

A Nuffield Farming Scholarships Trust Report

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Bovine TB eradication programmes in Europe

Dafydd Saunders-Jones

August 2016



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A Nuffield (UK) Farming Scholarships Trust Report



Date of report: July 2016

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

Title	Bovine TB eradication programmes in Europe					
Scholar	Dafydd Saunders-Jones					
Sponsor	Dartington Cattle Breeding Trust					
Objectives of Study Tour	The objective of the study tour was to investigate various TB eradication programmes across Europe and to investigate the advantages and disadvantages of different approaches to tackling the disease.					
Countries visited	Ireland, Northern Ireland, Switzerland, Italy, Belgium (Brussels), Sweden, France, Wales, England, Spain					
Messages	 A successful TB Eradication programme demands a clear understanding of the disease, structure of the industry and the sociological issues. All parties need a clear understanding of their roles and need to work together towards eradication. An eradication programme needs financial and political stability. Adherence to following testing protocols and movement restrictions is essential. A programme needs a strong communication plan with targeted key messages for the public, farmers, vets and government officials. Developments in research and testing techniques may help in the future but cannot be relied on. Action has to be taken with the tools that are currently available. An eradication programme has to evolve and develop different regional and national policies as it reduces the level of disease. Cattle movements and wildlife can have a big effect on the success or failure of a programme. 					

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DISCLAIMER

The views expressed in this report are entirely my own and do not necessarily represent the views of the Nuffield Farming Scholarships Trust, or of my Sponsor Dartington Cattle Breeding Trust. This Nuffield Farming report has been prepared in good faith on the basis of information available at the date of publication.

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1.0. Introduction

Bovine TB (bTB) is an invisible disease that impacts on individuals, families and communities. Over the years I've been working with bovine TB I have personally seen the devastation that this disease causes on farming businesses, livestock, the environment, people and communities. It is a zoonosis which means it can also affect humans.

My journey started before my Nuffield Farming Scholarship when I became Head of Bovine TB policy at the Welsh Government and worked with the Chief Veterinary Officer, Dr Christianne Glossop and the team to develop the Welsh Bovine TB Eradication Programme back in 2007. During my time at the Welsh Government I experienced highs and lows dealing with the disease, but also had some positive results in reducing the level of bovine TB in Wales. I met some fantastic farmers and veterinarians and their stories, heartbreaks and frustrations have stayed with me and is one of the main reasons I decided to undertake this Nuffield Farming Scholarship.

I'm 43 years old and have lived since 2000 on a beef and sheep farm outside Talgarth in Powys. I'm married to Rebecca and have three sons, Harri, Rhys and Tomos. I studied at Harper Adams College and Aberystwyth University and obtained a degree in Agriculture and Business.

I left the Welsh Government to work on the farm and develop my family educational publishing business producing books, games, websites and apps.

In 2012 I became a partner in the farm through the Welsh Government Young Entrant Scheme. I continue to be involved with bovine TB as Chair of the South East Wales TB Eradication Board where we look at the disease in our region and look at ways we could help improve things. For example, we have an ongoing project in the Gower where members are still working with cattle farmers on the peninsula to implement different action plans. Recently, we were successful in applying for funding from the Welsh Government to complete a farmer-led badger survey on the Gower.

Outside work, I am a rugby coach for Gwernyfed U11 team and a Governor at Ysgol y Bannau school which my children attend.



Figure 1: The author, Dafydd Saunders Jones



2. Background to the study topic

In terms of TB Eradication, there have been many studies and reports on TB Eradication in New Zealand and Australia. Some elements of their programmes are unique to those countries and to the attitudes of their governments and the general public towards eradicating the disease. For example, you had "Judas" cows in Australia that were sent loose with radio collars to locate other feral cattle, and methods of possum control were implemented in New Zealand.

Other aspects of their programmes have influenced some of the elements within the Wales and England bTB eradication programmes. But there are limits to what can be relevant to us. There is less emphasis on what is happening within Europe. In the context of bTB eradication in England and Wales it is essential to understand what other European countries are achieving - or not - under the same European legislative framework. They may also be certain key elements of other European animal disease eradication programmes that could be effective in the UK.

2.a. Definition of bovine tuberculosis (bTB)

Bovine tuberculosis is a chronic bacterial disease caused by Mycobacterium bovis. It is a major infectious disease among cattle and certain wildlife populations. It can be found in other mammals such as camelids, goats and domestic cats. It is a zoonotic organism and is treated as a risk/hazard group III organism which means appropriate precautions have to be taken to prevent human infection.

The biggest challenge for bTB is that the animal seems healthy but may be infectious. Due to this feature people continually challenge if an animal was/is infected. The most public example of this was the case of Shambo the religious bull (bullock) in South Wales (http://www.skandavale.org/shambo-sanctity-of-life/). The animal looked healthy but had tested twice inconclusively to the skin test and therefore had to be slaughtered. The case gained the attention of the media worldwide and bought into focus the issue of the invisible disease. At the laboratory post mortem TB lesions were identified (which confirmed bTB) but this did not receive similar media attention.

2.b. Definition of EU Bovine TB Eradication Programme

To achieve eradication it is important to understand what is meant by eradication. Annex I to Decision 2008/341/EC1 (EU directive) defines eradication, control or surveillance programme as follows:

See definition on next page



Eradication programme: Programme to result in biological extinction of an animal disease or zoonosis. The final target of an eradication programme shall be to obtain the free or officially free-status of the territory according to Union legislation, where such possibility exists. To achieve Officially TB free (OTF) status for a region or a Member State they must demonstrate that:the percentage of bovine herds confirmed as infected with tuberculosis has not exceeded 0,1 % per year of all herds for six consecutive years, and at least 99,9 % of herds have achieved officially tuberculosis-free status each year for six consecutive years, the calculation of this latter percentage to take place on 31 December each

calendar year;(Directive 64/432)





Figure 2: Bovine and Swine 2014 Annual report. (Source European Commission)

But it is important to note that if a country is classified as OTF these countries may still have pockets of bTB infection. This for example is the current case in France.

The EU strategy is focused on eradicating bovine TB. However, it realises that:

Effective control of the disease may be essential as a preliminary step towards eradication. The aim is for a rapid decrease in the prevalence of infection, which leads to an increase in the percentage of officially free (OTF) herds, and ultimately the recognition of OTF regions, prior to the complete eradication of bovine TB from a country. (Source: EU)



2.c. Bovine Tuberculosis (bTB) EU legislation requirements

The European legislative requirements are laid down in the following:

Council Directive 64/432/EEC on animal health problems affecting intracommunity trade in bovine animals and swine Council Directive 77/391/EEC introducing Community measures for the eradication of brucellosis, tuberculosis and leucosis in cattle Council Directive 78/52/EEC establishing the Community criteria for national plans for the accelerated eradication of brucellosis, tuberculosis and enzootic leucosis in cattle.

2.d. Key Areas within a bovine eradication programme

The EU bovine TB Task Force subgroup, which includes experts from across Europe, has provided guidelines for the design and operation of eradication and surveillance programmes for bTB. The Task Force was set up in 2000 to improve disease eradication and evaluate the cost effectiveness of animal disease eradication programmes. Their guidelines are:

Organisation

An adequate organisation of Government and others involved in the programme. Sufficient and proportionate financial resources must be allocated to the implementation of the programme.

Training and education

Continuous training for vets and farmers including practical training, education and awareness campaigns.

Stakeholder involvement

It is essential that all stakeholders involved in the eradication programme are independent of their respective roles and responsibilities, actively commit and contribute to the full implementation of all the measures within the programme.

Quality control

A system for controlling and measuring all inputs and outputs from the programme must be in place. For example, set standards for tuberculin, testing equipment, testing procedure, laboratory kits and procedures.

Enforcement

Systems should be in place to promote compliance with the eradication programme and to detect and measure any non-compliance with requirements under the programme.

Source: WD SANCO/10067/2013 - Working Document on Eradication of Bovine Tuberculosis in the EU Accepted by the Bovine tuberculosis subgroup of the Task Force on monitoring animal disease eradication

Regarding specific elements of an eradication programme, the specific key elements were detailed by EU documents. These are shown in Appendix A at end of this report on page 47.

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3.0. My study tour

During the preparation and design stages of my study I selected countries that gave a different insight into various elements of bTB Eradication. Some countries have little or no bTB but they had similar issues to contend with: such as borders, programme governance or a high animal health status. Below is a list of the countries I travelled to and the rationale behind the selection.

Country	Reason for choice	Date
Ireland	Ireland has had a positive impact in reducing the level of its bTB. It also has some worldwide experts on bTB with a breadth of experience in policy development and research.	Oct 15
Northern Ireland	Northern Ireland has a similar structure to rest of the UK, but has experienced political uncertainties which impact on their delivery of the policy. The Test, Vaccinate and Cull trial is also a first of its kind.	Oct 15
Switzerland	Switzerland is Officially TB Free (OTF) but had an interesting case in 2013 linked to "old" infection identified during slaughterhouse surveillance of an old cow. It also has to manage the risks of disease across its borders especially from Austria and France.	Feb 16
Italy	Italy has a strong regional approach to eradication of bTB. An additional element in Sicily was that the level of the disease is not decreasing.	Feb 16
France	France is OTF but has pockets where bTB is increasing. This is against a background where bTB awareness is low. They also have disease in wildlife.	Feb 16
Belgium (Brussels)	The aim was to understand the political and financial pressures. It also gave an insight of the EU perspective about UK eradication programmes and their impacts on political discussions.	Feb 16
Sweden	Sweden aims to have the 'cleanest agriculture in the world'. They have run successful animal disease eradication programmes. I also wanted to understand more about farmers' attitudes towards biosecurity.	Feb 16
Spain	Spain has the highest level of bTB after the UK and Ireland. The National Reference Laboratory for bTB for Europe is VisaVet in Madrid.	May 16
England	I wanted to understand the issues behind delivering new policies and understand the concerns of farmers.	2015/16
Wales	Understand new policies and the views of farmers.	2015/16

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4.0. Key Findings

4.a. Ireland

Ireland was my first visit mainly due to its recent success in reducing the level of bTB. It was also an opportunity to speak to world renowned experts in the field like Margaret Good. There are many similarities between the Irish Eradication Programme and the programmes in England and Wales. They also use the same test and have similar issues regarding the disease circulating within the cattle and wildlife population.

As can be seen from the figures below, Ireland has seen a substantial reduction in bTB over the last 10 years. They have implemented stringent controls on cattle and wildlife but still have challenges ahead. The farming community has a strong voice within government but I found limited evidence of the eradication programme being developed in unison with government, veterinarians and farmers.



Figure 3: herd incidence of bTB in Ireland



Figure 4: Reactors per 1000 tests in Ireland

Source for both graphs is Department of Agriculture, Food and the Marine (DAFM) Ireland



4.a.i. Compensation

Cattle are valued by an independent valuer but payments are restricted to a ceiling of 2,800 euros or 3,500 euros for one pedigree stock bull. Farmers and/or the Government can appeal the initial valuation at a cost, but the second valuation overrides the first valuation if it is higher or lower. If they disagree with the second valuation a binding decision would be made by an arbitration panel (independent arbitrator, farmer and a Department of Agriculture representative).

4.a.ii. Other Payments

Farmers may also qualify for:

Income Supplement – This is payable when more than 10% of cattle are removed but removal of the whole herd (known as depopulation) is not appropriate. It is paid up to a maximum of 100 cattle, but the herd owner is not eligible for payment once cattle are moved on to the restricted farm. The rate is 25.39 euro per animal per month.

Depopulation Grant – This is payable during the rest period following partial or full depopulation. The rate paid may vary depending on the length of the rest period. Rates are:

Animal Category	Rate (Euros)
Dairy Cows & in calf heifers, Pedigree Bulls > 12 months	57.13
Other cows/in calf heifers	31.74
Other animals	19.04

Source DARDNI

Hardship Grant – This helps restricted herds when cattle have to be kept and fed while the herd is restricted. It is paid for cattle kept between 1 November and 30 April. The herd must be restricted for 60 days before the herd is eligible, and can receive up to 253.94 euros a month up to a maximum of four months.

4.a,iii. Wildlife control

Ireland's badger removal policy has been very successful but has met its maximum capacity: they are now looking at vaccination. In the west of County Wicklow they have seen an increase in bTB with 12.89% herd incidence and 9.64% reactors per 1000, compared to the national average of 3.37% and 1.82% respectively. This increase is partly due to an increase in bTB in wild deer. A recent study of deer by DAFM has reported that 16% of deer were found to be infected by bTB.

4.a.iv. Cattle testing

All herds are tested once a year. Farmers have to pay a private veterinarian for their annual test. This is part of the cost sharing agreement for bTB eradication. If tests are not completed in agreement with the schedule the herds are restricted.



4.b. Northern Ireland

The programme in Northern Ireland is very similar to that of the remainder of the UK, but the political uncertainties and changes have limited its ability to deliver any radical or substantial changes. Similarly to the Republic of Ireland there seems to be a lack of ownership or common cause between farmers, veterinarians and the government.



Figure 5: Chart to show herd incidence in Northern Ireland since 2004

Herd incidence means the number of NEW reactor herds during the year as a proportion of cattle herds which have presented cattle for a TB herd test during the same time period. Source Department of Agriculture, Environment and Rural Affairs - https://www.daerani.gov.uk/articles/tuberculosis-statistics-northern-ireland

4.b.i. Political ecology

Dr Philip Alexander Robinson, who now lectures at Harper Adams University, has written a paper on 'A political ecology of bovine tuberculosis eradication in Northern Ireland'. The paper looks at the history of the disease and uses a social science approach to empirically investigate the disease and eradication of bTB in Northern Ireland. He highlights issues such as 'the spectre of regulatory scrutiny dominates the European Farming landscape, reshaping farmers and increasing their alienation from the state in its role as enforcer of EU and UK legislation. As a result, many farmers are reluctant to engage with the state, and that affects relationships and aspirations for partnership in disease control.' and 'there is a need to make TB visible again: the lack of clinical signs militates against taking the disease seriously'.

The issues raised and discussed in detail are relevant to all countries but within their own political landscape and history. But the fundamental issue of understanding these social issues should be the foundation stone to all eradication programmes or media campaigns

4.b.ii. Test and Vaccinate or Remove (TVR) Wildlife Intervention Research Project

This is a unique project that to a lay person seems to be common sense. The project is being carried out in 100km2 area in County Down. It started in 2014 and is a 5-year research project. Data from the project is currently being kept confidential to reduce premature speculation on project outcomes. It



is expected that a final report will be released in late 2019. The approach involves the capturing, micro chipping, sampling, vaccination and release of bTB negative badgers and all bTB positive badgers are to be removed. No badgers were removed during year 1 to allow for normal badger movement data to be obtained via GPS collars. This movement data was captured to help evaluate any evidence of perturbation (badgers moving outside their territory) following badger removal. Results from this project will be monitored closely by all countries trying to eradicate the disease from wildlife.

4.b.iii. APHIS (Animal and Public Health Information System)

APHIS online allows farmers to directly access their herd and flock details. It is similar to BCMS system but APHIS does include more detailed information. Using APHIS Online farmers can:

register cattle births, deaths and stillborns
 produce on and off movement notification of cattle moving off their herd to market, abattoir or farm
 confirm cattle movements into their herd
 view and download their herd list including information about their animals DARD statuses, TB & Brucellosis test results and export eligibility
 view movement and progeny history of every animal in their herd
 view post and ante mortem details of slaughtered animals
 produce a report to count and classify their animals in accordance with the Nitrate Action Programme
 (Source DARDNI)

Having this level of data available for farmers and vets in one location helps in reviewing bTB breakdowns and history.

4.b.iv. Testing compliance

All herds are tested annually; most tests are carried out by approved private vets. DARD (Government) vets carry out most high risk tests such as Reactor Herd Tests following disease disclosure. A 2009 Public Accounts Committee report and following supervisions have highlighted that some vets were not following correct procedures while testing. The problems encountered were: injection technique, siting of the injections, standard of the equipment, hygiene and identification of animals. Since then they have been improving training and quality control audits of testing procedures.

4.b.v. Technology

Vets in Northern Ireland use handheld devices that capture data during the test which is then downloaded to their central database. This provides an in-depth analysis of data and saves time during and after the test.

4.c. Switzerland

Switzerland has been OTF since 1960. Since 1980 the control of bTB has been reduced to slaughterhouse surveillance. In 2013 Switzerland had a case identified during slaughterhouse surveillance of an old cow. The cow was tested in 2000 during a previous outbreak but tested clear. It is suggested that the cow was anergic as she had lesions spread throughout the carcass. The investigations that followed traced other animals on other farms. One of the key elements in the



spread was the tradition of sending cattle to the 'alpage' for grazing where they would mix with other cattle. Around 7,000 cattle were tested and 7 cases of the bTB were found.

The outbreak highlighted the importance of slaughterhouse surveillance to identify any infected herds especially in an OTF region or country. Following the outbreak they increased training and education for slaughterhouse vets and produced a booklet explaining what to look out for and the reasons why this was important. The booklet can found at: https://www.bundespublikationen.admin.ch/ cshop_mimes_bbl/00/0024817F68691EE3A0E93ABA7145E61C.pdf



Figure 6: bTB lesions found in carcass during 2013

Source: Handbuch Rindertuberkulose (Bovine Tuburculosis handbook) BLV 2014 https://www.bundespublikationen.admin.ch/cshop_bbl/b2c/start/(citem=0024817F68691EE1B4B08AD5B235D 00F001F295B09551ED383DFDC1858E2D4F0&carea=0024817F68691EE1B4B08AD5B235D00F)/.do

4.c.i. Governance

Switzerland consists of 20 cantons and 6 half-cantons (see below). The cantons are the original states which formed the confederation in 1848 and assigned part of their sovereignty to this confederation. The cantons exercise all the rights which are not conferred to the Federal government. Every canton and half-canton has its own constitution, its own parliament, its own government and its own courts.



Figure 7: Map of Switzerland with its 26 cantons and half-cantons and its neighbouring countries.

Source: TUBS [CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons



Animal health legislation is issued by the central (federal) authorities, thereby promoting the application of uniform principles and standards for animal health nationwide. The role of the central authority is primarily to advise the cantons, to supply information and to support research and continuing education as well as to regulate conditions for import and export of animals, animal products and food, and provide border control for imports. The cantons are responsible for the implementation of the law and in the context of trade for the control and licensing of establishments that export animal products and for certification of exports of live animals and animal products. (*Source <u>www.bvet.admin.ch</u>*). Although there is cooperation between cantons there is less of a coordinated approach.

4.c.ii. Borders

Most of the Swiss border is made up of high mountains, major rivers and lakes. In some areas, there are no physical natural boundaries and, under certain conditions, farmers are allowed to use land to graze cattle outside the Swiss border. The temporary livestock grazing on land outside Switzerland is subject to special supervision, and testing which includes veterinary inspection at the beginning and the end of the pasturing period (Source: Federal Office of Statistics: http://www.bfs.admin.ch/bfs/portal/de/index/themen/07/01/pan.Document.118138.pdf)

Another element of concern on the borders is wildlife, especially deer from Austria. There is ongoing surveillance to monitor disease in deer to ensure that bTB doesn't enter the wildlife population of Switzerland.

4.c.iii. Monitoring

As Switzerland borders so many countries it is continually monitoring disease situations across the border. They produce a monthly disease report (RADAR, example below) which gives details of the current disease risks. They use a traffic control colour scheme to demonstrate the level of risk.



For bTB it highlights – '*More cases in France. Austria: completion of Investigations of Sömmerungstiere 2015.*' It then gives further details lower down the report. It concludes '*Due to the unchanged situation*



in both neighbouring countries, the increased monitoring in slaughterhouses (Lymon) as well as the wildlife monitoring in 2016 will continue.'

4.d. Italy

The eradication programme in Italy is a good example of how it is possible to eradicate the disease region by region allowing for the concentration of resources but also implement different policies to achieve eradication. In general, Italy is progressing with the eradication of bTB but Sicily is an ongoing issue. There doesn't seem to be a significant influence of disease in wildlife. This may be due to the fact that many animals are housed indoors throughout the year to maximise land usage for feed and fodder. Therefore, by using the single intradermal test and movement controls and restrictions they have been able to make progress with most of the northern regions of Italy with an OTF status.

Source: Bovine Tuberculosis in Italy 2015 Ministry of Health - ITALY



Figure 9: Italy OTF areas (green) Non OTF (white)



Figure 8: Italy bTB cases (open and closed) 2014-15



The area with the highest prevalence of bTB is Sicily which was 3,71% in 2015. The Ministry has implemented some corrective measures in Sicily such as verification of the efficacy; and a Ministerial Audit in July 2016. In the case of no improvement they are looking at other more stringent measures such as:

- Government controls as they were implemented in other regions
- Exclusion from the EU co-financed programmes
- Exclusion from the eradication programme
- Declaration of an endemic zone



- Ban on animal movements out of the region
- Destruction of the carcasses of positive animals without any compensation.

4.d.i. Governance

The Department of Veterinary Public Health, Food Safety and National Boards for Health Protection within the Ministry has responsibility for, among other things the animal health sector.

Regional Health Departments (Assessorati Regionali alla Sanità) are responsible for health protection services and activities within their region (regional vets). They are also responsible for planning the measures to be implemented by coordinating the action of the Local Health Agencies and checking how they operate.

Local Health Agencies (Aziende Sanitarie Locali – ASLs) operate on the ground through Local Veterinary Officers. They are under the administrative and financial control of the regions but enjoy extensive operational autonomy. This autonomy allowed them to target specific issues within the region to ensure they met their bTB targets.

The National Institute of Health (Istituto Superiore di Sanità) organises ring trials involving Italy's ten Laboratories. The Brescia Laboratory is the National Reference Centre for bTB.

4.e. Belgium (Brussels)

While in Brussels I met with UK representatives who are involved in negotiations regarding bTB, and staff involved in implementing the approved EU bTB eradication programmes' requirements and funding requirements. It was clear that the UK's progress towards bTB eradication was an important political and financial issue in Brussels. There was also an appreciation of the progress and also the frustration regarding components of the programmes. One clear message was: if you are serious about eradicating bTB you have to use the tools that are currently available and not pin your hopes on what may become available in the future.

They understood the complex political and disease picture in areas of the UK, but wanted to ensure that the UK were implementing progressive approaches to speed up the eradication of the disease. One key driver for this was the financial cost to the EU eradication programme budget.

Although the EU is a complex organisation it was clear that having the Eradication Programme as part of an EU funded eradication programme gave it some political stability and ensured pressure on UK governments to actively commit to eradication.

4.f. France

France is "officially free of bovine tuberculosis". Although they are OTF they have about one hundred bTB cases each year. As seen in the graph on next page, the number of bTB has been rising regularly since 2004. By 2014 bTB prevalence was just under 0.10% with incidence around 0.05%.





Source Bulletin: epidemiologique, sante animale et alimenation no 71 MRE –bilan 2014

The challenge for France is to raise stakeholder engagement and awareness and improve on the investigation of suspected cases while the level of disease is still very low. For instance, some areas have found a decrease in the level of disease while others have faced unexpected re-emergence. The main areas of concern are the areas where disease seems to be persistent in cattle and wildlife.

The disease is mainly found within specific regions (see next page), with 46% of farm cases being detected in Aquitaine. However, Charente experienced a remarkable increase in the number of farm incidents: from two outbreaks in 2013 to twelve in 2014. The number of new farm incidents in Côted'Or (Burgundy region) declined (-50% in 2014 and -30% in 2013) and no new outbreaks have been detected in the rest of Burgundy (Nievre nor in Yonne). Overall, over 78% of incidents in 2014 were outbreaks detected through bTB testing performed either during planned tests (60%) or on farms linked epidemiologically with an infected farm (18%).

Distribution of bTB incidents in France from 2000 to 2014 is shown at top of next page.

4.f.i. Cattle movements

An investigation into the 'Role of Cattle Movements in Bovine Tuberculosis Spread in France between 2005 and 2014' (*Aurore Palisson, Aurélie Courcoul, and Benoit Durand*) assessed the role of cattle movements in the spread of bTB in France between 2005 and 2014. Their conclusions were:

- At a national scale, they showed a statistical association between cattle movements and the bTB infection status of cattle herds.
- At a more local scale, they estimated the relative importance of cattle movements and local transmission in bTB spread and showed that cattle movements had a lower role compared to local transmission
- However, when analysing, for several spoligotypes, the networks of potential effective contacts between bTB-infected herds, they observed that trade links were frequently the way to connect distinct communities of bTB-infected herds. Therefore, cattle movements appeared to be crucial in the French bTB dynamics between 2005 and 2014.





4.f.ii. Wildlife

In 2001 the first cases of bTB were detected in deer and wild boars in the Forest of Brotonne (Normandy). In 2006, tuberculosis prevalence in that forest reached 24% in deer and 42% in boars. Both of these wild species are known to be capable of spreading bTB and being reservoirs of the disease.

Disease in badgers has also been seen in France, for example, In Cote d'Or from 2005 to 2010 there were 97 bTB cattle outbreaks recorded, with 43 cases in 2010. Once bTB infection was found in badgers they were culled within a 1km radius from infected farms or infected fields (grassland). To date around 2000 badgers have been removed in France due to bTB.

According to the results of other studies, conducted by the French National Game and Wildlife Bureau (ONCFS), French Agency for Food, Environmental and Occupational Health & Safety (ANSES) and the Institute of Research in Game Resources (INRA) in particular, wildlife (boars, deer, badgers) could be a reservoir for bovine tuberculosis in France; however, it has not yet been shown whether it is a factor in emergence of the disease in domestic animals.

(Source: https://www.anses.fr/en/content/anses-finds-link-between-boar-exposure-mycobacterium-bovis-and-distribution-tuberculosis

4.f.iii. Social aspects

In areas such as Burgundy there seems to be greater awareness and cooperation between farmers and government officials in trying to eradicate the disease. This area has important Charollais bloodlines and all involved do not wish to see the disease increasing. In contrast, in Aquitaine there is



less cooperation and willingness to accept that bovine TB is becoming an increasing issue.

4.g. Sweden

Since 1958 there has been no bTB in Sweden but I wanted to learn from other successful eradication programmes such as BVD, and also from the high health status of the national herds and their



Figure 12: The Swedish structure for animal health on farms

dedication to keep Sweden disease free. relatively There are no livestock markets in Sweden and cattle movements tend to be from farm to farm based on what is required. Delivery of veterinary advice is mainly given through two private organisations, namely Vaxa Sverige and Farm and Animal Health. The one thing that is clear is that all stakeholders have the same underlying goal of protecting and improving animal health status.

4.g.i. Biosecurity programme

A report looking at the views of Swedish farmers on infectious disease control concluded, that:

'Many Swedish farmers agree that prevention of livestock diseases is beneficial and important. However, type of farm and demographic factors, such as gender and education, influence opinions and perceptions in this matter. '(Differing perceptions – Swedish farmers' views of infectious disease control).

Following on from a Salmonella programme, Sweden has developed a new biosecurity programme for cattle herds, namely "Smittsäkrad besättning" which began in 2015. Research had shown that Swedish cattle farmers - compared with pig farmers - had a lack of knowledge on the prevention and spread of infectious diseases. There was also a large variation between herds regarding the appropriate biosecurity measures (*Nöremark et al*). An increase in herd size, production costs and public health concerns are a powerful force in achieving a higher level of biosecurity in cattle herds in Sweden.

The aim of the programme is:

To enhance the farmers' knowledge of how infectious diseases spread between farms, how this can be prevented, and to provide the tools for implementing on-farm biosecurity routines. The programme consists of two levels, namely the foundation and advanced



levels. All criteria for the foundation level need to be fulfilled before accessing the advanced level.

The foundation level includes an on-line theoretical course and an on-line questionnaire designed to identify biosecurity risks for each farm. The risk assessment covers:

- animal contacts (with other cattle herds)
- visitors and staff
- transports and shared equipment
- stall hygiene and health monitoring
- feed
- manure
- environmental issues

The advanced level includes a veterinary visit and a biosecurity course. The veterinary visit is repeated every second year. It consists of a control part where the farm has to pass basic biosecurity and hygiene check points, and an educational part. The educational part is based on the result of the on-line risk assessment and the control check points. For example, if there are key areas identified where there was lack of understanding or experience, those areas will be targeted as part of the educational programme. For both levels, animals can only be bought in from herds that are on the same or higher level of the programme and all herds that sell animals must be enrolled in the National BVD programme.

Herds enrolled in the programme are entitled to higher compensation in cases of salmonellosis from the Board of Agriculture. They are also looking at other possibilities for financial incentives.

(Source:"Smittsäkrad besättning" - A Swedish biosecurity program for cattle farms <u>http://www.jordbruksverket.se/download/18.37e9ac46144f41921cd8af4/13975510748</u> <u>89/III Andersson Ohlson BiosecProgramCattleSe.pdf</u>)

The following 6 graphics are illustrations taken from a presentation on the programme:

		Step 3	
	Step 2	Education pa - "FOCUS" of course	n rt 2 n-farm
Step 1	v	eterinary visit Control checkpoints Advice	
Biosecurity risk assessment	Education part 1 - Web based course	Biosecurity advice on farm building plan	Controlled animal movements

Levels to help acceptance





Some of the key areas covered under biosecurity



An important part of the programme design is to understand the sociological components of how to change attitudes and actions



Completing online training

On farm biosecurity inspection



4.g.ii. Alpacas

Because of the increasing interest in breeding alpacas, the number of imported animals has increased in recent years. Most of these imported animals have been imported with a "skin test" as security for freedom from tuberculosis. Because of the risk of bTB Sweden has introduced a monitoring programme for tuberculosis in alpaca, launched as a joint initiative with the alpaca industry, and Farm & Animal Health. The programme involves blood sampling of all adult animals in a herd. A negative sampling provides fixed-A status, after which a further sampling is taken. The programme is also associated with various conditions, such as recording all animals' contacts, which provides a basis for assessment and possible tracing if required. The programme is largely financed by public funds but the analysis is free. The aim of the programme is to maintain Sweden's status as being free from bovine tuberculosis.

4.g.iii. Farm structure

I visited Malma Gards who specialise in breeding Hereford cattle. They have developed working practices that highlight the importance of disease prevention and biosecurity. For example, manure and waste is collected from one entrance to the farm and these vehicles did not enter the animal and feeding areas. On turning up at the farm we had to enter an area to wash our hands and wear wellingtons supplied by them. On the door there was contact details to ring if no one was available. Examples can be seen below:



The entrance-instructions/tel number

Map of key parts of the farm and emergency contacts



Clean (on left) and dirty (on right) side of the farm





Cattle housing in an L shape - manure pushed to a central point



Muck storage - muck removal

Sheep shed

This enterprise was efficient and profitable and demonstrated how, with some thought and effort, things can be done to minimise disease risks.

4.g.iv. Import control

Since Sweden joined the European Union the Swedish Board of Agriculture had limited options regarding setting additional testing requirement for certain diseases in connection with the import of live animals. In order to maintain the country's animal health status, farmers and producers founded the Swedish Farmer's Disease Control Programme. The programme is run by the Swedish company Farm & Animal Health (Gård & Djurhälsan) in cooperation with LRF Dairy Sweden (LRF Mjölk). The scheme is voluntary but all importers of livestock are part of the programme. Any additional import requirements (above EU requirements) are set and recommended by the Swedish Farmer Disease Control Programme and demanded by the importing farmer or company as additional test to the official requirements set by the Swedish Board of Agriculture.



4.h. Spain

I visited Spain to learn about their programme and to visit the European Reference Laboratory on bTB in Europe.

There was minimal political engagement regarding how the programme should be implemented.

4.h.i. Testing

The whole of Spain has annual testing, but areas have been classed as:

- low prevalence area less than 0.1
- medium prevalence 0.1 2.99%
- high prevalence 3% +

In the high prevalence areas herds are tested every 6 months. The test is the single intradermal test and any confirmed cases have a compulsory gamma test.

Over the last few years they have identified issues with the quality of testing. They believed that the poor quality of testing meant that they were not getting an accurate disease (prevalence) picture. Testing is carried out by Ministry and private vets, but the quality assurance checks are concentrated on the private vets. This has included improved education and training and strict auditing of tests completed. They now believe that testing has become more robust. This improved testing regime led to a peak in the level of bTB in 2014/15. They believe that this peak represents the true prevalence of bTB in Spain.

The target is to define the low prevalence areas as OTF in line with EU guidance. This is a similar approach to Italy's.

4.h.ii. Compensation

The average compensation in Spain is @460 euros per animal, with a maximum of around @750 euros. They are of the view that compensation in the UK is too high.

4.h.iii. Fattening units

Some fattening units were outside the programme but these animals could only be sent to slaughter. These animals were not tested as part of the bTB programme. These units could be designated sheds on a farm.

4.h.iv. EU Reference Laboratory for bTB

The VISAVET Health Surveillance Centre (Universidad Complutense de Madrid, Spain) was appointed as the European Union Reference Laboratory for Bovine Tuberculosis in 2008.

continued on next page

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The **VISAVET Health Surveillance Centre** is a centre for research, support and teaching and is part of the **Complutense University of Madrid. It** is situated within the University to form the Faculty of Veterinary Medicine and Veterinary Hospital. The field work of VISAVET includes the following areas:

- Animal Health
- Public Health
- Food Safety
- Environment (Source: https://www.visavet.es)

The reference laboratory is also a laboratory for the Ministry responsible for ensuring consistency of protocols, similar to APHA (previously VLA) in the UK. As a reference laboratory they are involved in issues such as:

- Training personnel from countries outside the EU, such as Albania and Norway.
- Developments in DNA of tissue samples instead of culturing which could mean 48 hours for a bTB result rather than the minimum of 20 days.
- Holding discussion events between national reference labs to identify priorities and share best practice.

4.i. England

The bTB programme in England is very similar to that in Wales, with close connections at a government and industry level. There are also some key differences due mainly to political influences.

4.i.i. Badger control pilots

In 2012 Natural England issued a licence to remove badgers for West Gloucestershire and West Somerset. Removal began in August 2013 by using free shooting. Following the removal of badgers in 2013 an independent panel reviewed how humane, effective and safe the controlled shooting technique was in the first year of the two pilots. The panel highlighted some key areas of concern for which the Chief Veterinary Officer responded. The projects continued.

The amount of work and commitment and money it took from government and industry to set up these projects and to continue delivering this policy should not be underestimated. There is some anecdotal evidence of positive signs of herds coming off restrictions on the ground but this cannot be collaborated until a final report is published. In 2015 DEFRA announced the inclusion of an area in Dorset and it's expected that other areas will be added in due course.

4.i.ii. Cattle controls

Since April 2016, the following additional controls have been implemented:

- Farmers in the Low Risk Area of England need to post-movement test cattle coming from other parts of England and from Wales. The reasoning behind this is to minimise the risk of introducing infected cattle from other areas.
- All herds that have a bTB breakdown in a high incidence area will have to have two clear

Bovine TB eradication programmes in Europe ... by Dafydd Saunders Jones A Nuffield Farming Scholarships Trust report ... generously sponsored by the Dartington Cattle Breeding Trust



tests with severe interpretation as to whether or not lesions were found at post mortem.

- For cattle farms in the Low Risk Areas who are selling more than 20 cattle there is an option to apply for free pre-sale TB tests which will be funded by the government.
- Farmers have an option under certain conditions to apply for private use of gamma interferon.

These various policies demonstrate a regional approach that is targeting specific issues within regions to make the programme more efficient and effective. It also helps in showing progress towards getting certain regions OTF.

4.i.iii. TB hub

This website collates all the information any person or organisation would require to know about bTB. It communicates the information in a clear and concise manner. The hub is a joint industry initiative, supported by the Agriculture and Horticulture Development Board (AHDB), the Animal & Plant Health Agency (APHA), the British Cattle Veterinary Association (BCVA), the Department for Environment, Food and Rural Affairs (Defra), Landex and the National Farmers Union (NFU), and demonstrates what can be achieved when working together.

4.j. Wales

Wales has come a long way in its bTB eradication journey but has a long way yet to go. Policies such as annual testing and dealing with overdue tests have been influential.

4.j.i. Statistics

It is important that statistics are understood by all concerned. In the past some of the statistics presented have been too complicated and too difficult to understand (e.g. tables of numbers). The introduction of the bTB Dashboard, which was developed with the industry, has meant there are now some clear quarterly statistics that are easy to understand and which provide the user with a clear picture of how the programme is progressing.

See Wales bTB dashboard at top of next page.

4.j.ii. Cymorth TB

Cymorth TB is a free support and advisory service for farmers who have a bTB breakdown. During a visit, a vet offers tailored advice and support regarding issues such as: disease management on the farm, biosecurity, business continuity and best practice. The aim of the visit and the discusson session is to reduce the likelihood of future breakdowns. The advice and guidance is delivered by the farmer's own private vet who understands the farming enterprise and the herd's general health status. Farmers that have received the visit have reported finding the session useful in managing their breakdown.

4.j.iii. Long term breakdowns

In Wales there were around 100 farms that had suffered a long-term bTB breakdown (over 18 months). Resolving some of these cases would have a big impact for both the government and for the



farmers. Specific APHA veterinary case officers have been allocated to work with the local vet and the farmer to use all methods available to them, such as: more use of gamma interferon testing, epidemiological data analysis and practical changes on farm biosecurity. The results have been promising with around 50% of farms being declared OTF.

Some of the epidemiological analysis of these farms may help develop improved policies and testing protocols in the future.



Figure 13: Wales bTB Dashboard

http://gov.wales/topics/environmentcountryside/ahw/disease/bovinetuberculosis/bovinetberadication/t b-dashboard/?lang=en

4.j.iv. Delivery of bTB testing

bTB testing was managed by the Animal Plant Health Agency (APHA). They had individual contracts with private vets to deliver this testing on their behalf. This work was then sent out for tender by the Welsh Government. The successful bidders were Lechyd Da, a cooperative of private vets for south Wales, and Menter and Busnes working with north Wales private vets.

This change has had a positive impact not only on performance regarding delivery, but also regarding the private vet involvement and ownership of the eradication programme. For instance, the target of reporting reactors within 24 hours of identification used to be around 80%. It is now between 98 and 100%. Vets are also offering solutions for issues found in the field and working more closely with the government.



4.j.v. Linking compensation to good practice

Since April 2016 the arrangements for paying compensation in Wales have changed. The changes are:

Encouraging farmers to follow best practice.

In most cases, full compensation is paid but if certain rules have not been followed, the amount of compensation is reduced. If certain rules are continually broken then the reduction in compensation can increase. A list of these circumstances is shown below:

Circumstances where a multiplier will be less than 1

Non-compliance with an isolation notice or other notice under Article 10(3)

Unpasteurised milk from a suspected animal has been fed to calves or other mammals

Unlicensed move of a restricted animal

Veterinary Requirements Notice : 1st breach

Biosecurity Improvement Notice: 1st breach

Failing to comply with a notice restricting the storing, spreading or movement of manure or slurry

Failure to test an animal (interval between the specified test date and the test): is more than 60 days but not more than 90 days

Failure to test an animal (interval between the specified test date and the test): is more than 90 days

Animals brought into a restricted herd

During a bTB breakdown the Welsh Government may licence a farmer to bring an animal into a herd. In the event that this animal is then slaughtered because of bTB before the herd becomes OTF, the compensation for that animal is reduced. The aim is to share the financial risk of bringing healthy cattle into a herd with a known TB problem.

Approved units

If the conditions for approving an Exempt Finishing Unit (EFU) (a unit for cattle from TB-free farms, without them having a pre-movement test) or an Approved Finishing Unit (AFU) (a unit that can take clear tested cattle from restricted herds) are not followed, compensation is reduced for any animal slaughtered because of TB.

Delayed removal

Compensation is reduced when a farmer has not cooperated with the removal of an animal to be slaughtered and, because of this, the removal has been delayed for longer than 10 working days.

Compensation is not reduced where the 10-day target has been missed through circumstances outside the control of the farmer.



4.j.vi. TB Eradication Regional Boards

The Boards have been set up to look and advise on bTB issues within their region. Members include farmers, private vets, auctioneers, farming unions and representatives from Local Authorities, APHA and the Welsh Government. Different boards have various ongoing projects specific to their area. An example of such a project is the Gower project where a working group of Gower farmers and representatives from the board have got together to apply for funding to deliver a badger survey to help understand the badger/cattle interaction on the Gower. The project will be managed by the Gower group and is due to start in the autumn of 2016.

The chairs of the boards attend the Eradication Programme Board which is responsible for the overall programme. This ensures a close link between the issues on the ground with decision makers/influencers. Although the boards have been in place for many years there is a need to make them more visible and possibly review their roles to ensure that they make a difference.



5.0. Discussion

Considerable effort has been put into tackling bTB in the UK, but progress is slow in areas of high incidence such as south-west England and Wales. There are sociological and technical constraints that are hindering decision making in delivering appropriate policies to achieve eradication. This is against the backdrop of a changing cattle industry with larger herds and less farms, which means a more complex picture when trying to eradicate bTB. Below I discuss some of the key areas that I believe are important in delivering an eradication programme.

5.1. Organisation and stakeholder involvement

A key element to success is the involvement and the commitment of all stakeholders. To be successful, an eradication programme requires a long term plan in addition to financial security. Political control of a programme can impact on its viability and derail the enthusiasm of stakeholders. UK politicians must take responsible action that will consider both farmers and taxpayers and commit to a long-term strategy that is not dependent on elections.

If they cannot commit then maybe we should be looking at delivering through a different model such as seen in New Zealand or Sweden. A bTB eradication programme needs continuity. There are elements that demonstrate that an industry and government based delivery can be more effective: for example, the badger project in England, Gower project in Wales and the delivery of bTB testing in Wales.

There has been a lot of discussion regarding cost and responsibility sharing, but it tends to be more about cost saving than the true sharing of responsibility. To be effective government will need to implement important delivery decisions with the industry, along with sufficient funds that could be topped up by the industry.

The burden of TB control in New Zealand is shared between the government and industry, which makes it unique. TBfree New Zealand Ltd is a fully-owned subsidiary of the National Animal Identification and Tracing (NAIT) and OSPRI New Zealand Ltd which delivers bTB policies on the ground.

OSPRI was established on 1 July 2013 and manages the NAIT (National Animal Identification and Tracing) and TBfree programmes. It is overseen by a Board of Directors and is also accountable to its shareholders (DairyNZ, Beef + Lamb New Zealand and Deer Industry New Zealand) and a range of industry, central and local government stakeholders. It also has responsibilities to the Minister for Primary Industries. (*Source TBfree NZ*)

OSPRI's TBfree programme is funded through a government-industry partnership. The government has committed \$100 million for 2016 to 2020. Farmers will contribute \$150 million over the same period through DairyNZ, Beef+Lamb New Zealand, Deer Industry NZ and livestock export industry



levies. To support and promote the programme there are 15 Tbfree Committees. Their role is to maintain effective links with the farming community and stakeholders at a regional level. The committees also feed back to OSPRI on operational and policy issues.

In a recent interview Paul Livingstone, the TB Eradication and Research Manager for OSPRI's TBfree programme, has highlighted some key elements to TBfree New Zealand's success. He stated:

"Just as important was the Board setting high objectives for the technical team to design, cost, and then - following stakeholder approval - implement. In that regard the knowledge of staff to identify control options and forecast some 15–20 years into the future, and cost them, has been a strong point for strategy development. Because the Board had a single focus, it ensured that we met or exceeded the milestones and therefore our objectives.

The ability to develop options was dependent upon having a forward-looking research direction that has provided information to support strategy development, prior to setting the objectives. Further, research is honed to best meet practical implementation which enables us to maximise our effectiveness and efficiency.

In that regard, TBfree is fully in control of our research destiny, which is quite different to what happens in other countries where there is either no, or limited, relationship between what is researched in relation to programme needs or objectives.

The main factor is that OSPRI's TBfree programme is an incorporated society which has meant that the stakeholders have bought into the strategy and its funding. As far as I am aware, there are no other national disease control programmes - of the size and difficulty of the New Zealand TB control programme - that are managed by an NGO.

In all other countries that I am aware of, TB control is a managed by a central or state government department. As a consequence, funding is at the whim of the current government in power and strategies can be overturned through an election."

There is a great deal of skill and knowledge within the veterinary authorities, industry leaders, scientists and the government in the UK. There is now a need to look at developing a more effective delivery model that ensures stability for the bTB Eradication programmes that will not change with the colour of the government.

5.2. Training and education

While in Ireland I came across the saying "*Education is not about the filling of the pail, but the lighting of a fire*" - and that is definitely true in whatever field we work in. Providing education for farmers, veterinarians, the public and government officials, is essential in developing a desire and will to eradicate any disease. Information such as the TBhub in the UK is excellent in bringing information together; the challenge is to get people to engage with that resource.



When you ask different people across all countries regarding the education of farmers the normal response is "we have these leaflets". I'm not convinced that leaflets reach the right people at the right time. For instance, it is better to be aware of something before it happens than learning about it once it has happened. There are opportunities to develop more interactive educational tools like mobile apps that are engaging the user.

All countries have identified the important role of continual training and enhancing educational provision within the veterinary profession.

5.3. Quality control

During my visits to Ireland, Spain, Italy, Belgium and the UK they all emphasised the importance of carrying out the skin test in accordance with established protocols. To ensure testing is done correctly they all implement stringent quality control audits of vets. But there is also an opportunity here to educate farmers on how a test should be undertaken. This would allow them to raise any concerns with the vet or if necessary report back any issues to the relevant organisation or authority.

From my visits to the laboratories in Italy and Spain and in the UK, I have seen the importance of quality controls within those organisations. This is especially important as bTB is classed as a level 3 risk, which means there is a risk to humans.

5.4. Enforcement

For a programme to be successful it is important that its requirements are met. There are different levels of enforcement as seen in the pyramid below: It is important to note that only a very limited number of enforcement cases can become criminal cases.



Figure 14: Pyramid of enforcement tools. Source Defra



Enforcement is being used by most countries to:

- resolve a weakness in the programme, for example, dealing with an overdue test
- ensure compliance with the requirements such as ensuring animals are isolated when required
- influence behaviour, such as reducing the level of compensation if farmers do not follow a specific requirement

It can also be government action enforcing its regions to act, as seen in Italy. The important element is to ensure that the requirements are simple and easy to understand. Over-complicated requirements can cause farmers to make an error accidentally and cause a high level of enforcement for inappropriate reasons, which can damage the spirit of cooperation in an eradication programme.

5.5. Testing

Clinical signs of bTB are rare, and detection of visible lesions following post mortem of reactors will become less apparent especially when you have an effective testing programme. This in itself causes people to challenge if the animal is infected. It's the issue of the invisible disease: if an animal looked ill or had a physical defect then people would accept that an animal was actually infected.

The skin test or delayed hypersensitivity test is the standard method for detection of bovine tuberculosis across the EU and the world.

In the UK, we use the comparative bTB test, with bovine and avian tuberculin, as there is an increased risk of identifying false reactors if we used the single intradermal test, due to a high probability that the animal has come across the avian form of TB. The flip side is the test only removes around 80% of the infected cattle from the herd (under standard interpretation). In Spain and Italy they use the single interdermal test as they are of the view that it increases the chance of removing more infected cattle from the herd.

To increase the removal of infected cattle from the herd, countries are now using blood-based laboratory tests such as the gamma interferon. When talking to farmers who have had gamma used on their herds they have reported a faster return to being OTF than their previous experience with the skin test alone.

There are other tests such as the Antibody Test which is a blood test that has been developed to detect bovine TB, but no antibody tests are currently approved to test for bTB in cattle in the EU. This test can be helpful in identifying any anergic cattle within a herd.

At the present moment the skin test, if carried out following the correct procedure, is the best screening test available. There are issues regarding health and safety when carrying out the test, and the need to return 72 hours later increases the costs for government and industry. Therefore, the development of tests such as Gamma Interferon may help in the future. In the meantime, we have to put our faith in the skin test which is recognised internationally as the test for international trade.

Delivery of testing seems to be working effectively. There are peak periods of testing between October and April when cattle tend to be indoors. When a farm has a bTB breakdown its normal testing date



can be disrupted. For example, instead of testing in March they are now required to test in September. Farmers can move their test backwards but not forwards. One farmer wanted to move his test forward 2 weeks, by which time the cattle would be indoors. He was refused. This can give the farmer negative views of the test and the programme. In reality what impact would moving that test forward 2 weeks really have on the overall aim of eradication if it meant having a farmer with a more positive attitude?

5.6. Biosecurity

When you discuss biosecurity with a spectrum of people you will get a range of answers. For some it's disinfecting your boots and for others it's protecting their boundaries. In reality, it is much broader than that. In my view it's a cornerstone of running a profitable and healthy farm. It influences decisions such as purchasing stock or deciding which fields to graze.

Sometimes, when discussing biosecurity requirements with farmers, they are seen as being unrealistic for farmers to achieve. For example, having a complete closed herd is very hard to achieve and impossible when you lose a high percentage of stock. Advice should be more about how to manage these risks. Having The key to biosecurity is that all farms are different and one size does not fit all, but it has a massive role in reducing risk to a herd.

options for people who are not realistic has the impact of them switching off when your aim is to engage them. The biosecurity project in Sweden realised the importance of these issues and worked with the farmers to come up with practical solutions.

The key to biosecurity is that all farms are different and one size does not fit all, but it has a massive role in reducing risk to a herd.

5.7. Compensation

Compensation is a complicated and sensitive issue. There are different compensation systems across Europe with compensation in Spain averaging only 460 euros, compared to Wales which has the highest compensation in Europe.

There is no compensation for consequential losses in the UK but in Ireland and elsewhere there are other funds that can support farmers who have been hit dramatically by a bTB breakdown.

There are always winners and losers with the various compensation schemes and there is no perfect system. It is a balance between ensuring that compensation is appropriate and ensuring compliance with the programme. A major concern is when compensation levels have an impact of farmers not taking appropriate action to eradicate the disease. Linking compensation with good practice seems to be an effective way to ensure compliance with the programme.

We also live in an environment where financial pressures and the recent political changes in the UK may have a major impact on bTB compensation schemes here. It will force governments to re-evaluate how they implement a compensation scheme.



5.8. Restrictions

Restrictions are an important element of preventing disease spreading once it's identified. These restrictions can cause financial and welfare issues on some farms. Beef finishers find it particularly difficult to deal with restrictions as their cash flow depends on a continuous flow of cattle. Other farmers depend on their store cattle being purchased by the finishers. It was interesting that in Spain beef finishers could be outside the eradication programme, which then limited the support they would be given if cattle were identified with bTB. The Irish model of giving some additional hardship support helped with some of these scenarios.

This is an area where government and the industry need to think of ways of reducing the impact without impacting dramatically on the overall eradication programme. For example, they may be able to develop some form of veterinary plan for specific farms that send cattle to slaughter every 3 to 6 months.

5.9. Social aspects

During my journey I have realised the key role that sociology has in delivering a successful eradication programme. It is crucial to understand the views and concerns of farmers, veterinarians and the general public. Only then is it possible to develop policies and an appropriate communication infrastructure that will tackle some of these issues and influence their participation and understanding.

During my journey I have realised the key role that sociology has in delivering a successful eradication programme

While talking to Dr Philip Alexander Robinson regarding bTB in Northern Ireland I got to understand the social backdrop and

its influence on delivering or not delivering an eradication programme.

When you look at some of the work that Dr Gareth Enticott from Cardiff University has written, or research he has been part of, you get an understanding of the thoughts and beliefs of farmers and the public on various aspects of bTB. For example, a research paper by him on 'Public Attitudes to Badger Culling to Control Bovine Tuberculosis in Rural Wales' concluded:

The paper has shown that respondents in "deep rural" areas and those from areas with high levels of bTB are most in favour of a badger cull, whilst respondents from rural fringe and/or areas with low levels of bTB favour other control methods such as badger vaccination. A significant majority of respondents do not believe the current scientific evidence on the effectiveness of a cull is acceptable, and suggest for it to be acceptable it would have to be over three times its current level. The results raise interesting questions for policy makers and stakeholders who have sought to persuade the public to accept the cull by referring to the current scientific evidence. This strategy is likely to fail not just because there is a vast disparity between public and scientific expectations, but – as other research has shown – these attitudes are drawn from deep seated beliefs about nature that are unlikely to be easily changed. If public support is central to badger cull policies, then policy makers may wish to explore alternative ways of governing animal disease.'



The Defra funded research – 'Farming on the Edge: Farmer Attitudes to Bovine Tuberculosis in Newly Endemic Areas' concluded:

'.....there are indications that, farmers in areas defined as recently endemic for bTB share many of the same characteristics, attitudes and behaviours, whether they are bTB free or not. Most farmers in areas recently endemic for bTB, whether or not they have had a TB incident, believe they are unable to do anything about bTB or believe anybody can help them avoid bTB. However, these farmers, even some who have no bTB experience, have implemented some biosecurity measures and are keen for Government intervention to help control the spread of bTB by, for example, disclosing the locations of farms with bTB breakdowns. Further multivariable analysis is being undertaken to assess the relationship between bTB status, farm management and farmer attitudes and perceptions, and how these characteristics might influence a farmer's risk of infection in recently endemic areas. In addition, there appear to be no statistically significant differences between farmers' views and practices in Defra's Edge area and the HRA which raises questions around how policy makers should organize their engagement and communication with farmers in different epidemiological policy zones.'

An awareness of these issues is also important in communicating with the public about bTB and targeting the frustrations of farmers in an effective way. For example, during the Royal Welsh Show in 2016 the media headlines were "Farmers want a badger cull". This kind of message may explain the frustration of farmers but will not influence positively on public or political attitudes. It would be much better if the message was "We want to eradicate bTB" and explain the impacts the disease has on farmers, communities and the wider public. Only by explaining what impact bTB has on individual members of the public will they take notice and engage.

5.10. Cattle movements

There is no doubt that cattle movement has a role in spreading bTB especially from high incidence areas to low incidence areas. The impact of unknowingly moving infected cattle can have a catastrophic impact as demonstrated after the end of the Foot and Mouth outbreak in 2001 or the recent dispersal sale of cattle from a farm in Cumbria.

The 'Final report of an audit carried out in the United Kingdom in September 2014 in order to evaluate the effectiveness of, and progress made, by the programmes co-financed by the European Union to eradicate bovine tuberculosis' stated that *England and Wales*:

'still face important challenges inherent to the bTB eradication programme in those countries, in particular:

.....The complexity of animal trade networks and the risks associated to a very mobile cattle population, including considerable involvement of animals from bTB restricted herds. Even though those risks are increasingly mitigated with reinforced control measures and the use of Pre-MT, evidence still shows that they can contribute to increase the level of environmental infection with *M*. bovis, and facilitate the transmission of bTB.'



The lack of clarity around the definition of a farm holding (CPH) also causes difficulties dealing with breakdowns, especially if the farmland and cattle are dispersed over a wide area. The current CPH review is slow, but is an essential building block in an eradication programme.

It will be interesting to see what impact (if any) the change of policy by slaughterhouses, to reduce payments for cattle that have moved more than 4 times, will have on the structure of the industry.

5.11. Reservoirs of infection in wildlife

During my visits it was clear that if there were no wildlife involvement in bTB transmission then it was relatively easy to eradicate. For example, in Switzerland the cow that was initially identified with bTB had mixed with many cattle along the years, but the spread could have been much more widespread. In areas of Italy they have managed to eradicate the disease through strict cattle controls and During my visits it was clear that if there were no wildlife involvement in bTB transmission then it was relatively easy to eradicate.

testing. In contrast it is very difficult and complex when you do have wildlife transmission as in the UK, Ireland, Northern Ireland and areas of France.

The 'Final report of an audit carried out in the United Kingdom in September 2014 in order to evaluate the effectiveness of and progress made by the programmes co-financed by the European Union to eradicate bovine tuberculosis' stated that England and Wales: 'still face important challenges inherent to the bTB eradication programme in those countries, in particular:

...The current uncertainty in relation to the extent and geographical distribution of infection in wildlife, and the sociological and technical constraints hindering the decision-making process to select effective policy options to address that problem, such as culling and vaccination of badgers.'

Where there is wildlife involved in the transmission of disease within an area it needs to be dealt with. Currently there are three options available: removal, vaccination or a combination of both.

Projects such as the pilots in England and the TVR in Northern Ireland will bring extended knowledge and possible effective options. The results from these projects will impact on others using similar methods and in influencing public opinion.

> In the meantime, there is currently no vaccine available due to a world shortage of human vaccine (BCG). It is expected that this will be resolved in time, but any uncertainty regarding availability may have an impact on the viability of any future use within an eradication programme. Trials on vaccine bait are ongoing but the question is, will it be an affordable option? For vaccine to be successful farmers will need to see positive results in reducing bTB in cattle, coming from areas such as the Intensive Action Area in South-West Wales. It is estimated that it takes around 7 years before any impact on bTB levels in cattle can be seen.

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5.12. Reservoirs of infection in other animals

As bTB is a zoonotic disease it can affect any mammal including humans. The issue when eradicating the disease is to know if those animals have a role in disease transmission or are just spill-over hosts. The DEFRA statistics show the number of infected "other animals" that have been identified between 1997 and 2010. The numbers are extremely low compared to cattle but the most common species are deer, camelids, pigs and domestic cats. There was also an outbreak in goats in 2008. It is important that government, veterinarians and the farming/smallholder industry continue to raise awareness so any suspected cases can be reported and checked.

This has caused countries like Sweden to raise their surveillance of imported camelids. Of the cases I'm aware of, camelids do show clinical signs of bTB much more quickly than other cattle. The concern with camelids is that they seem popular with smallholders but there is limited/ or no information regarding their location and movements. The Welsh Government has introduced legislation to manage bTB in camelids but there is no regular testing in place. Camelids and goats may get tested if close to a cattle bTB breakdown. The camelid societies are aware of the issues and are working hard to raise awareness.

C	4007	4000	1000	2000	2004	2002	2002	2004	2005	2000	2007	2000	2000	2010
Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Farmed Deer	0	1	0	1	0	8	8	0	1	5	1	1	1	1
Park Deer	0	0	3	2	0	2	0	2	1	17	4	2	0	6
Wild Deer	3	6	7	6	1	3	14	42	31	29	20	31	18	15
Domestic Cat	0	2	0	3	0	2	2	6	13	14	15	18	26	23
Domestic Dog	0	0	0	0	0	1	0	1	0	0	1	1	3	2
Domestic Pig	0	0	0	0	0	1	8	1	12	2	5	10	23	29
Alpaca	0	0	0	0	0	0	2	1	0	1	4	13	68	43
Llama	0	0	3	0	0	0	1	0	1	8	16	9	0	0
Sheep	0	0	0	0	0	1	0	3	2	0	0	1	5	13
Goat	0	0	0	0	0	0	0	0	0	0	2	33	0	1
Ferret	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Farmed Wild Boar	0	0	0	0	0	0	0	0	0	2	0	0	0	1

Figure 15: Incidents of *M. bovis* infection in non-bovine domestic animals & wild deer in GB confirmed by laboratory culture (1997-2010 inclusive)- Number of infected animals by year and species

Source: DEFRA statistics - https://www.gov.uk/government/statistical-data-sets/other-tb-statistics Animal Health and Veterinary Laboratories Agency (AHVLA) TB Culture database.

There have been a few cases of the disease in camelids (alpacas, Llama etc.) as seen in the table on next page:



Year of disclo- sure	Infected herds (with > 1 dead or culled animal)	Type of herd infected (herd with > 1 culled animal)	Location of affected herds
2008	11 (6)	9x alpaca (4) 2x Ilama (2)	Carmarthenshire (llama), Devon (1 llama, 1 alpaca), Avon (2), Cornwall, Gloucestershire (3), Herefordshire, Worcestershire
2009	12 (6)	all alpacas	Devon (3), Derbyshire, Gloucestershire (2), Shropshire, Somerset (2), Staffordshire, Worcestershire (2)
2010	15 (6)	all alpacas	Devon (4) d, Cornwall (3), Gloucestershire, Hampshire, Monmouthshire, Staffordshire (2), Warwickshire, Worcestershire (2)
2011	6 (4)	all alpacas	Cornwall, Dorset, Gloucestershire (2), South Gloucestershire (near Bristol)e, Warwickshire
2012	14 (5)	11x alpacas (4) 2x Ilama 1x 'mixed' (1)	Carmarthenshire, Cheshire, Devon (4), Somerset(2), Staffordshire, Warwickshire c, West Midlands, West Sussex, Wiltshire, Worcestershire
2013	10 (6)	9x alpacas (5), 1 x 'mixed' (1)	Ceredigion, Cornwall, Devon, Gloucestershire (3) c, North Somerset (2), Shropshire, Vale of Glamorgan f
2014	7 (6) b	all alpacas	Devon, Gloucestershire, Herefordshire, Monmouthshire, Powys, Staffordshire, Wiltshire
2015	6 (3) b	4x alpacas (3), 2 x 'mixed'	Cornwall, Devon (3), Somerset, Wiltshire

Figure 16: Table to show incidence of the disease in camelids

Source: DEFRA statistics - https://www.gov.uk/government/statistical-data-sets/other-tb-statistics Animal Health and Veterinary Laboratories Agency (AHVLA) TB Culture database.

5.13. Statistics and epidemiology

Statistics are needed to:

- measure performance
- evaluate the success or deficiency of a particular activity.

Different stakeholders require different types of statistics. Epidemiologists and researchers require detailed data sets to help identify trends or specific issues. Farmers and the public require simple and easily understood statistics that facilitate understanding and tell a story. I found the Wales TB Dashboard to be an effective method of sharing useful information. I believe that it could be developed further to give a more regional disease picture for those who require that level of data.

Key Performance Indicators are also key elements in monitoring delivery against targets which are essential.

Epidemiological analysis is essential to help us understand what is happening with the disease and allow policies to be developed that may be better at dealing with specific issues. For example, the APHA epidemiology team have been looking at the recurrence of bTB breakdowns on farms within a 2-year period in Wales (*see graph on next page*). It demonstrates that around a third of breakdowns have another bTB breakdown within 2 years. Further epidemiological analysis may give an answer of why recurrence happens in those herds. You can suggest some reasons why, but the more data that is captured and analysed the closer we get to a solution. Another ongoing piece of work is looking at



what happens to inconclusive reactors during a breakdown and also what the future holds for those cattle (e.g. how many become reactors). From discussions with all countries the value of epidemiological data is seen as a crucial part of the programme and without it you're making assumptions that may or may not be the right ones.



Figure 15: recurrence of bTB breakdowns on farms within a 2-year period in Wales

5.14. Cattle vaccine

In 2007, I was told that bTB cattle vaccine was only 10 years away: but there is no current evidence that suggests a cattle vaccine will be available in 2017. There is a great deal of research going into cattle vaccine: a differential test (DIVA differentiates between a vaccinated and non-vaccinated animal) and its possible use as part of an eradication programme. Some of the key issues for its use will be legislative and export market impact, cost and availability of vaccine, as it's the same vaccine as the human BCG. I was told in Brussels that you have to use the current tools that are available to you and cattle vaccine is not currently available. In the future it may become part of the programme but it will not be the only solution.



5.15. Future tests

Research into the '*Performance of a Non-invasive Test for Detecting Mycobacterium bovis Shedding in European Badger (Meles meles) Populations'* by Warwick University found possibilities of using a new test to identify infected badger sets. They stated:

'Our study has identified the potential value of qPCR testing of faecal samples collected from latrines for monitoring *M*. bovis shedding in badger populations at the group level. This may prove to be a valuable adjunct to trapping and live testing in field studies to investigate the epidemiology of *M*. bovis spread in badger populations. However, the approach could be implemented as an alternative to capture and testing when the cost of the latter may be prohibitive for monitoring disease risks over relatively large areas. For example, qPCR testing of latrine faecal samples could be applied at the edges of the areas in which TB is currently endemic in the United Kingdom or throughout high risk areas, in order to provide spatial information on relative levels of environmental contamination, which may facilitate monitoring.'

Compared with the other tests available it performed well but was borderline on certain aspects. Further research for this test may be useful in the future especially if the Northern Ireland TVR trial is successful.

The EU Reference Laboratory in Spain is also working with others to develop techniques in bTB DNA sampling of tissue samples, instead of culturing, which could mean 48 hours for a bTB result rather than the current minimum of 20 days.

There is continual research into new tests. If more efficient or effective tests become available then they will lead to an improvement in the eradication programme.

5.16. Research

The amount of research on bTB is substantial and occasionally contradictive. It is essential that we continue to fund research that may deliver new methodology, better policies and/or a new test.

There is limited input to research from stakeholders, and research papers are difficult to find for the general public - and they require a fee. I think that it's important that research is guided by scientists, government and stakeholders to ensure that funds are spent in the areas that could make the biggest impact and to ensure scientists and stakeholders understand each other's viewpoints. Research papers can be very difficult for a non-scientist to understand, therefore a simplified paper on the research and its findings may be a useful tool to disseminate conclusions and results. Research needs to be an integrated part of the whole eradication programme as in New Zealand.

5.17. Genetics

TB Advantage is a new genetic index published by AHDB Dairy. This is an area that has developed over the last few years. The data is based on using data from 650,000 Holstein cows. It follows extensive



research into the genetics of bTB, undertaken jointly by the University of Edinburgh, the Roslin Institute and Scotland's Rural College (SRUC), and which was supported by Defra and the Welsh Government (*source: AHDB*). Work is now being carried out on the data of other cattle breeds, to see if the index may be extended.

This is the first genetic index of its kind and it offers an opportunity to breed cattle with lower susceptibility to bTB. But it's important to remember that this alone would not be effective and that it is essential to continue implementing the other components of the eradication programme.

5.18. Consumer

This is a component that tends to be forgotten as we tend to concentrate on things that affect us personally as farmers, on the industry or on the government. It is important that the consumer understands the issues and the impact that bTB may have on them and their food security. It is important that the messages are clear but targeted to inform the consumer. Animal health policies in Sweden are driven by the consumer's need for food products from healthy clean livestock.

5.19. Technology and databases

There is an opportunity for vets to develop improved technology that may not only be used for TB testing, but also may be used for any other diseases. There is a requirement to link the various databases together to a central hub so information regarding cattle movement, testing history and health status is available for the farmer and his vet to view. This would ensure that animal health is viewed in its entirety and not as individual disease.

5.20. Other diseases

It is important that farmers give animal health priority in their decision making and business planning. All diseases have a negative financial impact on the profitability of a farming business.

A high level of BVD or Johnes within a herd can also impact on the effectiveness of eradicating bTB from that herd. For example, there is a risk that Johnes can interfere with skin test sensitivity, as Johnes will provoke an avian reaction that may conceal a bovine reaction.

Eradicating a disease such as $\ensuremath{\mathsf{BVD}}$ from both a herd and

nationally is relatively straight forward compared to bTB. Achieving BVD-free would also demonstrate that by working together and using all the required knowledge and required policies, animal diseases can be eradicated. In a changing political world it is more important than ever for a farming business to improve its animal health status. We need to demonstrate to worldwide consumers that our livestock are the healthiest and that we have effective eradication or pevention programmes in place.

Johnes will provoke an avian reaction that may conceal a bovine reaction.



5.21. Brexit

Having an EU approved TB Eradication Programme gave UK programmes some stability, a degree of political pressure and some financial support. Leaving the EU may impact on the level of funding available and the political will to deliver.

It is envisaged that EU legislation will continue to play a role in policies, due to the need to export to the EU. I cannot see our legislation requirements becoming less than those of the EU, but possibly it may become higher than the EU's to give us a unique selling point to other countries.

It is also an opportunity to review the delivery landscape of TB eradication in the UK and to try and deliver policies, financial structures and long-term stability, with the support of all stakeholders.

As we have already seen in some areas, the failure to control and eradicate bTB will continue to have a big impact on the future of the cattle industry.

6.0. Conclusions

- Bovine TB Eradication is difficult but eradication has been achieved in other EU countries by working together and using all available tools.
- A succesful programme needs political and financial stability to succeed. The programme governance needs to ensure that these elements are key features of the programme.
- The nature of disease, the farming structure and the social background is very different between and within other EU countries. It is essential that policy makers understand these differences and involve all stakeholders in developing and delivering an eradication programme.
- EU legislation needs to be reviewed and revised to reflect social and scientific changes and the experience of all EU countries in implementing an eradication programme. Following Brexit there is an opportunity to review and amend UK legislation. However EU legislation will still govern international trade.
- Carrying out epidemiological analysis and acting on that information is an integral part of the continuous improvement of an eradication programme.
- Research has an integral role to play but this research must be targeted for the greatest impact and to be more inclusive of all stakeholders.
- Communication methods need to be targeted and reflect those aspects that are important to different stakeholders.
- Training and education has an important role to play but this must be engaging and available through contemporary communication media (e.g. mobile apps).
- Farming businesses need to ensure that animal health is an integral part of their business development and planning. As we compete within a global market having clean and healthy livestock will become a very important marketing tool.

7.0. Recommendations

- 1. Industry and government should look at developing a delivery model that can ensure the involvement of all stakeholders within a financially and politically stable framework.
- 2. The development of data sharing and the use of technology is important to help understand some underlying issues, to improve training and to deliver education and delivery efficiencies.
- 3. If eradication is the goal, then all currently available techniques should be used, rather than policies based on what may be available in the future.
- 4. There needs to be a communication strategy that is based on the understanding of the target audience
- 5. Involve all stakeholders in the research decision making process, and ensure that these decisions are accessible and understood by all.
- 6. Implement Compliance and Quality Control Protocols that ensure effective and consistent delivery.
- 7. As an industry we need to take actions to control and eradicate disease such as BVD and Johnes.



8.0. The next steps – after my Nuffield Farming study tour

Bovine Tuberculosis Eradication is a big part of my life! I have worked with ministers, veterinarians and policy makers. I have met some inspirational people and personally dealt with the stress and emotional pressure of a bTB breakdown on our own farm.

As chairperson of the South-East Wales Eradication Board I will share the knowledge that I have gained during my Nuffield Farming journey with policy decision makers and politicians and appropriate stakeholders.

The knowledge and the contacts, that I have gained will also play an important part in developing an industry-led BVD eradication programme for Wales. I'm currently working with various agricultural organisations to instigate and develop a Welsh BVD eradication programme.

During the Royal Welsh Show in 2016 I sat on a panel to discuss bTB eradication to 2020. I will continue to share my experience and knowledge with farming organisations such as the Farming Union of Wales (FUW), National Farmers Union (NFU), Young Farmers and other interested groups.

There are many stakeholders with a wealth of expertise who want bTB Eradication in the UK to succeed. The challenge is to further develop the current programmes and to ensure political and financial stability for these programmes.

The journey will continue until someone writes a report on "How bTB was eradicated from the UK"



9.0. Executive summary

Bovine TB (bTB) impacts on farming businesses and communities across Europe. Many papers have been written on the experiences of New Zealand and Australia but there is limited information on how European countries have implemented their bTB Eradication Programmes. Some countries have seen success, some are not so successful. Some have seen a gradual increase in the disease while others focus on protecting their livestock and boundaries. The UK has the highest level of bTB in Europe. Failure to deal with this disease has - and will have - further significant impact on the viability of cattle enterprises and our ability to export.

The main aim of my report was to learn about bTB eradication programmes in a sample of European countries and identify some key aspects that are important to achieve success. I visited Ireland, Northern Ireland, Switzerland, Italy, France, Belgium, Sweden, Spain, England and Wales and met farmers, policy makers, scientists and veterinarians with direct knowledge and experience of the disease. I have highlighted some key points from each country and discussed what elements are important for an effective eradication programme. My findings should help trigger discussions on delivering an evolving eradication programme.

Some of the main issues identified include the need to develop a delivery model that ensures the involvement of all stakeholders linked with financial and political stability. There are opportunities for a greater use of technology and data sharing to improve analysis, training and education. The formulation of policies and the development of communication strategies need to include and understand the social aspects that are interlinked. This would enable a more effective delivery and communication strategy. Paramount is targeted research designed in collaboration with stakeholders that will produce information that is understood by farmers. The tools currently available to eradicate the disease need to be implemented. Future technological and scientific improvements are important and may help efficiency and cost, but you cannot develop an eradication programme based on what may become available. We need to look at countries like Sweden which understands that consumers want food products from healthy farms, and strives to respond to those consumer needs. Healthy livestock means a more profitable business and, in a changing political world, it is an important marketing tool. We need to demonstrate to consumers worldwide that our livestock are healthy and that we have efficient and effective eradication or prevention programmes in place. We have some of the best stock in the world but if the health status of our stock is below par then our status is severely undermined and we are limiting our potential. We need to take action to control and eradicate diseases such as bovine TB, BVD and Johnes if we are to achieve this goal.



10.0. Acknowledgments and Thanks

I am hugely grateful to the 'Dartington Cattle Breeding Trust' for sponsoring me throughout the Nuffield Farming Scholarship. Their objective of improving the quality and health of livestock in Great Britain for the benefit of the public by furthering research; disseminating the useful results of research; supporting new entrants to livestock farming and others developing their livestock enterprises; and otherwise furthering education in livestock breeding, animal husbandry and related subjects are a key element of my study.

I would like to thank my wife, three children, parents and parents-in-law for their immense support during my Nuffield Farming experience. Without them none of this would be possible and I'm a lucky person to have such supportive family and friends.

The people I've met during this journey have been inspirational and honest, sharing the good and the bad, and I would like to thank them all. I would like to thank them all for their time, patience and the sharing of their knowledge. A special thanks to those who organised and help plan my visits in each country. I've met Chief Veterinary Officers, Heads of TB policy, farmers, and veterinarians across Europe and they have all been open and honest. There are similarities in their approach to dealing with the disease, but with a degree of difference. Their farming industries, political governance and the distribution and density of the disease vary - but with one common goal: namely to eradicate bovine TB.

I would also like to thank my mentor John Alvis for his advice, contacts, patience and support and Anne Beckett for her editing expertise and patience.



Reading Lists

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Appendix 1

Key areas within a bovine eradication programme

This Appendix is further amplification of *Working Document on Eradication of Bovine Tuberculosis in the EU Accepted by the Bovine tuberculosis subgroup of the Task Force on monitoring animal disease eradication referred to* on page 4 of this report:

Regarding specific elements of an eradication programme, they highlighted the following key elements:

Diagnostic tests

Test characteristics are important for all diagnostic components of the programme. There is usually a trade-off between sensitivity (the proportion of infected animals detected by the test) and specificity (the proportion of non-infected animals cleared by the test). However, in a regulatory context where the minimum cut-off values are laid down in legislation these should not be changed nor adapted to relax these although more stringent criteria may be used within the context of the relevant rules.

Definition and application of the epidemiological unit

The primary unit of concern or epidemiological unit for TB is the herd. "Herd" in the legal context of Council Directive 64/432/EEC is defined as "an animal or group of animals kept on a holding (within the meaning of Article 2 (b) of Directive 92/102/EEC) as an epidemiological unit". From an epidemiological perspective, the fragmentation of holdings and/or management linkages between farms presents a problem for TB eradication. The wide range of cattle industry systems in operation in the EU makes it difficult (or even impossible) to apply an EU-wide definition of "epidemiological unit" for TB eradication purposes. This issue therefore requires to be addressed at the individual MS level in the design of the eradication programme.

Source: WD SANCO/10067/2013 - Working Document on Eradication of Bovine Tuberculosis in the EU Accepted by the Bovine tuberculosis subgroup of the Task Force on monitoring animal disease eradication

Post mortem surveillance

The detection of TB in the slaughterhouse is, among other things, influenced by the stage of infection in an individual animal. Slaughterhouse surveillance is of particular importance in Officially TB Free (OTF) areas/regions and regions that do not test annually.

Frequency of herd testing

The minimum frequency of tuberculin tests on herds is set out in EU legislation. In order to accelerate eradication it may be necessary to increase the frequency of tuberculin tests to more than the minimum requirement. A higher testing frequency contributes directly to the reduction of the reproduction rate by enabling earlier detection of infected animals and their early removal.

Interpretation of the tuberculin test

The Standard Interpretation of the tuberculin test is described in Annex B.2.2. to Council Directive 64/432/EEC (trade context). The severe interpretation of the tuberculin test effectively means that the inconclusive reactors as defined in 64/432/EEC are to be considered as positive reactors and are to be removed for slaughter from the herd. Other more severe interpretations of the test can be applied.

The single tuberculin test has a higher sensitivity while the comparative test has a higher specificity. In infected herds or areas it is recommended that the single test be used, where specificity is sacrificed in the interest of sensitivity.



Strategic use of the IFN-y assay

Parallel testing in order to detect the maximum number of infected animals in a herd or region of high prevalence, increases the sensitivity of the diagnostic regime.

Movement control

Movement of infected, yet undetected, cattle provides a well-established means of spreading TB from herd to herd. The performance of a tuberculin test prior to and/or after movement, provide some assurance in regard to the risk of introducing TB into herds through the introduction of such cattle from another herd.

Epidemiological data analysis: performance and epidemiological indicators

Basic indicators for the follow-up of the co-financed eradication programmes and reporting of animal diseases are provided in EU legislation. However, when evaluating the progress of the programmes, international 'trading rules' are frequently used as the sole or main benchmark.

Additional indicators to monitor the progress of TB eradication that are recommended include:

- slaughterhouse submission rate,
- number (and proportion) of herds detected by post mortem inspection with test reactors on follow-up tests,
- number (and proportion) of test reactors with visible lesions at slaughter,
- number (and proportion) of reactors that are confirmed as infected
- post-mortem,
- number (and proportion) of positive herds with a history of positive reactors (and/or inconclusive reactors),
- number of human cases caused by Mycobacterium bovis and M. caprae or otherwise of zoonotic origin, reproduction rate of the disease.

Management of infected herds

As a basis for the management of an infected herd, a thorough epidemiological investigation is needed. This is important for decisions on test interpretation strategy, application of additional tests, necessary biosecurity measures, removal of in-contact animals and perhaps removing the entire herd

Reservoirs of infection in wildlife and other animals

There are currently no legislative provisions on EU level for TB eradication in animal species other than cattle (except for milking goats in direct contact with cattle in the context of food safety rules). An active approach to the removal of TB-infected wildlife, or other species that share the environment with cattle and the development of appropriate means of preventing transmission of TB from these sources to cattle, and vice versa, is recommended.

It has been demonstrated that the persistence of an infected animal reservoir that enters into contact with cattle is a major obstacle to the eradication of TB. This obstacle should be addressed in tandem with the measures implemented in relation to the cattle population.

Compensation schemes

Compensation should be adequate but not, in any way, pose an obstacle for the progress and success of the programme. Compensation schemes should be subject to regular review and linked to the herd-owner's compliance.

The compensation scheme should also be aimed at modifying the behaviour of farmers in a way that they will avoid the introduction of the disease and further spread the disease in their herds. Furthermore, compensation should never be above that of the current market price of comparable healthy animals.



Future perspectives

Vaccination of cattle against TB is explicitly forbidden in the EU legislation on disease control (Council Directive 78/52/EEC) and implicitly also in intra-Union trade legislation, as vaccination is not compatible with the provisions for testing and herd qualification (Council Directive 64/432/EEC). The main reason for the current vaccination ban is due to the possibility that vaccinated animals are not fully protected against TB infection. The development of vaccines and new tests for domestic animals as well as for wildlife will mean that legislation and guidelines will need to be reviewed and perhaps revised.

Source: WD SANCO/10067/2013 - Working Document on Eradication of Bovine Tuberculosis in the EU Accepted by the Bovine tuberculosis subgroup of the Task Force on monitoring animal disease eradication