain, injury and disease is also one of the 'five freedoms' which constitute WOAH's guiding principles for animal welfare (appendix 1). Cattle health schemes are primarily concerned with the absence of disease which is inherent for both good 'health' and 'welfare'. Schemes which certify cattle welfare often require health plans to be in place and CHSs can be used to demonstrate adherence to farm assurance and processor requirements.

6.1.1 – High herd health

Whilst visiting a dairy farm in Denmark I was challenged to refine my definition of 'high health'. I visited a 180-cow herd which was certified free of major infectious diseases. Their replacement heifers were kept in one shed until two months prior to first calving. They were tightly stocked on concrete slats with no bedding and limited lying space and I detected high levels of respiratory disease. Despite having 'high health' status on paper according to CHSs, these heifers would not meet the WHO definition of good 'health'. Cattle are extremely resilient; the cows in this herd demonstrated good production parameters, the absence of major immunosuppressive diseases controlled by CHSs may have allowed them to survive, but production and welfare could thrive with a more holistic approach to youngstock health.

There is a risk that CHSs create a false sense of security if 'high health' status is allocated without consideration of the overall health and welfare picture. This is particularly risky for herds which trade animals with diseases for which there are no formal CHSs such as Salmonella and Q fever but could have a significant detrimental effect on a herd if introduced. This is also the case for multifactorial conditions such as respiratory disease, scour, mastitis and lameness. Whilst CHSs have their place in targeting specific diseases, welfare schemes or producer contracts which look at health and production parameters provide an indication of the overall cattle health picture and demonstrate a shift away from purely 'tick-box' herd health planning to a more dynamic, herd health management approach.

6.1.2 Productivity trade-offs

Fernglen Sheep Dairy is the first dairy farm in New Zealand to be awarded SPCA Animal Welfare Certification. I was impressed by their holistic approach to animal health, incorporating disease prevention, nutrition, genetics and environment. Developing a well-rounded flock creates trade-offs with chasing the highest possible production. Manager Cameron Ravenwood estimates that increasing milking frequency from once to twice a day would increase the farm's profitability by 15% but for them this is not worth the trade-off in terms of time spent in the parlour – he would rather

invest this time working 'on' the business rather than 'in' the business, as well as reduce some of the production pressure on the animals. Their business model is low-input low-output – the milk yield breakpoint (yield required to cover cost of production) of an average New Zealand sheep dairy is approximately 300L/ewe/lactation but for Fernglen it is around 180L/ewe/lactation. By ensuring the fundamental health and welfare basics of their animals are well catered for, Fernglen do not need to push their animals too hard to enable a sustainable business model.



Figure 9: Milking ewes at Fernglen Sheep Dairy: sustainability through health and welfare including reducing stress through single daily milking.
Source: author's own.

6.2 Finding the balance in achieving animal health

Animal health is a balance; *reducing exposure* to pathogens will help reduce the overall incidence of disease while *improving resilience* will help animals to respond to any pathogens that are encountered. It is primarily the former which CHSs are concerned with in order to obtain a disease 'status', however better animal health results are achieved by taking a holistic approach.

6.2.1 Reducing pathogen exposure

Biosecurity is a first line of defence against introduced pathogens and is relevant both between and within farms. One of the most stringent examples of biosecurity I have seen was at Triple C Pigs who breed 4660 sows over four farms around Harare. In Zimbabwe coordinated disease control is a challenge due to the wider political climate: with a lack of structured support producers take personal responsibility for the disease status of their livestock. Triple C Pigs have created

exceptionally high biosecurity standards. They are not part of any voluntary health schemes as these do not exist in this market and there is no financial bonus for high health or welfare status. And yet Triple C has impressive health and production performance and would sit in the top 1/3 for most key performance indicators when compared to UK farms (AHDB Indoor Breeding Herd KPIs, 2023). Whilst this cannot purely be attributed to biosecurity measures, the long-term absence of disease incursion will have contributed to the excellent health and performance of this herd.



Figure 10: Biosecurity at Triple C pig farm, Zimbabwe. *Source: author's own.*

In Norway, geographical boundaries and small, isolated herds can create a favourable environment for disease control, which is one of the factors which vet Dan Jansen attributes to the success of disease eradication programmes there.

The Shetland Islands were an early example of CHSs in the UK. The Shetland Animal Health Scheme is now CHeCS accredited and has contributed to the Shetland Islands successfully maintaining low levels of cattle disease for many years.

6.2.2 Improving resilience

Disease resilience is the ability to respond to the pathogens when they are encountered by the immune system. There are multiple factors which impact resilience, including immunity, nutrition, genetics and stress. At Wageningen University in the Netherlands research is ongoing into the role of baculoviruses in lepidoptera (butterfly and moth) populations – these viruses lie dormant in larvae but when they are exposed to 'trigger factors', they become lethal, causing the colony to liquify and

die. Many of these trigger factors are not yet identified but include overstocking, heat, cold, humidity and the introduction of other pathogens. Every type of livestock unit I visited during my study tour faced the same challenges – from insects to cattle to crocodiles – the basic needs of animals need to be met otherwise disease will occur even from pathogens which are otherwise completely harmless.

There are two ways in which immunity is developed in cattle: passively (via colostrum) or actively (via infection or vaccination). Vaccines are an effective way to control disease in an at-risk population and often play a preventative role in CHSs. In Zimbabwe I visited some proactive cattle farms with extensive vaccination protocols, implemented due to the risks of disease incursion from roaming wildlife and domestic livestock, as well as to improve fertility and production. A vet I spoke to described how prior to Zimbabwean land reform the country was an agricultural powerhouse in Africa. Infectious diseases such as foot-and-mouth disease were previously under good control but for many farms access to vaccines is now challenging and these diseases are now endemic. The exception is rinderpest which was eradicated globally and this vet attributes this success to the widespread use of an effective vaccine.

Genetics is a key basis for disease resilience and the heritability of susceptibility varies between different diseases. Donagh Berry, Senior Principal Research Officer at Teagasc in Ireland believes that successful CHSs should take into account genetics and breeding strategies. He described how the ICBF (Irish Cattle Breeding Federation) database collects and analyses data on cattle health and performance, enabling farmers to make informed breeding decisions about herd health without the additional cost or challenges of adoption of other preventative measures such as vaccination and biosecurity. The database facilitates farmer breeding decisions and enables genetic analysis of disease susceptibility where test results are available (e.g. bTB testing, BVD tissue sampling) at a national level without farmers having to input additional data.

6.3 Technology and data

Accuracy of data can be a challenge especially where it relies on manual input or interoperability between privately run or isolated platforms. Donagh Berry describes how statistically these accuracy challenges can be overcome as increasing the number of records has a better impact on the accuracy of genetic analysis than ensuring very high quality of a few records. Automation of reporting, platform interconnectivity, as well as reducing the burden requirement for manual data input could therefore be helpful in facilitating collaboration as an industry and a cohesive approach towards disease control.

As well as ICBF there are some good examples of databases in mainland Europe. VeeOnline in the Netherlands and the Danish Cattle Database both provide a central point for farmers, vets and other industry stakeholders to access records on movements, breeding, diagnostic results, herd health and medicine parameters. These databases mean that Dutch and Danish cattle are some of the most closely monitored in the world, enabling decisions to be made about their health quickly and transparently as well as demonstrating proof of standards both within the industry and outside of it. The contribution of CHSs to overall national cattle health is greater where their data feed seamlessly into existing systems and contribute to the wider picture. The fragmentation of the UK cattle industry is reflected in the multitude of different databases, platforms and management systems and improved interoperability would facilitate a more streamlined approach to cattle health.

Central to data provision going forward is the fast-paced development of cattle technology and monitoring which produce large quantities of standardised, automated data. Technologies such as cow collars for monitoring health and heat events are becoming widely adopted and this integration of technology into CHSs has potential to measure health and welfare parameters objectively and transparently. This builds trust across the entire food chain, allowing commodities to be transformed into value-added products through improved animal health and welfare.

Technology and automated monitoring enable data-driven decision-making in cattle health. Recent developments in artificial intelligence (AI) are likely to enhance this in labour-short agricultural spaces. However, even the smartest of technologies do not replace the need for good stockmanship; the requirement for 'good basics' still stands and people are needed, but technology provides opportunities for efficiency and automation in achieving them, sometimes to a greater level of sensitivity than is achievable by humans alone. As CHSs develop going forward the role of technology, data and AI should be considered as they evolve into a pivotal role in cattle health.

6.4 Chapter summary

- A holistic approach is needed for good animal health and welfare – CHSs are part of the picture but should be seen against a backdrop of meeting the wider basic needs of the animal.
- Reduced pathogen exposure, achieving disease immunity and resilience should be included in CHS design.
- A centralised national database allows for a cohesive approach to cattle disease control. Cattle health schemes have greater value where data are interconnected with the wider picture.
- Cattle monitoring and technology are rapidly providing more opportunities for data-driven decision-making in cattle health and CHSs should evolve to reflect this.

Chapter 7 – Conclusions

1. Whilst the aim of CHSs is usually to prevent, control or eradicate cattle disease, there are a variety of reasons for participation in such schemes. The financial, commercial and social

cost-benefits need to be understood and approached flexibly to achieve the aims of the scheme.

2. Collaboration and communication across all stakeholder levels can help to achieve the aims of CHSs and provide an opportunity to demonstrate transparency and trust both within and outside the cattle industry.

3. Cattle health schemes provide necessary frameworks to demonstrate adherence to standards but are only part of the picture – a holistic approach to getting the basics right is required for good animal health.

4. Industry fragmentation and regulatory burdens, including duplication of data collection, are barriers to CHS participation and achieving success.

5. Data and technology play an increasingly important role in animal health data-driven decision-making and CHSs will be required to evolve to reflect this.

Chapter 8 – Recommendations

These recommendations are principally for CHS designers and those rolling out the schemes but also highlight the need for involvement of all stakeholders; the whole cattle sector, the veterinary profession and governments have roles to play to achieve the real success of CHSs.

1. Identify key stakeholders and their 'bigger picture'; consider the wider cost-benefits of participation in cattle health schemes, not just financial and but also commercial, personal, social and environmental, to understand what 'success' looks like from different perspectives.

2. Cattle health schemes should not be used to provide a stamp of 'high herd health' in isolation, but should be part of overall herd management with good basics of nutrition, breeding, environmental management and preventative animal health at the core.

3. Frameworks must clearly define the aims, milestones and responsibilities of the CHS. These should be reviewed regularly and with preparedness to adapt.

4. Processes should be streamlined to prevent additional regulatory burden on farmers. Data and technology have a role to play here and cattle health schemes should evolve to incorporate new technologies as they become increasingly commonplace in cattle health monitoring and decision-making.

5. The opportunity for regular collaboration, communication and - where possible - consolidation should be incorporated with stakeholders at all levels.

Chapter 9 – After my study tour

It is difficult to summarise the past 18 months concisely and to predict where it might lead. I am full of inspiration, ideas and challenges which continue to reframe my thinking both professionally and personally.

My Nuffield farming tour has led me to experience a vast array of different livestock production systems. It has evolved from exploring cattle health schemes to exploring the underpinning factors for good animal health, reminding me that for all the silver bullets that appear to exist in the market - nutritional supplements, genetics, machines and strategies – we must not forget the essentials; without getting the basics right we cannot have good animal health.

The ideas and experiences I have had are already being incorporated into my daily work with vets and farmers but I hope that by sharing my learnings I can help to shape the future of UK livestock health for the better. We are in a time of fast-paced change and now is an opportune time to speak up for livestock health as UK strategies and policies are developed for the years to come.

Having been fortunate to travel to both developed and developing countries I have come to understand that we are in a privileged position to be able to implement cattle health schemes in the UK. The challenges that agriculture faces are global ones and I am more convinced than ever that good animal health is a solution to many of these. We cannot afford to put our head in the sand. Agriculture must continue to look to Africa as the world's most rapidly growing continent and as agricultural leaders Nuffield has a role to play here, something which I continue to explore with our African scholars.

Many of the conversations that have challenged my thinking have not been directly related to agriculture. I have taken inspiration from those I see taking action and speaking up for what they believe in; if I can take away even a fraction of their confidence to do the same it will have been a valuable experience.

Chapter 10 – Acknowledgments and thanks

I could not begin to count the number of individuals who I would like to thank as part of my Nuffield journey, but will start with thanking the Nuffield Farming Scholarships Trust for seeing potential in me as a Nuffield Scholar and offering me this significant opportunity.

None of this would have been possible without the financial support and encouragement from the Central Region Farmer's Trust and I am particularly grateful to them for going above and beyond by helping me to undertake a GFP.

When I first considered applying for a scholarship I was hesitant about taking time away from my job; I am forever grateful to my manager, Brian Geary, for being a champion for me throughout the whole process. Particular thanks go to the Ruminant Business Unit at MSD Animal Health for their support and especially to the southern and technical teams for covering while I was travelling.

I still pinch myself to be part of the Nuffield network and am so grateful for the incredible kindness of strangers who have welcomed me into their homes and businesses, fed, entertained, inspired and counselled me. I have been fortunate to share some of my travels with people who have been instrumental in shaping me as a scholar and a person, and I know will continue to do so in the years to come:

- My GFP group – great sparring partners with whom we had our preconceived notions about global agriculture challenged.
- The 'Zimbabwe crew' – with whom we shared the trip-of-a-lifetime and will continue to remain accountable to for putting into practice what we have learnt on our travels.
- The 2022 UK Nuffield Scholars, affectionately known as 'the Dollars' – I couldn't think of a better bunch to be on this journey with.

Thanks go to Tanya Robbins who was the first person to welcome me at my first Nuffield event and has been a practical and kind mentor as well as an inspiration as someone who has made the most of their scholarship opportunity to the full.

Last and by no means least, my husband, Shane. Planning a wedding and doing a Nuffield simultaneously has had its challenges, but he has never wavered in encouraging me to make the most of Nuffield - even when it has meant me leaving for weeks or months on end - and met every opportunity with a resounding 'go for it!'. Thank you.

Liz Cresswell

Chapter 11 – Glossary

AHDB – Agriculture and Horticulture Development Board – the UK agricultural and horticultural levy board.

AHI – Animal Health Ireland

AI – Artificial intelligence

AMR – Antimicrobial resistance

AMU – Antimicrobial use

BCoV – Bovine coronavirus

BRD – Bovine respiratory disease

BRSV – Bovine respiratory syncytial virus

bTB – Bovine tuberculosis

BVD – Bovine viral diarrhoea

CHECS – formerly Cattle Health Certification Standards

CHS – Cattle health scheme

EBL – Enzootic Bovine Leukosis

FAO – Food and Agriculture Organisation of the United Nations

FMD – Foot and Mouth Disease

GFP – Global Focus Programme

GF-TADs – Global Framework for the Progressive Control of Transboundary Animal Diseases

IBR – Infectious Bovine Rhinotracheitis

KPI – Key performance indicators

LTO – Land- en Tuinbouw Organisatie Nederland

NAIT – National Animal Identification and Tracing

OIE – see 'WOAH'

RCVS – Royal College of Veterinary Surgeons

SPCA – Royal New Zealand Society for the Prevention of Cruelty to Animals

WHO – World Health Organisation

WOAH – World Organisation for Animal Health (formerly Office International des Epizooties (OIE))

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13 - Appendix

Appendix 1 – The World Organisation for Animal Health's 'Five Freedoms' of animal welfare.

The guiding principles which inform WOAH's work on the welfare of terrestrial animals include the 'Five Freedoms'. Developed in 1965 and widely recognised, the five freedoms describe society's expectations for the conditions animals though experience when under human control. They are:

1) Freedom from hunger, malnutrition and thirst
2) Freedom from fear and distress
3) Freedom from heat stress or physical discomfort
4) Freedom from pain, injury and disease
5) Freedom to express normal patterns of behaviour.

978-1-916850-10-1

Published by The Nuffield Farming Scholarships Trust
West Wing Earnshill House, Hambridge, Langport, Somerset TA10 0AX
email : office@nuffieldscholar.org