TB Strategic Partnership Group
Interim Report
A Consultation
June 2015
Please note: A number of documents, reports and legislation are referenced through this report. We have listed these documents at Annex E rather than as footnotes given the number and frequency of these.
CHAIRMAN’S FOREWORD

Bovine Tuberculosis (TB) has a devastating impact on herd keepers, their families and wider communities, and presents a threat to the cattle industry, other livestock and wildlife, which cannot be underestimated.

During the past 10 years the TB herd incidence level has fluctuated between 5 and 7.5 per cent and, unless additional firm action is taken, this level of disease is likely to continue. The programme cost to taxpayers is almost £30 million per year, and, in addition, the compliance cost to farmers is some £10 million per year. This must not be allowed to continue indefinitely.

The eradication of bovine tuberculosis (TB) therefore presents us with a very significant challenge, but we are convinced that achievement is possible. Eradication has been realised in other countries and regions, using the same diagnostic tools that are available to us today. That said, our farm structures and culture are different from those elsewhere, so simply replicating what is done elsewhere may not deliver eradication here. We need to develop a bespoke response appropriate to our needs.

Success elsewhere was predicated on a shared understanding and commitment by government, private vets, farmers, the agri-food industry and environmental bodies to progressively reduce the levels of bovine TB until the aim of eradication was realised. Achievement of that success took time, resource input, industry discipline, and a united focus on the desired outcome. There is every reason why we, with common purpose, should be able to deliver the same desired result.

For some 60 years now, a continual programme, aimed at controlling and reducing TB has been operational here. Several generations of farmers have become very familiar with the TB testing regime; the compulsory removal of diseased or high-risk animals to slaughter and the associated animal movement restrictions. Testing is necessary to enable the removal of diseased animals from our herds which carry the risk of onward infection spread both within, and between herds, in order to minimise any risk to human health.

The TB testing programme also provides an essential underpinning to our ability to trade internationally and contributes to the commercial success of our export dependent agri-food sector. We should be alert to global competition and consumer preference, which demand ever-higher standards for livestock husbandry and food production; it is therefore regrettable that we have not been able to remove the scourge of bovine TB. We note that the Agri-Food Strategy Board in its “Going for Growth” report has recommended TB eradication.

The current TB programme, with its on-going compliance cost to farmers and Government, cannot continue indefinitely. We need to effect real improvement. It is a continuing drain on the public purse, a burden on farming operations, an animal and wildlife health issue and as well as a public health one.

We need to establish achievable eradication goals and time frames, share that vision with the farming industry and the public and work steadily to achieve it. We must
establish and share the conviction that eradication is indeed achievable in our local farming context.

While recognising that eradication will necessitate a long-term strategy, we must not be complacent. Eradication, not just reduction, must be our goal. EU Commission and local political drivers encourage us toward that end. High standards of animal health help optimise farm profitability, competitiveness and secure agri-food market opportunities.

We must set challenging targets and a time frame for early disease reduction gains and then progressively recalibrate the programme to ensure that we bear down upon the remaining levels of disease. We fully appreciate that the goal of complete eradication will not be achieved in the short to medium term, that it will have significant expenditure, and will present an on-going challenge to all stakeholders. We must also recognise that a resolute approach may detect more disease in the short term, so TB herd and animal incidence may increase before a sustained reduction is achieved.

The road to eradication will require everyone working co-operatively together: that is herd keepers, veterinarians, environmentalists, conservationists, Government, politicians, and the wider community. Each has a vital role to play, and a common goal to achieve. A change of culture and attitudes will be needed. Acceptance of personal responsibility for good disease prevention will be required. Reappraisal of existing and sometimes deeply held beliefs, political stances and positions, will be a necessity. All stakeholders will be required to co-operate to effect real, lasting and evolving change. The adage that there is no gain without pain, certainly applies here.

Success will be hard won and it will take time but by uniting all the talents available, combined with industry and Executive commitment on a common purpose, this goal can be achieved. Any successful programme will need to be compatible with our farming structure and culture, and address the issue of disease in both cattle and wildlife.

We recognise that this Interim Report is long and detailed. That is due to the wealth of input the TBSPG received from farmers and other industry representatives; veterinary organisations; practices; individual vets; environmental organisations; scientists and officials; and recognised international experts. This report attempts to capture their valuable insight; and now we seek your detailed consideration and advice.

Clearly it would be impossible to introduce all the proposals at once. The strategy will be a progressive one; it will require new thinking in how the farming industry works with government; new approaches in how we fund TB eradication; and a new commitment from all stakeholders. There will also be a need for additional economic appraisal of the final recommendations to ensure value for money and optimal success. We anticipate that there will also be hard choices to make in relation to affordability and funding and that implementation will require on-going political support.
It has to be within our collective effort to be able to substantially reduce the levels of TB here in coming years and then take the next steps necessary to eradicate the disease. There is no single action which is likely to eradicate TB; it will require a combination of responses. That is why we need your consideration and advice. We would ask you to read this report in full and not just those chapters of primary interest to you.

We would value your views on the most efficient and pragmatic actions to take this strategy forward. We need to be able to determine what the priority actions are, how we achieve the greatest reduction in the level and cost of bovine TB, in the shortest possible time. At that point we should be better able to ascertain what additional actions are necessary to move on from lower levels of infection achieved, towards complete eradication.

Sean Hogan

Chair TBSPG
CHAPTER 1

INTRODUCTION

The disease

1.1 Bovine TB is a chronic disease of animals caused by a bacterium called *Mycobacterium bovis* (*M. bovis*), which is closely related to the bacterium that causes tuberculosis in humans. Although cattle may be the true hosts of *M. bovis*, the disease has been reported in many other farmed and wild animals.

1.2 The disease is contagious and is spread mainly by contact with infected domestic and wild animals. Inhaling infected droplets expelled from the lungs is the usual route of infection. Drinking raw milk from infected cows can also infect calves and humans. The development of the disease is slow. A diseased animal can spread TB to many other contacts before it begins to show any visible signs of the disease. Therefore, movement of undetected infected cattle and association with infected wild animals, are considered to be the principal means of spreading the disease.

1.3 Since the introduction of compulsory testing in 1959, bovine tuberculosis has been reduced to, and maintained at a low level, but not eradicated.

The period of the late 1990s saw, as a trend, a steady increase in herd incidence, to a peak of 10.21% in February 2003. This peak was after the Foot and Mouth Disease outbreak in 2001 when on-farm testing was suspended for 6 months followed by a further longer period to clear the backlog of testing.

A steady trend in reducing herd incidence followed until 2007. Since then the trend remained reasonably level until August 2011, when TB herd incidence was reduced to 4.99%. Since then there has been a sharp rise in incidence to a peak at 7.46% in late 2012 before starting to decline again to reach 5.95 in September 2014. Since then the disease levels have risen again and the current TB herd incidence (at 30 April 2015) is 6.62%. Table 1 and Table 2 below illustrate the historical movement of TB incidence in herds.

1.4 TB is a complex disease and a large number of factors are involved in its spread. Eradication is only going to be achieved through attention and action to the multiple factors involved and the use of all the tools available.
**Table 1**

TB herd and animal incidence: 1995 to 2013

**Table 2**

TB Herd and Animal Incidence:  
(12 month moving average: January 2002 to April 2015)

*Directive 64/432 states that “a Member State or part of a Member State may be declared officially tuberculosis-free according to the procedure laid down in Article 17 if it meets the following conditions:
(a) 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

1.5 TB continues to be our most costly animal health problem with costs of the TB Eradication Programme during the last 3 years being of the order of £27-29 million per year. Although the TB eradication programme has been applied rigorously the TB herd incidence has fluctuated between 5% and 7.5% since
It is considered that the TB eradication programme as currently applied will not achieve significant further reduction and/or eventual eradication.

1.6 In NI we have over 24,000 farms, with almost 48,000 people employed there and over 1.5 million (beef and dairy) cattle on those farms. The industry is the largest player in our agri-food economy. The health and wellbeing of our farms and cattle is vital to supporting our £1,000 million plus export dependent trade in livestock and livestock products. The “Going for Growth” report highlights the importance of animal health to the further development of the industry in securing and developing the economic potential of emerging markets.

The TB eradication programme

1.7 The effort to eradicate TB will need to include a number of key people and organisations:

- **Farmers** – currently are required to comply with annual TB testing and movement controls, which has a significant compliance cost for them estimated at £10m per year. Although they receive 100% compensation for any TB reactors and in-contact animals compulsorily removed, the disease has damaging effects on the farm business. There can be consequential costs for farm businesses arising from TB herd breakdowns.

- **DARD** – currently vets conduct risk based bovine TB testing and investigate breakdowns seeking to determine the source of infection; valuers carry out compensation valuations of TB reactor and in-contact animals; and meat inspectors conduct post-mortem inspection of all cattle slaughtered.

- **Private vets** - nominated by farmers to conduct annual surveillance TB testing of their animal(s) and any additional risk testing allocated by the Department.

- **AFBI / VSD** - carry out laboratory analysis of blood samples, post-mortem tissue samples, strain typing M. Bovis isolates from infected animals and research on TB etc.

- **Contract hauliers** - remove reactor animals from TB breakdown farms to be slaughtered by contracted processors.

1.8 The fundamentals of the statutory TB Eradication Programme involve: the compulsory annual testing of all cattle herds using the Single Intradermal Comparative Tuberculosis Test (SICTT) - a skin test - in line with the EU Trade Directive 64/432; the compulsory removal of animals that give a positive reaction to the skin test; and tracing and testing of in-contacts. The gamma interferon blood test (IFNG) may be used as a supplementary test in certain circumstances and the programme also involves routine abattoir surveillance of all cattle slaughtered.

1.9 Where bovine tuberculosis is detected in a herd, the reactors and any inconclusive or negative in-contact animals which the Department has
selected for compulsory removal are valued at full market value (as if the animal was not diseased) and compensation is paid to the farmer. The reactors and in-contacts are removed from the farm and slaughtered. Live animal movement restrictions and increased frequency of testing is implemented until the herd tests clear of disease.

1.10 Following a confirmed TB breakdown, neighbouring farmers are alerted and their herds may be allocated an associated risk herd test. Cattle which have left a herd prior to infection being found are traced, placed under movement restriction and tested. If it is not possible to test the traced animal, then a herd test will apply in the recipient herd. Herds from which a TB reactor has originated, or moved through, are tested also. The result of all these controls is that, on average, farms here are tested every 9 months.

**Purpose and Role of the TB Strategic Partnership Group (TBSPG)**

1.11 On 17 September 2013, Minister Michelle O’Neill MLA announced to the NI Assembly Agriculture and Rural Development (ARD) Committee her intention to establish a government / industry partnership to develop a long-term strategy to eradicate TB from the cattle population here. The composition of the TBSPG reflects the importance of the farmer, veterinary and scientific input to its considerations. (Details of members can be found at Annex A).

1.12 Our role is to provide the Minister for Agriculture and Rural Development with a strategy and an implementation action plan to effect a progressive and sustained reduction in both the levels of TB and the cost of the TB eradication programme; improve detection of disease; encourage better bio-security; reduce disease risks throughout the cattle industry; and find cost-effective ways to mitigate the wildlife risk factor. We are expected to consider the cost of implementing the various elements of the strategy; detail how these elements will be funded; and agree who will lead on their implementation.

1.13 The main elements of our task therefore is to:

- **Review** the current TB eradication programme;
- **Develop** a long-term strategy to eradicate bovine TB;
- **Develop** within 12 months of establishment an implementation action plan;
- Consider the **resources** necessary to deliver these strategic outcomes;
- Regularly **review** and revise the action plan;
- **Provide strategic advice** to the Minister taking account of the full range of industry and stakeholder interests;
- **Re-energise** relationships with all industry stakeholders;
- Consider the **enhancement of primary and secondary legislation**; and
- Consider **other means** to tackle and eradicate this disease.
CHAPTER 2

OUR APPROACH

Public consultation December 2014

2.1 In December 2014, we sought views from all parties who had an interest in TB eradication and asked how they considered it would be possible to reduce the incidence of TB in cattle; its impact on the farming industry; and the cost of the eradication programme.

2.2 That 7 week consultation period ran between 8th December 2014 and 23rd January 2015 and an advertisement was placed in the Irish News, Belfast Telegraph, Belfast Newsletter, Farmers Journal, Farm Week and Irish Farmers Journal.

2.3 We sought views across a broad spectrum of issues, ranging from cattle management, programme management, compensation, control of wildlife, diagnostics, and research requirements and respondents were asked to put their views in writing in not more than 500 words.

2.4 A total of 28 responses were received from private individuals, industry representative bodies and non-government organisations (NGOs). These are named in alphabetical order at Annex B. The responses were analysed and categorised under thematic categories and these are summarised in Table 3 below. Some respondents provided comments on more than one category.

Table 3

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<td>Testing &amp; Diagnostics</td>
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<td>Relationships</td>
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2.5 All responses were reviewed and as might be expected there was overlap between submissions on certain areas. Below is an overview of the main points and suggestions made within thematic areas.
A. Testing and Diagnostics

2.6 Detailed responses expressed views on the difficulties facing any TB eradication programme, the drawbacks of the testing regime and indicated that a holistic approach would be needed to review testing methodology, testing practice, bio-security and epidemiology.

2.7 There was general agreement that the measures taken to eradicate TB must be based on sound scientific research and evidence, coupled with the application of sound veterinary epidemiology.

2.8 Of the 9 responses from the agri-industry including farmers, there was a general consensus on the need to improve the accuracy of the TB test. Further investment in testing technology and its accuracy was viewed as essential, leading to cattle vaccination with any technical hurdles being resolved with ‘flexible thinking’. One respondent referred to the potential use of nanotechnology as the way forward for disease control in animals.

2.9 Five responses were supportive of further research, which would lead to control strategies which could be expanded to cover larger areas but be cost effective, recognising that this would require further long-term investment from DARD.

2.10 There were 4 responses from individual farmers and private veterinary practices suggesting a reduction in the number of tests which would lead to a reduction in costs. It was also suggested that lay testing, as employed in England, could be considered here to improve the service and reduce costs.

2.11 One response recommended that the farming industry should contribute to testing costs by placing a levy on farmers.

2.12 Another commented that research and development had the potential to deliver real improvements in disease control, particularly in areas such as genetic susceptibility, effects of other infections on cattle susceptibility, diagnostic tests, and the impact of concurrent disease on diagnostic tests, the wildlife aspect and sources of outbreaks.

2.13 One respondent made a strong case for greater and more accessible use of existing data that would assist in research and development. Reference was made to being able to access APHIS data. This information could, under certain controls, be shared outside of DARD allowing researchers and epidemiologists to extract important relationships in the information. Potentially it could also be used by industry to check on the status of herds and cattle before purchases.

2.14 There was support for DARD’s current evidence led strategy, with success being attributable to robust herd testing. One respondent believed that an enhancement would be the removal of animals testing as ‘inconclusive’.

B. Management

2.15 One respondent expressed frustration at the longevity of the TB problem and felt that changes to the system were necessary. If DARD could not eradicate
TB, then a way forward might be to let industry set up a private company to take forward solutions to the problem.

2.16 Another strongly suggested that TB control should be a meaningful partnership between the efforts of the farmer, private vets and DARD.

2.17 Some expressed concern around the movement of cattle and called for robust cattle movement controls, which could include pre-movement testing.

C. Compensation

2.18 In relation to compensation, one respondent highlighted the financial and emotional impact on the farmer of a TB herd breakdown. It stated that compensation payments for cattle not intended for sale resulted in higher taxable income, so compensation was not a stress free solution for the farmer.

2.19 Another suggestion was that there should be a review of the compensation approach with the possibility to link part of the compensation payment with improvements to bio-security on the farm; or that the level of compensation should be linked to the farmer’s bio-security compliance, i.e. demonstrating that the farmer is taking adequate measures to prevent an outbreak.

2.20 Yet another respondent suggested helping to meet the cost of compensation through a levy system or making the industry contribute in some way, whereas others cautioned that compensation changes would not be acceptable until the issue of TB in wildlife is adequately addressed. It was also suggested that costs could be reduced using fewer vets to carry out the tests and utilising lay testers instead.

D. Wildlife

2.21 There were a variety of opinions in relation to the management of the wildlife factor. Of the 15 responses about badgers, 7 were against a cull in any circumstances, 4 were in favour of a cull in certain circumstances and 4 advocated vaccination.

2.22 NGOs representing wildlife and the environment were generally against any type of cull and advocated vaccination and bio-security measures. They expressed concern that a widespread cull of badgers would contravene the Bern Convention on the Conservation of European Wildlife and Natural Habitats and felt the disease could be spread due to perturbation. They also expressed the view that there was inconclusive scientific evidence about disease transfer from badgers to cattle as being the main cause of TB incidence.

2.23 There was a view equally strongly expressed in support of proactive wildlife action. Some respondents were adamant that badgers were the sole cause of TB spread from farm to farm and recommended widespread culling, or reactive culling, citing the approach in the south of Ireland.

2.24 There was also support for the Test and Vaccinate or Remove Wildlife Intervention Research Project (TVR).
E. Bio-security

2.25 Of the responses received, 8 indicated general support that improvements were needed to bio-security measures on farms. It was suggested that bio-security could be incentivised in the next Rural Development Programme (RDP) to allocate funds towards bio-security measures, e.g. double fencing on farms. One proposal suggested that the level of reactor TB compensation payments could be linked to bio-security compliance.

F. Vaccination

2.26 Vaccination was mentioned in 10 responses as being an important part of the medium to long term solution in addressing TB and should be progressed. However, some others felt that this would be difficult to achieve.

2.27 Two of the responses expressed the belief that the scientific knowledge and new technologies were currently available and could make a cattle or wildlife vaccine workable. Some indicated that the technology was already available for good oral vaccines for badgers; although they did not express an opinion as to how the vaccine might be delivered.

2.28 One respondent in favour of vaccination of cattle suggested a controlled trial on some herds with reduced testing being used as an incentive. Another organisation, whilst in favour of badger vaccine, cattle vaccine and TVR, felt that a TVR approach would not be feasible without changes to the relevant legislation that would allow lay vaccinations to reduce the cost of delivery. It was also recommended by two respondents that exploration and development of a badger and cattle vaccine should be supported by DARD funding.

G. Farm management and relationships

2.29 There was a broad range of additional points raised concerning relationships, communication and information exchange. Significantly it was highlighted that TB breakdowns caused emotional, physical and financial hardship on farmers’ families, created a level of frustration at a perceived lack of understanding together with poor press relations and public attitude to the plight of farmers.

2.30 One recurrent theme in over half of the comments received suggested that the control and eradication of TB should be a partnership between farmers, vets and DARD. A bold visionary approach and cross cutting measures were to be considered essential to any disease control strategy.

Subsequent Briefing Sessions

2.31 In addition to the public consultation exercise, we met with a number of organisations and individuals who provided responses to the consultation in order to better understand the comments that were made. A list of those organisations that attended these meetings is detailed at Annex C.

2.32 We also met with representatives of a variety of government bodies, research providers and other experts, to gather a broad base of information; consider best practice in Britain, Ireland and internationally; and discuss issues with
those directly involved in dealing with TB elsewhere. A list of these contributors is detailed at Annex D.

Emerging approaches

2.33 Bovine TB is a complex disease. How the disease is acquired and transmitted, its potency and infectiousness, its detection and how some infected animals escape detection until post mortem inspection, means that TB will continue to be the subject of much research and debate. The challenge for us going forward is therefore to identify the key issues, explore these and then consider how best we can collectively address them.

2.34 We have grouped the issues and potential approaches into thematic areas. Under each theme, we have outlined what we see as the key or major issues which need to be addressed in order to make a difference towards eradication. We acknowledge that there is no quick or even medium term solution and that no single action will achieve the goal of eradication. What is required will likely be a combination of sustained actions over an, as yet, unquantified period of time. The options are presented at a strategic level. Once consulted upon they will need to be developed into operational recommendations. Your views will help in doing this.

2.35 We have been able to identify a range of actions or changes to the current programme, which we believe could make the difference; however, before any definitive decisions can be taken, we want to hear your views on the options emerging as a result of our considerations. Whilst we have included some questions at the end of each section as an aid to assist you to think of the issues, these should not restrict you in your comments or suggestions.

2.36 We acknowledge that each of the options presented has resource implications but at this point detailed estimates of cost have not yet been calculated. We are cognisant of the current financial environment and the challenges that this presents. All options will need to be assessed in terms of their cost and benefit. It may be that in some instances the cost/benefit equation may rule some options in or out and that is a reality of the financial environment we all must operate in. We need to try and ensure best value in the deployment of limited resources for the agriculture industry and the public purse whilst always mindful of our objective to eradicate TB.
CHAPTER 3

Culture and Communication

3.1 Bovine TB continues to be a chronic problem affecting in the region of 5% to 7.5% of herds over recent years. While other diseases such as Aujeszky’s (which the industry led on) and Brucellosis have either been eradicated or are on the verge of eradication, TB remains a continuing problem for many beef and dairy cattle farms. Over 60 years of TB testing has not led to eradication and it is arguable that this may have resulted in a level of tacit acceptance of the current situation. It is suggested that it may have lessened the view that TB is a serious infectious disease which negatively impacts on the agri-food industry. The viability of our export trade in part depends on customers being convinced there is a viable disease control programme in place.

3.2 For many farmers the main issues are around:

(i) Testing: whether their herd (or those of their neighbours) are found to be infected. Their focus, therefore, has often been more on complying with the programme requirements than the disease itself. The programme in turn has become viewed as one of containment rather than eradication;

(ii) Badgers: some see the problem as solely or largely resulting from badgers and feel frustrated at the lack of action in relation to this protected species.

These factors, in turn, have inevitably contributed to the view that TB is a DARD/ government problem to resolve.

3.3 Currently compensation is paid at 100% of market value; which may have the effect of diluting the will of the industry to take the necessary action to address TB and its causes. Previous attempts to change the level and structure of compensation have not had political or industry support. However, changes to compensation arrangements may now be necessary in order, not only to ensure that a new TB eradication programme can be funded but also to help facilitate the cultural change necessary to drive it forward to success (see also section on Finance).

3.4 In addition, some consider that DARD has become resigned to the view that the disease is an intractable problem. They point to the lack of an overall strategy and eradication timetable. It was suggested that delivery of the programme could benefit from greater engagement by DARD with farmers and private vets at a local level.

3.5 Concerns have also been raised about the variability in the quality of testing by some private vets; this was also reflected in the 2009 PAC report. There have also been questions raised around potential conflict of interest between private vets carrying out tests on their clients’ herds, (see also Farm Practice section).
Possible options for change:

3.6 We believe that the focus of attention needs to transfer to TB “the infectious disease” rather than TB “the testing programme”. There needs to be a sea change in approach to secure meaningful partnership between the industry, vets, government and scientists working together to eradicate the disease. Farmers will need to be more involved at a neighbourhood/local level and DARD will need to be much better at sharing information and communicating with all other stakeholders. At this local level there is a perception of a lack of proper engagement between the herd owner and DARD other than that based on testing or farm payments. The ‘trust gap’ will need to be addressed through enhanced cooperation between practice vets, farmers and DARD in order to ensure an optimum flow of information both locally and between the local area and DARD headquarters. The relationship between the vets, whether from DARD or a private practice, and the herd owner needs to shift from testing and inspection to a much broader and inclusive one, (see also Chapter 5 on Existing Tools and Processes).

3.7 There are also cultural issues associated with use of land and movement of cattle. The short term conacre land lease system is unique to this island. Many farmers continue to take conacre land and while often close to the home farms such lettings can also be many miles away. Cattle and other livestock can be moved considerable distances without any need for notification of that movement. This, however, presents a significant risk in the spread of TB and a new approach and a new thinking in relation to the use of conacre may need to be considered (see also Chapter 8 on Farm Practice and Bio-Security). Movements to and from live cattle marts and agricultural shows, which also provide a social dimension in the local agricultural scene, may also present a disease risk.

3.8 In order to change these relationships and dynamics, we could change the process to secure greater industry involvement, working alongside statutory bodies and veterinary practices. This could be both at local and regional level, (see also Chapter 4 on Governance and Delivery). Industry and farmers would, therefore, have a greater say in how TB is confronted particularly in their local area. This is likely to require financial contribution from industry, (see also Chapter 10, Funding TB Eradication.)

3.9 We have listened to a number of private veterinary practitioners involved in TB eradication who have suggested the establishment of local animal health committees involving farmers, vets, DARD officers and others where appropriate, e.g. hauliers, auctioneers and environmentalists. Local could be at a DVO area level or a townland level, this is open to consideration as to what would be most effective. These groups would be to the fore in collating and sharing information, promoting best practice, raising local awareness, and in seeking a reduction and eventual eradication of TB in that area. The local private vet and their practice would play a key role in this; from a local knowledge aspect but also in promoting best practice on farms and building trust (see also Chapter 4 on Existing Tools and Processes).
3.10 Current and accurate information is essential, if informed decisions around the appropriateness of preventive actions are to be taken in the local environment. This will need to be communicated in an effective, relevant and meaningful way so that it is easily received and readily understood by all stakeholders.

3.11 We recognise the need to change mindsets and promote best practice and so we suggest that there is a need for a vigorous publicity campaign to promote best practice in farm bio-security and all other preventive measures. Any campaign would need to demystify the testing regime and provide information on why it is necessary, how it works and how results are used. We also recognise that it is one thing to provide information but another to ensure this is received and understood by those who need it. There may be a role for the tester as part of their visit talking the farmer through the information.

3.12 Questions to consider:

a) What do you consider to be the main barriers to TB eradication facing all stakeholders e.g., attitude, knowledge, culture, resignation to the current TB situation?

b) Do you agree that developing a local partnership approach as outlined at 3.9 is the most effective way to develop the constructive engagement necessary to overcome these barriers?

c) In terms of the option presented at 3.8, how might farmers and private vets take greater responsibility for TB eradication?

d) Thinking about option 3.11, how should we develop stronger engagement, raise awareness and create a more proactive culture around TB eradication?
CHAPTER 4

Governance and Delivery

4.1 The section on Culture and Communication highlighted some of the possible changes at the local level. It also considered attitudes of the people involved, their potential roles and responsibilities, and how these will need to change to improve governance and delivery at a local and regional level. In this section we wish to explore possible governance structures for TB eradication at a regional level, on the premise that the existing structure, which has evolved over 60 years, is, perhaps not best placed to achieve this goal. Principally the current governance structure involves senior DARD policy and veterinary officials, with scientific input from AFBI. While there are long established TB-stakeholder working groups, these mainly facilitate information exchanges between DARD and industry representative organisations. It is argued that their effectiveness is also impaired by a lack of continuity in the personnel involved. We believe that a re-think in the governance structure(s) is required if new impetus to eradicating TB is to take place. Experience elsewhere would suggest that a re-balancing of both the formal and informal arrangements is necessary, if a more focussed and sustained effort is to be realised.

4.2 Having considered models in other countries which have successfully eradicated BTB, we consider that there is merit in having greater industry involvement in tackling the disease at a strategic level. The question we are now considering, therefore, is how we retain all the strengths and positive relationships that presently exist between DARD and stakeholders but raise industry involvement and ownership to a level higher than information exchange?

4.3 We recognise, however, that any changes proposed must ensure that DARD is able to continue to fulfil its competent authority role in relation to the EU Commission and international trading partners. It is also recognised that there would be cost involved in the adoption of any of the options suggested and in some cases these may be significant. The benefits of any particular approach, therefore, would have to be clearly established.

Possible options for change:

4.4 One possible approach would be to create an oversight board for TB eradication. The TBSPG, after developing the eradication strategy and implementation plan, will be required to regularly review and revise the action plan and contribute to the development of associated operational plans, targets and key performance indicators. This option envisages the establishment of a formal oversight body with industry representation to monitor implementation. It could have the benefit of bringing a wider perspective to strategic decision making at regional level, together with enhanced accountability, while simultaneously building on the existing structures and knowledge base.
4.5 Another option could be the appointment of a “TB eradication champion” who would be charged with leading on the implementation of the TB eradication strategy and who would be allocated a budget and precise disease reduction targets, timeframes, etc. The intention would be to focus the programme through a single experienced individual who would be the public face and the central driver of the eradication programme.

4.6 A further variation could be the creation of a TB eradication agency, as a DARD arms length body, with a CEO. The agency could be constructed from a core of DARD veterinarians and policy/administrative staff, but would still require the commitment of private vets in performing some 90% of all TB tests and, of course, the involvement of other stakeholders to ensure an “ownership” of the programme by all.

4.7 It may be possible to form a totally independent TB eradication board, similar to that which operates in New Zealand. Their model has been developed in a context where agriculture exists largely without public funding, being supported by industry contributions. Indeed the degree of farmer representation on the TBfree New Zealand board is consistent with farmer financial contribution and responsible stewardship of public funds. Establishment of such an independent eradication board here would require a new statutory basis and agreed cost sharing with the industry. It would also require clear lines of responsibility to be established, not least in relation to competent authority status and relations with the EU Commission. The financial advantage to government is obvious but advantages to the agri-community are also significant in terms of control of the programmes and policy direction.

4.8 It may be that there are variations of these options which could prove to be the most appropriate; or they could be brought forward in a staged or sequential progression. This could begin with the creation of an oversight body (perhaps an enhanced role for the TBSPG) and could progress over time towards the creation of an independent TB Eradication Board, if required.

4.9 All options need to ensure that the potential to compromise any office holders; for example the DARD Permanent Secretary’s Accounting Officer position, or the Chief Veterinary Officer’s operational discretion; is taken into account.

4.10 We also note that increased industry involvement at a strategic level in other countries has also been accompanied with cost and responsibility sharing.

4.11 Questions to consider:

a) Taking into account the options presented at 4.4 to 4.7, do you consider that a new system of governance is needed to successfully eradicate TB?

i. If yes, do you support any of the options outlined and why?

ii. If not, why not?
b) Do you consider that increased industry involvement at a strategic level should be accompanied by cost and responsibility sharing with Government?
   
   i. If yes, on what basis?
   
   ii. If not why not?
CHAPTER 5
Existing Tools and Processes

5.1 The current TB testing and diagnostic tools for TB in cattle have been in use for many years and they have proved adequate to control TB in other jurisdictions, especially so when other issues such as wildlife infection are addressed simultaneously. It should be recognised that at a global level, the mix of control measures that are employed in any country or region is dependent on the stage of the epidemic. For example, severe measures to “stamp out” the disease may be appropriate as the disease moves towards eradication. These same measures, however, may not be appropriate in the early stages of an eradication campaign, or where significant progress is blocked by difficult issues such as significant and ongoing re-infection from wildlife. The same considerations also apply to how the tools and processes are employed and interpreted. In other words, an appropriate, balanced mix of measures will depend on the stage of the epidemic and the important epidemiological determinants for any region, i.e. one size does not fit all. Here the incidence of TB remains broadly static and there is little evidence of systematic decline. Under these circumstances it is necessary to consider if adjustments to the tools themselves, or in their method of use, could enhance disease control and more effectively reduce the number of infected animals and limit disease spread. This may initially lead to an increase in detection, and therefore a rise in disease incidence, but ultimately it should result in reduced disease levels. If successful, the costs to both farmers and government could be reduced significantly in the medium to longer term.

5.2 It is helpful firstly to explain what tools we have at present and their limitations. They are:

- **Single Intradermal Comparative Tuberculin Test (SICCT)** - also known as the skin test or tuberculin test. This is the only approved test used to detect infection in the live animal and is applied as defined by the EU Trade Directive 64/432/EEC. It depends on the response of each animal’s immune system to challenge by the Bovine (PPDB) and Avian (PPDA) antigens which are injected into the skin of the neck. The response is measured by comparing the increase in skin thickness at the injection sites three days after injection. The sensitivity of this test (ability to detect infected animals) varies between 50% and 80%, while the specificity (i.e., ability to detect uninfected animals) is usually above 98%. This means that this tool may not detect all infected animals at each test, but as herds are tested frequently it should be able to detect most diseased animals. At a herd level it is rare that false positives are removed as a result of using this test. The use of more severe interpretation of the TB skin test is a recognised method of increasing test sensitivity (80%) when the risk of disease has increased but the specificity is lower as a result. However this is a complex issue and specificity / sensitivity will depend on a number of factors such as how the measurements were made and the progress of the disease in the animal.
- **Gamma Interferon Test (IFNG)** – also known as the blood test is approved as a supplementary test by the EU. By supplementary we mean that it must be used in association with the SCITT test. It is not used as a screening or general surveillance test. The IFNG assesses the response of the animal’s immune system to disease, by measuring a response between the PPDA and PPDB antigens in blood cells. In this test the sensitivity is higher than the SICTT test, but the specificity is lower. Blood samples are taken and measurements are made in the laboratory. The IFNG test may detect animals at an earlier stage of the disease than the SICTT, so such animals may be negative to the SICTT and not show lesions at post mortem. However the lower specificity suggests that a greater proportion of false positives would be removed as reactors.

- **Post mortem examination** is carried out at the abattoir on all animals slaughtered in NI. The carcase is inspected for suspect disease lesions with samples of any lesions taken for laboratory examination. However it will be virtually impossible to detect early lesions. Slightly less than 50% of SICTT test positive animals will show lesions; however some 15 - 20% of breakdown herds are detected as a result of lesions at post mortem, which were not identified through testing. A further problem which arises in relation to our ability to detect M Bovis in culture is that like other members of the Mycobacteria family the organisms may exist in a latent state which would reduce its detectability and furthermore may compromise the animals immune response.

- **Samples from potentially diseased lesions are submitted to the laboratory for histological examination and bacteriological culture to see if the causal organism for bovine TB is present. Finding the organism, which can take 4 - 6 weeks, is definitive for the presence of the disease. However not all submissions result in positive findings: the organism may not be present in the sample tested, may be below the detection limit of the test, or the lesion was not the result of *M. bovis* infection. Animals that test positive to the SICTT but where no lesions are found at the abattoir are classed as NVLs (non visible lesions).

- **Other diseases** may interfere with the currently available tests, for example the Johne’s disease organism has some of the same components as *M. bovis*. Infection with Liver Fluke can interfere significantly with disease diagnosis. Diseases such as Bovine Viral Diarrhoea (BVD) virus may increase susceptibility to TB and interfere with the diagnosis of TB.

- **Conducting the tests** (the SCITT) is carried out by either Private Veterinary Practitioners (PVPs) or DARD vets over two visits. The conduct of the test is laid down in the EU Directive but because of the number of people involved and the need for consistency it is essential that the tests are carried out uniformly and consistently by adequately trained and qualified personnel. Concern has been raised about potential conflict of interests due to PVPs conducting tests on their clients’ herds. The Department in response to the PAC recommendations and ARD Committee report has further developed its statistical comparison model to better inform its understanding of the consistent significant differences that have
existed for many years in bovine detection rates between DARD staff and PVPs and to monitor progress towards a solution (see PAC Report paragraph 31 and NIAO Report Paragraph 2.37). Under some circumstances it may be possible to carry out the tests by lay testers but this has to be under appropriate control by a qualified veterinarian.

- **An effective quality control system and benchmarking system** is essential for the uniform and vigorous implementation of the TB control programme. DARD pioneered a system in the UK for assessing the quality and delivery of the SICCT test on farms. The current system is supported though scrutiny of test results and field inspections of test implementation. Statistical comparisons are also carried out by the Department on test outcomes using an independently verified methodology. The objective is to achieve continuity and consistency of test implementation and delivery applied uniformly across NI. Laboratory testing is also quality controlled with similar objectives.

- **Genetic Selection** Recent animal disease genetics research has indicated that there is significant and potentially exploitable heritability for host resistance to bovine TB in cattle. This raises the potential of breeding cattle that are more resistant to the disease. Our information indicates that academic and industry partners are moving to implement the findings of this research and as a first step plan to publish (December 2015) breeding values for increased TB resistance through the Agriculture and Horticulture Development Board’s (AHDB-dairy) available Holstein bull list. Further research is underway to progress genomic technologies which will increase the rate of genetic progress for increased TB resistance.

- The Agri-Food Strategy Board has established a sub-group on livestock genetics to provide strategic direction to the industry here. The sub-group is currently evaluating options to develop IT infrastructure for improved genetic evaluations and the potential to develop new benchmarking applications, using a wide range of livestock data in an integrated system. Such potential developments could help genetic improvement play a significant role in a wider bovine TB risk management strategy.

- **High Risk Herds** DARD does not currently have a single definition of a high risk herd. When considering what determines a ‘high risk herd’ caution needs to be exercised as circumstances may differ from one area to the next and may be influenced by a number of factors. High risk can also be viewed in terms of a range of issues, for example, risk of re-breakdown, risk of selling infected cattle, risk of spreading infection to neighbours, risk of prolonged persistence of infection. In terms of when the INFG test is applied the following criteria are applied in the context of a herd being viewed as high risk;
  - Herds with 5 or more intradermal TB reactors identified at the previous test OR
- Herds with intradermal reactors identified on at least 3 separate occasions within 2 calendar years preceding selection and TB confirmed in the same period  OR
- Current breakdown herds having had a confirmed LRS (lesion at routine slaughter) within the 60 days preceding selection, following a herd test in the 90 days preceding selection.
- The herd must be due an RH1 or RHT type test (i.e. the parallel skin test is not a clearance test)

Possible options for change:

5.3 Presently when 5 or fewer animals during a breakdown are Non Visible Lesioned (NVL), this herd is given a TB Suspended status (OTS) and requires one clear herd test to remove the movement restrictions. When more than 5 animals are NVL, the herd is given a TB Withdrawn status (OTW) and requires 2 clear herd tests to remove the movement restrictions. We have received presentations on the classification of herds that have more than 2 NVLs and whether these should be classed as OTW. It may be appropriate to introduce this approach on account of the high probability that these are diseased animals. Thus instead of 5 NVLs being classed as OTS, 2 NVLs would be sufficient to classify the herd as OTW which would result in additional testing of the herd.

5.4 The main objective of an eradication programme is to remove as many diseased animals to prevent further transmission as early as possible. While the diagnostic tests available are not perfect, the option exists to use the tests in combination, i.e. both the SICTT and IFNG. Currently use of the IFNG test is voluntary and removal of any IFNG positive animals is subject to the farmer’s agreement. An option would be to make the use of the two tests mandatory. We should explore various test combination protocols to identify those that would give maximum benefit with acceptable cost/benefits ratios.

5.5 Currently test positive animals are DNA tagged by the DARD testing officer reading/declaring the test but not by private vets. Any animal not DNA tagged at the time of the test is however subsequently tagged by a DARD valuer at time of valuation. We consider that all DNA tagging might best be carried out by the officer reading / declaring at the time of the test i.e. including those positive animals identified by PVPs. This would help to reduce any potential for an animal identity to be lost before valuation. This would require an enhanced contractual arrangement with PVPs.

5.6 It is suggested that research is initiated into issues surrounding latency and the potential to resuscitate M Bovis which, if shown would enable further identification of the organism where it may not be found using current methods. The implications for disease discovery and control would be far reaching, improve disease discovery, confidence in our diagnostics and to farmers in the effectiveness in our control regime not least in probably being able to confirm disease status much faster than at present (see also Chapter 9 Research and Policy Development).
5.7 It is recognised that certain herds have more frequent disease outbreaks than others. Often larger herds carry a higher risk profile. Furthermore disease is often focused in certain localities. It is possible that a combination of these factors and others could be used to provide a focus for a more rigorous/focused disease control programme and concentrate efforts on the high(er) risk herds.

5.8 Genetic typing of \textit{M. bovis} isolated from diseased lesions is a powerful tool for tracing disease progression within and between herds and wildlife. This should continue to examine whether outbreaks are caused by a single strain or whether multiple types are involved, i.e. identifying the possibility of multiple sources of \textit{M. bovis}. We consider that it may be beneficial that this approach should also examine the possibility of multiple sources of infection in the same animal (see also Research section).

5.9 We consider that there would be benefit in introducing a system of herd risk categorisation. This could assist farmers to make informed decisions when purchasing and reduce the risk of importing diseased stock to their farm. This information could possibly be made available at marts. One model is that used in New Zealand where herds are categorised as C1 to C6 depending on the length of time they have been free of disease. In Wales a system of informed purchasing has been recently announced along with support for marts to purchase equipment to display this information. In looking at this option, consideration would need to be given to the appropriate roles for farmers, marts and government taking into account cultural, cost and data protection issues.

5.10 We also know that animal movement is a risk factor in the spread of TB and mechanisms to limit its impact could offer advantages in control of TB. One option would be to introduce pre-movement testing on a limited basis. This would not apply to all herds but could be applied to those herds designated as high-risk herds (see also section on Farm Practice/Bio-Security section).

5.11 Quality Control by DARD of testing performance is critical to ensuring uniform and unbiased assessment of disease status. Because of the focus on export from NI it is essential that our inspection and quality control systems are carried out to a high standard and conform to and are implemented to international standards. Laboratory testing is already implemented to ISO 17025 standards. This is not the case at present with the testing quality control system. The international standard for the inspection process is EN 4501 / ISO 17065. Such an approach to the testing protocols would give independent confidence in both the rigour and application of the inspection process especially to those being inspected and to all the stakeholders including external markets that have an interest in ensuring that an effective disease control process is in place. This would apply whether the testing was being deployed by DARD vets, PVPs or even lay testers.

5.12 Questions to Consider:

a) Do you consider that the parallel testing regime with INFG as suggested at 5.4 would speed up disease control and reduce the potential for disease spread?
b) Do you consider that the responsible person making a diagnosis should DNA tag the animal to reduce the risk of inadvertent substitution as suggested at 5.5?

c) Do you see a role for lay testers under appropriate supervision?

d) In terms of the option presented at 5.9, do you consider that herds should be designated on the basis of risk?
   i. If yes,
      • what risk factors should be taken into consideration?
      • how should the information be made available to those purchasing cattle?
   ii. If no, why not?

e) Should a system of pre-movement testing as outlined at 5.10 be introduced?
   i. If yes which herds should it apply to?
   ii. If no, why not?

f) Do you consider that the agricultural industry should pay for the pre-movement test?
   i. If yes what factors should be taken into consideration?
   ii. If no, why not?

g) What are your views on the value in the inspection of animal testing being carried out to international inspection standards as suggested at 5.11?
CHAPTER 6

Wildlife

6.1 Wildlife is recognised internationally as a potential reservoir for TB in cattle populations. Control measures to reduce wildlife access to cattle are necessary to reduce or eliminate TB risk from wildlife. Reduction of a protected wildlife population to reduce the disease pressure is controversial as badgers are legally protected, being listed in Schedules 5, 6 and 7 of the Wildlife (NI) Order 1985 (as amended). An alternative approach is to vaccinate the wildlife population. The crucial issue therefore is to determine what approach should best be used here to enhance disease control in both the cattle and wildlife populations. There will be a high cost associated with any wildlife intervention. This needs to be considered against the financial cost of TB and its impact on the agri-food industry. We have listened to a range of interested parties seeking to establish what will best reduce the incidence of TB in wildlife, stop wildlife acting as a potential reservoir of TB and/or reduce the potential for transmission of TB between wildlife and the cattle population here.

6.2 The primary wildlife disease risk to the cattle population is the known infection which occurs in the badger population. The Road Traffic Accident (RTA) survey indicates widespread infection in badgers with 15.2% of badgers examined infected (1998-2011 data). Studies elsewhere would indicate the real level of infection is higher due to the use of enhanced detection methods. Research has shown evidence of an association between infected badgers and TB breakdown herds. Furthermore detailed studies using genomic technology on *M. bovis* isolated from the infected badgers has conclusively demonstrated the occurrence of identical TB strains in contiguous badger and cattle populations in NI. Inter-species transmission has been confirmed through assessment of genomic information from badger and cattle samples from a discrete disease cluster in Co Down.

6.3 Environmental groups have concerns about badger culling without clear scientific evidence to demonstrate the direction of transmission, i.e. cattle to badger or badger to cattle. However disease will travel from the infected to the non-infected susceptible animal irrespective of species, i.e. disease transmission is therefore likely to be a two way process between the species. Both the badger and cattle populations can act as a reservoir of TB.

6.4 The Test and Vaccinate or Remove (TVR) wildlife intervention research project in Co. Down also seeks to further our understanding of badger behaviour. Full results of this study will not be available until 2019.

6.5 There is substantial evidence that reducing the infected badger populations reduces the incidence of TB in associated cattle populations (Randomised Badger Culling Trial (RBCT) in England and the East Offaly and Four Area studies in the south of Ireland, which included both treatment and reference areas to obtain a controlled comparison with respect to the intervention). These studies all demonstrated a positive impact of badger culling on cattle disease, which lasted for at least 5 years after the intervention terminated.
Internationally, reducing the influence of appropriate wildlife where implicated, has had been a major factor in controlling/eliminating TB in cattle populations.

6.6 Current research in NI is based on a dual diagnostic approach, i.e. using a serological test alongside the use of gamma interferon (IFNG). The serological test can be used in the field, while the IFNG requires laboratory analysis. Using the combined test regime may result in both a high sensitivity and specificity. Subsequent post mortem examination is helpful as it permits isolation of *M. bovis* and subsequent genomic typing, which permits tracking of infection between associated badger and cattle populations. An alternative more cost effective approach could be the detection and qualification of *M. bovis* in badger faecal samples obtained from sett latrines. This technique may be appropriate when the results of the current evaluation being carried out by DEFRA are available and the results evaluated. Decisions have yet to be taken as to what level of *M. bovis* in faeces would warrant intervention.

6.7 One possible consequence of culling which has emerged in the RBCT studies is perturbation or dispersal. Culling will reduce badger density but could promote dispersal into the culled area as well as expanding badger ranging behaviour. While perturbation has been proposed in England to explain enhanced disease in areas surrounding the cull areas, no such consequence has been observed in Irish studies. The reasons for this apparent difference are as yet unclear.

6.8 Current control measures here (in addition to the TVR Research Project) are primarily the separation of wildlife from the cattle population (bio-security measures). However fencing cattle away from badger setts and securing meal stores from badger incursion are not known to be widely adopted.

6.9 The potential risk from other wildlife species needs to be evaluated. It is known from elsewhere that infected deer can transmit disease. It is considered that infected deer are contributing to TB spread in the Wicklow area. Although the TB risk from deer here would appear to be low and/or localised at present, this needs to be kept under review as the available data is limited.

Possible options for change:

6.10 We have received briefing on TVR and hope that this study will continue, recognising that it will also enhance our knowledge including badger dynamics in the study area. It is acknowledged that there is significant cost attached to the study.

6.11 We would suggest that there is benefit in furthering our understanding of disease spread and associations with the local cattle population if any captured wildlife were to be blood sampled for TB testing using both the sett side test and the IFNG. All dead badgers, if infected, could also have TB isolates typed using genomic technology.

6.12 Bearing in mind representations from environmental groups, farming bodies and international experts, an option of a strategic control programme involving
the removal of badgers in defined high risk area(s) (see chapter on Tools) could be considered. This control measure would involve:

- Identifying that badgers in the area are infected, i.e. the TB status of dead badgers is determined.
- Similar strain types of TB are found in both the cattle and badger populations implying disease exchange between species.
- An officially regulated and implemented badger removal programme.

6.13 We would suggest there is value in a limited strategic survey of TB in targeted local deer population(s) being carried out in order to monitor potential changes in disease status. This would require the necessary resource being secured.

6.14 Questions to consider:

a) Which of the following do you consider as the best option to help reduce the reservoir of TB infected badgers:
   - a programme of badger vaccination?
   - a programme of vaccination and removal of infected badgers (like TVR)?
   - a programme of badger removal?

b) Which of these options do you consider outlined at a) above would help to prevent disease exchange between the cattle and badger populations?

c) The trapping and injection of individual badgers is costly and can be in excess of £600 per badger. Given the significant cost of any badger intervention how such an initiative might be funded?

d) Taking into consideration the information at 6.2 to 6.8 what evidence would be required to support such an initiative as limited controlled culling of infected badgers?
CHAPTER 7

Vaccination

7.1 Vaccines are used to reduce the spread of a disease in a population by stimulating the body’s immune response. Vaccines are considered to be much less effective in individuals already infected. Vaccination has been successfully used in eradication programmes for viral diseases, but the efficacy of vaccination in bacterial diseases, such as TB, is more problematic. However, the BCG vaccine has been used in humans since the early 1900s and is prepared from a live, attenuated (weakened) strain of the TB bacteria. An ideal solution to the problem of TB eradication in cattle, and indeed the wildlife population, could be the deployment of an effective, easily administered vaccine. However, the vaccine used in cattle would have to be acceptable for the maintenance of the export trade and have no adverse implications on cattle health, production or exports due to implications, actual or perceived, on humans following consumption of products.

7.2 There are, however, no authorised TB cattle vaccines available. Vaccination of cattle is presently prohibited under EU law and therefore vaccinated cattle would not be eligible for international trade. The current best candidate vaccine to protect cattle is the BCG vaccine. However, use of the vaccine will interfere with the officially recognised tuberculin skin test, which is the basis of statutory control measures. If the BCG vaccine is to be used as part of any TB control programme, a diagnostic test is required to detect infected animals within a vaccinated population (DIVA test). The use of vaccine is dependent on the availability of the DIVA test. DEFRA have been in negotiation with the EU Commission, which has set out a timetable of the approval steps required to enable the use of a candidate vaccine in cattle. It is estimated that this evaluation process will continue for some years and approvals to enable intra-EU trade in vaccinated cattle are not anticipated before 2023.

7.3 An injectable BCG-based TB badger vaccine has been licensed since 2010. The principle of vaccination is to raise the immunity against bovine TB within the badger population which, over time, would reduce the incidence and severity of infection and reduce opportunities for badger to cattle transmission. However, in some areas approximately one third of the badger population may be already infected and vaccination in these areas is considered to be much less effective in the control of the disease. This is why in the TVR study blood test positive animals are removed.

7.4 Data generated from the English Badger Vaccination Deployment Project and the Badger Vaccination Project in Wales may help evaluate the long-term cost/benefit of badger vaccination. They will also assess the efficiency of the administration of the vaccine by licensed trained lay staff. Governments in both regions recognise the potential benefits of vaccination, probably in conjunction with strategic culling, as part of an overall control strategy in high risk areas. DEFRA has financially assisted privately funded local projects involving the licensed use of injectable badger vaccine in their edge and high risk areas. Interest in the vaccination of badgers has been indicated by environmental organisations. However the high cost of administration, (estimated to be approximately £600 per badger), and limited confidence in
reducing disease levels in the short term has restricted the uptake of badger vaccination projects, using the injectable badger vaccine. However, the Westminster EFRA Select Committee has commented that, “badger vaccination must form part of any strategy to eradicate bovine TB, though badger vaccines cannot cure diseased badgers. These diseased animals will continue to infect cattle herds.”

7.5 Developing an oral vaccine against TB for use in badgers is proving more difficult than originally estimated and a viable oral badger vaccine for use in the field may be problematic. Studies in the south of Ireland and England have established the proof of principle that vaccination of captive badgers with BCG and delivered by a variety of routes, including orally, can give a level of protection against bovine TB. These findings have been developed into a large scale trial in Kilkenny to assess the efficacy of oral vaccination and the logistics of cost effective delivery in wild badger populations. Progress has been made in identifying candidate edible bait for effective delivery. Estimation by DEFRA of the best scenario for the deployment of an oral TB badger vaccine in the field is 2019, although we would advocate the trial of an oral vaccine in NI at the earliest opportunity.

7.6 There is a cost/benefit issue to badger vaccination which must be considered when weighing up options. The price of a dose of vaccine is normally justifiable as part of a costly control/eradication programme. The oral administration of an effective vaccine, via a proven, edible bait delivery scheme, is relatively inexpensive. However, the trapping and injection of individual badgers is very costly and can be in excess of £600 per badger and therefore prohibitively expensive except in specific trial areas. Conclusive demonstration of the cost/benefit of vaccination of badger populations may require the availability of the relatively inexpensive deployment of an effective oral vaccine.

Possible options for change:

7.7 We have consulted with representatives from a range of environmental groups, industry representatives and veterinary organisations and have explored with them the issue of vaccination and now consider that there are options which merit consideration. Some of the options outlined may be stand alone single actions or it may be that a combination of options is considered to be the most appropriate response.

7.8 Injectable Cattle Vaccine. Presently, this will be limited to monitoring of the DEFRA studies to obtain EU and OIE acceptance of an authorised TB vaccine for cattle, with an associated accredited DIVA diagnostic test, to facilitate intra-community and international trade. However, the importance of exports to the local agri-food sector, and the perception about any effect on human health from BCG vaccinated cattle entering the food chain, may render the use of this vaccine problematic in NI.

Injectable Badger BCG Vaccine. A number of options could be considered:

7.9 In supporting the TVR study we would propose that we await the results of the TVR study area and assess the outcomes to determine the logistical and cost effectiveness of future deployment of the injectable vaccine in other areas.
7.10 Employ the early use of the badger vaccine as part of a strategic control programme under local stakeholder management, in a similar manner to its use in the TVR study area, in identified TB hot spots / high risk areas. The cost of trapping and injecting the badgers may make this type of vaccination and control strategy financially prohibitive.

7.11 Administration of the injectable badger vaccine, with or without a strategic removal programme, in infected or at-risk badger populations in specific, more extensive areas under local stakeholder management control.

**Oral Badger Vaccine.** Again a number of options are possible:

7.12 Routine use of oral vaccination when available where infected or at risk badgers has been identified.

7.13 Strategic, enhanced deployment of oral vaccination in specific hot spot / high risk areas plus the strategic culling of infected badgers as part of a local TB control programme.

7.14 Routine, widespread routine use of oral vaccination in the general badger population, with implementation and delivery by either stakeholders or government.

7.15 **Questions to consider:**

a) Do you consider vaccination of badgers to be an acceptable approach to assist in the eradication of TB in the badger population and cattle?

b) Considering 7.9 to 7.14, if badger vaccination were to be deployed what would be the best way to deliver this and why?

c) Should badger vaccination be carried out in conjunction with a targeted cull of diseased badgers as outlined at 7.11 and 7.13?

d) Do you agree that if a vaccination programme were to be deployed that it should be focused on specific areas and, if so, which?

e) Who should administer / deliver a badger vaccination strategy; private vets, licensed persons, environmental bodies, DARD?

f) Given the potential significant additional cost of any badger intervention as outlined at 7.6, how would such an initiative be funded?
CHAPTER 8

Farm Practice and Bio-Security

8.1 Good Farm Practice is about operating a set of robust management practice measures designed to protect a holding from the entry and spread of pests and diseases. This must include bio-security measures that prevent disease causing agents entering or leaving any place (e.g. farm or market) where livestock are being kept or have recently moved through. Good bio-security reduces the risk of spreading disease by controlling the movement of people, vehicles and equipment within those areas.

8.2 In many beef and dairy farms, it is suggested that bio-security may be less than satisfactory. This may be due to a variety of factors: lack of knowledge; prioritisation; size; scale and age of farms; farm layout; farming culture; cost concerns; and practicalities of implementation. But it must be recognized that poor bio-security increases the risk of disease which impacts on farm health, productivity and costs, which ultimately lead to negative effects on farm profitability. Improvement of bio-security is to be encouraged.

8.3 We have considered farming practice and bio-security issues in relation to the following:

- **Farm Infrastructure.** Farms are generally organised around a main farm holding with expansion through portions of land taken on short term lease known as conacre. These portions of land are leased annually (typically from March till November) with no guarantee of renewal. This practice makes it very difficult for the farmer leasing the land to justify constructing stock proof fencing or following good bio security protocols. A livestock farmer often farms multiple sites with as many as ten or more different contact cattle herds. There is no central information source available to establish where animals from a TB restricted herd (or indeed animals from any herd) are being grazed and if they present a risk, or are at risk themselves from other cattle or wildlife.

- **Cattle housing.** Cattle are increasingly being housed in large groups for ease of management. Most modern houses have good ventilation. However pneumonia and other respiratory diseases are still common on many farms and current housing practices could facilitate the spread of TB.

- **Storage.** Most cattle feed is stored in bins or feed hoppers but some is stored loose, which is often unsecured and kept in open sheds. Some farmers feed concentrates and whole crop on open feed passages where wildlife can have easy access. Badgers are attracted into farmyards and buildings where there is access to such food sources.

- **Isolation and handling facilities.** Good Isolation pens, cattle races and head crushes are vital for good disease control, yet they are variable on many farms. If proper TB testing procedure is to be carried out, the animal needs to be secure and the cattle races and head yokes needs to be of a standard to prevent injury to both testing officers and animals. Good dedicated isolation facilities are required rather than a multi-purpose building such as a calf shed. Often the isolation facility is being used for sick or injured animals and therefore unavailable when a TB breakdown
occurs. TB reactor and inconclusive dairy cows are very difficult to completely isolate due to the practicalities of milking.

- **Cattle Movements (farm to farm).** At present a purchaser of cattle has little information available on the disease risk to their own herd when buying animals. There is no requirement to pre-movement test. There is also no information on the level of TB in the area the purchased cattle are originating from or the originating herd TB history. Many farmers rely on cattle dealers to make purchases on their behalf and, hence, are another step removed from assessing disease risk. Many cattle finishing units hold animals for only 60 to 100 days and are sold direct to slaughter; these herds are generally infected with TB due to multiple throughputs and are tested every 60 days.

- **Cattle movements (conacre).** Conacre will continue to play a major role in livestock farming. Demand for grazing land means farmers will continue to rent pockets of land often over considerable distances with multiple contact herds. When TB is detected in a herd, a Veterinary Officer (VO) visits the farm and maps all of the premises and lands used or owned by the herd keeper. The VO discusses TB risks, including movements of cattle. Veterinary Service (VS) then write to adjoining neighbours where there is a disease risk and these farmers may be required to carry-out additional risk testing. However, cattle movements between the parts of the farm are not restricted and the herd keeper is not obliged to subsequently inform VS of such moves. Therefore theoretically cattle could be moving from a TB infected herd in a high risk area to low risk areas without the knowledge of local farmers or seeking permission from DARD. While we do not know the extent to which this occurs, it is appropriate that this potential gap in controls is reviewed.

- **Cattle movements (marts / shows).** Many modern marts now have good bio-security measures in place. We are aware that the current legislation requires marts to provide adequate vehicle washing facilities (to deal with the number of vehicles using the premises), with drainage and adequate supply of water. However this is not always the case nor is best practice always adhered to. Showing livestock is an integral part of agriculture shows and many exhibitors show the same cattle weekly throughout the summer months. Currently cattle are exhibited at local shows by means of a self written movement document.

- **Slurry contractors / spreading / storage.** Agriculture contractors will continue to be widely used on livestock farms for both spreading slurry and farmyard manure. Most are unaware of the risks of spreading TB from farm to farm by their equipment and staff. There is scientific evidence which has shown that this can be a source of infection. Some older underground slurry stores are only accessible within the cattle shed; these provide a greater risk of disease spread. New above ground slurry stores are now more common and provide less risk of disease spread. While a large proportion of slurry is spread in spring when the cattle are housed, it is generally well absorbed into the soil before cattle graze. Later summer and autumn spreading pose a higher risk for grazing animals. There are no obvious contractor trade representative bodies which make it difficult to agree minimum bio-security standards and ensure that these are applied.
• **Links to other diseases.** Many production diseases common on our farms lower the resistance to TB in cattle and also reduce the reliability of the TB test. Diseases such as BVD, Johne's, IBR and Liver Fluke can interfere with the TB test interpretation. Many farmers routinely vaccinate for production diseases (these vaccines may lower the resistance to TB infection), which can also impact on results.

• **General bio-security issues.** The practice of sharing livestock trailers, cattle crushes, calving jacks, slurry equipment and sharing a stock bull also pose risks of spreading disease and detract from any eradication of TB and other diseases.

**Possible options for change:**

8.4 Reducing nose to nose contact between different herds would help to decrease the risk of disease transmission. Co-operation by neighbours to avoid grazing cattle from different herds in adjacent fields, use of double fencing or using electric fencing by farmers could all help lower the level of contiguous infection. Additionally cattle should be fenced away from badger setts and latrines. It is however recognized that this advisable action will not of itself eliminate disease spread.

8.5 Another advisable action could be to protect feed stores from entry of wildlife. Where cattle feed passages are open, farmers should be encouraged to put in place measures such as a barrier, door or gate, even a row of silage bales, or an electric fence to keep badgers and other wildlife out.

8.6 We consider that the farmers’ own vets (PVPs) should provide advice on a range of bio-security measures to include animals’ movements, cleaning and disinfectant procedures and airflow and ventilation in housing, which would help lower incidence of many diseases including the spread of TB in the herd. In TB breakdown herds where basic bio-security measures are requested by DARD Veterinary Service are not put in place, further restrictions should be considered.

8.7 We would suggest routine annual cleaning and disinfecting of cattle houses, and that washing houses between batches becomes routine practice.

8.8 Farmers should be encouraged to adopt informed purchasing (buy stock where the health status of the cattle is known to be of an equivalent or higher standard). One option worth considering could be to require marts to display the length of time since the seller herd’s last TB restriction. Allied to this would be a need to raise awareness within the farming community as to how best to interpret and use this information when considering purchasing cattle (see also Chapter 3 on Culture & Communication).

8.9 We consider that a key area for consideration might be pre-movement testing for certain animals, or groups of animals, deemed to be high risk. This might include for example; cattle moving from high risk herds; animals moving within a time period (to be decided after epidemiological assessment but likely to be one year) after the herd has been de-restricted from TB; cattle moving from a high risk area; or cattle moving significant distances within parts of restricted herds. We would suggest that further work is carried out by the DARD
Veterinary Epidemiology Unit (VEU) to establish if the risk and cost/benefit can justify such an approach.

8.10 We suggest that that all cattle marts should be required to have multiple cleaning and disinfection points and their use should be a requirement.

8.11 We propose that any contractor bringing equipment onto a farm or any equipment shared by farmers should be cleaned and disinfected. Visitors, where practical, should stay outside cattle sheds. Where contractors need to enter cattle sheds then cattle should be penned well away from equipment and disinfectant should be provided and used. Cattle should be kept out of fields for as long as possible after spreading.

8.12 We consider that farmers should participate in animal health programmes for production diseases. This would have disease control and financial benefits.

8.13 The group considers that local knowledge of TB outbreaks in the area would help contain the spread of disease. We believe that farmers in conjunction with their vets and other interested parties are best placed to provide this knowledge in relation to cattle movements within the infected herd(s).

8.14 We would suggest that a mechanism to assist farmers in following through with farm practice changes would be to issue ‘Improvement Notices’. These would detail what actions need to be carried out by the farmer to help prevent the spread of disease. Failure to make changes could be linked to compensation payments, herd restriction or cross compliance measures. This approach is being tested in Wales.

8.15 We believe that animal location can cause problems with respect to possible disease spread between holdings. Currently there is no legal requirement on the farmer to record internal movement on their farm. We consider that this is an issue that needs careful consideration to help to control disease spread. A possible option to improve on this would be to require a farmer who takes land more than, for example, 5 miles from the home farm to class that land as a new farm with a separate herd number with animals transferring to and from it requiring animal movement registration on APHIS. This could address a component of animal movement, which cannot easily be determined at present. It needs to be borne in mind that this would require commitment from industry in its operation and could have additional administrative costs.

8.16 Whilst acknowledging that conacre will continue to play a key role in farming in NI, the short term leasing of land, usually less than a year, is a deterrent to any potential investment a farmer might make such as improved fencing or grass quality. We would suggest that consideration be given to the provision of longer term conacre leasing.

8.17 Questions to Consider:

a) In terms of the bio-security measures outlined at 8.4 to 8.11, which of these in order of preference do you think would give the greatest TB control benefit and why?

b) Should pre-movement testing as detailed at 8.9 be introduced and, if so, for what movements and why?
c) Should farmers pay for pre-movement testing?
   i. If yes, what factors should be taken into consideration?
   ii. If no, why not?

d) As outlined at 8.15, should farmers be required to notify DARD if moving animals within their farm over a certain distance; e.g. 10 miles or 5 miles in the case of restricted herds?
   i. If yes, do you think the distances are right? If not, what distances would be right?
   ii. If no, why not?

e) As outlined at 8.8, should information boards at livestock marts display the date a herd was last TB restricted? What other information would be beneficial to farmers purchasing livestock?
   i. If yes, what information would you wish to see displayed
   ii. If no, why not?

f) Should animals in total housing finishing units continue to be TB tested bi-monthly?
   i. If not, why not?

g) Do you agree with the idea of ‘Improvement Notices’ as outlined at 8.14?
   i. If yes, what factors should be taken into consideration and how should compliance be incentivised?
   ii. If no, why not?

h) As outlined at 8.16 would farmers leasing conacre land on a longer term basis (minimum of 5 years) improve bio security and other land management practices?
   i. If yes, what factors should be taken into?
   ii. If no, why not?
CHAPTER 9

Research & Policy Development

9.1 Worldwide research into Bovine TB has been carried out over many years. We acknowledge that this research has progressively informed our evidence and knowledge base to assist with the bovine TB Eradication Programme in NI and internationally. It has also helped to provide farmers with information on how to protect their herds from bovine TB. To date, research outcomes alone have been insufficient to inform how best to achieve a sustained reduction in TB levels in the cattle population of NI. Research into bovine TB can be extremely expensive, logistically complex and frequently inconclusive in the outcomes of individual projects. We appreciated that it may not be possible to answer some of the pertinent questions surrounding TB in cattle and note that many questions have remained unanswered worldwide despite many attempts to do so. However, targeted, strategic research projects should be considered where they could advance the eradication of TB in the cattle population of NI by adding to our knowledge and expertise in areas where established evidence gaps still exist, or emerge during the routine delivery of the TB Eradication Programme.

9.2 The bovine TB research programme funded by DARD under the Evidence and Innovation Research Programme focuses on a range of relevant research including evaluation of diagnostic tests and the epidemiology of transmission of bovine TB. We have reviewed the worldwide research on TB and the affiliated national control/eradication programmes and consider it essential that there continues to be an active local research programme on bovine TB. Research carried out elsewhere cannot develop and maintain the required local expertise. Local scientific expertise is necessary to evaluate the implications of international research results for the NI Programme to ensure that opportunities are not missed to address problems and evidence gaps in an appropriate and prompt manner. It is therefore critical that local expertise is consistently available to DARD, the industry and other stakeholders.

9.3 In the current financial environment, with corresponding budgetary restrictions, DARD funded research projects should be targeted at those areas which are most likely to benefit from further development of the existing control policies. This is especially so where evidence gaps exist and control measures are problematic or ineffective. Other, more general research can be obtained as part of a wider collaborative programme of activity including joint funding at international centres of research excellence, for the particular scientific subject under investigation.

Possible Research Models

9.4 Targeted research projects commissioned by DARD, could be integrated into the TB Eradication Programme to facilitate early monitoring of the specified research objectives. The results of research could be available on a real time interactive basis for policy development and effectively implemented into the current Eradication Programme, at the earliest opportunity. This research model will be most efficient and cost-effective if a substantive proportion of the research material (e.g. samples, test results, epidemiological data etc.) is readily available as part of the current statutory control programme. A key element of the proposed model would be the accessibility of test results and
associated data/information to expert Veterinary Epidemiologists and the existing Eradication Programme, immediately they are available. The Epidemiologists can then rapidly reprioritise their work plan to facilitate analyses of results and make timely recommendations for policy development and early implementation into the current Eradication Programme, in important areas where evidence gaps exist or control measures are ineffective.

9.5 To ensure early access to the results of research and maximise the early practical application of specific results, research projects could be managed by a forum which includes key stakeholders, as well as DARD officials and the principal researchers. This Research Project Management Forum could have direct communication and engagement links to the stakeholder control committees managing the disease, both centrally and in particular local areas, (as outlined in 4.4 of chapter 4). This could ensure that evidence based decisions, on the early implementation of research results, are made as they become available. The model could also facilitate the reporting of the effectiveness of the evidence based decisions, under field conditions, back to both the Research Project Management Forum and the management control committees.

Suggested areas for research:

9.6 We suggest that there is more information available in the existing data from the current control measures which could give a better understanding of the problem areas and evidence gaps in the TB Eradication Programme. A DARD-funded research project is already evaluating gamma interferon testing in bovine TB in NI, the outcomes from which should be made available for use in the current Programme. Similarly, additional analyses could be carried out as soon as possible of the results from the strain typing of TB isolates and these should be made available for use within the current Programme. An assessment of the cost benefit of their application to date would be useful.

Other research areas for consideration;

9.7 We would suggest that there are a number of other topics which could benefit from further research and these are listed unranked below.

- **Epidemiology and Mathematical modelling** - Problem solving and evidence gaps.
- **Diagnostics** - Enhanced antigens for increased specificity/sensitivity.
- **TB Strain Typing** - Enhanced use in Epidemiological Investigations at Regional and Local Levels.
- **Vaccination** - cost-effectiveness in “field” trials.
- **Cattle Genomics** - Possible use in commercial breeding programmes.
- **Latency of TB Infection** - Interference with “field” and laboratory diagnostics and the effectiveness of control measures.
- **Concurrent Infections** - Immune suppression and interference with diagnostics (e.g. Johne’s disease, BVD, Liver fluke etc.).
- **Economics of animal and social science** - disease control.

We would consider that each specific research area must address;

- Gaps in evidence
• Legislative requirements
• Capability for interactive engagement with the existing TB Eradication Programme
• Real-time availability of the results to DARD and stakeholders, in support of policy, implementation and delivery
• Cost-benefit analysis of the outcomes of the research on an ongoing manner.

9.8 Questions to consider

a) What are your views are sought on the suggested research areas and the approach to taking these forward?
CHAPTER 10

Funding TB Eradication

10.1 The cost of the TB programme during the last 3 years has varied between £27m - £29m per annum, although this is partially offset by an annual contribution of some £4m - £5m from the EU Veterinary Fund. At present, Government currently covers all costs relating to the TB programme and compensation. There is also a compliance cost to farmers of some £10m per annum. TB, therefore, is not just a disease which results in a frustrating regime of testing, reactor removal, movement restrictions, etc; it is also a major ongoing drain on the public purse and to farm businesses.

10.2 While cost saving is not a driver for us in our considerations, we cannot ignore the wider financial realities facing both Government and the agri-food industry. We recognise that public finances are presently under major pressure and Departments and agencies in NI have had to reduce their spending, requiring some very hard and difficult decisions to be taken. DARD is not immune to this.

10.3 We need to agree, therefore, how we best use the funding available and how we might secure further funding to allow us to better target and drive out the disease. Some options would require a change in culture for both farmers and Government and may have to be balanced with greater influence being given to industry in strategic decisions.

Compensation

10.4 The current reactor compensation arrangements of 100% are generous compared to other regions (see table 4 below). It could be argued that this has contributed to a culture where TB is accepted as a normal business risk rather than a disease to be avoided and eradicated; this then acts as a barrier to the development of a shared government and industry vision, which is needed if we are to successfully eradicate the disease. This has been noted by the FVO in past audit reports.

Table 4

<table>
<thead>
<tr>
<th>Country</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Northern Ireland</td>
<td>100% of commercial value including pedigree stock determined by on farm valuation. Pedigree stock at full valuation</td>
</tr>
<tr>
<td>England</td>
<td>England pays average market price for the category into which the animal falls at the relevant date [or individual if no value for the category]. Compensation may be % reduced if tests are overdue.</td>
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<tr>
<td>Ireland</td>
<td>Maximum of 2,800 euros (approx. £2000) commercial value. One pedigree stock bull maximum of 3,500 euros (approx. £2,500). Farmers pay for one herd test per year. They contribute via beef and milk levies to approximately</td>
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<td></td>
<td>50% of compensation costs</td>
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<td>----------------</td>
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<tr>
<td>Wales</td>
<td>Pay 100% market value (as deemed by an on farm valuation) for commercial and pedigree stock. A keeper may also receive less than the market value for the animal in certain circumstances, (reduction in compensation can be as much as 95%); e.g.</td>
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<td></td>
<td>- a failure to test the animal</td>
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<td></td>
<td>- a failure to comply with the requirements of a Veterinary Improvement Notice</td>
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<td></td>
<td>- where there has been a breach of the TB Order</td>
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<tr>
<td>Germany</td>
<td>The German programme for statutory diseases is set up by national legislation, but each Bundesland is responsible for running the program. The Bundeslander draws up the detailed rules of the application. The scheme is compulsory, also based on levies for the farmers. The compensation payments are made from the available funds to 100% and will be refinanced to 50% from the Federal State.</td>
</tr>
<tr>
<td>France</td>
<td>France pays replacement value determined by agreement between two valuers appointed by the owner. There are various specific top ups, e.g. restocking costs.</td>
</tr>
<tr>
<td>New Zealand</td>
<td>NZ legislation provides for 65% of fair market value (if not affected) although there is an agreement by which some dairy animals have received additional payment to 100% full market value since 2005.</td>
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</table>

**Levies**

10.5 We have looked at some potential options such as ‘Informed Purchasing’ (risk based trading), and an independent TB eradication oversight body. These would potentially see the farming industry taking a lead on these. Given the restrictions on government finances, one approach might be an additional levy on industry to finance some of the eradication recommendations. The current situation in NI in relation to levies is that the dairy industry opted for the voluntary levy as it avoids the need for the bureaucracy and cost associated with a government statutory levy. In relation to the beef industry the Livestock and Meat Commission for NI (LMC) collects statutory levies from beef and sheep producers and slaughterers in Northern Ireland and in return provides a range of services to the industry.

10.6 Farmers in the South also contribute to the eradication programme under the Bovine Diseases (Levies) Act, 1979. Levies are charged to farmers on the following basis; in relation to dairy cattle and milk production, the amount of 0.5 cent per gallon is charged. As regards animals slaughtered or exported live, the amount is 3 euro per animal.

10.7 By way of comparison in New Zealand the cattle slaughter levy is $14 NZ per head, this raises $8.5m NZ from the dairy sector and $19m NZ from the beef sector. The dairy levy is 2 cents NZ per kg milk solids raising $15.5m NZ. The deer sector pays 5 cents NZ a kg of meat raising $1.5m NZ. In addition to this industry funding central Government contributes $30m NZ and local
Government $6m NZ annually. This is agreed for 5 year periods with quinquennial reviews of performance and expenditure in addition to annual reports from OSPRI.

Tests

10.8 In Ireland, farmers are responsible for arranging annual herd tests conducted by their private veterinary practitioners (PVPs) within timescales prescribed by DAFM. The general rule is that a farmer will make payment for the TB test to the veterinary practitioner carrying out the test except where reactors are disclosed. DAFM will ordinarily pay for any second or subsequent herd level TB test completed within the 12-month period. Payment for such tests will be made directly to the PVP and not to the farmer.

10.9 In New Zealand the frequency of testing, plus any requirements for pre-movement testing, depends on an assessment of the TB risk in a herd or an area. Routine testing varies between one, two and three years. In areas where infected wild animals are known to exist, or where it is important to monitor the possible spread of TB amongst these populations, herds are tested each year and pre-movement testing is required before any animal can be moved off the property. All herd owners will be advised of which animals will be tested and when. Industry funding means that TB-testing for cattle is free of charge.

10.10 In England, TB testing intervals, either 1 or 4 years are based on the level of disease risk. Herds in the low risk areas are tested every 4 years. Herds in the high risk areas and designated edge areas are tested annually. All cattle keepers with an annual or 6-monthly testing interval must also comply with pre-movement testing requirements, unless an exemption applies to the animal being moved or the type of movement. The cost of testing is paid by government and delivered through contracts at a regional level rather than individual PVP practices as formally operated.

Possible options for change:

10.11 One potential significant change for consideration would be a new system of compensation. Not only would this reduce the cost of eradication to the taxpayer, but it would encourage individual farm businesses to seek to maximise good disease control practice. There are a number of options to consider:

- A capped compensation approach up to a specific monetary limit, e.g. switch to the system that operates in ROI;
- Reducing the levels of compensation from 100% to a lower percentage level;
- Consider valuation based on commercial productivity and market value, i.e. without any additional consideration for pedigree status;
- Compensation being paid at current rates but a portion being linked to demonstrable implementation of stated bio-security measures (see section on Farm Practice/Bio-security).
10.12 If a new TB eradication programme were to be agreed, then consideration should be given as to how a new structure and delivery model might be supported. This could include a contribution from industry in proportion to the degree of responsibility accepted. Options in relation to this might be:

- A direct contribution from industry representative bodies and live marts;
- Utilising existing industry levies through either increasing these or directing a percentage of these towards the TB programme;
- Introduction of a statutory TB eradication scheme levy;
- Introduction of a new voluntary TB eradication levy scheme similar to that in the ROI;

Consideration would need to be given to the nature and structure of this, the amount of the levy, who collects and administers it, etc.

10.13 In relation to TB testing, currently this is paid for by DARD, but in the south of Ireland farmers pay for one annual herd test. An approach worth considering might include a situation where farmers pay for one annual herd test by a private vet. As the farmer is paying the vet there would be a likely be a greater interaction in discussing how best to maximise animal health than where the vet is being paid by DARD.

10.14 Delays in testing can jeopardise disease control, not only in the farmer’s own herds, but also in neighbouring herds. However cross compliance intentional breach penalties of between 15%-100% of direct agriculture support payments already apply for herd tests overdue by more than 3 months, (negligent breach penalties of up to 5% may apply when herd tests are overdue by between 1 and 3 months). In addition to the current penalties another option to address late testing could be to require farmers to pay for any herd tests overdue by more than one month.

10.15 Questions to Consider:

a) Do you consider that the current position in relation to 100% compensation as outlined at 10.4 is a disincentive and requires change?
   i. If yes, what factors should be taken into consideration?
   ii. If no, why not?

b) In relation to the options for change in compensation levels as outlined at 10.6, which one do you think would work best, and why?

c) Should compensation be linked to bio-security as outlined at Chapter 8 Farm Practice and Bio-Security, 8.14?
   i. If yes;
      • should the approach be one of a basic 80% compensation value with a top of up to 20% based on evidenced good bio-security?
• Or
  • should this be 100% compensation payment with reductions following a lack of implementation of identified bio-security measures?

ii. If no, why not?

d) In relation to the option at 10.12, do you consider that industry should make a financial contribution as part of its role in the delivery of a TB eradication programme?

e) Do you consider that an alternative funding model may be needed irrespective of whether or not industry participates in the organisation and running of any future TB eradication programme?

  i. If yes, what factors should be taken into consideration?

  ii. If no, why not?

f) Should farmers be required to pay for one annual herd test as detailed at 10.13?

  i. If yes, what factors should be taken into consideration?

  ii. If no, why not?

g) In terms of the option outlined at 10.14 do you agree that there should be financial penalties linked to repeated test avoidance?

  i. If yes, what factors should be taken into consideration?

  ii. If no, why not?
CHAPTER 11

HOW TO RESPOND

11.1 Chapter 3 has outlined some of the key issues and possible options resulting from our review to date. These do not represent our final recommendations or conclusions but do reflect some of the emerging thinking. We now seek to explore further what could be possible ways forward.

11.2 We wish to receive responses from anyone who has an interest in bovine TB eradication: this may be from individuals, representative organisations, industry sector bodies or NGOs. This is intended to afford an opportunity to contribute meaningfully to the development of recommendations in our final report in December 2015.

11.3 There are a number of thematic areas explored in Chapter 3. It would be helpful if you provided your comments under each of the theme subject headings referring to the section and option number.

11.4 Please limit your response to no more than 500 words against each theme and include your name, organisation if you are representing a body or group, and a contact telephone number and email address as we may wish to meet with you to discuss your submission.

11.5 You do not have to comment against every thematic area, but we would appreciate as full a response as possible.

Responses to this consultation should be sent to:

TB Strategic Partnership Group
c/o Department of Agriculture and Rural Development
Room 650
Dundonald House
Upper Newtownards Road
Ballymiscaw
Belfast
BT4 3SB

Or alternatively by email to: TBBR.Policybranch@dardni.gov.uk

Timetable

11.6 Responses to the consultation paper should be sent to the addresses above and should arrive no later than 5.00pm on 04.Sept 2015. It may not be possible to consider responses received after this date. An acknowledgement will be sent to confirm receipt of each response.

Publication of Responses

11.7 We will publish a summary of responses as part of our final report scheduled for December 2015. Your response, and all other responses to this publication, may be disclosed on request. We can only refuse to disclose information in exceptional circumstances. Before you submit your response,
please read the paragraphs below on the confidentiality of responses and they will give you guidance on the legal position about any information given by you in response to this publication. Any confidentiality disclaimer generated by your IT system in email responses will not be treated as such a request.

11.8 The Data Protection Act states that information provided by respondents to this consultation exercise will be held and used for the purposes of the administration of this current exercise.

11.9 The Freedom of Information Act gives the public a right of access to any information held by a public authority, including the TBSPG in this case. This right of access to information includes information provided in response to a consultation. We cannot automatically consider as confidential information supplied to it in response to a consultation. However, it does have the responsibility to decide whether any information provided by you in response to this consultation, including information about your identity should be made public or be treated as confidential. If you do not wish information about your identity to be made public, please include an explanation in your response.

11.10 This means that information provided by you in response to the consultation is unlikely to be treated as confidential, except in very particular circumstances. The Lord Chancellor’s Code of Practice on the Freedom of Information Act provides that:

- TBSPG should only accept information from third parties in confidence if it is necessary to obtain that information in connection with the exercise of any of the TBSPG’s functions and it would not otherwise be provided;
- TBSPG should not agree to hold information received from third parties “in confidence” which is not confidential in nature; and
- Acceptance by the TBSPG of confidentiality provisions must be for good reasons, capable of being justified to the Information Commissioner.

11.11 For further information about confidentiality of responses please contact the Information Commissioner’s Office (or see web site at: http://www.informationcommissioner.gov.uk/).
# List of questions

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Questions to consider</th>
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<tbody>
<tr>
<td><strong>3. Culture and Communication</strong></td>
<td><strong>a)</strong> What do you consider to be the main barriers to TB eradication facing all stakeholders e.g., attitude, knowledge, culture, resignation to the current TB situation?</td>
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<td></td>
<td><strong>b)</strong> Do you agree that developing a local partnership approach as outlined at 3.9 is the most effective way to develop the constructive engagement necessary to overcome these barriers?</td>
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<td><strong>c)</strong> In terms of the option presented at 3.8, how might farmers and private vets take greater responsibility for TB eradication?</td>
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<td><strong>d)</strong> Thinking about option 3.11, how should we develop stronger engagement, raise awareness and create a more proactive culture around TB eradication?</td>
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<tr>
<td><strong>4. Governance and Delivery</strong></td>
<td><strong>a)</strong> Taking into account the options presented at 4.4 to 4.7, do you consider that a new system of governance is needed to successfully eradicate TB?</td>
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<td>i) If yes, do you support any of the options outlined and why?</td>
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<td>ii) If not, why not?</td>
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<td></td>
<td><strong>b)</strong> Do you consider that increased industry involvement at a strategic level should be accompanied by cost and responsibility sharing with Government?</td>
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<td></td>
<td>i) If yes, on what basis?</td>
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<td>ii) If not, why not?</td>
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<tr>
<td><strong>5. Existing Tools and Processes</strong></td>
<td><strong>a)</strong> Do you consider that the parallel testing regime with INFG as suggested at 5.4 would speed up disease control and reduce the potential for disease spread?</td>
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<td><strong>b)</strong> Do you consider that the responsible person making a diagnosis should DNA tag the animal to reduce the risk of inadvertent substitution as suggested at 5.5?</td>
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<td></td>
<td><strong>c)</strong> Do you see a role for lay testers under appropriate supervision?</td>
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<td><strong>d)</strong> In terms of the option presented at 5.9, do you consider that herds should be designated on the basis of risk?</td>
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<td></td>
<td>i) If yes, what risk factors should be taken into consideration? How should the information be made available to those purchasing cattle?</td>
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<td>ii) If no, why not?</td>
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### 6. Wildlife

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<tr>
<th>e)</th>
<th>Should a system of pre-movement testing as outlined at 5.10 be introduced?</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>If yes, which herds should it apply to?</td>
</tr>
<tr>
<td>ii)</td>
<td>If no, why not?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>f)</th>
<th>Do you consider that the agricultural industry should pay for the pre-movement test?</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>If yes, what factors should be taken into consideration?</td>
</tr>
<tr>
<td>ii)</td>
<td>If no, why not?</td>
</tr>
</tbody>
</table>

| g) | What are your views on the value in the inspection of animal testing being carried out to international inspection standards as suggested at 5.11? |

### 7. Vaccination

<table>
<thead>
<tr>
<th>a)</th>
<th>Which of the following do you consider as the best option to help reduce the reservoir of TB infected badgers:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• a programme of badger vaccination?</td>
<td></td>
</tr>
<tr>
<td>• a programme of vaccination and removal of infected badgers (like TVR)?</td>
<td></td>
</tr>
<tr>
<td>• a programme of badger removal?</td>
<td></td>
</tr>
</tbody>
</table>

| b) | Which of these options do you consider outlined at a) above would help to prevent disease exchange between the cattle and badger populations? |

| c) | The trapping and injection of individual badgers is costly and can be in excess of £600 per badger. Given the significant cost of any badger intervention how such an initiative might be funded? |

| d) | Taking into consideration the information at 6.2 to 6.8 what evidence would be required to support such an initiative as limited controlled culling of infected badgers? |

| a) | Do you consider vaccination of badgers to be an acceptable approach to assist in the eradication of TB in the badger population and cattle? |

| b) | Considering 7.9 to 7.14, if badger vaccination were to be deployed what would be the best way to deliver this and why? |

| c) | Should badger vaccination be carried out in conjunction with a targeted cull of diseased badgers as outlined at 7.11 and 7.13? |

| d) | Do you agree that if a vaccination programme were to be deployed that it should be focused on specific areas and, if so, which? |

| e) | Who should administer / deliver a badger vaccination strategy; private vets, licensed persons, environmental |
f) Given the potential significant additional cost of any badger intervention as outlined at 7.6, how would such an initiative be funded?

<table>
<thead>
<tr>
<th>8. Farm Practice and Bio-Security</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a)</strong> In terms of the bio-security measures outlined at 8.4 to 8.11, which of these in order of preference do you think would give the greatest TB control benefit and why?</td>
</tr>
<tr>
<td><strong>b)</strong> Should pre-movement testing as detailed at 8.9 be introduced and, if so, for what movements and why?</td>
</tr>
<tr>
<td>i) If not, why not?</td>
</tr>
<tr>
<td><strong>c)</strong> Should farmers pay for pre-movement testing?</td>
</tr>
<tr>
<td>i) If yes, what factors should be taken into consideration?</td>
</tr>
<tr>
<td>ii) If no, why not?</td>
</tr>
<tr>
<td><strong>d)</strong> As outlined at 8.15, should farmers be required to notify DARD if moving animals within their farm over a certain distance; e.g. 10 miles or 3 miles in the case of restricted herds?</td>
</tr>
<tr>
<td>i) If yes, do you think the distances are right? If not, what distances would be right?</td>
</tr>
<tr>
<td>ii) If no, why not?</td>
</tr>
<tr>
<td><strong>e)</strong> As outlined at 8.8, should information boards at livestock marts display the date a herd was last TB restricted? What other information would be beneficial to farmers purchasing livestock?</td>
</tr>
<tr>
<td>i) If yes, what information would you wish to see displayed</td>
</tr>
<tr>
<td>ii) If no, why not?</td>
</tr>
<tr>
<td><strong>f)</strong> Should animals in total housing finishing units continue to be TB tested bi-monthly?</td>
</tr>
<tr>
<td>i) If not, why not?</td>
</tr>
<tr>
<td><strong>g)</strong> Do you agree with the idea of ‘Improvement Notices’ as outlined at 8.14?</td>
</tr>
<tr>
<td>i) If yes, what factors should be taken into consideration and how should compliance be incentivised?</td>
</tr>
<tr>
<td>ii) If no, why not?</td>
</tr>
<tr>
<td><strong>h)</strong> As outlined at 8.16 would farmers leasing conacre land on a longer term basis (minimum of 5 years) improve bio security and other land management practices?</td>
</tr>
<tr>
<td>i) If yes, what factors should be taken into?</td>
</tr>
<tr>
<td>ii) If no, why not?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9. Research and Policy Development</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a)</strong> What are your views are sought on the suggested research areas and the approach to taking these forward?</td>
</tr>
</tbody>
</table>
| 10. Funding TB Eradication | a) Do you consider that the current position in relation to 100% compensation as outlined at 10.4 is a disincentive and requires change?  
   i) If yes, what factors should be taken into consideration?  
   ii) If no, why not?  

b) In relation to the options for change in compensation levels as outlined at 10.6, which one do you think would work best, and why?  

c) Should compensation be linked to bio-security as outlined at Chapter 8 Farm Practice and Bio-Security, 8.14?  
   i) If yes; should the approach be one of a basic 80% compensation value with a top of up to 20% based on evidenced good bio-security?  
      Or  
      Should this be 100% compensation payment with reductions following a lack of implementation of identified bio-security measures?  
   ii) If no, why not?  

d) In relation to the option at 10.12, do you consider that industry should make a financial contribution as part of its role in the delivery of a TB eradication programme?  

e) Do you consider that an alternative funding model may be needed irrespective of whether or not industry participates in the organisation and running of any future TB eradication programme?  
   i) If yes, what factors should be taken into consideration?  
   ii) If no, why not?  

f) Should farmers be required to pay for one annual herd test as detailed at 10.13?  
   i) If yes, what factors should be taken into consideration?  
   ii) If no, why not?  

g) In terms of the option outlined at 10.14 do you agree that there should be financial penalties linked to repeated test avoidance?  
   i) If yes, what factors should be taken into consideration?  
   ii) If no, why not?  |
CHAPTER 13

NEXT STEPS

13.1 We will continue our review work during the consultation period gathering further information and develop our thinking in relation to the key issues. Once the consultation closes, all responses received will be considered by us for review. We may decide that we wish to meet with some respondents to explore further the points made in their submission.

13.2 Work will then begin to finalise our recommendations taking on board the responses to the consultation and all of the input that we have received from practitioners and experts in the area of TB eradication.

13.3 The final draft report will be submitted to Minister Michelle O’Neill MLA for consideration by the end of December 2015.

13.4 In addition, an Implementation Action Plan will also be developed, which will outline the practical aspects of the how, who and when for the TB Eradication Strategy.

13.5 We will, following acceptance of the TB Eradication Strategy and Implementation Plan, continue to fulfil a monitoring role to oversee the adoption and roll out of the Plan.
### Annex A

**Membership of the TB Strategic Partnership Group**

<table>
<thead>
<tr>
<th>Name</th>
<th>Role/Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sean Hogan, Chair</td>
<td>Former chair of the Agri-Food and Bio-Sciences Board</td>
</tr>
<tr>
<td>Campbell Tweed OBE</td>
<td>Past President of the Ulster Farmers Union</td>
</tr>
<tr>
<td>John Thompson</td>
<td>Past President of the Ulster Farmers Union</td>
</tr>
<tr>
<td>Dr Cecil H McMurray CBE</td>
<td>Former Chief Scientific Officer</td>
</tr>
<tr>
<td>Dr George McIlroy</td>
<td>Former Deputy Chief Veterinary Officer/ Former CEO Agri-Food Biosciences Institute</td>
</tr>
<tr>
<td>Geraldine Fee</td>
<td>Director, Animal Health and Welfare DARD</td>
</tr>
<tr>
<td>Robert Huey</td>
<td>Chief Veterinary Officer DARD</td>
</tr>
</tbody>
</table>

**Secretariat:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seamus Murray</td>
<td>DARD</td>
</tr>
<tr>
<td>Russell McCurry</td>
<td>DARD</td>
</tr>
<tr>
<td>Philip Bryson</td>
<td>DARD</td>
</tr>
</tbody>
</table>
Annex B

Alphabetical list of the private individuals, industry representative bodies and NGOs who responded to TBSPG’s public consultation in December 2014

- Agri-Food & Biociences Institute (AFBI)
- Annette Magee – private individual
- Anonymous (Frustrated Farmer) – private individual
- Anonymous (Salient Points) – private individual
- Association of Veterinary Surgeons Practising in Northern Ireland – (Vet NI)
- British Veterinary Association
- Council for Nature Conservation and the Countryside (CNCC)
- David Rea – private individual
- David S J McBriar - private individual
- David Wallace – private individual
- Downe Veterinary Clinic, Newcastle Co. Down
- Dr Michael Welsh – former Head of Virology, AFBI
- Farmers for Action
- Freda Cave – private individual
- J M McBriar – private individual
- Jimmy – private individual
- Kate Kendall – private individual
- Kevin Mullan – private individual
- Martin Hancox – private individual
- Mike Rendle – private individual
- National Trust
- NI Badger Group
- Northern Ireland Environment Link
- Parklands Veterinary Group
- Roy Harpur – private individual
- Tyrone Land Owner – private individual
- Ulster Farmers’ Union
- Ulster Wildlife Trust
Annex C

List of respondents to the Consultation who attended meetings with TBSPG on 10 and 12 March 2015

- Agri-Food and Biosciences Institute
- British Veterinary Association
- Council for Nature Conservation and the Countryside
- Environment Link
- National Trust
- Northern Ireland Badgers Group
- Parklands Veterinary Group
- Ulster Farmers' Union
- Ulster Wildlife Trust
- Veterinary Association of Northern Ireland
Annex D

List of contributors to briefing sessions with TBSPG

- Dr Christianne Glossop, Chief Veterinary Officer for Wales
- Dr Paul Livingstone, Manager TB Eradication & Research New Zealand
- Dr Philip Robinson, Harper Adams University
- Dr. Margaret Good, Department of Agriculture, Food and the Marine, Dublin
- Dr. Patrick Burke, Bovine TB Programme, Department for Environment, Food and Rural Affairs (DEFRA)
- Elaine Dickson, Veterinary Officer, Armagh DARD
- Ian Mc Kee Head of TB/BR Policy Branch DARD
- John Cross, Chair Bovine TB Eradication Advisory Group (TBEAG), England
- Owen Denny, Senior Principal Veterinary Officer Enzootic Disease & Animal Welfare Division DARD
- Professor John Davis Agricultural Economics Queen’s University Belfast
- Professor Jonathan Rushton Animal Health Economics Royal Veterinary College
- Professor Simon More, School Of Veterinary Medicine, University College, Dublin
- Roly Harwood, Senior Principal Veterinary Officer Enzootic Disease & Animal Welfare Division
- Roy Watt, Veterinary Officer, Ballymena DARD
- Dr Stanley McDowell, Veterinary Sciences Division, AFBI
- Dr Robin Skuce, Veterinary Sciences Division, AFBI
Annex E
Reference documents

2. Public Accounts Committee – Report on the Control of Bovine Tuberculosis in Northern Ireland
3. Northern Ireland Audit Office – The Control of Bovine Tuberculosis in Northern Ireland – Report by the Comptroller and the Auditor General NIA 92/08-09
4. ARD Committee's Review into Bovine Tuberculosis Report
5. Written and Oral Evidence Provided to the ARD Committee
6. ARD Committee Report into Bovine TB (2012)
7. PAC Report into Bovine TB (2009)
8. EU Commission Approved Eradication Plan 2014
9. EU Commission Approved Eradication Plan 2013
10. ARD Committee Recommendations Update Report
11. Official Report (Hansard) Dard Officials update on CAP, RDP and Bovine TB to the ARD Committee
12. Official Report (Hansard) Dard Officials update on Badger Sett Survey/TVR to the ARD Committee
14. Official Report (Hansard) Assembly's approval of the ARD Committee’s Bovine TB Review Report, call for Minister to bring forward a timetable for implementing the recommendations contained within the report.
15. Bovine TB Review: DARD Officials Briefing on general update of the Departments TB Programme
17. Badger Sett Survey Report by AFBI
18. TB Bio-security Study by AFBI
19. Slurry Literature Review by AFBI
20. Badger-Cattle Proximity Report by AFBI
21. TB/BR Programme Spend (from 1995)
22. Review of International Application of the Gamma-Interferon Test by AFBI
23. Bovine tuberculosis: A review of diagnostic tests for M. bovis infection in cattle by AFBI
24. Bovine tuberculosis: a review of diagnostic tests for *M. Bovis* infection in badgers by AFBI
25. Bovine TB: a review of badger-to-cattle transmission by AFBI
27. BCG vaccination against tuberculosis in 1. European badgers 2. (Meles meles): a review by VEU
30. A Strategic Framework for Bovine TB Eradication in Wales
31. Current Welsh Strategic framework for TB eradication
32. NI TB Eradication Plan 2013
33. UK TB Eradication Plan 2014
34. Defra badger faeces study SE3289
35. Defra Statement on bTB - APHA Publication Arrangements - Defra Badger Cull
36. bTB - Defra citizen dialogue research publication - 16 January 2015
38. TB Resistant cows, China – web link to press release
39. Animal and Plant Health in the UK Building our Science Capability workshop agenda
40. Lessons Learned during the successful eradication of bovine tuberculosis from Australia – Simon More
41. History bTB policy NI; Philip Robinson
42. Effects of liver fluke paper
44. Welsh and English government TB Strategy Papers
45. BDO Stoy Hayward report & AVSPNI response to NIAO
46. Press Release and link from Agriculture and Horticulture Development Board regarding announcement of prototype system for exchange of cattle information across supply chain
47. Summary of responses to the use of snares in NI; DoE 2013
49. Cost of badger vaccination in Wales
51. Farming Life clippings info in relation to bio-security
52. Quality control of implementation of the TB skin test since 2011

55. NZ classification C1 to C10 etc http://www.tbfree.org.nz/herd-status-classifications.aspx

56. Genomics refs: Roman Biek1., Anthony O'Hare1., David Wright2,3, Tom Mallon 2, Carl McCormick2, Richard J. Orton1, Stanley McDowell2, Hannah Trewby1, Robin A. Skuce2, Rowland R. Kao1*

57. Whole Genome Sequencing Reveals Local Transmission Patterns of Mycobacterium bovis in Sympatric Cattle and Badger Populations
   a. Plos Pathogens November 2012 | Volume 8 | Issue 11 | e1003008


70. S. Singh, I. Saraav, S. Sharma Immunogenic potential of latency associated antigens against M Tuberculosis in Vaccine 2014 vol.32 712- 716
72. M. Domingo, E. Vidal, A. Marco Pathology of bovine tuberculosis in Research in Veterinary Science 2014 vol 97, S20- S29
75. H. M. Vordermeier, B. Perez De Val, B M. Buddle, B. Villarreal-Ramos, G. J. Jones, R.G. Hewinson, M. Domingo Vaccination of domestic animals against tuberculosis: Review of progress and contributions to the field of the TBSTEP project in Research in Veterinary Science 2014 vol. 97, S53-S60
79. B. Radunz. Surveillance and risk management during the latter stages of eradication: Experiences from Australia in Veterinary Microbiology 2006 vol. 112 283 – 290
estimated transmission rates for Mycobacterium Bovis infection in an undisturbed high density badger (Meles Meles) population in Epidemiol. Infection 2013 141 1445-1456
85. J. A. Drewe, H. M. O’Connor, N. Weber, R.A. McDonald, R. J. Delahay Patterns of direct and indirect contact between cattle and badgers naturally infected with tuberculosis in Epidemiol Infection 2013 vol. 141 1467 – 1475
86. N. Weber, S. R. Carter, S. R. X. Dall, R. J. Delahay, J. L. McDonald, S. Bearhop, R.J. McDonald, Badger social networks correlate with TB infection in Current Biology 2014 vol. 23
88. EFSA. Scientific Opinion on the field trials for bovine tuberculosis vaccination in EFSA Journal 2013, vol 11 (12) 3475
89. EFSA. Scientific Opinion on the use of the gamma interferon test for the diagnosis of bovine tuberculosis in EFSA Journal 2012, vol 10 (12) 29
97. S. Biletov, V. Potapov, E. Ganina, K. Downing, B. D. Kana, A. Kaprelyants The role of resuscitation factors promoting factors in pathogenesis and reactivation of M tuberculosis during intra - peritoneal infection in mice in BMC Infectious Diseases 2007 vol. 7 :146


100. Kana Gordhan Downing Vostroktunova Machowski Tsenova Toung Kaprelyants Kaplan Mizrahi The resuscitation promoting factors of M Tuberculosis are required for virulence and rescutation from dormancy but are collectively dispensible for growth in vitro Molecular Microbiology 2008 67 672-684

101. Mukamolova, Turapov, Young, Kaprelyants, Kell, Young A family of autocrine growth factors in M tuberculosis Molecular Microbiology 2002 46 623 - 635

Note: A range of other information and policy papers were provided by DARD
<table>
<thead>
<tr>
<th><strong>Wording</strong></th>
<th><strong>Explanation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>AFBI</td>
<td>Agri Food and Bio Sciences Institute</td>
</tr>
<tr>
<td>AHDB</td>
<td>Agricultural and Horticultural Development Board</td>
</tr>
<tr>
<td>Anitgens</td>
<td>An antigen is any substance that causes your immune system to produce <strong>antibodies</strong> against it</td>
</tr>
<tr>
<td>APHIS</td>
<td>Animal and Public Health Information System</td>
</tr>
<tr>
<td>Aujeszkys</td>
<td>Disease of pigs caused by a herpes virus</td>
</tr>
<tr>
<td>BCG</td>
<td>Bacillus Calmette-Guérin vaccine) protects against TB</td>
</tr>
<tr>
<td>Brucellosis</td>
<td>Brucellosis is a bacterial infection originating in animals that can cause long-lasting flu-like symptoms</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>Conacre</td>
<td>The subletting for a single season of small portions of a farm</td>
</tr>
<tr>
<td>DARD</td>
<td>Department of Agriculture and Rural Development</td>
</tr>
<tr>
<td>DEFRA</td>
<td>Department of Environment, Food and Rural Affairs</td>
</tr>
<tr>
<td>DIVA</td>
<td>Detect infected animals within a vaccinated population (DIVA test)</td>
</tr>
<tr>
<td>DVO</td>
<td>Divisional Veterinary Office(er)</td>
</tr>
<tr>
<td>Epidemiologist</td>
<td>Scientist that studies the patterns, causes, and effects of health and disease conditions in defined populations</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FVO</td>
<td>Food and Veterinary Office (within European union)</td>
</tr>
<tr>
<td>Histological examination</td>
<td>The study of a tissue specimen by staining it and examining</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
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<tr>
<td>IBR</td>
<td>Infectious Bovine Rhinotracheitis</td>
</tr>
<tr>
<td>INFG</td>
<td>Gamma Interferon Test carried out on a blood sample</td>
</tr>
<tr>
<td>Intradermal skin test</td>
<td>A test for hypersensitivity or allergy in which a small amount of the suspected allergen is injected into the skin</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organisation for Standardisation</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental organisations</td>
</tr>
<tr>
<td>NVLs</td>
<td>Non visible lesions</td>
</tr>
<tr>
<td>OTF</td>
<td>Officially TB free</td>
</tr>
<tr>
<td>OTS</td>
<td>Officially TB suspended</td>
</tr>
<tr>
<td>OTW</td>
<td>Officially TB withdrawn</td>
</tr>
<tr>
<td>PVPs</td>
<td>Private veterinary practices</td>
</tr>
<tr>
<td>RDP</td>
<td>Rural Development Programme</td>
</tr>
<tr>
<td>RTA</td>
<td>Road Traffic Accident</td>
</tr>
<tr>
<td>SICTT</td>
<td>Single Intradermal Comparative Tuberculin Test (the skin test)</td>
</tr>
<tr>
<td>TB</td>
<td>Tuberculosis (TB) is a bacterial infection spread through inhaling tiny droplets from an infected animal</td>
</tr>
<tr>
<td>TBSPG</td>
<td>TB Strategic Partnership Group</td>
</tr>
<tr>
<td>TVR</td>
<td>Test and Vaccinate or Remove wildlife intervention research project</td>
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<tr>
<td>VEU</td>
<td>Veterinary Epidemiology Unit (DARD)</td>
</tr>
<tr>
<td>VO</td>
<td>Veterinary Officer</td>
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<tr>
<td>VS</td>
<td>Veterinary Service</td>
</tr>
<tr>
<td>VSD</td>
<td>Veterinary Sciences Division</td>
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</table>