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Animal Health: TB Eradication

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This paper has been prepared by IGEES staff in the Department of Agriculture, Food and the Marine. The views presented in this paper do not represent the official views of the Department or the Minister.

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Executive Summary

Ireland operates a bTB Eradication Programme in compliance with related European and national legislation. The bTB Eradication Programme is the most significant farmed animal health programme in the State and has set an ambitious target to eradicate the disease in Ireland by 2030, which has motivated stakeholders to cooperate and identify the necessary measures to achieve this objective. The considerable financial cost of the Programme to farmers and the Exchequer also provides a powerful incentive to achieve eradication as soon as possible.

TB levels in Ireland are at historic lows at present (c. 3.5% of herds affected), but the progress has flat-lined in recent years. If current conditions were to persist, it is estimated that the Programme would not eradicate bTB for another 60-70 years which in turn would incur significant further costs for stakeholders. Accordingly, additional effective policy measures will be needed if eradication by 2030 is to be achieved.

The net cost of the programme in 2018 was €92 million which is broken down as follows:

- €47 million from the Exchequer – this includes an estimated staffing cost of €28m
- €9.7 million[1] co-financed by the EU – which is on a steady downward path reflecting EU budgetary pressures and the emergence of other diseases in the EU which require funding
- €35.2 million paid by farmers – this is constituted of an estimated €28 million in bTB testing paid for by farmers and €7 million in bovine disease levies.

Programme costs have increased by €8.2 million (10%) since 2015 despite the stable levels of herd incidence mainly driven by an increase in financial support payments to farmers accounting for €4.7 million of this increase. Financial supports are an important aspect of the Programme to reflect the particular hardship for affected farmers during a breakdown. Financial supports should be balanced to offset some of the losses incurred, but also to counteract the moral hazard of potentially encouraging excessive risk-taking behaviour. Accordingly, the level of financial supports should be re-examined following an independent Cost Benefit Analysis (CBA) of the entire Programme which has been proposed in the recent TB Stakeholder Forum Report to the Minister for Agriculture, Food and the Marine. The CBA is intended to examine if the current split of funding between public and private sources is optimal in the context of achieving eradication.

Reflecting the need for additional policy measures required, the TB Stakeholder Forum was established in 2018 to consider options that can accelerate progress towards eradication, and international experience as well as peer-reviewed research has highlighted a number of measures that warrant further discussion. These include proposals which:

- address enhanced governance structures designed to harness stakeholder support
- advocate for clearer communication to farmers
- outline additional targeted controls for herds identified as being at elevated levels of risk
- continue to reduce the risk of disease transmission from wildlife.

The Spending Review broadly supports the initiatives outlined in the TB Stakeholder Forum Report (DAFM, 2019) and advocates that necessary measures are implemented to achieve eradication by 2030 in the interests of all stakeholders.

Glossary of Terms

Term	Definition
CVERA	Centre for Veterinary Epidemiology and Risk Analysis
DAFM	The Department of Agriculture, Food and the Marine
DPER	The Department of Public Expenditure and Reform
ERAD	Eradication division within DAFM
EU	European Union
OFMV	On Farm Market Valuation
PVPs	Private Veterinary Practitioners
bTB	Bovine Tuberculosis
UCD	University College Dublin

[1] This may be subject to a 10% penalty from the Commission due to deteriorating trends in disease metrics.

1. Introduction

Bovine Tuberculosis (bTB) is a chronic, highly infectious disease of cattle caused by a bacterium called *Mycobacterium bovis (M.bovis).* The bacterium can cause disease in other domestic or wild animals and also in humans. Ireland operates a bTB Eradication Programme in compliance with related European and national legislation. From the perspective of scale and cost, the bTB Eradication Programme is the most significant farmed animal health programme in the State. As outlined in the National Farmed Animal Health Strategy (NFAHS) (DAFM, 2017), optimal animal health is critical to the future profitability and sustainability of farming and processing industries, and to the protection of public health and the environment.

The mission statement set out in the National Farmed Animal Health Strategy is:

> *"Animal health programmes will be appropriately and sustainably funded on the basis of a formal objective evaluation of benefits and costs" (p. 25)*

Furthermore, the NFAHS stresses the importance of working in partnership, acknowledging and clearly displaying the roles and responsibilities of stakeholders, and to reflect the costs and benefits of a particular programme. However, of most interest is the principle that 'prevention is better than cure', which is the foundation for disease eradication. The mission statement is consistent with the objectives of the Spending Review to review the current policy including the existing funding arrangements in light of their on-going sustainability to ensure that appropriate funding is provided until the point at which eradication is achieved. In addition, the NFAHS also calls for animal health proposals to have clear rationale, specific objectives, appropriate funding mechanisms and clarity over the costs and benefits of the scheme.

The bTB Eradication Programme is a requirement of EU trade law. As Ireland exports approximately 90% of its beef and dairy output, the bTB eradication Programme is a fundamental pillar in supporting Irish agriculture. Recent experience in securing trade deals suggests that the terms and conditions associated with gaining access to third countries in future agreements will contain more stringent requirements related to animal health issues such as bTB. For example, the protocol for beef market access to China specifies that live cattle from which beef is to be exported originates from farms which have not been restricted due to bTB within the last 12 months. The importance of trade access to third countries is likely to become increasingly important post-Brexit. In short, being deemed to be bTB free is beneficial for beef trade. At farm level, the near 4,000 bTB restrictions each year are a source of significant mental and financial stress. A restriction can impede a farmer's planned production cycle resulting in challenges to manage stock and finances.

Ireland's Bovine TB Eradication scheme started in 1954 when approximately 80% of cattle herds and 22% of cows in the country were infected with bTB (DAFM, 2018). Following several decades of implementation of the Bovine Eradication Programme, latest figures available show that bTB cases are now at historically low levels of c. 3.5% for herds affected. The number of reactor animals being culled per annum typically ranges from 15,000-17,500, significantly down on the 44,000 reactors in the late 1990s. However, in recent years further

progress has not been realised. Herd incidence has remained broadly unchanged since 2013-14 and trends to date in 2019 suggest further stasis. This lack of recent progress is of significant concern and has led to a re-examination of the policies needed to achieve eradication in a timely manner to the benefit of the farming sector.

Reflecting this, the Minister for Agriculture, Food and the Marine has set a target of eradication by 2030. However, in order to achieve eradication by 2030, further improvements on the existing Programme are required (More, 2019). A bTB Stakeholder Forum was established following a Government decision in May 2018 to consider initiatives consistent with eradication by 2030. Consultation papers were issued by the Department of Agriculture, Food and the Marine (DAFM) to aid discussions, in which DAFM highlighted that if current spending trends continue, this would equate to a further €1 billion investment in bTB Eradication by 2030. Following several meetings of the Forum between September 2018 and mid-2019, the Chairman of the Stakeholder Forum formally submitted an interim report to the Minister for Agriculture, Food and the Marine on 22 July 2019 (DAFM, 2019).

The net direct cost of the bTB Eradication Programme in 2018 was estimated to be €91.7 million split as follows:

- €46.8 million from the Exchequer – this includes an estimated staffing cost of €28.3 million
- €9.7 million co-financed by the EU[2]
- €35.2 million paid by farmers – this is constituted of an estimated €28 million in bTB testing paid for directly to private veterinary practitioners by farmers and €7 million in bovine disease levies

While TB herd incidence has been broadly static since 2015, the net cost of the programme is estimated to have increased by €8.2 million (9.9%) between 2015 and 2018. The primary factors underpinning this increase are:

- Financial support - ↑ €4.7 million
- Programme supplies - ↑ €1.5 million
- State paid TB testing - ↑ €0.9 million
- Estimates of farmer paid TB testing - ↑ €0.8 million

Objectives of the Spending Review

The purpose of this Spending Review is to provide a broad overview of the current bTB eradication programme and identify potential areas that may accelerate the progress of the policy objective of eradication by 2030. As such the Spending Review focus will be on the continued relevance of the existing policy in terms of its suitability to achieve this objective.

[2] Potentially subject to a 10% penalty related to Programme performance

Specifically, three broad research questions will be addressed which include:

1. Is the existing Scheme progressing the overarching policy of achieving the 2030 target of achieving bTB-free status[3] in Ireland?

2. Are the current funding arrangements for the Scheme appropriate?

3. Does the bTB Scheme in Ireland reflect international best practice and are there lessons learnt that could improve the existing programme in Ireland? If so, what economic considerations underpin these?

Methodology and Limitations

In order to address the research questions posed in this Spending Review, this paper will include a comparative analysis of the current Programme with international counterparts and an overview of the existing financial supports provided to farmers who incur a loss. Additional options to accelerate the progress of the policy to deliver its objective will be explored.

This paper is set out in sections as follows:

- Section 2 provides an overview of the current policy including its evolution to this point and the current funding structures in place.
- Section 3 addresses the research questions and examines the feasibility of achieving eradication by 2030, the current funding structure and discusses the Irish policy in an international context to identify any lessons that may warrant consideration to accelerate progress in the Irish case.
- Section 4 offers conclusions on the current policy and identifies areas for further improvement to ensure the overarching goals of eradication by 2030.

The review will follow the principles of the Spending Review process as set out by the Department of Public Expenditure and Reform (DPER, 2018) and focus on the continued relevance of the current Programme in achieving its objective. The research is desk based and led by the Irish Government Economic and Evaluation Service (IGEES) unit within DAFM.

The analysis aims to provide a critical overview of the existing programme focusing on data including the number of herds affected, the number of reactors and the funding structures among others over time. This data will be used to evaluate the continued relevance of the current Programme and to identify any other policy instruments that may help to achieve the objective. It is not intended to provide an exhaustive economic analysis of these issues which will fall outside the scope of this paper, but inform further investigation in follow-up studies.

[3] Official bTB free status at national level is defined in the EU as a herd incidence of bTB of less than 0.1%.

2. Background

This section defines bTB, provides the rationale for funding an eradication programme in an Irish context, and describes the current process in place.

Definition of Bovine bTB

As noted in the introduction, bTB is a chronic, highly infectious disease of cattle caused by a bacterium called *M.bovis.* The bacterium can cause disease in other domestic animals and also in humans which are key factors in the rationale for providing a policy to address this issue.

The disease can take months to advance to a clinical stage, which is where cattle become infected with multiple lesions particularly in the lungs which thankfully today is a rare occurrence. When the bTB eradication programme was first introduced in 1954, it is estimated that 80% of herds and 17% of cattle were infected with bTB. This was a source of major concern for trade with the UK where there was a commitment to eradicate bTB by 1961 (Arnold, 2008).

TB is a zoonotic disease and in the 1950s it is estimated that 230/100,000 people in Ireland contracted TB from contact with infected animals or consumption of TB infected milk. Bovine TB in humans in Ireland is now extremely rare, and only three cases in humans were reported in 2016.

Current Context

After significant improvement in reducing the incidence of bTB in the national herd in the early part of this decade, progress has noticeably slowed in recent years. In 2018, there was a slight increase in herd incidence, and concern has been raised that the opportunity for full eradication will be missed unless the existing Programme is strengthened to improve its effectiveness.

The number of reactors since the introduction of the original scheme is provided in Figure 1. Reactor numbers since 2013 have remained relatively consistent which demonstrates the need for enhanced measures to regain positive momentum in reducing bTB levels. Figure 2 presents a map detailing the spatial distribution of TB in Ireland. Bovine TB rates have been a particular concern in the broader Monaghan/Cavan area throughout 2018/19. This is being addressed by a tailored Blackspot Action Plan which was developed following consultation with local stakeholders. This has involved a more intensive effort to combat disease in the area through more frequent and targeted testing as well as an enhanced wildlife programme. The development of Blackspot Action Plans is a commitment in the Programme for Government.

Figure 1: No. of TB reactors in Ireland

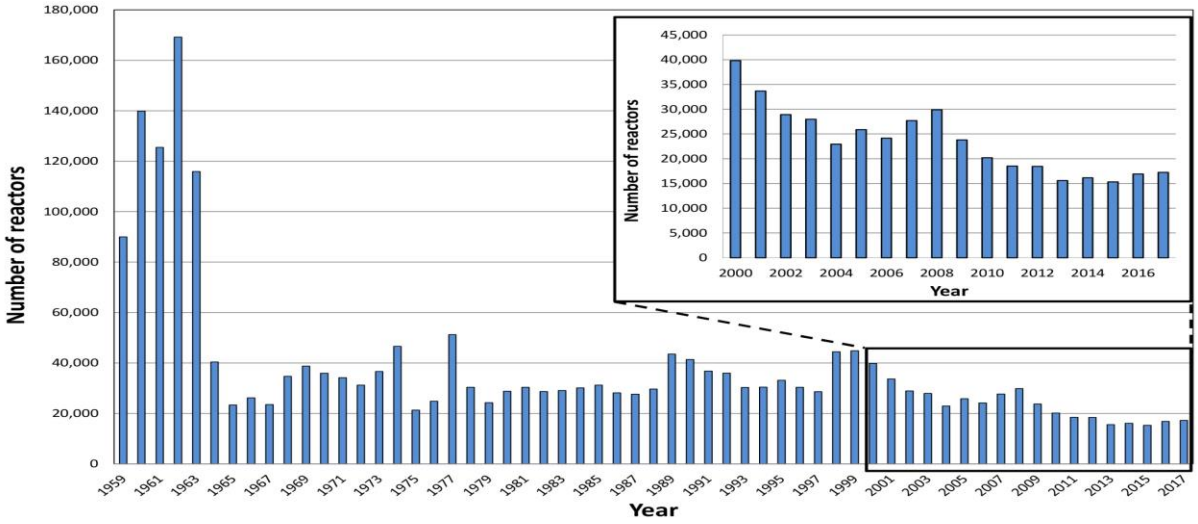
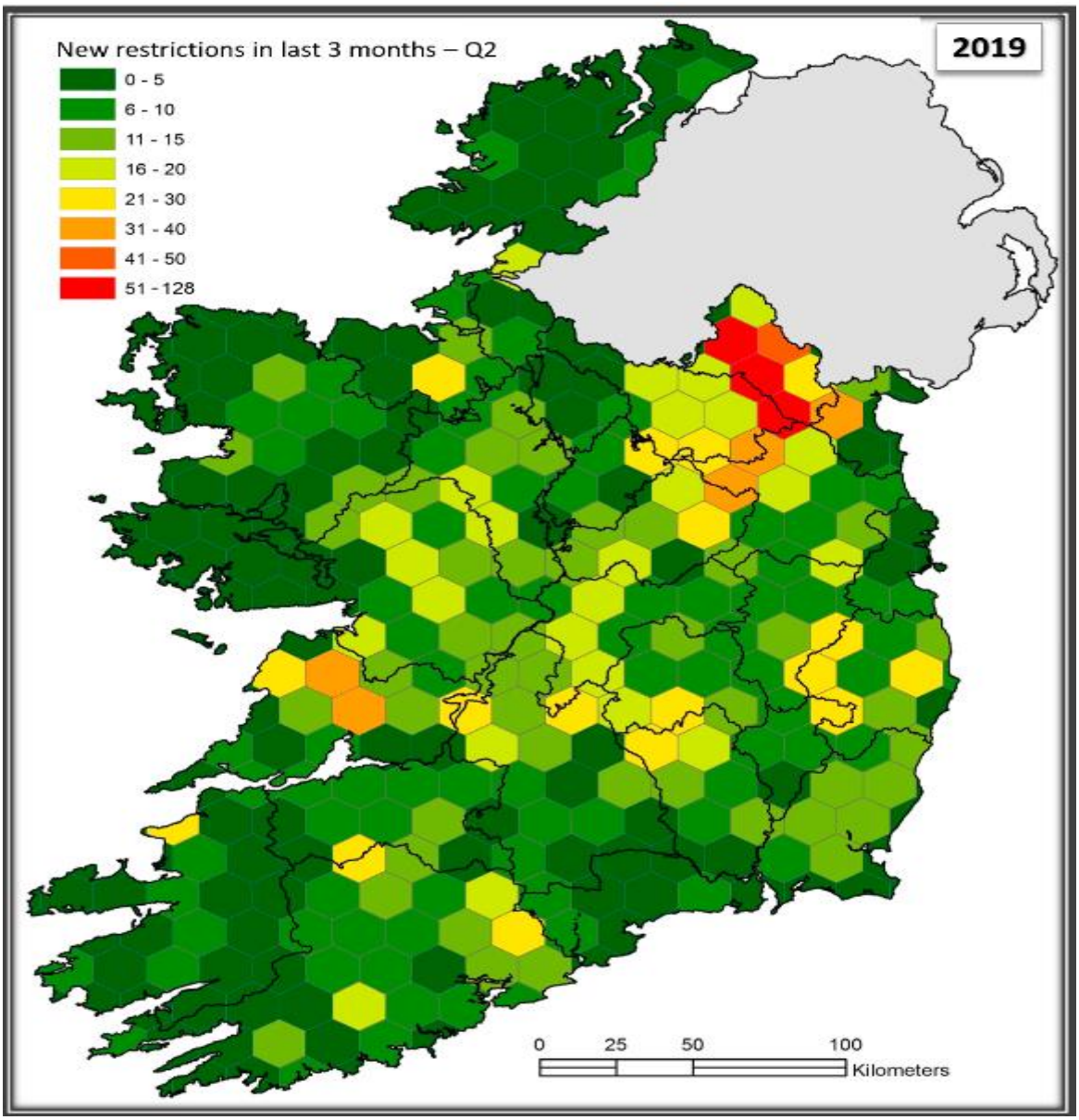


Figure 2: Spatial Distribution of TB restrictions in Ireland



Key principles of the existing Programme

There are three key principles that underpin the bTB Eradication Programme. These are:

1. Identifying infected animals through a robust surveillance and testing system
2. Confining the disease through restricting the movements of infected herds
3. Removing and slaughtering infected animals

Detection of bTB

All cattle herds in the country must undergo an annual skin test for screening purposes, with a further gamma blood test initiated for certain breakdown herds. Additional risk-based testing is also undertaken in line with scientific research findings. Post mortem surveillance is carried out at slaughter plants. The testing procedures comply fully with EU requirements.

The screening skin test is accepted internationally as the best option at present to detect bTB. It has a sensitivity of approximately 80% meaning that for every 10 infected cattle, the skin test will on average correctly identify 8. This can mean that all infection in a herd may not be identified and therefore limit the ability to eradicate disease. Conversely, the probability of an uninfected animal being incorrectly diagnosed as having bTB is extremely low (approx. 1 in 5000) using the skin test.

Reflecting the challenge of correctly identifying all disease in a herd, research highlights the heightened likelihood of recurring infection in herds that were previously bTB-restricted (Clegg et al. 2015). In Ireland, it is estimated that a herd which is derestricted from a bTB breakdown has a 30% chance of being re-restricted for bTB within three years (Houtsma et al. 2018). Clearly, if the Programme can address the issue of recurrence more comprehensively, this will be beneficial to the objective of eradication.

Taking account of the challenge some derestricted herds face with elevated recurrence probabilities, the bTB Stakeholder Forum Interim Report proposes that enhanced support be provided to herds which have a chronic history of severe bTB or that have a pattern of repeated breakdowns.

i. Each of these herds will be provided with a tailored TB risk management plan which mitigate the risk of the key disease transmission routes

ii. Cattle moving from these herds must have a pre-movement bTB test carried out within the 60 days preceding the movement

iii. These herds will be subject to an enhanced testing regime in the event of a breakdown complemented by a thorough investigation into the source of the disease.

Together these measures when implemented can help identify a greater proportion of infected animals and provide enhanced protection to the 97% of bTB free herds.

Confinement of bTB

The next principle refers to restricting the movements of animals in herds which bTB has been detected, slaughtering animals that have reacted to the bTB test and confining animals which showed inconclusive results to the herd of disclosure unless they move to slaughter. The reactor animals are compulsorily slaughtered and no cattle are allowed to move in or out of the herd until the remaining animals in the herd have passed at least two consecutive skin tests to overturn the restriction. Neighbouring herds of those affected can also be subject to additional tests to ensure all efforts are made to prevent the outbreak from spreading further. If inconclusive animals pass a retest 42 days after the initial test, they are restricted to that herd for life as they are considered at higher risk of becoming infected at a later stage in their life cycle. In addition, herds that have emerged from a breakdown are subject to more frequent testing for the immediate period after de-restriction for 18 months. A herd experiencing a breakdown is also visited by DAFM personnel to conduct an epidemiological risk analysis to ensure that suspect animals are isolated and all Programme measures are being complied with.

DAFM has recently revised the process its veterinary inspectorate undertakes in completing an epidemiological assessment of a bTB breakdown. The objective was to develop a more robust, comprehensive investigation of the risk factors relevant to a particular breakdown.

The bTB Stakeholder Forum Interim Report has also proposed an enhancement of the existing inconclusive policy. Existing policy dictates that inconclusive bovines are retained in the herd of disclosure for the rest of their lives. Reflecting the fact that inconclusive animals are at a much higher risk of developing bTB, the Forum has proposed that inconclusive animals are subject to regular blood testing to mitigate the development and spread of the disease.

As noted, the bTB Stakeholder Report has brought forward proposals that provide for more enhanced engagement with higher-risk herds that are currently derestricted and free to trade. This is consistent with the principle of a risk-based approach based on scientific research. Bearing this in mind, it may also be beneficial for the renewed bTB Strategy to provide for enhanced infection-control measures for restricted herds whose herd history indicates an elevated level of risk.

Farmers play a critical role in the confinement of bTB with bio-security measures necessary to lower the risk of contracting bTB. Farmers are reminded at the annual bTB test of the steps they can take including:

- Maintaining the security of boundary fences
- Ensuring there is no contact between cattle in their herd and other herds
- Isolating cattle entering their holding from other herds or animals that are sick
- Providing disinfection footbaths and overall for personnel visiting their holding
- Providing clean drinking water for their animals
- Securing feed stores to prevent access by livestock, vermin and wildlife
- Fencing off access to badger setts and latrines in pasture land
- Providing secure, clean feeding troughs to prevent access by wildlife or rodents

This information is also provided by veterinary inspectors but there is further scope for improving the communications aspect of the Programme. Despite the bTB Eradication Programme being in place since 1954, it is clear that many farmers are not fully informed of how the disease is transmitted and what actions they can take to protect their herd.

DAFM has developed a comprehensive communications strategy to address this which is currently being delivered. This includes:

- Public meetings in collaboration with farm bodies and co-ops;
- Short videos uploaded on DAFM's YouTube channel explaining components of the programme[4];
- Meetings with farm body executive groups;
- Amended letters to herdowners which reflect behavioural economic theory; and
- Leaflets to be handed out at meetings and available in regional offices explaining the TB Programme

DAFM has initiated a Research Programme with the ESRI Behavioural Research Unit to further advance its communications with farmers.

Removal of Reactors, Financial Supports and Further Research

Animals identified as reactors are removed by licensed hauliers contracted and paid for through the Programme to approved slaughtering plants based on a tendering arrangement. The slaughtering plant pays the salvage price of the reactors directly to the farmer. The animals are also assigned a market valuation under the On Farm Market Valuation Scheme (OFMV). This value is based on the price the animal would have received had it not contracted bTB, and the difference between the salvage value and the OFMV is paid to the farmer.

Briefly, this system involves the collation of a database representative of over 15,000 animal values per annum from open market sales which is amended on a weekly basis. A weekly Summary of Market Prices (SMP) document is compiled which has prices representing hundreds of categories of bovines. Independent valuers refer to this SMP and undertake valuations in line with a Code of Practice. Values of reactors are reviewed by DAFM officials and the affected herdowner. An appeals system, comprising of an optional second independent valuation and ultimately an arbitration hearing chaired by a member of the Chartered Institute of Arbitrators, is also in place to resolve issues that arise in this process in line with the principle of fair procedures. Analysis illustrates that 97% of first valuations are accepted by both the herdowner and DAFM (Oireachtas, 2018).

The OFMV is designed to facilitate an independent process with fair procedures. One consequence of the steps that provide for this is that average reactor removal times are just over 20 days. This timeframe is significantly in excess of administrations within the UK who do not provide for as rigorous a valuation process. For example, it is understood that reactor removal times in England are on average 10 days. Delays in removing infected animals from a holding are not consistent with best practice in eradicating disease and preventing its

[4] https://www.youtube.com/watch?v=PxJgDiadTj0

spread. Therefore, any measures that can reduce reactor removal times should be considered.

In addition to the OFMV, the Programme also provides financial support in relation to:

- Income Supplement – to assist farmers to partially offset the consequential loss of income arising from the removal of reactor animals;
- A Hardship Scheme – to assist farmers with additional costs incurred over the winter period where they may have to feed/house animals that are prevented from being sold;
- A Depopulation Grant – to assist farmers in re-stocking herds if they were fully depopulated due to a chronic bTB problem in their herd.

The system of financial support in Ireland is unique in providing compensation above the valuation of an animal. Although these support payments are clearly not intended to fully offset farmers for the loss of every potential litre of milk or kilogram of meat, they are intended to ease the consequences of suffering a bTB breakdown. Research from the OECD (2012) advocates the provision of support payments for animal health programmes to ensure principal/agent motivations are aligned. The research suggests financial support should be set at a level that encourages farmers to comply with the programme. If set too low, farmers may hide infected cattle limiting the effectiveness of the Programme and if set too high this may result in moral hazard or encourage excessive risk-taking behaviour. Clearly, stakeholders need to be cognisant that moral hazard or excessive risk-taking behaviour should not be facilitated through the compensation regime.

Research to eradicate bTB is crucial to ensuring that the latest technologies and best practices are followed to accelerate progress towards eradication. Analysis of the programme in conjunction with scientific partners has included improving the existing testing methods and in particular advancing progress to mitigate the risk at the cattle/wildlife interface, particularly with regard to badgers where a culling and vaccination programme have been implemented. Senior DAFM officials stated at the Oireachtas Joint Committee on Agriculture, Food and the Marine in December 2018 that approximately 6,000 badgers are culled each year with a further 1,000 vaccinated (Oireachtas, 2018). However, as the badger is a protected species under the Berne Convention, there is a limit to the land area (30%) in which badgers can be culled under licences granted by the National Parks and Wildlife Service. However, there is no limit to vaccination and the intention is to incrementally increase the number of badgers being vaccinated. These significant developments have enabled the eradication of bTB to become a reality, and the continued effort to control the risk in wildlife will be key going forward.

While disease transmission from badgers is being addressed under the current Programme, farming bodies have raised concerns that deer may be a contributory factor to bTB incidence in certain areas where deer densities are elevated. Research may be required to investigate this issue thoroughly to inform any potential policy decisions. At present the evidence on the risk posed by deer is inconclusive and further research is needed to verify and address this issue.

Stakeholders involved

A number of key stakeholders play important roles in the Irish bTB programme, each united by their interest in eradicating bTB. An overview of each is provided in Table 1:

Table 1: Stakeholders affected by TB programme

Stakeholder	Role
Exchequer/Taxpayer	The taxpayer through the Exchequer contributes c. 50% of the bTB Eradication Programme's direct funding each year in recognition of the public good associated with the Programme.
Farmers	Farmers make a significant contribution by complying with the programme requirements and movement controls, by mitigating the risk of bTB by appropriate bio-security and hygiene measures, by ensuring their stock are tested adequately and by contributing to the programme through fees and levies. All prevailing research and policy documents (DAFM, 2008 & 2017; More, 2009; More & Good, 2015) highlight that the primary beneficiary from animal health programmes are the owner/keeper of the animals i.e. farmers.
DAFM	DAFM is responsible for the policy in terms of its implementation and ensuring the efficient delivery and verification of the data generated.
Private Veterinary Practitioners (PVPs)	PVPs perform the testing of animals to comply with the requirements as set in the Programme and provide advice to farmers on how to curb their exposure to bTB.
Marts/Export Points/Slaughterhouses	These stakeholders provide real time information on the animal status at the point of sale/slaughter/movement to ensure prompt recording of detection of suspect bTB lesions to ensure restrictions where necessary pending laboratory analysis.
Milk Processors	Avoiding the consumption of milk from positive/inconclusive animals is the role for processors. Milk from clear animals in reactor herds can be used after undergoing a heat treatment equivalent to pasteurisation. Accordingly, milk purchasers communicate with DAFM to monitor restrictions and de-restrictions of herds.
Research Community	A number of research agencies carry out research to enhance current policies and to develop new technologies to achieve the objective of eradication.
EU Commission	The EU Commission oversees the operation of the bTB programme and provides co-funding for certain elements subject to appropriate auditing practices.

Previous Reviews

A number of reviews have been undertaken over the years on the costs and benefits associated with the bTB programme.

For example, a 1991 UCD study on the costs and benefits of the programme found that retaining access to premium markets was dependent on employing an effective bTB programme, and that it facilitated improvements in animal productivity and human health. They also provided a conservative estimate of the benefits of approximately 7% of total cattle and milk output.

A Public Accounts Committee in 1994 reviewed the bTB programme. While this review is now 25 years old, many of its findings appear to be as relevant now as they were then. The PAC concluded that progress towards eradication would only be achieved if the principles guiding it are (i) the protection of the interests of the 97% of disease-free herds, and (ii) the protection of the interests of the taxpayer. These two guiding principles align with the NFAHS principles and the target to eradicate bovine bTB by 2030. The Committee was critical of the measures in place at the time as the 'politically soft' options, and that in effect this would prolong the existence of the programme as opposed to addressing the issue using more robust controls. Reflecting the principle of protecting the interests of the 97% of disease-free herds, the PAC was critical of the lack of protection afforded to cattle buyers noting that *'Herds which have just been de-restricted but which have a chronic history of disease trade under precisely the same terms as herds which have never had disease'.* This situation continues to prevail today.

A Value for Money and Policy review conducted in 2008 (DAFM 2008) concluded that a bTB programme was necessary to ensure access to export markets, that productivity losses would remain as long as there were incidences of bTB infections, safeguards are necessary to prevent the spread to other animals and to humans, and that farmers are the main beneficiaries of the programme but the wider public also benefits. Their recommendations included that the split in the proportion of programme costs should be kept under continuous review. It was also recommended that the bovine disease levies equate to 50% of compensation expenditure. If this recommendation was implemented it would address an observation from the NFAHS that, *'The relationship between farmer contributions and the costs of the programme or indeed relating to compensation have been on an ad-hoc basis and are not aligned to any particular strategy or agreement.'*

The VFM Review also assessed how the operational functions of the Programme were discharged and if these were done as cost-effectively as possible while preserving the Programme's integrity. The review noted:

- that there is significant Department staffing costs in implementing the Programme across numerous streams,
- Private Veterinary Practitioners undertake the majority of bTB testing
- Valuation of reactors is undertaken by independent valuers
- Delivery of the Wildlife Programme relies heavily on private sector resources; and
- Private hauliers are used for the collection of reactors.

It observed that international experience suggested the use of outsourcing in the delivery of a bTB Eradication Programme could result in greater efficiencies. It also concluded that market mechanisms were employed to a greater extent in Ireland than in other benchmarked countries. Furthermore, the VFM highlighted that Programme delivery should continuously be examined to ensure value for money is being achieved.

The findings of these reviews continue to resonate with the current iteration of the bTB eradication strategy in 2019. However, it must be noted that the policy options available when those reviews were conducted did not have the capacity to fully eradicate bTB due to data limitations and a lack of understanding or solutions to the potential disease spread from wildlife. These have since being overcome and eradication of bTB in Ireland is now scientifically possible.

3. Responses to Research Questions

This section provides responses to the research questions set out in section 1. Each question is addressed in turn, with a more synthesised discussion provided in the concluding section to follow.

Q1 - Eradication by 2030?

Ireland's current bTB Programme is operating largely successfully. Herd incidence is now at historically low levels and all disease transmission routes are being addressed by the Programme's policies. Disease incidence in Ireland is lower than experienced by other countries' eradication programmes dealing with similar environmental challenges (e.g. England, Wales, and Northern Ireland).

However, it is also clear that progress has stagnated suggesting a limit has been reached within the confines of existing policies. It is important therefore that additional steps are taken to accelerate the progress at present and drive towards achieving eradication, which in turn will drive market access for trading partners and herd quality for the future.

Research confirms that further enhancements are required if eradication by 2030, or indeed before the latter part of this century, is to be achieved. Eradication in as quickly a timeframe as possible is in the interests of all stakeholders and particularly for farmers given they are recognised as being most impacted by the disease.

Prior to the introduction of badger vaccination in 2018, the policy tools were not available to fully eradicate TB in Ireland (Aznar, 2018). Now that vaccination is a core part of the Programme, the Centre for Veterinary Epidemiology and Risk Analysis (CVERA) within UCD estimate that eradication may be achieved in 60-70 years with existing policy tools. In his appearance at the Joint Committee on Agriculture, Food and the Marine on 26 February 2019, Professor Simon More of UCD stated that there are three fundamental areas that require additional focus. These are:

1. Adequately addressing TB risk from wildlife
2. Additional Risk-based cattle controls; and
3. Programme governance and financing.

Initiatives that were recently submitted to the Minister for Agriculture, Food and the Marine by the bTB Stakeholder Forum offer some potential options to progress the bTB Eradication Strategy. The initiatives put forward by the Forum are consistent with the NFAHS principles, conclusions from previous reviews of the bTB Programme and the views expressed by Professor More at the Oireachtas Committee. These initiatives include:

- The provision of biosecurity advice to farmers – this measure can better help farmers mitigate the risk of their herd contracting bTB. The report does note that in the absence of appropriate incentives, the impact of this measure may be limited;
- Designated 'Black Spot Action Plans' – in circumstances where bTB breakdowns occur in a clustered pattern in a localised area, a specific action plan will be developed and implemented to eradicate the disease from infected herds and limit its spread;

- Continuing to enhance efforts to limit the spread of bTB by wildlife sources. This includes the progressive roll-out of badger vaccination and additional research into any potential role played by deer in spreading bTB;
- Providing (i) a risk management plan, (ii) enhanced testing regime, and (iii) pre-movement testing to herds that are currently derestricted whose bTB history suggests they are at a much higher risk of disease recurrence. This risk-based measure addresses research findings which highlight that 30% of herds that are derestricted will experience another breakdown within three years;
- The development of simple and clear herd bTB risk categories that provide farmers with requisite information on how best to manage their herd in mitigating against future breakdowns;
- Enhanced communication from DAFM to farmers which will facilitate a greater understanding of bTB risk;
- The incentivised removal of inconclusive animals; and
- A range of governance measures which strengthens the role industry has in overseeing Programme implementation and in proposing additional measures to the Minister which are consistent with the goal of eradication by 2030.

The implementation and subsequent impact of these policy options will inform whether additional measures are required to successfully eradicate bTB by 2030. Although achieving eradication by 2030 is recognised as ambitious, the importance of having a target date for eradication has been an important motivational tool to engage stakeholders under a common goal with a sense of urgency. Equally, the identification of the significant financial costs and commitments provided by stakeholders each year to the Programme provides a strong incentive to bring the Programme to a conclusion. Together, both the 2030 target and major financial costs have led to an increased focus on the issues that will drive eradication. A continual assessment of the Programme's effectiveness will act as the basis for identifying the additional measures needed to achieve the goal of eradication on time.

Q2 - Appropriateness of current funding mechanisms?

The current funding of the Programme operates under a co-funding system between DAFM, farmers and the EU. The cost breakdown is provided in Figure 3. In 2018 in net terms, the Exchequer provided €46.8 million (51%) to the Programme with €9.7 million[5] (11%) and €35.1 million (38%) contributed from the EU and farmers respectively. A core principle under the NFAHS is to ensure funding of animal health programmes is informed by a formal evaluation of benefits and costs.

The overall cost of the Programme has increased by over €8 million between 2015 and 2018. This has been funded through additional contributions from the Exchequer (+€7 million) and from farmers (+€2 million) which was offset by a reduction in EU funding. The increasing national herd has resulted in additional bTB tests paid for by farmers. Also receipts from

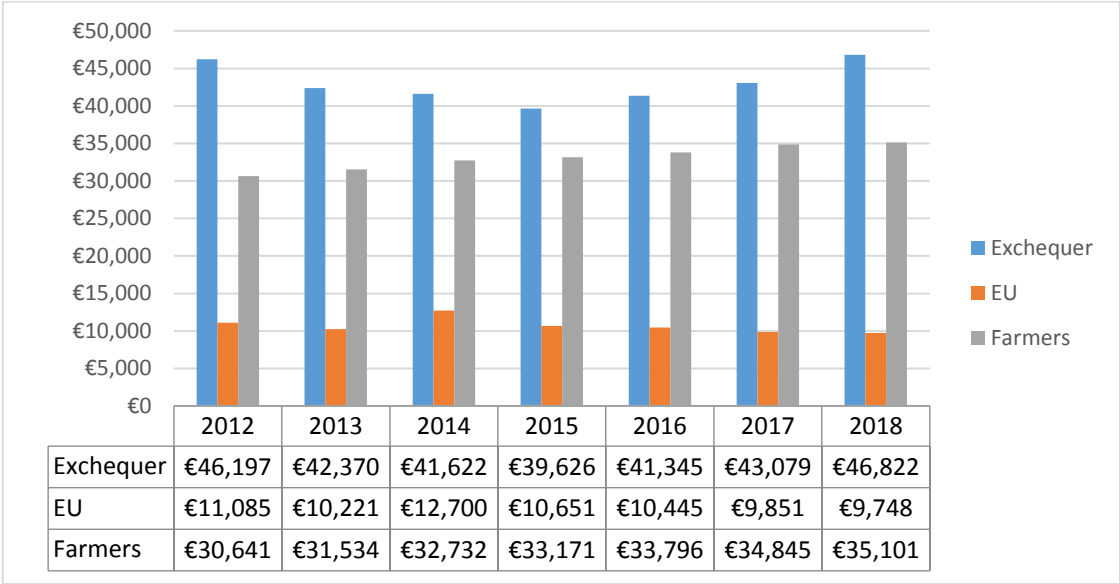
[5] This was the assumed EU co-funding contribution which may be subject to a 10% penalty related to deteriorating headline disease metrics

bovine disease levies have been an on upward curve reflecting increased output in beef and dairy.

EU funding was expected to be €9.7 million in 2018 and is capped at €8.3 million in 2019. This compares to funding of €12.7 million in 2014 which represents a 35% reduction in five years. The observed trend, as well as policy developments at EU level, suggests further significant reductions are likely in the future. The conditionality of qualifying for EU co-funding is that the Member State is making demonstrable progress towards eradication. Penalties of up to 100% of co-funding can be applied if Commission experts deem that sufficient progress or efforts are not being made towards eradication. Any reduction in EU co-funding, through reduced ceilings or penalties, will create a funding shortfall and the remaining stakeholders will need to address this issue.

Following three consecutive years of deteriorating headline metrics in relation to Ireland's bTB Programme, there is provision in the Commission's co-funding guidelines to impose a 10% penalty in respect of 2018 Programme funding. If this penalty is imposed, this would equate to just under €1 million. In the event that there is a further deterioration in headline disease metrics in 2019, the standard policy from the Commission is to implement a 20% financial penalty. This would equate to a penalty of €1.7 million and result in EU co-funding falling to €6.6 million. If such penalties are imposed, replacement funding should accrue from remaining stakeholders.

Figure 3: Breakdown of net funding ('000)[6]



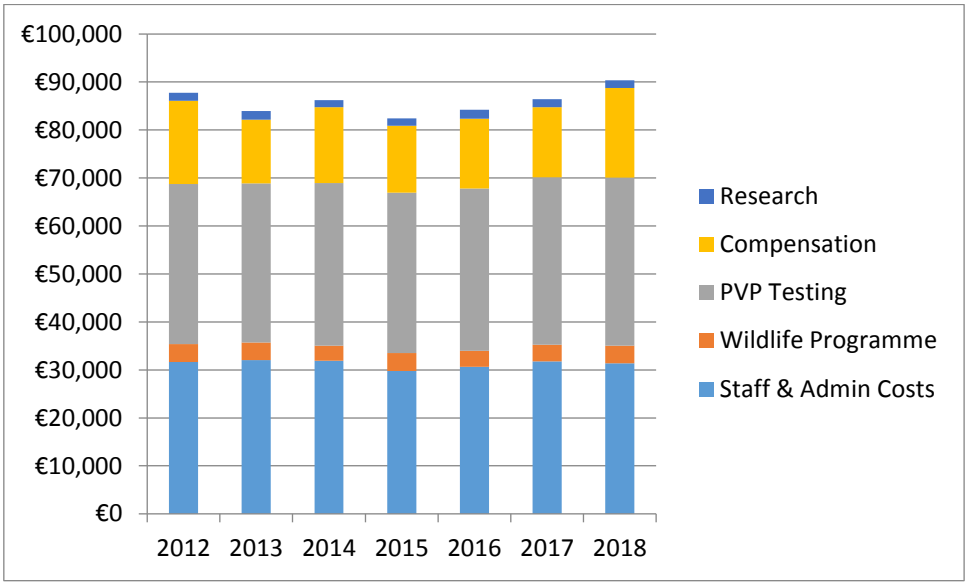
	2012	2013	2014	2015	2016	2017	2018
Exchequer	€46,197	€42,370	€41,622	€39,626	€41,345	€43,079	€46,822
EU	€11,085	€10,221	€12,700	€10,651	€10,445	€9,851	€9,748
Farmers	€30,641	€31,534	€32,732	€33,171	€33,796	€34,845	€35,101

Note: Farmer fees include cost of testing and bovine disease levies
Exchequer contribution includes DAFM staffing cost of c. €28.3 million

[6] Net funding used for clarity as it represents the actual spend per annum. Gross funding by the exchequer does not deduct Appropriations-in-Aid received by the Exchequer i.e. bovine disease levies paid by farmers (€7.5m) and the EU funding (9.7m).

The fact that Programme costs have increased since 2015 is of concern given disease metrics have remained broadly stable. A full breakdown of the costs is provided in Figure 4. This shows where funding has been allocated and illustrates that the costs of testing and financial supports have increased over the period 2012-2018, while the remaining costs stayed relatively static.

Figure 4: Breakdown of Programme Expenditure



Financial Supports

Financial supports provided under the Programme are further divided into categories in Table 2. The On-Farm Market Valuation (OFMV) scheme is by far the most resource intensive of these, as it refers to the value paid to farmers for reactor animals removed from the herd. These values are calculated based on a system which provides for the open market value of the reactor to be paid to the herdowner as if it the animal had otherwise been healthy.

The other financial support schemes refer to an income supplement scheme, a hardship scheme and a depopulation grant to assist farmers for consequential income losses or costs arising from lower stock numbers, or through feeding animals that cannot be sold, or to re-stock herds after de-restriction.

Table 2: Financial Support Payments 2012-2018

Financial Support	2012	2013	2014	2015	2016	2017	2018
OFMV	€14,256	€10,478	€12,919	€11,272	€11,261	€10,500	€14,255
Other Supports	€2,419	€2,192	€2,307	€2,127	€2,731	€3,545	€3,832
Valuer Fees	€643	€607	€563	€531	€533	€539	€548
Arbitration	€7	€4	€11	€10	€12	€15	€11
Total	**€17,325**	**€13,281**	**€15,800**	**€13,940**	**€14,537**	**€14,599**	**€18,646**

Note: amounts refer to '000s of euro

Financial support payments had been on a broadly downward trajectory between 2012 and 2015 reflecting a drop in herd incidence from 4.26% to 3.37% and reactor numbers falling from 18,476 to 15,317. However, support payment costs in 2018 relative to 2015 have increased by €4.7 million (34%).

Costs of the OFMV Scheme are influenced by the:

- Number of reactors
- Salvage value of reactor – money paid directly to herdowner by slaughtering plant
- Gross Differential Amount (GDA) – value of reactor as determined by independent valuer less the salvage value

As Table 2 illustrates, the cost of the OFMV scheme in 2018 increased by 36% relative to 2017 largely reflecting lower salvage values, higher market values for reactors and a subsequent elevated GDA. In line with wider beef market conditions, bovine salvage values have been under significant pressure. Separately, as illustrated in the Teagasc National Farm Survey (Teagasc, 2019), income levels among dairy enterprises are significantly in excess of other bovine enterprises which may have encouraged a shift in the national herd towards greater dairy numbers. The market value of dairy animals is largely associated with their breeding and milk production while the salvage value of dairy animals is typically much lower than non-dairy animals. Taking account of all these factors, the average GDA has been increasing and conversely the average salvage value as a proportion of the overall market value has been decreasing.

Table 3 highlights the breakdown between GDA and average salvage value in recent years. It is important to note that prices can vary significantly between and also within years as shown by the end of June figures with the end of year. The table shows an increase in GDA compared to a decrease in salvage value which increases the proportion of the final value paid under the OFMV. The proportion of payment paid through the OFMV has varied from a low of 48% in 2016 to a high of 58% in 2018. Latest figures to 2019 show a 55% coverage under the OFMV. This implies a depression on values through the salvage market price, without a proportionate decrease in market values for cattle sales.

Table 3: OFMV payment breakdown

	2015	2016	2017	2018	2018 to end-June	2019 to end-June	2018 June	2019 June
GDA per head	€698	€661	€599	€718	€705.20	€727.36	€756.6	€696.6
Average Salvage Price per head	€560	€531	€583	€544	€569.88	€467.50	€548.2	€500.7
Payment per head	€1,258	€1,192	€1,182	€1,262	€1,275	€1,195	€1,305	€1,197

Financial support payments represent a significant cost to the bTB Programme. While support payments are important to assist herdowners experiencing a bTB related restriction, stakeholders must ensure adequate safeguards are in place to address any moral hazard risks. In examining the impact of support payments on farmer behaviour in bTB eradication programmes, other jurisdictions have raised concerns that compensation may reduce the incentive for industry to take ownership of the problem. It is questionable whether allocating €18.6 million (20% of Programme costs) for financial support for the 3.5% of affected herds is consistent with these guiding principles. It is understood that CAP Reform proposals allow for the adoption of mutual insurance schemes under Article 70 for use as risk-management tools to finance compensation expenditure. This is also an option put forward by the English 'Bovine TB Strategy Review' chaired by Professor Sir Charles Godfray (Defra, 2018)

The bTB financial support system in Ireland is unique in providing additional supports (namely, the income supplement and depopulation and hardship grants) to the valuation scheme which is more common in other countries such as the UK. Expenditure related to the additional support schemes totalled €2.1 million in 2015. It is noteworthy that this increased to €3.8 million in 2018 representing an 80% increase in four years. This is primarily related to significant policy changes adopted in 2016. Prior to implementation, estimated costings related to these policy amendments was €480,000 per annum. These changes relaxed the criteria for which herdowners qualify for additional compensation and increased the rates of income supplement that herdowners receive. For example, income supplement for each qualifying dairy cow taken as a reactor increased from €25/mth to €55/mth for the duration of the restriction. The policy rationale for increasing support rates at this time was to more accurately reflect the income foregone associated with a bTB restriction.

Q3 - International Best Practice?

The Irish bTB Eradication Programme shares common similarities with international counterparts, as well as significant differences. Other countries may have succeeded in eradicating bTB, but it is important to note the differences in circumstances that apply to each context. For example, their context for wildlife was different, or they did not have the same cattle movement system as the Irish production system, or suffer the same motivational issues that have characterised the Irish case (Sheehy and Christiansen 1991).

The bTB Stakeholder Forum established in Ireland in 2018 to discuss methods to progress the goal toward eradication is similar to a forum established in Northern Ireland in 2014 (DAERA, 2016) as a bid to strengthen brand perception through eradication of the disease representing a new cooperative approach. Their 38 recommendations made by the Northern Irish Forum across 7 themes included:

- A new governance structure with oversight from a national body supported by regional and local teams
- Improved communication and knowledge transfer plans to change culture towards prevention
- Improved tools and processes around testing and dealing with suspect animals
- Continued review of wildlife influence
- Improved herd health management
- Capping compensation levels with a plan to future reductions as progress is made
- Continued investment in research to identify and disseminate new innovations

A similar review of a bTB programme was conducted for England and published in October 2018 (DEFRA, 2018). This report found that a lot of attention focussed on the wildlife threat of TB particularly in relation to how to deal with badgers, but little focus was drawn to on-farm bio-security measures, and trading practices where high-risk animals frequently moved from farm to farm, with 'risk-based trading' highlighted as a potential solution to the latter point. Similar to the Northern Irish case, the English report found that new governance structures were needed, increased ownership of the issue for farmers supplemented with an appropriate advisory programme and improved surveillance methods. The report draws two broad conclusions which resonate with the Irish case, namely:

- TB eradication is complex and controls must build in flexibility to the systems in place and to ensure new insights developed through research are incorporated into the policy
- Given the complexities it is imperative that the multiple rules and regulations that are necessary to achieve the objective of eradication are considerate of the consequences for stakeholders in executing the necessary measures to accelerate progress.

The Welsh government also published a report on bTB eradication in 2017 (Wales Assembly, 2017). Their key recommendations included:

- Setting a target date to be officially bTB free
- Setting interim targets at short, medium and long term timelines to ensure progress
- Conducting research on risks associated with larger herds and slurry spreading
- Applying latest evidence to improve testing practices
- Developing an online bio-security package farmers can implement on-farm
- Encouraging informed trading i.e. risk-based trading
- Intensifying efforts to control risk from wildlife whilst keeping evidence under review
- Ensuring all evidence produced is disseminated and transparency within the process
- Facilitating cross-border cooperation with their English counterparts
- Offering reasonable compensation to farmers affected with levels kept under review
- Ensuring funding deficits due to EU withdrawal are met by Welsh government
- Seeking assurances from UK government that bTB status will not affect access to EU single market

Australia's approach was a policy originally wholly funded by the Australian government that subsequently received support from industry and cost sharing that developed social expectations as to bTB being a priority and eradication was achieved. New Zealand has a similar experience to Australia, in that their successes are largely due to collaboration between private and public stakeholders to achieve a common goal. New Zealand also employs a form of 'risk-based trading' where buyers in the market have full information on the risk associated with purchasing from other herds similar to the system being introduced in the UK. In the New Zealand case, farmers are classified based on risk, and then can only trade with a similar class to prevent cases where farmers considered high-risk are prohibited from selling to low-risk. In addition, New Zealand does not offer any form of financial support for herds that have suffered a breakdown. New Zealand also has a wildlife issue, namely through the possum, but are not constrained by the Bern Convention as possums are an invasive species in New Zealand and so they can cull possum as needed.

Other EU countries outside of Ireland and the UK do not have significant problems with bTB. Spain and France have certain areas with cattle bTB problems but the wildlife hosts are different and the challenges in controlling wildlife interface transmission more amenable to controls and therefore their eradication policies were more successful.

Irish officials are in regular contact with international colleagues in respect of their bTB Programmes with a view to learning how to strengthen the Programme further. The Irish Programme is recognised as being robust. A policy tool which has been part of other successful eradication programmes is 'Risk-based trading'. While consultation documents in advance of the bTB Stakeholder Forum explored this issue, the Forum's Interim Report has not advocated its inclusion in the Irish bTB Programme due to a lack of broad consensus..

4. Conclusion and Recommendations

Continued Relevance

The discussion in this Spending Review provides an overview of the issues, and potential options that could enhance the existing bTB eradication programme. Clearly, the relevance of having a bTB eradication policy is of key strategic importance given Food Wise 2025 targets, and developing new markets for cattle based output particularly in the case of market access to China. The structure of bovine farming in Ireland has changed in recent years, particularly since the abolition of milk quotas and the subsequent expansion of dairy farms. More intensive farming practices associated with larger herds is recognised as posing a greater risk of disease transmission from animal to animal, and will require an appropriate policy response to mitigate this potential risk. On that basis, the need to eradicate bTB becomes increasingly relevant to reflect the evolving nature of bovine related production in Ireland.

The current trends in Ireland related to bTB are static (and arguably slightly deteriorating) and without further actions the target of eradication by 2030 will be challenging. Without further progress and at current spending (c. €92 million per year), an additional €1 billion will be spent by 2030. Accordingly, additional actions are necessary to accelerate the progress to ensure the target of eradication is achieved. For example, as outlined by More (2019), eradication of bTB in Ireland would not have been possible in the absence of a badger vaccination programme. Following the successful trialling of badger vaccine, it was formally adopted as a key component of the bTB Programme in early 2018 (DAFM, 2018a). This research represents an important milestone for all stakeholders that eradication is now possible and will be achieved if appropriate further measures are adopted.

Previous reviews have identified issues that continue to persist in relation to bTB eradication. For example, Sheehy and Christiansen (1991) conducted a Cost Benefit Analysis and estimated the benefits of the scheme at £146 million (7% of total cattle and milk output in 1988), although they acknowledged that this is based on a subjective view as there is no counterfactual of a non-bTB scheme environment for comparison. In addition, they also noted that costs were typically inflated based on difficulties disaggregating veterinary tasks to isolate bTB related work, and the opportunity costs incurred at a time of high unemployment in Ireland. In contrast, benefits were likely deflated as they were based on the present values at that time and that they cannot accurately estimate the productivity gains or attribute the expansion of the herd to the bTB scheme which undoubtedly facilitated this growth. Quantifying the benefits of the programme at present is met with similar challenges in terms of a non-existent counterfactual for comparison. However, it is crucial that the benefits of the programme are considered in any discussion that refers to costs, as there is an associated impact from incurring those costs. A similar type of Cost-Benefit Analysis on the existing iteration of the Eradication scheme would inform this discussion, with a view to providing an updated and accurate representation of both the costs and benefits over time, and therefore identify the optimal way to fund the Programme going forward. This includes the breakdown of that funding among the public and private stakeholders, and to ensure the remainder of the programme is funded sustainably to drive toward eradication as envisaged.

Furthermore, the Public Accounts Committee in 1994 found that stakeholders preferred taking the 'softer' policy options at that time. Since then, the possibilities to achieve eradication have developed due to advances particularly towards mitigating the threat from wildlife infection. Implementing 'softer' policy options may be insufficient at this point as the level of bTB infections has flat-lined and there is a danger of further increases given the current structures outlined above. These challenges pose a risk to achieving the objective of eradication by 2030 and towards gaining market access to other trading partners as evident in the beef market access to China. Thus, additional policy measures are needed to continue the progress towards eradication, and these are likely to provide a significant challenge for stakeholders. This issue was discussed in the bTB Forum and a number of initiatives were put forward that are currently being considered by the Minister. The international experience indicates a shift toward knowledge transfer activities to promote on-farm behaviours that can improve biosecurity against the risk of bTB, and capping compensation regimes and/or reviewing existing rates more frequently. These options are worthy of further consideration for the Irish case.

Recommendations

This paper has highlighted a number of factors that have been effective at driving towards the eradication of bTB in Ireland. The setting of an ambitious target date for eradication by 2030 follows a similar approach in Wales and has acted as a powerful motivational tool to unite stakeholders under the common objective and identify solutions to accelerate progress towards eradication. However, a number of issues remain that must be addressed if eradication is to be achieved by 2030 as intended.

Ensuring that all stakeholders are involved and contribute to developing initiatives to accelerate progress towards eradication is essential. This was credited as a key driver of eradication in Australia and is central to the strategies from the other countries in their pursuit of bTB free status. Governance proposals from the bTB Forum have advocated a similar approach in Ireland to facilitate this process and while agreement will not always be possible, a number of targeted policy proposals have already been put forward that are now being considered by the Minister for Agriculture, Food and the Marine. The current programme is delivered via a mixture of private sector (PVPs, Farm relief service, haulage contractors etc.) and public sector (DAFM) actors; this mixture and the balance of private sector and public sector actors used in the delivery of the various elements of the programme should be kept under review to ensure that it remains appropriate and effective while delivering value for money.

The role of farmers themselves is critical to achieving eradication through a series of on-farm measures, but there appears to be a knowledge gap on the necessary actions and a lack of clear incentives in relation to the motivations and drivers which would encourage farmers to take additional actions to reduce the bTB risk to their herd. Therefore, an enhanced communication strategy through a range of channels coupled with clearer incentives for farmers to take action would be useful; and DAFM has now established a number of initiatives in relation to this (see 'confinement of TB' in Chapter 2). Furthermore, a communication strategy that is targeted at farmers to encourage on-farm measures are taken to improve bio-

security and prevent bTB from entering a herd would mitigate the risk of contracting bTB further. The Northern Irish, English and Welsh cases showed an emphasis on farm-level behaviour was important in terms of learning and applying measures on farm to reduce risks, but as yet the Irish case has not been as focused on this issue. Similarly, the international experience highlighted the risks associated with cattle movements and the transmission of bTB, which is also an area that could be addressed. It is also recommended to continue to work closely with Northern Irish counterparts to ensure both Programmes are aligned where possible, which is particularly relevant given the recent Blackspot Action Plan implemented in the Monaghan region.

The bTB Stakeholder Forum Interim Report has proposed a number of initiatives which have the potential to further mitigate cattle-to-cattle disease transmission. These are welcome but further measures may be required if the stated eradication target of 2030 is to be attained. Options should be explored to reduce reactor removal timelines as each additional day spent on a holding increases the risk of disease spread. Policies need to be consistent with the objective of protecting the 97% of herds that are bTB free which should be a recognised priority amongst all stakeholders in the plan to eradicate the disease. Whilst many other countries have introduced a form of risk-based trading, the appropriateness of a similar system in Ireland may be worthy of further consideration in the context of protecting the 97% of herds which are not infected with bTB. The issue of recurrence must be addressed more comprehensively through the Programme to increase the likelihood of achieving eradication.

The recent trends in expenditure on financial supports should be re-examined as they represent a main driver of the increasing cost of the bTB programme, and Ireland is unique in providing additional financial support above compensation for the loss of animals only. This is not to say that there should not be any financial support for farmers as they endure significant hardship during a breakdown. However, given the observed significant cost increases for financial support at a time when herd incidence has remained broadly stable, this area warrants further discussion. The level of financial support should be balanced to assist farmers who have experienced a bTB breakdown and subsequent losses in the first instance, but must also counteract the moral hazard of potentially encouraging excessive risk-taking behaviour.

It is also important to note the importance of funding research activities so that new tools to reduce disease transmission can be developed and to enable a continual evaluation and improvement of policy based on scientific findings. The advances in the wildlife programme are an example of a breakthrough that has enabled the possibility of eradication. Research on transmission at the cattle/wildlife interface is continuing, particularly in relation to badger culling and vaccination. Further research into the risks posed by deer should also be considered. Continued efforts should also be on-going to improve surveillance techniques to ensure risks are minimised.

Another example of bTB research leading to new tools to reduce bTB levels is the research on genetic resistance of cattle to bTB. Teagasc research has shown that the variation in genetic resistance to bTB among bulls leads to very significant differences in outcomes for their progeny following exposure to bTB. Through the Irish Cattle Breeding Federation database,

sires have been identified that confer more resistance on their progeny than other sires which is important information to consider when estimating breeding values, enabling farmers to select sires whose progeny are less likely to become infected to bTB (Oireachtas, 2018).

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6. Quality Assurance

Quality assurance process

To ensure accuracy and methodological rigour, the author engaged in the following quality assurance process.

☑ Internal/Departmental

- ☑ Line management
- ☑ Spending Review Steering group
- ☑ Other divisions/sections
- ☑ Peer review (IGEES network, seminars, conferences etc.)

☑ External

- ☑ Other Government Department
- ☑ Steering group
- ☑ Quality Assurance Group (QAG)
- ☑ Peer review (IGEES network, seminars, conferences etc.)
- ☑ External expert(s)

☐ Other (relevant details)

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