

ANNEX C

FARM PRACTICE AND BIO-SECURITY

Infectious disease represents a major threat to the productivity and welfare of cattle herds throughout the world. The introduction of infectious agents into farms may be through direct transmission (purchased cattle, reintroduced resident cattle and contact with contiguous cattle) or indirect transmission (fomites, visitors, other species, and biological materials) (Mee et al., 2012)

The importance of implementing bio-security to aid in controlling infectious disease at farm level is recognised internationally (EC, 2007; Conraths et al., 2011; Maunsell and Donovan, 2008; More, 2007; Negrón et al., 2011)

There are many definitions for bio-security, including “The actions taken to ensure the prevention of disease-causing agents entering or leaving any place where farm animals are present or have been present recently. It involves a number of measures and protocols designed to prevent disease causing agents from entering or leaving a property and being spread.” (Speijers et al., 2015)

Bio-security may be divided into components;

Bio-exclusion (external bio-security) - preventing the introduction of new infection or diseases into a population from an external source

Bio-management (internal bio-security) - reducing the spread of disease among animals on premises where infection is present, and

Bio-containment - preventing the escape and spread of pathogens already present within a population to other populations (Adapted from an article by Pat Hoffman, Genus Genetics <http://www.genesus.com/global-tech-report/bio-security>). .

The application of bio-security measures provides protection against a wide range of infectious diseases. Therefore the promotion and uptake of improved bio-security practices for any disease should have an overall positive effect on herd health. For example the bio-security measures that are recommended in relation to the BVD eradication schemes in NI and the ROI, would also have positive effect in protecting against the spread of a broad range of infectious diseases.

However, currently there is a lack of consensus internationally in the published literature regarding bio-exclusion protocols (Daly, 2011; Moore et al., 2008), their efficacy (Faust et al., 2001; Van Winden et al., 2005) and their cost-effectiveness. These barriers may explain the slow adoption of such practices by many farmers (Gunn et al., 2008; Heffernan et al., 2008; Moore et al., 2008).

Farmers need to be motivated to both change existing behaviours and to continue to implement effective practices to avoid bio-security breakdowns (Truyers et al., 2010). It is easy for government to recommend a raft of measures, based on first principles, that should be effective but there is little empirical evidence upon which a farmer decide on the most effective measures to implement in their situation. The relative

importance of each risk, and counter measure, varies with the disease, the locality and the farm business. Therefore farm specific advice is important.

On the basis of the evidence it has gathered and recent work conducted in NI **TBSPG** believes that on-farm bio-security could be substantially improved. This will potentially reduce transmission of disease within a herd, between farms and to and from wildlife (Godfray et al., 2013).

1 Improving bio-security to reduce risk

1.1 Issue

It has been shown that on many farms within Northern Ireland, the active uptake of effective bio-security measures has been less than satisfactory (O'Hagan et al., 2013). This is due to a variety of factors; lack of knowledge, farm layout, farming culture, cost concerns, time and the practicalities of implementation. A recent AFBI study concluded that the main factors are time and cost (Speijers et al., 2015).

Studies elsewhere have highlighted how the implementation of bio-security at farm-level is often sub-optimal, and poor or inappropriate knowledge-transfer is often cited as a potential cause (Brennan and Christley, 2012; Derks et al., 2012; Gunn et al., 2008; Heffernan et al., 2008; Moore et al., 2008; Sanderson et al., 2000; Sayers et al., 2013; Schemann et al., 2011).

The practical implementation of bio-security at farm level requires knowledge of the pathogens that constitute a threat to the farming enterprise and also of the livestock production system in operation (Graham et al., 2008; Larson, 2008).

Relevant input from different experts may be required, for example using the combined expertise and experience of PVPs and Dairy Advisors to provide a useful, industry-recognised means of communicating bio-security advice to dairy farmers (Brennan and Christley, 2013; Gunn et al., 2008; Hernández-Jover et al., 2012; Jensen et al., 2009; Sayers et al., 2013; Schemann et al., 2012; Vergot et al., 2005).

Poor communication amongst stakeholders (Gunn et al., 2008; Vaillancourt and Carver, 1998) and the provision of conflicting information from multiple sources result in confusion and apathy amongst farmers with regard to the implementation of bio-security (Moore et al., 2008).

Wells (2000) highlighted the need for effective bio-security to be adaptable, decision-focused, and underpinned by a sound understanding of basic bio-security principles and disease epidemiology. Sayers et al provided an 'importance-ranking' of a number of bio-exclusion/bio-containment measures, a resource gap identified by Moore et al. (2008). They drew attention to the fact that the importance of measures may vary between farms (Maunsell and Donovan, 2008) and to an 'education gap' amongst PVPs, highlighting a need for further training/greater awareness in this area. The study illustrated that the use of the bio-security weightings could provide a simple but useful risk assessment tool to engage farm clients with issues relating to bio-security. (Sayers et al., 2014)

The risk factors associated with TB are well documented (Skuce et al., 2012). A proportion of the risk may be mitigated by government intervention through the introduction of evidence based legislation and implementation of disease control policies. A proportion of risk will remain within the farmers' control and may be mitigated by the application of bio-security measures. It is reasonable to conclude that failure by both parties to take steps to reduce the known risk factors will have a negative effect on progress towards eradication.

In general, the most consistently identified risk factors are biologically plausible and consistent with known transmission routes involving a) cattle-cattle and b) badger-cattle spread. Risk factors will vary across regions due to factors such as differing farm structures, farm management practices, local TB control, and the relative importance of specific risk factors within individual areas.

The risk factors that have been most consistently identified in relation to bovine TB, particularly in recent UK and Ireland studies include historic incidence, farm area, cattle movement, occurrence of TB on contiguous premises and/or the level of bovine TB in surrounding areas (infection pressure or force of infection), and herd size.

The literature review states that taken together, these studies illustrate the complexity of the host/pathogen/environment interactions or "epi-system" in bovine TB and the variation in study design and outcome. It may not be possible to reliably identify particular risk factors which could be widely adopted and predicted to lead to reduced transmission of disease to and from cattle. It should be appreciated that environmental features are rarely controllable by the herd keeper.

In summary there are two key bio-security related risks

- a) Contact with infected cattle
- b) Contact with infected wildlife (including an infected environment).

More is known about the risks associated with contact with infected cattle, with cattle movement and contiguous spread playing a prominent role. Where the risk has been analysed, and is understood, the evidence in support of the application of specific bio-security measures is stronger.

There are important gaps in knowledge about aspects of *M. bovis* epidemiology in badgers and how it is transmitted between badgers and cattle. Therefore advice in this respect may be more generic and the associated benefits less certain.

It is important that this context is recognised when providing advice so that farmers see it as realistic and understand the degree of certainty around the benefits associated with specific recommendations. This is not to take away from the importance of good bio-security; it is to maintain credibility and trust to encourage as high a level of uptake as possible.

DAERA currently provides a range of information both through its web site and also in a number of leaflets aimed at providing general advice and guidance to

farmers on bio-security. DAERA also provides, through the College of Agriculture, Food and Rural Enterprise (CAFRE), training and advice seminars on good bio security.

The TBSPG has heard from industry representatives, private vets and DAERA staff that from their experience the available information and education initiatives have not been particularly effective in changing attitudes or leading to significant improvements. TB bio-security is just one aspect of farming life demanding attention – there are multiple others (Robinson, 2014). However, evidence from the studies of farmers’ attitudes suggests that farmers have an interest in bio-security and TB bio-security in particular (Speijers et al., 2015). Actions are therefore required that will prioritise bio-security among the many things vying for the farmers’ attention.

A key aspect of the level of uptake of bio-security messages is attitudes, so it will be important to review progress and consider further development, or updating, of this work to identify strategies that will encourage livestock farmers to best achieve improved bio-security.

1.2 Recommendation

- It is recommended that herd keepers are pro-actively encouraged to **improve farm bio-security**, to take responsibility for bio-security on individual holdings particularly in relation to relevant risk factors that are relevant to their situation and over which they have control. For example cattle movement; contiguous contact; wildlife access to animal housing and feed stores, contractor hygiene and movement.
- It is recommended that a **bio-security assessment checklist** is developed and made available to farmers.
- It is recommended that PVP and DAERA staff **provide advice to farmers** about on farm bio-security measures to increase herd keepers’ awareness and knowledge, identify areas for action and improvement, and to help reduce the risk of TB breakdowns and disease spread. They may use the assessment form as a starting point.
- It is further recommended that, in the longer term, a system of **‘Improvement Notices’**, similar to that operated in Wales, is given consideration, if it is apparent that good bio-security practice is not being adopted voluntarily.

1.3 Rationale for change

Bio-security and good farm practice go hand in hand. Good farm practice is about operating a set of robust management practices designed to protect a holding, market or other place, from the entry and spread of pests and disease, and to prevent pests and disease leaving any premises to contribute to further spread. In addition, bio-security is enhanced by controlling the movement of people, vehicles, slurry and equipment within outbreak areas.

It is vital to break the cycle of disease to reduce, and eliminate, all known sources and methods of disease spread, whether between cattle or cattle and wildlife. We also recognise the cumulative effect that a range of small but effective improvements

in farm practices can have on the overall disease eradication programme. Improving the bio-security in a herd has the potential to produce a beneficial impact on neighbouring herds, so generally limiting disease spread. The opposite is also true.

As indicated above, the current application of bio-security measures by herd keepers is suboptimal. Improving the communication between PVPs and herd keepers with respect to bio-security is a means of bringing about change in attitudes and application. TBSPG recognise that the current arrangements between PVP's and the herd keeper are often limited to testing, with restricted scope in respect of broader engagement on reducing the risk of TB infecting a herd.. The main source that farmers say they look to for advice on disease control and bio-security issues are their PVP (Speijers et al., 2015). The Group therefore believe that enhancing that relationship and facilitating the provision of professional advice could have benefits for both the herd keeper, PVP and the eradication programme.

This recommendation will provide the herd keeper with as much evidence based advice as possible from a trusted source and enable the PVP to be more fully involved in TB eradication. It will potentially assist in reducing the risk of infection through the identification of general and specific risk factors relevant to that farm business, encouraging the farmer to make farm improvements and curtailing high risk management practices.

1.4 Evidence

Information from the industry briefings to TBSPG indicates that herd keepers and farmers would benefit from an enhanced and informed understanding of bio-security and disease prevention and how to implement effective measures based on good practice. This is also supported by findings from the TB bio-security study and the AFBI Bio-security Research Team.

A TBSPG consultation on its Interim Report in June 2015 reflected a recognition that the issue of poor bio-security is a contributory factor to TB infection and spread. In addition many environmental organisations advocated better bio-security as a means to reduce the risk of cattle to badger contact.

TBSPG has also met with representative bodies of farmers, private vets and with Departmental staff. These engagements provided examples of both good and poor practice on farms and evidence of a genuine willingness to improve matters.

The AFBI Bovine Tuberculosis Bio-security Study (O'Hagan et al., 2013) highlighted that all participating farmers found TB control important, with 81.3% of farmers stating it to be very important. While most farmers reported that they felt that current TB controls were adequate (62%), some 81.8% felt that they had enough information to help them control TB in their herd although 57.6% also stated that they would welcome additional advice on measures to prevent TB in their herd. Additionally, 25.3% of farmers said they would welcome an advisory visit on bio-security measures to prevent TB.

Bio-security measures were thought to make a significant difference to the risk of introducing TB infection according to the majority of farmers (67.7%), and this was

reflected in the farmers' preparedness to take further bio-security measures in the future; this was supported by 68.2% of farmers.

It was notable from the 2010-2011 survey that less than 10% of participating farmers took adequate bio-security measures concerning fencing off badger latrines, isolating cattle returned from a sale, show or contract housing, taking precautions to prevent badger access to housing/feed stores, installing solid gates/badger proof fencing around farm yard and fencing off badger setts to prevent access by cattle. There were other examples where there was significant room for improvement where less than 50% of farmers advised that they did not make arrangements with neighbours to avoid grazing contiguous fields, maintain a closed herd, or have solid doors to prevent badger access to housing/feed stores. The relevant implementation of these measures would greatly enhance the standard of on-farm bio-security for the majority of farmers in Northern Ireland, and as a result reduce the likelihood of infection entering their herd.

An ARD Committee Review of Bovine Tuberculosis in 2012 noted, as one of its recommendations, 'that DARD investigate how bio-security training and advice could be reinvigorated and delivered at a pace and in a setting that best suits the farmer and herd keeper' (Anon, 2012). This was followed by the publication of the 'TB Bio-security Study Report', referred to above, in November 2013 (O'Hagan et al., 2013).

Following on from this, work has been ongoing to ensure that TB bio-security training would be funded under the 2014-2020 Rural Development Programme (RDP)¹, under the Knowledge Transfer - Farm Family Key Skills measure. In addition it will be possible for farmers to apply for funding through the Farm Business Improvement Scheme – Capital Grants for assistance in provision of practical, on-farm bio-security measures. The Bio-security training will be delivered by both DAERA vets and PVPs to farmers participating in the Business Development Groups (~ 3,300) and under the Farm Family Key Skills measure of the RDP over a 5 year period.

TB bio-security training is currently being delivered through the College of Agriculture Food and Rural Enterprise (CAFRE) to students as part of the animal health modules of all relevant courses. In addition DAERA's 'TB & Bio-security' information leaflet² and its 'TB in Wildlife' leaflet³ are also disseminated to all attendees at CAFRE organised events, at its Greenmount Campus.

Additionally, farmers have on-line access to TB advice and, in particular, TB breakdown farmers receive a printed copy of DAERA's "TB in your herd" booklet and bespoke VO advice during the course of any breakdown. At the suggestion of PVPs, the Department developed and published a webinar in August 2015 to further assist the dissemination of targeted advice to PVPs and farmers regarding good preventative and bio-security practices. See link below:

¹ DARD 2014-2020 Rural Development Programme:

² TB & Bio-security' information leaflet: <https://www.daera-ni.gov.uk/sites/default/files/publications/dard/bio-security-measures-tb-leaflet.pdf>

³ TB in Wildlife leaflet: <https://www.daera-ni.gov.uk/sites/default/files/publications/dard/tb-wildlife-bio-security-leaflet.pdf>

<https://www.daera-ni.gov.uk/articles/tb-bioexclusion-webinar>

The above aspects of bio-security advice include mitigation of risks relating to animal movements. Divisional Veterinary Office staff has been trained to give bespoke advice to farmers in relation to identifying where badgers may have direct or indirect contact with cattle and the practical steps that can be taken to reduce the risk.

Sayers et al. (2013) concluded that bio-security is a cornerstone of disease control and suitably designed and demographically-relevant education programmes are required to ensure optimal farmer participation in its implementation and that differences in the implementation of bio-security require further investigation to ensure the correct design and targeting of educational tools and the effective dissemination of information on bio-security to farming communities.

1.5 Detail

The new Rural Development Programme (RDP) will include measures which farmers will be able to apply to support effective bio-security improvements. The Farm Family Key Skills element of the RDP will have a role to play in terms of knowledge transfer in respect of improving farm practice and bio-security through;

- a. Initially a bio-security farm 'good practice' assessment check list will be developed. It will be generic and available to herd keepers to complete at any time but, under the terms of the new TB Testing Services contract PVPs will complete the assessment form once a year at a TB herd test visit. The assessment will focus on measures which could reduce the potential for entry and spread of infectious disease and, where appropriate, measures to eradicate infectious disease from the herd.
- b. As a subsequent step an opportunity will be provided to have a vet visit, and complete a more detailed bio-security checklist, to tailor advice to the individual circumstances relating to the farm business. This would enable specific recommendations to be made, advice on how they could be achieved, and the potential benefits to herd health. On subsequent visits the farmer and vet could review progress against the checklist. Initially this approach would be to encourage and facilitate improvements, provide advice and could be supported by farm visits to see good practice in operation, facilitated through the RDP. In terms of the provision of enhanced and farm specific advice on bio-security PVP contracts will need to be revised to reflect this additional service.

The introduction of assessment checklists and working with vets to identify areas of improvement will, initially, be a voluntary one. After a period of time, and a review of progress, the new oversight body (TBEP) may consider the introduction of 'Improvement Notices' (see section 2 below)

The new oversight body may also wish to give consideration to linking compensation payments to repeated failure to implement bio-security measures.

1.6 Impact

TBSPG acknowledge that bio-security alone will not ensure that the risk of TB is negated; however the main factors associated with the risk of TB infection are well described in scientific literature and improving bio-security will reduce the risk of TB and other infectious diseases. It is the cumulative effect of all actions which will address the problem of TB and poor bio-security is an element that cannot be ignored.

Using PVPs, a trusted source of advice, in an advisory role to improve bio-security and farm practice will help change the nature of the relationship between the farmer and the vet whereby it is not one based on a testing regime but one of broader advice and support aimed at reducing risk and improving productivity.

The section on Culture and Communication talked about the need to changes hearts and minds for those involved in TB eradication. Making bio-security an accepted natural part of farming will be part of that cultural shift as will the change in the farmer and vet relationship. Raising the quality of bio-security across the Northern Ireland herd will also demonstrate a significant commitment by the farming community and the effectiveness of this partnership approach.

The impact of the message is likely to be enhanced the wider benefits are emphasized and a joined up approach is taken with other programmes, schemes or bodies to reinforce the message in the farmers' eyes.

1.7 Timeline

A bio-security assessment checklist will be made available as soon as possible (likely to be October 2016). Following Ministerial agreement on the Strategy, work will begin on the development of a more detailed bio-security checklist with appropriate engagement with PVPs and industry representatives.

After finalisation of an agreed checklist, its use will be trialed in 2017. There would then be a short implementation review 12 months post implementation to enable an assessment of the uptake and effectiveness of the checklist.

It is recognised that DAERA currently has no legal basis to link compensation with bio-security. If this is something that the new oversight body believes would be beneficial, following review, then this will require an amendment to primary legislation (Article 18(6) of the Diseases of Animals Order (NI) 1981) and the introduction of an independent appeals mechanism.

2 Improvement notices

2.1 Issue

. As outlined in 1.5 above, TBSPG and DAERA hope that all farmers will be proactive and receptive in relation to the implementation of effective bio-security measures on a voluntary basis in the interests of the health status of their own farm and others. However in circumstances where advice is not acted upon, or is deliberately ignored,

the use of Statutory Improvement Notices could provide a mechanism to ensure that appropriate action is taken where the voluntary approach does not work.

2.2 Recommendation

- It is recommended that, after a period of time and a review of progress and available evidence, the new oversight body considers the **introduction of statutory Improvement Notices**, for use in circumstances where it is considered that on-farm bio-security improvements have not been implemented despite the identification of need and provision of consistent advice and support. It is anticipated that the choice of “improvements” to be eligible for inclusion in the improvement notices would be based on epidemiological evidence.

2.3 Rationale for change

The majority of farmers through support, advice and guidance either already operate good bio-security, or are willing do so (Speijers et al., 2015).

However, as in all walks of life, there are some who will ignore or refuse advice and fail to make positive changes. The damage that this small minority could inflict on other farms through negligence or refusal to make basic improvements could be significant in terms of disease spread. If there are instances where some farmers are repeatedly refusing to make recommended changes then there needs to be a mechanism available to enable DAERA to enforce these changes to protect farmers and tackle TB. The use of statutory Improvement Notices would be a formal mechanism available to DAERA to insist on improvements following repeated failure by a farmer to put in place basic bio-security measures. It is hoped that this would be a rare occurrence and that peer pressure from other farmers and discussion through the Disease Response Teams, would result in action being taken without recourse to the use of Improvement Notices.

2.4 Evidence

TBSPG has looked at the issue of whether Improvement Notices should be introduced on a statutory basis or be implemented as an administrative exercise. TBSPG concluded that in the medium to long term it would be essential to have in place strong effective tools and mechanisms to deal with the most intractable situations where the farming practices of particular individuals present a serious threat to the achievement TB eradication. Having taken the position that this could only be fully effective within the force of a statutory framework it is therefore recommended that consideration be given by the new oversight body to the introduction of statutory Improvement Notices, for use in circumstances where, following review, it is considered that on-farm bio-security improvements have not been implemented despite identification of need and provision of consistent advice and support.

2.5 Detail

On the basis of the evidence, it is anticipated that the vast majority of farmers would be supportive of improving their on-farm bio-security and working with their vet to implement positive measures that would affect change. Improvement Notices would only need to be considered if the new oversight body, following a review, considered that there was still an issue and that this presented a significant risk in the drive to eradicate TB.

The purpose of an Improvement Notice is to require changes to existing (or absent) bio-security measures when previous advice has not been acted upon. Improvement Notices should be seen as a deterrent for use in circumstances of continuous refusal by individuals to take identified actions necessary in the drive towards eradication of bovine TB.

An Improvement Notice would require the keeper, by a date specified in the notice, to take action(s) or to refrain from certain activities or practices for the purpose of preventing the spread of disease. These measures would be in addition to any other legislative requirements. The activities required as part of an Improvement Notice must be reasonable, proportionate and appropriate. Consideration could be given to make it an offence not to comply with an Improvement Notice. Improvement Notices could in time be linked to possible reduction in compensation. However, there would need to be clear evidence of non-compliance in order to proceed with a reduction in compensation.

2.6 Impact

Not all farmers exercise good practice in bio-security and in so doing increase the risk to their own herds and to other herds. If the introduction of Improvement Notices is deemed necessary this would be to seek to force the small minority of farmers who do not put in place minimum bio-security measures to take specified action to reduce the risk of disease introduction and spread. This would help to protect the majority of farmers who do take bio-security seriously and also send a strong message that the new oversight body and government are determined to be proactive in a joint effort to eradicate TB.

2.7 Timeline

In the medium term, and following the introduction of necessary legislation, statutory Improvement Notices could be introduced. These notices could be linked to the available compensation payable in the event of a bTB outbreak. However, it is recognised that DAERA currently has no legal basis to link compensation and bio-security. To do so will require an amendment to primary legislation (Article 18(6) of the Diseases of Animals Order (NI) 1981) and the introduction of an independent appeals mechanism.

3 Informed purchasing

3.1 Issue

A significant risk factor associated with bTB is the purchase of animals. Studies in the Republic of Ireland have suggested that 6-7% (Clegg et al, 2008) or 15-20% (Griffin et al., 1993; Denny and Wilesmith, 1999) of herd breakdowns can be attributed to the purchase of infected cattle. In Northern Ireland purchased animals were identified as the probable cause of infection in 13% of breakdowns by DAERA Veterinary Officers. In Northern Ireland it has recently been shown that movement intensity into a herd is a significant factor in the recurrence of TB breakdowns (Doyle et al., 2016).

There were over 2.2 million animal moves recorded in Northern Ireland in 2011, most were to slaughter but over 0.5 million were from farm to farm/market/export centre or show (VEU, 2015).

Herd breakdowns due to bovine tuberculosis (bTB) have been found to be strongly associated with cattle movements (Gilbert et al., 2005). Purchase of stock, in particular from markets, has also been significantly associated with the risk of bTB breakdown on farm, even in areas endemic with bTB (Ramírez-Villaescusa et al., 2010). Gopal et al. (2006) described purchased animals as the most likely source of bTB introduction in 30/31 outbreaks discussed. These new introductions are an important cause of persistence as herds are re-exposed and possibly re-infected each time cattle are purchased. (Adkin et al., 2016)

Farmers buy directly from markets, use the services of a dealer to buy on their behalf or buy from other farmers directly. Purchasing decisions are largely based on price, experience and local knowledge, viewing on the day of sale and discussion with the seller, if present.

An important disadvantage with this process is that the TB testing histories of the selling herd and the animal are missing in the decision-making process. A farmer may wish to minimise the risk of bringing potentially infected cattle into their own herd, and whilst a clear TB test does not guarantee that the particular animal is TB free, at the point of purchase, it does at least provide an improved level of information upon which to base an informed purchasing decision.

For bTB several eradication programmes have implemented Risk Based Trading schemes based on the number of years that a herd tests clear of disease. The Australian scheme coupled this herd classification with a ban on the movement of cattle from high risk farms/zones to low risk farms/zones, where zones were classified by a maximum permissible between herd prevalence (Cousins and Roberts, 2001; Adkin et al, 2016). In other words movement of cattle between herds is determined on the basis of herd and area risk (More et al., 2015)

In New Zealand, trade can occur between farms of differing bTB risk; however, the farm status is based on the lowest of all animals in the herd, deterring the purchase of lower status cattle (Adkin et al., 2016)

In 2013 a voluntary system in England was initiated where purchasing farmers are being urged to ask sellers the date of the last pre-movement test, date of last herd test and date of TB free status in a step towards starting the conversations needed. This approach is based on the probability of TB in a herd.

Such schemes need to be (1) practical: risk categories need to be presented in a simple, standardised and unambiguous way enabling rapid identification of different risk levels, (2) transparent: farmers need to be able to understand how risk scores are estimated and be able to gain sufficient information from those scores to make an informed choice at purchase, and (3) based on accurate and available data: in order for any scheme to work the information used must be robust, with categories and the relative rankings reflecting the risk that animals originating from that herd are infected.

Adkin et al. (2016) concluded that a trading scheme, on its own, will not completely prevent the spread of bTB from cattle movements, however, it may, in certain areas, contribute to the aim of reducing R0 (reproduction number), indicating spread of infection, to below one in combination with other measures.

Care is needed in identifying the data that will most accurately assist an interested buyer.

3.2 Recommendation

- It is recommended that the farming industry should lead in the **adoption of an informed purchasing** approach to bringing in stock to their farm.
- To promote information openness and transparency TBSPG recommends that **livestock markets be encouraged to display as much information** as is practically and legally possible to better inform prospective purchasers as to the level of potential risk from individual cattle being presented for sale. This will require leadership from industry to encourage the adoption of changes to buying practice. TBSPG is conscious that direct farm to farm purchases also take place, but even in respect of these transactions it should be possible, through awareness-raising and informed dialogue, for all parties to the transaction to determine, and share, the animal's TB test history before purchase and transfer.
- TBSPG is aware that information displayed must be compatible with data protection legislation, in particular that data which is considered "personal information" may require the permission of the individual before being displayed. In this context, informed support and leadership from the farming community will be required to make this recommendation effective.
- It is also recommended that **awareness-raising actions** on "informed purchasing" are put in place, as an integral part of the overall communications strategy, led by the new oversight body in partnership with industry.

3.3 Rationale for change

The aim of this recommendation is to reduce the risk of TB spread by using as many effective tools as are available.

When purchasing an animal a farmer is making a significant business investment for his farm. He or she wants to ensure that they get the best value animal which will improve their herd/business. What farmers don't want is an animal which potentially could have a negative impact on their herd by bringing disease in. So just as much as a farmer will look at pedigree or performance or even shape, they also should be able to consider the health history of that animal. All of this information will enable the farmer to make a value judgment on buying that animal.

Being better informed as to the TB test history and, where possible, the movement history of cattle being purchased allows the purchaser to make decisions informed by a holistic picture of the perceived level of risk.

It is acknowledged that the status of the latest test(s) of a particular animal will be no guarantee that the animal will not subsequently go down with TB, however it will provide a potential purchaser with a more informed picture of the health history of that animal that can assist a judgment in assessing the risks involved in completing the purchase.

3.4 Evidence

TBSPG fully considered and discussed in detail the use of herd classification and purchasing, based on herd TB history as operated in New Zealand. Discussions were also held directly with the head of TBFree New Zealand. Whilst we have much to learn from New Zealand and how they have approached the problem of TB with very strong leadership from the industry, the situation and structures in New Zealand are different from Northern Ireland, not least in the approach taken to eradication, and nature of wildlife. Additionally they are much further in their programme of eradication and industry is the lead body in delivery of the programme. TBSPG certainly feel that the New Zealand model is one which may in the future be considered. At this point based on the detailed consideration of these engagements it was concluded that the grading of herds based on TB history was not something which could be introduced to Northern Ireland in the short to medium term. However, this issue should be kept under review by the new oversight body.

TBSPG has discussed the approach taken to the display of information at marts being piloted in England with DEFRA officials. It has met with DAERA officials and discussed what information is available currently and also the constraints on what information can be shared in the context of data protection.

TBSPG acknowledges that buying cattle which have a clear test history is not a guarantee of removal of risk, given the complex nature of the disease, but believe that this approach to purchasing is one way in which farmers can reduce the risk of importing disease into their herd.

The 2015 TBSPG interim report sought views in respect of the display of TB test history and other information that may be beneficial to potential purchasers at livestock marts. Industry respondents indicated qualified support for such information being made available. It was suggested that such action(s) may be more appropriate later in the disease control programme, as their imposition at current levels of TB

incidence could have a negative impact on the market. The veterinary associations were supportive of the concept. Having considered this feedback the TBSPG recommend that this approach is adopted on a voluntary basis initially.

3.5 Detail

Using information held on APHIS/NIFAIS details of the last 3 years of an animal's TB test history could be displayed at livestock marts. Initially this would be by way of a voluntary disclosure by the selling farmer and the mart. Following review after a sufficient period of time, disclosure and display of information on testing could be made mandatory as part of a strategy to reduce overall risk relating to TB spread.

Further review by the new oversight body of the impact of this approach and acceptance by the industry could lead to an approach of herd classification based on herd health similar to that operating in New Zealand. It is acknowledged that the position in relation to eradication in New Zealand is different to that in Northern Ireland in terms of how eradication is being addressed and therefore, the system in operation in New Zealand would not, in TBSPG's view, be directly applicable to Northern Ireland in the short to medium term. It may be something which TBEP will give further consideration to once progress on eradication has been made.

3.6 Impact

The overall aim is to reduce the level of risk of bTB spread. Buying in cattle to a herd represents one of the major risk areas associated with the spread of the disease. Purchasing cattle with a known testing history should potentially reduce that risk though not totally remove it, given the complexity of the disease and the potential for latent infection and the sensitivity of the skin test.

A purchasing farmer will potentially achieve benefits in relation to improved herd health, reduction of importing risk into the herd, and in turn, when selling, a farmer will see a potentially higher sale price for cattle based on their health status at point of sale.

3.7 Timeline

Whilst accepting that it will be difficult to directly measure the impact on disease incidence given the multi-faceted nature of TB, TBSPG is convinced that on first principles this recommendation is a positive measure that will produce positive outcomes.

When the Strategy and recommendations have been agreed, the display of information should be trialed in 2018. A review of this should take place after 12 months, by the new oversight body, and if it is considered that the approach is beneficial to farmers and impacting positively on the reduction of disease, it should then be rolled out to all livestock markets in Northern Ireland.

A further review should be considered in 2021-2022 in terms of its effectiveness and uptake, and subject to the outcome of that review, the oversight body may then consider whether there would be benefit in making the availability, or display, of herd history a mandatory requirement.

4 Farm Fragmentation

4.1 Issue

The Group has been advised during evidence sessions that a farm unit may comprise land, either owned or taken in conacre, some of which could be located a considerable distance from the home farm. In the event of a TB breakdown, it is possible that cattle movements are taking place between such pockets of land thereby increasing the risk of the spread of TB to neighbouring herds. Conversely herds that are free of disease may put their animals at risk by moving them to land close to a TB breakdown. There is no central record maintained concerning such movements, and this lack of information could inhibit the timely traceability of potential disease risk factors. Currently there is no formal mechanism that can be applied to reduce the risk of spread both within and between land parcels.

4.2 Recommendation

- The Group recommends that DAERA undertakes a review of existing farm fragmentation data to establish whether the practice of farm fragmentation (conacre) adversely impacts on the control of disease following a TB breakdown.
- The Group also recommends that, in the interim, a formal means of reducing the risk of spread associated with fragmentation should be introduced. This should take the form of a notice which would be used to protect other herds that are at risk of disease spread from high risk groups within TB breakdown +herds. The notice would be applied by DAERA staff and would specify where animals must be kept, thereby preventing movement of high risk animals in breakdown herds to fields close to other herds. The fields may be within a particular land parcel or in a separate land parcel.

4.3 Rationale for change

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 to November) with no guarantee of renewal. This practice makes it very difficult for the farmer leasing the land to justify potentially expensive modifications to the conacre land to improve bio-security, such as constructing stock proof fencing.

It is understood that livestock farmers often farm multiple sites each of which could have ten or more different potential 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 disease risk, or are at risk themselves from other cattle or wildlife.

Currently there is no formal mechanism to reduce the risk of spread, other than by isolation of TB test reactor and inconclusive animals, within and between herds. This risk may be associated with a main farm holding and/or farm fragmentation. The FVO concluded that “The high amount of unregulated frequent movements of cattle that occur within, and into fragmented herds where the presence of bTB has been confirmed is likely to be contributing to: a) increase the levels of environmental infection with *M. bovis* and the probability of transmitting bTB to wildlife, b) expose cattle, even in distant geographical areas, to the risk of getting bTB, and c) feed the disease present in infected herds with susceptible animals that can further increase the probability of recurrent breakdowns.” (FVO, 2015).

4.4 Evidence

One of the observations in a paper assessing the Northern Ireland TB programme was that the nature of the farming industry here is conducive to the transmission of bovine tuberculosis among cattle. High herd and cattle density, small farm unit size and extensive use of outlying, rented pasture (“conacre”) facilitate cattle-cattle spread, exacerbated by significant between-herd movement and winter housing of cattle. (Abernethy et al., 2006). As an indication of the extent of farm fragmentation here, the herds in a study of intra-herd cattle movements (Abernethy, 2008) had a median of 3 premises (range 2-9) and the median distance between premises was 2.75 km (range 0.01 – 35 km).

The Group is aware that farm fragmentation, primarily due to the use of land taken in conacre, could inhibit disease control efforts following a bTB breakdown. This is thought to be due to fragmented farms having large perimeter to area ratio and this potentially lends to an increase in the number of neighbours with contiguous farms. Such fragmentation also means that there is likely to be an increase in animal movements across landscapes, which potentially increases the risk of disease spread within the breakdown herd, to other herds and to wildlife.

4.5 Detail

The Group understands that the DAERA protocol following a bTB breakdown is that a technical officer (AHWI) visits the farm and carries out detailed mapping of the premises and a farm fragment assessment of lands used or owned by the herd keeper. The officer discusses TB risks, including groupings and movements of cattle. DAERA VSAHG informs adjoining neighbours in writing where there is a disease risk and these farmers may be required to carry-out additional risk testing.

The Group appreciates that conacre land will continue to play a major role in livestock farming. It is also acknowledged that demand for grazing land means farmers will continue to rent pockets of land often over considerable distances with multiple contact herds.

However, cattle movements between the parts of the farm are not restricted and the herd keeper is not obliged to subsequently inform DAERA of such moves. Therefore

theoretically cattle could be moving from a TB infected herd in a high risk area to low risk areas, either to land owned or taken in conacre, without the knowledge of local farmers or seeking permission from DAERA. While we do not know the extent to which this occurs, it is appropriate that this potential gap in controls is reviewed.

There has already been some work done by the DAERA Veterinary Epidemiology Unit on farm fragmentation and considerable data has been collected by the DAERA VSAHG, or is available from existing GIS data, and it is the view of the Group that this information should now be consolidated and put to practicable use.

The Group is also of the view that it should be possible to reduce the risk of spread in a breakdown situation by segregation of high risk and low risk animals where applicable.

Segregation would be achieved via a notice (Segregation Notice) which would achieve the following;

- Groups of animals kept on parts of the farm stated on the notice
- Cattle not moved from the areas specified unless a movement licence has been received.

The main reason for the segregation notice is to protect neighbours and farms adjacent to conacre land taken by the infected herd;

The groups of cattle which are the greatest risk are identified and these groups kept as far away as possible from the rest of the herd, from neighbouring herds, and from other parcels of land that have not been grazed by reactor or inconclusive cattle.

Ideally to prevent risk, the boundary fields of the farm would not be grazed. If this is not possible then the lowest risk cattle should be on the boundaries of the farm with the highest risk cattle ideally housed in the centre. The VO will match the highest risk cattle to the safest areas of the farm.

Ideally these cattle should be housed. Otherwise, if suitable housing is not available, all cattle from the highest risk group should be kept on part of the farm away from other cattle groups and from boundaries.

The notice can also be used to state which parts of the farm should not be grazed or that may be grazed by certain low risk groups only. This may be because grazing of the land by potentially infected cattle poses a high risk to neighbours and/or the land is reported not to have been previously exposed to infected cattle.

If necessary cattle may be moved under a licence issued by DAERA and spot checks may be carried out to check compliance.

When the disease risk has reduced, the notice will be lifted from the herd.

4.6 Impact

The overall impact of farm fragmentation with regards to disease control needs to be considered as part of the review of existing data

The immediate implementation of the Segregation Notice should reduce the risk of spread of disease between herds. The application of the notice will have some impact on the farm business. It is envisaged that approximately 400 notices would be issued annually.

4.7 Timeline

The review of existing farm fragmentation (conacre) data should commence in 2017. The segregation notice will be implemented within 9 months of the start of implementation of the new strategy.

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