Summary of factors and costs associated with different bovine Johne's disease management options in Queensland

January 2014

Executive Summary

The Department of Agriculture Fisheries and Forestry (DAFF) began work in January 2013 on a *Scenario analysis for the management of Bovine Johne's Disease in Queensland* (Scenario Analysis, Attachment 1) as part of its normal response to a disease or natural disaster.

The Queensland cattle industry asked the Queensland Government for information to help them assess different bovine Johne's disease (BJD) management options. In June 2013, the early findings of the Scenario Analysis were discussed by Dr Jim Thompson in an industry forum. There have also been a number of updates to the Scenario Analysis as more information became available. DAFF has now finalised the Scenario Analysis.

In summary, the results show that:

- The cost of maintaining the Protected Zone status is estimated at $6 - $7 million for the original single infection node, approximately split between industry ($2.7 million) and DAFF ($3.6 million). Two nodes may increase costs to $23-25 million.
- Costs for destocking of infected properties are estimated at $1.5 million per commercial beef property, with a stud likely to incur costs substantially higher.

The total costs across industry of moving to a Management Area Scenario were not able to be accurately costed, as they would largely be borne by individual producers, depending on spread of the disease and how producers manage BJD at a property level over time (for example whether industry adopt measures such as market assurance testing programs).

Costs were able to be calculated at the industry level for scenarios relating to production losses caused by BJD infections (up to $300,000 per annum across beef and dairy), scenarios exploring the impacts on the export market including: loss of income to live cattle exporters ($10-$15 million per annum); costs of vaccination ($2-2.4 million) and reduction in farm gate price across industry ($16 million); and a hypothetical scenario to explore impacts on sensitive beef markets ($9 million per annum).

The Scenario Analysis undertaken by DAFF assesses data available to the Government in the context of possible future developments. Its conclusion is that maintaining the Protected Zone status buys safety at a predictable cost. The uncertain cost of managed BJD depends on the occurrence or absence of low-probability but potentially high-cost events such as loss of market access. This means that the scenario analysis is not definitive. It depends on stakeholder's views of the risk of loss of market access, due to BJD becoming endemic.

As a general conclusion, the higher the risk of loss of market access in the future due to BJD, the more appropriate the Protected Zone scenario becomes. The lower the risk of loss of market access, the more appropriate the management zone scenario becomes.

The Scenario Analysis undertaken by DAFF presents one source of information based on data available to the Government. As many of the factors to be considered relate to market perceptions and risks, and the implications of managing BJD risks on farm, industry should consider all available sources of information about these risks.

This summary report provides the key findings of the Scenario Analysis along with additional information that DAFF has gathered during the BJD response. Industry is encouraged to consider this report as one source amongst a broad range of information that needs to be considered in assessing the costs and benefits of responding to BJD.

Queensland Government's response to BJD to-date

BJD is a serious disease of cattle that has late onset, and as a result it can spread throughout a herd undetected until the cattle begin to show symptoms. There is no cure and managing an infected herd means either taking steps to decrease the impacts or destocking. Queensland has a very low prevalence of the disease, particularly in the beef cattle herd which is worth more than $3 billion per annum.

BJD is a notifiable disease under the Queensland Stock Regulation 1988 to ensure BJD can be identified, managed and controlled.

In November 2012, Biosecurity Queensland confirmed that BJD was present in a Queensland stud herd, and identified 170 properties that had received cattle from the stud that would require investigation.

Under the National BJD Control Program, Queensland has a Protected Zone status and is required to place affected properties under movement restrictions while Biosecurity Queensland undertakes risk assessments and testing. These movement restrictions also protect other properties from infection.

While under movement restrictions, affected properties can only move cattle direct to slaughter or to another property under permit. Movement restrictions are lifted from each property once testing and risk assessments show that the property is not infected. The time frame for this can vary from a few weeks through to a few years depending on the level of risk at each property.

The Queensland Government met with the cattle industry in late 2012 to discuss the impacts that this would have on properties. It was acknowledged that properties would incur financial losses such as loss of breeding cattle that were purchased from the stud that may need to be slaughtered for testing, and loss of market access (such as live export markets) due to being quarantined. Due to loss of market access, some properties facing long term movement restrictions may also have to develop alternative supply chains for cattle that will need to be turned off.

The Minister for Agriculture, Fisheries and Forestry, John McVeigh has met with the cattle industry throughout the response to BJD. To date, industry has supported maintaining Queensland's Protected Zone status, as industry considers that the long term benefits to industry as a whole is likely to outweigh the short term costs to the affected properties.

In January 2013, the Queensland Government announced $2 million in financial assistance to assist producers with these losses, combined with another $3 million to kick start the Queensland Cattle Industry Biosecurity Fund. The Fund will provide a long-term solution for industry to fund future disease responses via a voluntary industry levy paid by producers.

On 31 May 2013, the BJD Assistance Scheme opened to provide financial assistance for eligible producers. Assistance is currently capped at $50,000 per property and is not intended to provide full compensation.

In mid 2013, industry requested further financial assistance and in September 2013, the Queensland Government announced that it would bring forward the $3 million in funding for the Queensland Cattle Industry Biosecurity Fund and use this to enhance the financial assistance program.

With advice from an industry committee, Minister John McVeigh approved that assistance will be increased to $100,000 per property and that two additional payments will be made available to properties under movement restrictions for more than four weeks – an initial payment of $3,000 and a second payment of $5,000 upon release from movement restrictions

Scenario Analysis

The Queensland cattle industry have asked the Queensland Government for information to help them assess the risks, costs and benefits associated with different BJD management options. The Scenario Analysis undertaken by DAFF presents one source of information based on data available. As many of the factors to be considered relate to market perceptions and risks, and the implications of managing BJD risks on farm, there is an unavoidable element of subjectivity to any economic assessment of a disease such as this.

As part of its normal response to a disease or natural disaster, the Department of Agriculture Fisheries and Forestry began work in early 2013 on a *Scenario analysis for the management of Bovine Johne's Disease in Queensland* (Scenario Analysis, Attachment 1) to estimate the costs associated with different BJD management scenarios using best available data and assumptions about the disease impact.

In mid 2013, the early findings of the Scenario Analysis were discussed in an industry forum:

- Estimated costs of $6.5-7.5 million to maintain BJD Protected Zone status
- The difficulty in costing alternative scenarios due to the high levels of uncertainty, and
- Reinforcement that regardless of Queensland's status, market access requirements for BJD need to be met at the property level, such as entry requirements to Western Australia and the 42 importing countries that have testing requirements for BJD.

A small number of producers have suggested Queensland should adopt a different BJD management option, such as changing the state's status to a Management Area under the National Johne's Disease Control Program. To the extent possible, the costs and implications of this scenario have also been considered in the Scenario Analysis.

Findings of the Scenario Analysis for the Protected Zone status

The Scenario Analysis estimates the cost of maintaining the Protected Zone status. The estimated costs of the Queensland Government's current BJD response are as follows:

- Costs to industry, government and economy of controlling the current BJD incident are difficult to quantify, but are estimated in the vicinity of $6 to $7 million[1]. This is approximately split between DAFF ($3.6 million) and industry ($2.7 million). A second node of infection may increase total control costs to $23-25 million.
- In addition to the above, significant destocking costs could be incurred by infected properties. These are estimated as $1.5 million in net cash flow for a commercial beef enterprise, with destocking of a stud herd and restocking to form an equivalent stud are likely to lead to substantially higher losses[1].

- The industry assistance package will transfer some of the costs from individual producers to industry and Government via provision of $5 million in seed funding for the Queensland Cattle Industry Biosecurity Fund to be further supported by a voluntary industry levy. The estimated cost of the BJD assistance package is $12.2 million over four years[2].

The value of the benefits to unaffected properties of maintaining low levels of BJD prevalence in Queensland were not costed in the Scenario Analysis. There are approximately 19,226 cattle producers in Queensland[3]. As at 8 January 2014, there are 52 properties that had received animals from either the initial infected property or a second property that was subsequently found to be infected, that remain under movement restrictions. This means that there are over 19,000 cattle producers currently unaffected by BJD in Queensland.

Findings of the Scenario Analysis for the Management area

Under a Management Area arrangement, the government's role in the management of the disease would diminish. While this may give increased freedom for infected properties to trade, they would still need to meet market access requirements about BJD which may mean that they need to eradicate BJD from their property without assistance from Biosecurity Queensland.

Removal of movement restrictions on infected properties would have consequences such as increased spread of BJD throughout the Queensland cattle herd. This would place increased responsibility on cattle buyers to conduct due diligence about cattle health at point of purchase to minimise risks of bringing BJD into their herd.

The Scenario Analysis estimates costs given an assumed infection rate of no more than 5% of the mature breeding herd with the disease in a preclinical stage and no more than 1% showing clinical signs of the disease[1]. Because the government's role would diminish, most of the costs of managing BJD would be borne by producers.

The Scenario Analysis estimates costs would include:

- Vaccine costs of $22 per dose (uneconomical for most producers).
- Testing costs (eg CattleMAP) for 5% of producers to demonstrate freedom of the disease estimated at $2.5 million (based on faecal testing of 1000 properties[1]).
- Producers that are likely to participate in CattleMAP are those that need to maintain a BJD free trading reputation (eg studs and properties that target live export markets). Compliance with the highest level of CattleMAP - Monitored Negative 3 status (MN3) requires: three negative tests of herd over a period of at least 4 years, a Herd Management Plan in place and Annual Veterinary Reviews[4].
- A small level of production losses for beef (up to $250,000 per annum across industry by 2050) and dairy ($40,000 per annum across industry by 2028) [1].

Findings of the Scenario Analysis regarding Market access

Although BJD is an endemic disease in Australia and all other cattle-exporting countries, other jurisdictions within Australia and many importing countries are still sensitive to the risk of BJD.

Access to these markets requires meeting any animal health standards set by the importing country, which can include requirements to demonstrate freedom from BJD. These

requirements can apply to all live cattle - beef, dairy, feeder and breeder cattle, as well as genetic material such as semen and embryos. However Australian beef (meat) exports do not have to meet any importing country requirements about BJD.

The Scenario Analysis recognises that 42 countries currently have BJD requirements for live cattle imports[1]. Queensland exported live cattle to 15 markets over the past five years[5], with 12 of these markets currently have conditions relating to BJD. For example, Indonesia requires five years freedom from BJD for feeder cattle imports.

These current requirements have been used to inform the Scenario Analysis; however the requirements are set by importing countries and are subject to change at any time. The buying behaviours of markets (including the domestic cattle market) can also be influenced by factors other than formal health requirements – for example reputation and perception of quality are important factors when sourcing beef and cattle but have not been able to be costed in the Scenario Analysis.

The Scenario Analysis has considered a limited number of hypothetical future market implications should importing country requirements, or buying behaviours, change. As many of the factors to be considered relate to market perceptions and risks, and the implications of managing BJD risks on-farm to meet these requirements, stakeholders may have different expectations about these future risks.

Hypothetical market impact scenarios considered in the Scenario Analysis:

- If access to live export markets was completely lost, then exporters of live cattle from Queensland could have their income reduced by between $10 million and $15 million (if the average number and value for live exports for the last five years to 2011 is used to estimate losses) [1.]
- Australian beef exports do not have to meet any importing country requirements about BJD. However some beef markets may have sensitivity to BJD, for example Japan has listed BJD for eradication in its herds. A 10% redirection of beef exports away from Japan could cost industry $9 million per annum based on current prices and estimated values[1.]
- If the closure of live-export markets were to increase abattoirs' market power, leading to a farm gate price reduction of 0.5%, the Queensland cattle industry would lose $16 million[1].
- If exported cattle had to be vaccinated as a precondition, total costs to live exporters may be around $2-$2.4 million[1].

Other market impact scenarios exist that were not considered in the Scenario Analysis:

- Costs of meeting the current requirements for domestic cattle movements into Western Australia (i.e. costs for Queensland producers to be able to supply cattle that have a Cattle Market Assurance Program (CattleMAP) status of MN2 or MN3, or be from a herd that has had a negative Check Test within 12 months prior to movement and no subsequent contact with beef cattle of a lower BJD status).

[1] Scenario analysis for the management of Bovine Johne's Disease in Queensland (2013) DAFF
[2] Queensland Cattle Industry Biosecurity Fund: Have your say (2013) DAFF
[3] ABS Cat no 7121-201011 Agricultural Commodities, Australia 2010-11
[4] RULES AND GUIDELINES OF THE AUSTRALIAN JOHNE'S DISEASE MARKET ASSURANCE PROGRAM FOR CATTLE (2008) Animal Health Australia
[5] ABS, live cattle exports value by destination, SITC codes 00111 and 00119 (2011-12)

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Attachment 1

Scenario analysis for the management of Bovine Johne's Disease in Queensland

January 2014

This publication has been compiled by Strategic Policy and Planning, Department of Agriculture, Fisheries and Forestry

The analysis reported herein concerns the potential future impacts of a disease largely unknown in Queensland. Consequently, there are very few confirmed parameter values for the spread and impact of the disease in Queensland.

The best available expert and published information from other jurisdictions is used instead to represent the potential range of values for these parameters. The analysis applied indicates the range of potential outcomes, corresponding to the combined effect of individually uncertain parameter values.

Abstract

This study forecasts the economic costs of two management scenarios for Bovine Johne's Disease (BJD) in Queensland. Absence of data for BJD impacts in Queensland, together with a lack of relevant research on the disease in beef cattle, forces the use of best-available estimates for parameters in the calculations. These estimates reflect the extrapolation of research from the dairy industry and the opinion of experts interviewed, unavoidably involving some subjectivity and uncertainty.

Scenario 1 aims at controlling BJD, in order to retain Queensland's current "BJD-protected" status and, thus, reputation. The major tool would be the identification and quarantining of infected properties. Costs will include reduced income and increased payments for animal handling and testing by producers, as well as DAFF Queensland expenses in managing the operation and providing laboratory services. Infected animals may still be slaughtered, although this may not be economic for all and doing so will cause major losses for stud stock. Given the surfeit of options under unpredictable market conditions and individual circumstances facing producers, destocking costs were quantified for a limited example only. If the current outbreak does not spread beyond the properties identified in the first round of quarantine notices, total costs may be as low as $6-7 million, excluding potential destocking costs associated with lifting quarantine restrictions on infected properties.

If another node of infection were found, further tracing and testing of animals would be needed, resulting in a further round of quarantine. Assuming a similar-size second infection as the current one, the total costs of controlling the expanded outbreak may run to $23-25 million, again without destocking costs.

Scenario 2 assumes endemic BJD in Queensland, managed similarly to that in Victoria. In this case, costs required for controlling BJD in Scenario 1 would be replaced by different costs over different timeframes, borne by different stakeholders. In a worst case, direct annual production losses by beef and dairy are expected to be around $260,000 and $40,000 respectively at a steady-state level by the middle of this century, due to lower cull weights of some breeding animals and a small increase in mortality. Producers participating in a CattleMAP-type assurance program would have to conduct tests. If Queensland enrolment were equivalent to other comparable Australian states, at a steady-state level of 0.5% of beef properties at a given time, one round of faecal testing would cost the enrolled producers around $250,000 in total. Transition to steady state may involve different levels of testing.

Market access for live animals, embryos and semen is most vulnerable to BJD. Live-cattle exporters able to provide assurance of freedom from BJD are likely to continue, although Indonesia has strict requirements for breeding animals.

Meat is not affected by the BJD pathogen that is, in any case, endemic in all Queensland competitors. Nevertheless, since Japan is considering eradicating BJD, there might eventually be competitive advantages for beef into that market if Queensland's protected status were retained. If endemic BJD reduced beef exports to Japan, their redirection to other markets may cause some price reduction. Currently, the Japanese price premium over other volume markets is around 10%.

If abattoirs were to gain and use market power from the closure of the live-export market, causing a farm gate price reduction of 0.5%, the Queensland cattle industry may lose some $16 million. If exported cattle had to be vaccinated as a precondition, total costs to live exporters may be around $2-$2.4 million.

In all, the higher cost of Scenario 1 gives higher market certainty. Scenario 2 may have a lower overall cost, unless low-likelihood/high-impact events (eg, market disruptions, abattoirs using market power) eventuate.

Contents

Summary

This report is an analysis of two scenarios developed to consider the current outbreak of Bovine Johne's Disease (BJD) in Queensland. The scenarios identify the costs associated with either controlling the current outbreak of the disease or managing it as endemic.

Scenario 1 – Costs of controlling the current BJD outbreak

Scenario 1 considers the likely costs to the Queensland beef industry, government and economy of controlling the current BJD outbreak. These costs are extremely difficult to quantify.

Controlling the current BJD outbreak could incur costs in the vicinity of $6 to $7 million if the potential costs of destocking infected properties are excluded. The total costs (net of destocking costs) will be approximately equally split between DAFF ($3.6 million) and industry ($2.7 million) and include the direct and indirect costs to DAFF plus the costs to properties identified in the current round of testing and quarantine activities. Again, if destocking costs are set aside, the largest cost to producers of controlling the current outbreak is the loss of market access resulting from quarantine movement restrictions. These costs will be incurred mainly by stud and store producers as their market access is more restricted.

A second estimate has been compiled to indicate potential costs if the current outbreak is more extensive in spread than first thought. On this basis, the total costs of controlling the current outbreak could be in the vicinity of $23 to $25 million if the potential costs of destocking infected properties are excluded. It appears the total costs would still be roughly equally split between DAFF ($13.4 million) and industry ($10.1 million). Note – It is difficult to estimate the time frame over which these costs will be incurred due to the range in times that restrictions could be in place on quarantined properties.

Destocking costs associated with controlling the current outbreak could be significant and additional to the costs listed above. For example, a commercial beef enterprise with about $6-8 million of capital invested and running 2500 adult cattle equivalents could incur costs of approximately $1.5 million in net cash flow (or $1,500 per breeder) if they destocked to remove quarantine restrictions. The destocking of an infected stud herd and then restocking with suitable livestock to form an equivalent stud (or a commercial enterprise) would be expected to lead to losses of a substantially higher amount due to the write down in the capital value of existing livestock.

The implementation of an industry assistance package in the form proposed will transfer a proportion of the costs identified from individual producers to industry and Government. The net economic cost of an industry assistance package is likely to be the administration costs associated with its implementation and maintenance.

Scenario 2 – Costs of managing BJD as endemic disease

Scenario 2 models the costs potentially incurred if Queensland managed BJD as an endemic disease and implemented management strategies similar to those currently in place in Victoria or Tasmania. Those jurisdictions currently manage the disease within the framework of the National BJD strategic plan as a management area. Dairy and beef producers are encouraged to manage and control BJD and can provide a measure of assurance they are free of disease by participating in CattleMAP, or provide a National Cattle Health Statement when selling cattle.

Managing the disease as endemic in Queensland would shift the costs from a split between government and producer to largely producer costs as the occurrence of BJD on an infected property would largely be the responsibility of the producer to manage.

Production losses due to BJD becoming endemic in Queensland are difficult to estimate. The low impact of the disease within adjacent regions where it is endemic has not encouraged research of production losses, particularly in beef cattle.

Beef production losses: A long term (over a number of decades) and uncontrolled infection of BJD in a 2500 adult equivalent breeding and fattening beef herd in Queensland could result in no more than 5% of the mature breeding herd with the disease in a preclinical stage and no more than 1% showing clinical signs of the disease. This would lead to a reduction in the herd gross margin from $305,735 to $304,653 - about $1013 or 0.41% per annum. Once fully established, the estimated production cost of the disease to the Queensland beef industry could be up to $260,000 per annum by the middle of this century (2050) depending upon the rate of spread

Dairy production losses: A similarly modelled typical dairy farm resulted in a farm gross margin of about $334,609 without the disease and $333,067 with the disease, a reduction of $1,542 per annum or about 0.46%. Extending this loss to an expected maximum of 25 infected farms across Queensland by 2028 indicates that the average annual impact of the disease on the Queensland dairy industry could be about $40,000 per annum from that time on.

Testing costs: The initial costs to industry of wide scale testing for BJD are difficult to estimate but could be significant. If 5% or 1000 beef properties conduct faecal testing as part of a market assurance program, then the total cost could be up to $2,500,000. If the initial test costs are limited to those properties currently subject to quarantine (or suspicion) the costs would be minimal at the level of the industry.

If long term testing follows the pattern shown in other jurisdictions where the disease is endemic, it is expected that about 0.5% of beef properties will be enrolled in the CattleMAP at any time and only conduct a single round of testing. Stud and trading enterprises are more likely to require testing to provide market assurance.

The current total cost of faecal testing in Queensland is assessed as being quite high ($180 per batch for a sample of 5). If tests are offered by the Queensland government on a cost recovery basis, the number of producers willing to conduct herd testing will be limited. For the same test in New South Wales producers pay $22 per batch for a pooled sample of 5. This implies a cost to Government if it was desired to encourage ongoing testing for the disease by cattle producers in Queensland.

A vaccine is available at $22 per dose that significantly reduces the chances of BJD spreading in a beef herd. Some producers may choose to vaccinate susceptible stock in their herd against the disease but it is considered to be uneconomic for most to do so.

Market access: Changes in access to export markets that may result from the partial deregulation of BJD in Queensland are considered unlikely to cause measureable costs to be incurred at the level of the Queensland beef industry. Some sectors within the industry may experience variable levels of costs and benefits.

Some export markets for live beef require standards to be met for BJD status. If it was hypothesized that access to live export markets was completely lost then exporter's of live cattle from Queensland could have their income reduced by between $10 million and $15 million if the average number and value for live exports for the last five years to 2011 is used

to estimate losses; or if estimates are based on the expected number to be exported in the current financial year, then about $3 to $6 million would be lost by that sector if exports were totally lost.

The potential loss of live export markets for steers is unlikely to have a measurable impact at the level of the Queensland beef industry once the steers have been finished through an alternative marketing process. Although the vendors of previously exported live steers are likely to sell at a lower value than expected and suffer a loss, the overall Queensland beef cattle industry would be expected to absorb the additional livestock and turn them off to other export markets without impacting the prices received in those sectors. In this way, part of the loss made by the former live export steer vendor may be picked up in profit made by the final seller of the finished steer to the abattoirs.

In most cases it appears likely that exporters of live cattle from Queensland should be able to continue exporting by providing assurances of freedom from BJD unless they are subject to the current quarantine process or have an animal tested as positive in the future.

The trade in cattle semen and embryos out of Queensland is currently less than $1 million per annum in value, the destination of exports are currently unknown and little data exits from which to estimate an impact.

Export markets for beef products other than live beef, embryos and semen do not currently require standards to be met for BJD status. On this basis, no disruptions to the general trade in beef are expected to be caused in the foreseeable future under the second scenario – possibly with the exception of the Japanese market.

Japan is working to significantly reduce the incidence of the disease and it could be hypothesized that it may expect its trading partners to supply beef from herds with a similar health status in the future. On the balance of probabilities, it would appear Queensland could be significantly better off that its main competitors in either of the two scenarios considered in this analysis.

If Japan changed its requirements for imported beef concerning BJD, the BJD status of Queensland was maintained as a protected zone and the current outbreak controlled, Queensland would enjoy a significant market advantage over other regions exporting to the Japanese market.

Conversely, if Japan changed its requirements for imported beef concerning BJD and the disease was partly deregulated in Queensland, the expected slow rate of spread of the disease and low incidence in infected herds would allow Queensland to meet the changed import requirements more quickly and easily than its competitors on the Japanese market.

It appears unlikely that Queensland could be singled out for special access regulations relating to BJD status by Japan if either changed its current disease management policy. BJD as a trigger for unilateral discrimination against Queensland beef by Japan would not be admissible under international trade rules; especially as it could only be replaced predominately with beef from sources with endemic BJD.

Nonetheless, a major disturbance of export access to the Japanese market (that fell on Queensland alone) would have significant impacts on the profitability of the Queensland beef industry. For example, if Queensland had to redirect 10% of its beef to the next best paying country the cost to industry could be around $9.1 million in lost sale revenue per annum. Based on current prices and estimated values, the redirection of all Queensland beef exports away from the Japanese market appears likely to reduce the Gross Value of Production of Queensland beef by less than 3%.

Introduction

This analysis considers two scenarios identified by senior Department of Agriculture, Fisheries and Forestry staff and others during a meeting convened to consider the potential economic and financial impacts of the current Bovine Johne's Disease (BJD) outbreak in Queensland. The meeting was held on the 18th January 2013.

The scenarios the meeting asked to be considered were:

- What are the likely costs to the Queensland beef industry, the Queensland Government and the Queensland economy of controlling the current outbreak of BJD? This scenario should include consideration of the potential costs of the outbreak if it proved to be more extensively spread across Queensland than estimates indicate.
- What would be the potential costs to the Queensland beef industry, the Queensland Government and the Queensland economy of a policy of managing the current outbreak of BJD as an endemic disease similar to the management protocols currently in place in the State of Victoria?

The evolving nature of the BJD outbreak indicates that this document will necessarily be subject to amendment and change as more detailed information becomes available.

Analysis of the costs of control for the current outbreak

The policy of the Queensland Government is to eradicate outbreaks of Bovine Johne's Disease where and when they occur.

The current outbreak of the disease has some novel characteristics in that:

- the key infected herd is a significant stud breeding enterprise,
- it has potentially supplied infected seed stock to a large number of stud and commercial enterprises in northern Australia, plus
- it has most probably had cattle with the disease as a preclinical infection for a significant number of years.

One possible result of the novel characteristics of the current outbreak is that cattle with the disease in a preclinical stage may have been spread widely across the north Australian beef industry over a number of years. Where these livestock have been used in breeding or similar enterprises, the disease may have had the capacity to infect additional cattle and be spread further.

Although it is considered to be a very low-probability outcome of the current disease outbreak, the usually very slow development of the disease in preclinical cases makes it possible that BJD is now established, but with a low prevalence, across the Queensland beef industry.

The expected outcome of the outbreak is that infection has been spread to a relatively small number (estimated at twelve) Queensland properties and has become established within a very small number of herds (estimated at four). It is possible that these may be large herds that also have stud herds incorporated within them.

The expected costs of controlling the current outbreak

The control costs of the current outbreak will be incurred in part by the Department of Agriculture, Fisheries and Forestry (DAFF) and in part by investors in the Queensland beef industry.

DAFF will incur direct and indirect costs through the implementation and management of the control campaign. These costs will mainly be associated with undertaking and managing the field work and laboratory activities plus the overhead and operating costs associated with the provision of these services.

Queensland beef producers will incur costs associated with the handling and testing of livestock under quarantine and loss or delay of income associated with the culling or forced sale of quarantined and infected stock.

It is assessed that the largest cost to producers of controlling the disease is the loss of market access resulting from quarantine restrictions. These costs will be incurred mainly by stud and store producers who are currently in quarantine. These costs are extremely difficult to quantify and the estimates made here will be adjusted as the impacts on individual producers become clearer.

Table 1 shows a summary of the estimated costs likely to be incurred during the current outbreak. These estimates cover the properties identified in the initial round of quarantine activities but do not include the potential cost to industry of destocking infected properties.

Later sections of this scenario analysis show the calculation of each total in the summary table below.

Table 1: Estimate of direct and indirect costs associated with current BJD outbreak

Item	DAFF	Producers
Direct costs due to field work and associated activities	$333,577	$333,577
Travel, vehicle hire, accommodation and other operating costs	$127,500	
Disease management and support direct costs	$652,303	$163,076
Laboratory supplies and services	$220,727	
Allowance for indirect costs and overheads	$2,232,223	
Direct industry costs associated with quarantine		$2,200,000
Industry assistance package (administration costs only)		
	$3,566,330	$2,696,653

*Note – these costs are not incurred over a set period of time as they are activity based. Biosecurity Queensland staff were unable to identify the length of time required to complete some of the activities associated with the lifting of quarantine and other restrictions.

If no further infected properties similar in nature to the key infected property are found and the majority of quarantine restrictions currently in place are removed within the short to medium term, it is likely that the total costs of controlling the current outbreak may be not

much more than the costs identified above. On this basis, the costs of controlling the current outbreak would be in the vicinity of $6 to $7 million if no potential costs of destocking infected properties are included. It appears the total costs will be roughly equally split between quarantined producers and DAFF.

The implementation of an industry assistance package will transfer a proportion of the costs identified under the heading “Direct producer costs associated with quarantine” from individual producers to industry and Government. The net economic cost of an industry assistance package is likely to be the administration costs associated with its implementation and maintenance.

The expansion of the outbreak to include further infected properties similar in nature to the key infected herd would cause government and producers to incur additional control costs similar in size to those indicated above for each similar key property found.

Table 2 indicates the total costs of control if another property similar in nature to the initial key infected property is revealed. Once again, the potential costs of control through completely destocking infected properties are not included.

Table 2: Total control costs if two key properties are found to have long term BJD infections

Item	DAFF	Producers
Total costs first year	$3,566,330	$2,696,653
Total costs second year	$3,566,330	$2,696,653
Total costs third year	$1,783,165	$1,348,326
Total costs fourth year	$1,783,165	$1,348,326
Total costs fifth year	$445,791	$337,082
Ongoing costs to year 10	$2,228,956	$1,685,408
	$13,373,736	$10,112,449

*Note – Please note again that these costs are not incurred over a set period of time as they are activity based. Biosecurity Queensland staff were unable to identify the length of time required to complete the activities associated with the lifting of quarantine and other restrictions. The total years included in this table is the informed view of the author and has only been included to provide a measure of the potential amount of time that could be taken to control the disease.

On this basis, the costs of controlling an expanded outbreak would be in the vicinity of $23 to $25 million if no potential costs of destocking infected properties are included. It appears the total costs will be roughly equally split between producers and DAFF.

It is difficult to estimate the time frame over which these costs will be incurred due to the range in times that restrictions could be in place on quarantined properties.

The details of the costs shown in summary in Table 1 are identified in the following sections.

1. Direct costs due to field work and associated activities

These costs are incurred by both producers and DAFF.

Biosecurity Queensland staff have provided estimates of the direct costs of the current control program to DAFF.

These estimates are based on the activities to be completed by Biosecurity Inspectors and laboratory staff to clear the quarantine on approximately 150 separate beef properties plus the first round costs of the disease control on any infected properties.

Estimates of the direct costs incurred by producers in meeting the requirements of Biosecurity Queensland to test and quarantine cattle have been based on the effort expended by Biosecurity staff in field work activities. These producer costs do not include the costs incurred by producers where the disease is identified and the decision is made to eradicate the disease from the property by destocking.

Table 3 provides the estimate of the direct costs to DAFF ($416,077) of sampling and reporting activities on the 150 properties initially involved in the outbreak. The direct cost to industry of the field work required is thought to be at least equivalent to the direct labour costs incurred by DAFF ($333,577).

Table 3: Direct cost of field activities

Field work	No. Properties	Days	Total days	$/day	DAFF
Issue quarantine notices and set up records	150	1.5	225	$262	$58,867
Property Disease Investigation Plan	150	1.5	225	$262	$58,867
Sampling of quarantined properties					
simple properties - one collection	50	1.5	75	$262	$19,622
medium effort properties; 2 samples	50	3	150	$262	$39,244
complex properties; 2 collections plus travel	50	6	300	$262	$78,489
Reporting results of analysis	150	2	300	$262	$78,489
Total direct field work costs			1275		$333,577
Travel expenses	**Days**	**$/day**			
Travel, vehicle, operating, accommodation	1275	$100			$127,500

2. Disease management and support direct costs

Both producers and DAFF are expected to incur costs in managing and reporting on the field and laboratory activities. It was assessed that producer expenditure would be a quarter of that of the Department in this case.

Table 4: Direct costs of managing the field, testing and reporting activities

Management and support	FTEs	Months	Gross $/month	DAFF
	12	3	$11,444	$411,981
	1	21	$11,444	$240,322
				$652,303

Note - Many staff will spend only a small portion of their time on the disease outbreak. The total effort and the average cost of the effort are estimated by summing all of the time contributed by a large number of staff and converting the total effort to Full Time Equivalents (FTEs). All figures for salaries and wages include an allowance for on-costs such as superannuation payments, leave loading and workers compensation.

Producer costs incurred in managing the field activities are assessed as $163,076 (25% of the above total).

3. Direct costs of laboratory supplies and testing

DAFF will incur the costs of storing and testing samples plus providing reports on the results. The estimated direct costs of the laboratory activities are shown in Table 5.

Table 5: Direct costs of DAFF Laboratory activities

Laboratory work	FTE					DAFF
Pathologist	1	6	months	PO4(4)	$112,055	$56,028
Scientist	1	6	months	PO4(4)	$112,055	$56,028
Laboratory technician	2	6	months	TO3(4)	$85,166	$85,166
Administration Officer	0.5	6	months	AO3(4)	$74,282	$18,571
Laboratory supplies and services						
Telephones	4.5	@	$330	per FTE		$1,485
Stationery	4.5	@	$100	per FTE		$450
Travel	Months					
Laboratory consumables	6		$500	per month		$3,000
						$220,727

Additional costs are expected to be incurred by DAFF in investigating and/or using the latest testing procedures available in other jurisdictions. These costs will be included as they are identified.

4. Indirect costs and overheads

DAFF incurs overhead and operating costs associated with the facilities required to house its staff, provide laboratory facilities and support the staff undertaking the control activities. These costs are estimated by applying a standard multiplier to the identifiable direct costs. In this case the multiplier applied is the standard multiplier used by DAFF to estimate the total costs of research projects.

Table 6: Allowance for indirect costs and overheads

Item	Direct cost		Multiplier	Total Indirect costs
Field work	$333,577	times	1.85	$617,118
Management and support	$411,981	times	1.85	$1,206,761
Laboratory work	$220,727	times	1.85	$408,344
				$2,232,223

Indirect costs are not allocated to the producer field work activities, as the allocation to outbreak management costs should be sufficient to cover any indirect as well as direct costs incurred.

5. Direct producer costs associated with quarantine and control

These are in addition to the costs associated with the field work and laboratory activities identified above. They are incurred by producers in meeting the quarantine requirements and controlling the disease.

Quarantine costs could include loss of income due to forced sales or reduced values being achieved when compared to expected sales programs. There may be some extra costs incurred in selling livestock to a different destination or feeding livestock to meet quarantine restrictions - although most additional handling costs should be captured in the estimates of industry costs accounted for previously.

Anecdotal and other data suggest that these costs could be significantly greater than recorded here but they are extremely difficult to quantify. It may be possible to estimate these more accurately using data obtained via the industry assistance package and when the potential length of quarantine for some store producing properties becomes clearer.

Table 7 provides some preliminary estimates of the quarantine and associated costs incurred by producers. They will need to be brought up to date as better information becomes available.

Table 7: Allowance for industry costs associated with quarantine

Item	Number		Value		Total
Industry bulls slaughtered	100	bulls @	$2,000	lost value per head	$200,000
Lost income on commercial stock	10,000	head sell at	$100	less value at sale	$1,000,000
Lost income on stud stock	1000	head sell at	$1,000	less value at sale	$1,000,000
					$2,200,000

Disease control costs range from the costs associated with the slaughter and testing of only one or two suspect animals on a quarantined property through to (potentially) the complete destocking and slaughter of all livestock on an infected property. The costs associated with the slaughter of one or two bulls on any individual property are included in Table 7 above.

It must also be remembered that these costs are mostly borne by individual producers, not by the overall industry. For example, one producer's loss on quarantined steers that are sold below value because of the quarantine may be offset at the level of the industry by another producer purchasing those steers and marketing them as usual. That producer's property may be quarantined by the purchase of the steers, but if their business is only the sale of finished steers, this may be of very little consequence to them and they will gain through the purchase of the steers below market value. If impact were to be measured as net impact at the level of the industry then no net impact would be measured. The loss of one producer is probably equivalent to the gain of the other in such a circumstance.

Destocking costs

The costs associated with destocking (and then restocking) a beef cattle property in Queensland in an attempt to have BJD quarantine restrictions removed depend upon the nature and size of the enterprise and the number of industry participants who attempt the strategy at any time. It is possible to rapidly destock all of the livestock and potentially achieve a quicker release from quarantine. It is also possible to destock a property in stages and delay the release from quarantine accordingly.

This analysis currently only considers the more rapid complete destock strategy in an attempt to provide a guide to the impact of a destocking decision. Impacted producers would need to undertake their own analysis to identify the best way to destock if that was the chosen course of action. Less rapid options for property destocking are not included in this initial analysis as they are considered likely to eventuate in the same (but delayed) quantum of impact.

A model of a commercial beef enterprise in central north Queensland was constructed to identify the overall impact of a destocking strategy on a beef breeding and fattening enterprise. This model was chosen as there is reasonable data available for this type of enterprise, not that it is likely to be the type of enterprise destocked.

The modelled enterprise was constructed to run breeders and produce mature steers mainly to meet the requirements of the Japanese beef market. It mated approximately 1000 breeders in any year and sold cull breeding stock, surplus heifers and finished steers direct to the abattoirs. The total investment in the property was estimated to be about $6 to $8 million and the modelled property started with no outstanding debt. Approximately 2500 adult equivalents were carried on average.

The herd model was constructed using the Breedcow and Dynama suite of programs (Holmes et al 2012). This suite of programs has been used extensively by both beef producers and the Department for more than two decades to model the physical operations and financial results of beef production systems in northern Australia.

The destocking and restocking process was modelled with the following timelines and inputs.

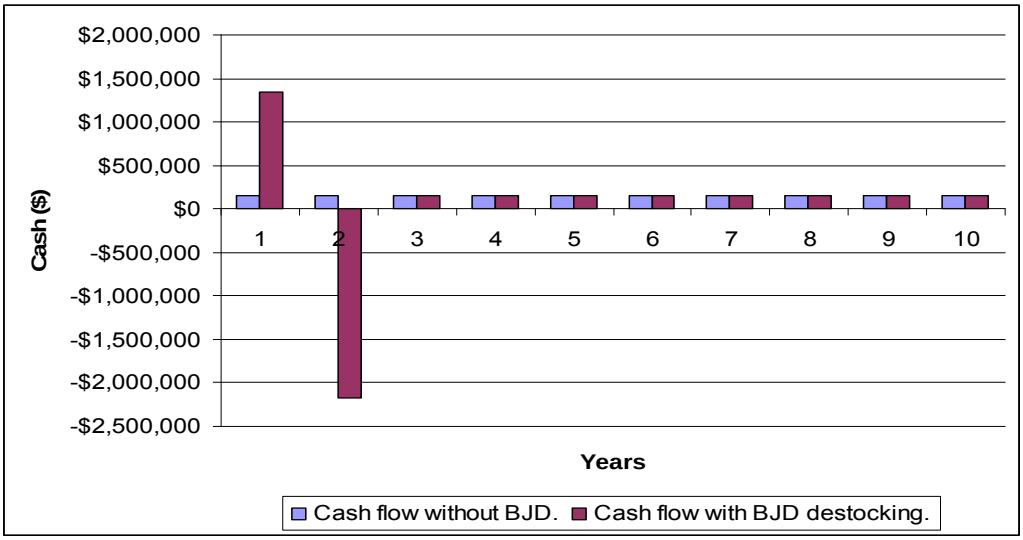
Firstly, all cattle are sold for slaughter in the first year of the model (between March and April 2013) and the property remains destocked for slightly more than a year (until April / May of 2014). The sale values achieved for the overall herd reflect current market prices but are 15% (steers) to 25% (females and bulls) below the expected sale prices usually achieved as all cattle are being destocked and sold, not just the livestock ready for sale.

The expected operating costs not saved by destocking (including an allowance for the drawings of the owners) and associated with the property are accumulated in the model and added to the purchase cost of replacement stock. All livestock necessary to reinstate the same herd as previously owned are purchased except for the cohort of steers that would have been sold during the second year of the destocking (in this case 2014).

Once the livestock are returned to the property, the ongoing performance of the herd is identical to that which was sold. Replacement livestock are purchased based on current market store values but at levels sufficient to replace “like with like”. Whether similar market values will apply fifteen months after any destocking event is unknown.

The potential impact on the annual net cash flow and cumulative net cash flow of the modelled business are summarised in figures 1 and 2 below.

Image 1: Annual cash flow for a modelled beef business without and with BJD destocking



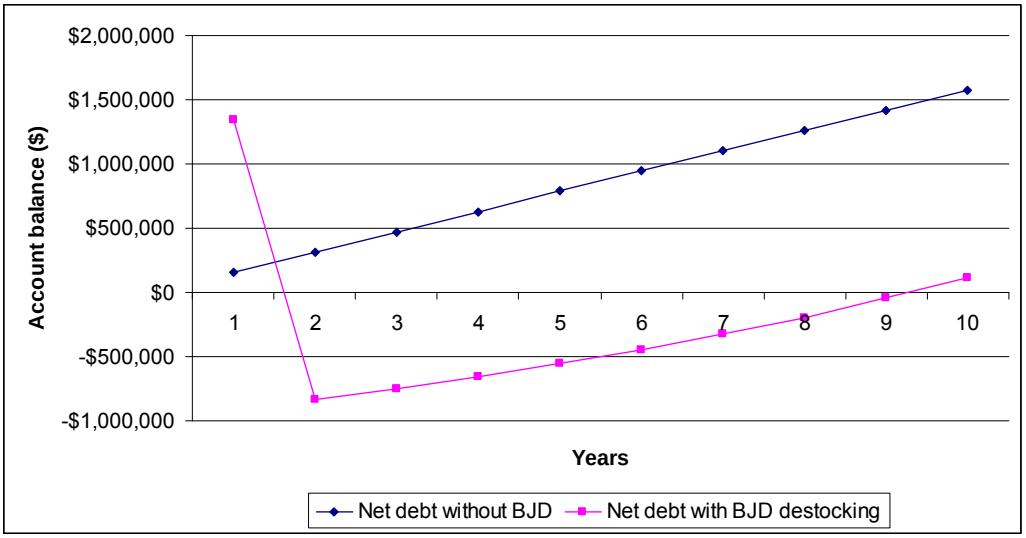
Although significant cash income is gained from the sale of the herd in the first year (2013), large expenses are incurred in running the property and restocking it in the second year (2014). Annual net cash flows are modelled to return to “normal” in the third year (2015), possibly a best case scenario.

The implications for taxable income and any changes to tax payments arising from a destocking response are not included in the analysis. There may also be potential to gain some income from trading in cattle during the period the property is destocked but such cattle would only be owned for a short period and would have to be sold to an abattoirs or a

feedlot. Such a strategy would have significant risks but could offset part of the lost net cash flow.

Figure 2 presents the same data as Figure 1 but adds the totals for the net cash flows the individual years to calculate a cumulative net cash flow over time.

Image 2: Cumulative cash flows for a modelled beef business with BJD destocking



The debt accumulated by the business through destocking is eventually repaid by the ninth year after the event. The interest rate on the debt was set at 10% per annum.

The destocked modelled property is set back by approximately $1.5 million in net cash flow over the decade after the destocking event (or $1,500 per breeder) and this capital lost in the destocking exercise will never be recouped. The impact on a beef enterprise of similar size that produces store stock is likely to be greater due to the lower underlying profitability of those enterprises.

The level of impact of a destocking campaign on a stud property that converted to a breeding and fattening enterprise after the destocking event would be larger than that shown above if the capital lost in the sale for slaughter of all stud stock was included. Although some data has been provided for the capital value of the stud herd initially quarantined in this outbreak, this data is unlikely to apply more generally to other studs and capital losses applicable to those studs would need to be calculated on an individual basis.

The destocking of a stud herd and then restocking with suitable livestock to form an equivalent stud would also be expected to lead to substantial losses in capital.

6. Costs of Industry Assistance

The industry assistance package will offset some of the relevant costs to individual producers of being infected with BJD and therefore represents a transfer from industry and Government in general to impacted producers in particular and is borne largely by industry and the Queensland taxpayer. The potential level of the transfer has been identified in the previous section headed - 5. Direct producer costs associated with quarantine and control.

The Queensland government has committed $2 million in immediate grant assistance. A further $3 million loan proposed to extend the assistance to be matched dollar for dollar with funds collected via a voluntary industry levy.

It appears the industry assistance package is designed to operate over the longer term as an industry funded but Government managed insurance scheme set up to offset some the producer costs associated with controlling disease and pest outbreaks not covered by the national eradication agreements currently in place.

The Queensland government incurs costs associated with the start-up funds and the cost of administration of the fund while industry incurs the cost of the levy gathered to offset the relevant losses of impacted producers. The industry assistance fund is a transfer within the Queensland economy and is not an additional economic cost associated with the disease.

The extra (or net) costs incurred by the economy in this BJD outbreak due to the industry assistance package will be the administration costs of the scheme paid to QRAA, and incurred by producers applying for assistance. As stated previously, the funds gathered under the scheme represent a transfer from Government and Industry to individual producers to offset costs or losses already incurred.

Benefits of maintaining the control strategy

A number of potential benefits accruing to the maintenance of the current BJD status of Queensland have been identified. They include:

- continued market access where markets currently have requirements relating to the BJD status of exports from Queensland
- protection against future changes to market access requirements for BJD by importing countries and other Australian jurisdictions
- prevention of losses due to the impact of the disease on the production from beef and dairy industries in Queensland, and
- the potential costs related to managing the disease if it were to become endemic in Queensland

As these potential benefits become potential costs in a management scenario, the value of maintaining these benefits will be identified where possible in the next section.

Analysis of alternative scenario – managed endemic BJD

An alternative policy suggested by some sections of industry is to largely deregulate Bovine Johne's Disease and have a situation in Queensland similar to that currently in place in Victoria or Tasmania. That is, Queensland would become a Management Area for the disease similar to Victoria or Tasmania.

This section considers the potential costs that may arise from implementing such a policy in Queensland.

The scenario considered here has the following parameters:

- A policy would be implemented that maintained BJD as a notifiable disease in Queensland but allow individual property owners to manage the disease:
    - within the framework established by the National BJD Strategic Plan (see http://www.animalhealthaustralia.com.au/programs/johnes-disease/bovine-johnes-disease-in-australia/the-national-bjd-strategic-plan/) and
    - the regulations of the Victorian State Government (see http://www.dpi.vic.gov.au/agriculture/pests-diseases-and-weeds/animal-diseases/beef-and-dairy-cows/bovine-johnes-disease)

- Properties in Queensland infected by the disease would not be quarantined and regulations governing the movement of beef and dairy cattle with the disease would be similar to those currently in force in Victoria.
- The partial deregulation of the disease in Queensland would likely be accompanied by the promotion of CattleMAP and other tested assurance protocols to industry. Details of the current CattleMAP and manual can be found at http://www.animalhealthaustralia.com.au/programs/johnes-disease/market-assurance-programs-maps/cattlemap-manual/
- In addition, vendors of beef and dairy cattle in Queensland would be encouraged to provide a National Cattle Health Statement to a purchaser revealing the health status of their herd, including the BJD status. A copy of the National Cattle Health Statement can be viewed at http://www.farmbiosecurity.com.au/toolkit/declarations-and-statements/
- The disease would be classed as endemic after the change in regulations in Queensland and would be expected to spread across beef cattle and dairy properties.

The likely prevalence of the disease across the dairy and beef cattle industries, the potential impact within herds plus the other costs that may arise from such a policy are considered in the following sections.

Potential impact on production in the Queensland beef industry

Very little information exists concerning the potential production losses that could arise if the disease became endemic across the Queensland beef industry. Studies of the disease undertaken in nearby jurisdictions (Webb Ware et al (2012), Larsen et al (2012) and Brett (1998)) together with anecdotal evidence gathered during the construction of these scenarios suggest that a beef breeding herd with a long term BJD infection (in existence for a number of decades) in Queensland would have no more than 5% of the mature breeding herd with the disease in a preclinical stage and no more than 1% showing clinical signs of the disease.

The selling and culling procedures in place in most breeding herds in Queensland would indicate that none of the growing stock or sale steers in an infected herd would show any effects of the disease prior to sale and that most breeding cows with the disease in a preclinical stage would be culled in the normal herd management process and therefore sold before the disease was likely to manifest in its clinical form.

A few investigations of the impact of the disease in dairy herds suggest that cows with the disease in its preclinical form may be lighter at sale than uninfected cows from the same herd. Other studies show no impact of the disease on production when found in is its preclinical form. (Mee and Richardson 2008; Chaffer et al 2002)

Even though little information is available to identify accurately the likely epidemiology of the disease under the extensive and generally hot and dry subtropical conditions of Queensland, the herd model previously applied in the destocking analysis was used to estimate the potential financial impact at the property level of a long term, established BJD infection in a typical Queensland beef breeding and fattening herd.

The model was initially parameterised to represent the typical production performance of a herd free of BJD and the financial performance of the herd recorded. The herd then had the following adjustments made:

- 5% of cull breeding cows were sold at 10% lower final weights and 1% of cull breeding cows were not sold but converted to additional herd mortalities. This level of impact is thought to be more than sufficient to cover any potential production impacts to be found in an infected breeder herd.

- No production losses or deaths in young stock were included as it appears such impacts would be unlikely to be encountered in an extensive beef breeding herd infected with the disease under Queensland conditions.

The impact of the disease at this level reduced the herd gross margin from $305,735 to $304,653; a reduction of about $1013 or 0.41% per annum. When expressed as the amount of change in gross margin per adult equivalent after interest, the impact reduces this measure from $110.80 to $110.35, a reduction of $0.45.

The Queensland beef herd is comprised of about 11.5 million adult equivalents and about 20,000 beef enterprises giving an average size of beef enterprises of 575 adult equivalents. On the basis of the estimate of impact calculated above, a Queensland beef business with an average size herd and with a long term BJD infection would suffer a reduction in output equivalent to about $259 per annum.

The future rate of spread of the disease across properties in the circumstances of a "managed" disease scenario is unknown but it may have the potential to infect 1% of the beef industry within 15 years. From that point it could remain stable at that level or increase to 2.5% or up to 5% of the herd within 30 years. (L Gavey personal communication)

A level of damage of $259 per annum to 1% of the total Queensland herd (on average) by 2028 is equivalent to a loss in production of $51,800 per annum at that time. If the prevalence of the disease reached 2.5% of Queensland beef herds by 2043, the amount of impact would be about $129,500 per annum at that time. An upper level of prevalence of 5% in 2043 would be equivalent to production losses of about $260,000 per annum being incurred in total by the Queensland beef industry.

Once fully established in the Queensland beef industry, the disease may have an upper level impact on the value of output of up to $260,000 per annum. This could be compared to the current estimated economic cost of tick fever to the Queensland beef industry of $5 million per annum for tick fever vaccines and $ 4 million per annum for losses due to tick fever in unprotected stock (Chudleigh and Franco Dixon (2009) unpublished data).

The impacts described above do not include the potential impact of purchasing a breeding bull infected with BJD. It is possible that such a bull could have reduced fertility in the preclinical stage of the disease. When used in a mixed mating group, the loss associated may be minimal if other healthy bulls are available. If used in a single sire mating regime, the use of the bull may result in a lower pregnancy rate and, in extreme cases, lead to very few calves being produced by that mating.

Potential impact on stud and cattle trading enterprises

The furore caused by the current outbreak is likely to change the attitude of cattle buyers in the short to medium term, particularly when purchasing stud, breeder replacement and store stock. A partial deregulation in such circumstances could lead to additional disease testing costs being incurred by industry.

For this reason future buyers of some Queensland stud stock, in particular, may need to be assured that purchased livestock are free of the disease. To provide a level of market assurance, some Queensland based stud cattle producers are therefore thought likely to enrol in the CattleMAP and test their stock for infection.

The blood tests required by the CattleMAP are currently about $6-9 per head for the analysis of a blood sample with an extra $5 per head is likely to be incurred due to the required involvement of private veterinarians in the testing process. Table 8 indicates the current cost

of testing samples for BJD provided by the New South Wales Government (see http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/110042/testing-for-bovine-johnes-disease.pdf

Table 8: NSW DPI schedule of charges for BJD testing

Test	Lab cost*	Time	False positives	Sensitivity Clinicals†	Sensitivity Preclinical†
Faecal culture – conventional	$19–$22	21 weeks	0%	90–100%	30–50%
Faecal culture – Bactec	$39‡	9 weeks	0%	90–100%	30–50%
Absorbed ELISA (blood test)	$6-9**	1–2 days	1%	90%	25–30%

* Approximate cost per test includes GST, and can be affected by the number of samples per herd. ‡ Bactec cost excludes further examination by PCR ($82 incl. GST), which is only necessary where growth is detected. See link for details. † See link for details. ** CattleMAP ELISA testing is at the lower rate

The herd sampling required for CattleMAP testing in the southern States indicates that most studs running 300 or more cattle would expend about $4500 for each round of testing and all tested cattle would need to be individually identified so that test results could be matched to individual livestock.

Unfortunately there is a problem with false positives in the blood test used to screen beef herds for BJD.

The table of charges provided by NSW DPI above indicates a 1% rate of false positives for the Absorbed ELISA test and a survey in 2000-01 of the incidence of BJD in beef cattle herds in southern Australia (Animal Health Australia 2012) showed a better result. The survey tested about 13,000 cattle from 81 herds. Only 19 of the 13,000 cattle, or 0.15%, reacted to the screening ELISA test with four of these reactors, in four different herds, confirmed as infected. This means that 0.12% of the total tested were false positive tests.

Local advice for Queensland (R Glanville personal communication) indicates that the rate of false positives under Queensland conditions could be as high as 15% but would be expected to be in the range of 5% to 10% in each herd tested.

Table 9 indicates the number of false positive results likely if such a screening program was carried out in Queensland and the lower or higher rate of false positives was achieved.

Table 9: Number of false positives expected to an ELISA test based screening process

% of properties tested	Number of properties tested	Number of cattle tested per property	Total cattle tested	False positives 0.12%	False positives 10%
1%	200	250	50,000	60	5,000
2%	400	250	100,000	120	10,000
5%	1,000	250	250,000	300	25,000
10%	2,000	250	500,000	600	50,000

Stud producers and others could start with the lower cost test and hope for no false positives. If the rate of false positives is closer to 10% than 0.12%, it is more likely that starting with the more expensive faecal tests may be a better way to go in the long run.

Table 10 indicates the potential costs associated with testing a number of herds for BJD. Queensland has approximately 20,000 beef properties but it is expected that only a small percentage of the total would be tested to confirm a status of low risk for stud or store selling purposes.

Table 10: Approximate cost of one round of faecal testing of a percentage of Queensland beef herds

% of total beef properties tested	Number of properties tested	Number of cattle tested per property	Total cattle tested	Total cost to industry @ $10 per head*
1%	200	250	50,000	$500,000
2%	400	250	100,000	$1,000,000
5%	1,000	250	250,000	$2,500,000
10%	2,000	250	500,000	$5,000,000

* note: costed on the basis of a pooled sample of 5 being tested for $22 per test at the laboratory plus $5 per head sample collection costs

If testing is limited to those properties currently subject to quarantine (or suspicion) the costs could be minimal at the level of the industry. Wide scale and repeated testing by a large number of producers to provide a high level of market assurance could lead to significant costs being incurred.

Note: added after reviewer feedback: Table 22 attached in the Appendix indicates that between 0.46% (NSW) and 0.86% (Victoria) of beef producers are currently registered with CattleMAP. The nature of the Queensland cattle industry suggests that about 0.5% of Queensland beef producers could be enrolled in a CattleMAP type arrangement in any year over the longer term.

How often the tests would have to be repeated to meet the ongoing requirements of a CattleMAP in Queensland is unknown but some herds may have to be initially tested three times over four years and then every three years to provide the highest level of assurance. It is likely that the retained estimate of $10 per head per test is at the low end of expected industry costs if the testing process cannot be fitted in with normal husbandry practices.

In the short term, the Queensland beef industry is considered likely to incur costs in testing for the presence or absence of BJD in stud and store trading herds even if the disease where to be treated as endemic. This is mainly due to the nature of the comments made about the disease during the current outbreak and the effect of those comments on market confidence.

The nature of BJD indicates that any testing regime based on herd sampling may not be a complete guarantee that a herd is free of the disease, only that the risk of the disease being found in the sampled herd is very low. Any animals that return a positive test are slaughtered to confirm the disease although in a managed scenario the herd would not be quarantined.

The response by industry in southern jurisdictions (see table 22 attached in appendix 1) suggest that about 0.5% of beef producers are likely to be enrolled in the CattleMAP at any one time over the longer tem with most apparently only completing one test.

There is also potential for the uptake of faecal testing cattle for BJD in Queensland leading to increased costs for the Queensland Government.

It appears that most of the testing for BJD in southern States is provided by publicly funded agencies and the total costs could are partially subsidised. For example, the estimate for undertaking the current round of faecal tests for the control program in Queensland laboratories is about $65 per test for direct costs and about $180 per test if overhead and other costs are included. (See previous estimates for laboratory costs)

It appears unlikely that tests undertaken in other jurisdictions are as costly as predicted for Queensland given their experience with the disease but the total costs incurred are likely to be significantly above the level of charges advertised.

If a faecal test for BJD was provided by the Queensland Government at a similar cost as is charged by the NSW DPI as a part of a CatleMAP, then a subsidy of about $160 per test is implied if both direct and indirect laboratory costs are included. Setting up laboratories to undertake a number of tests over an extended period of time is likely to incur additional capital costs but significantly reduce the cost per test. If cost efficiencies could be achieved and the total cost limited to about half the current cost or $90 per test, the Queensland Government could face additional expenditure of approximately $0.5 million per annum (over the longer term - see note above) if something like 0.5% of Queensland cattle producers wanted to partake in a CattleMAP and part of the costs of testing were met by the Government. This level of expenditure may continue for a number of years.

If a CattleMAP program were not supported by the Queensland Government and industry expected to undertake the tests on a full cost recovery basis, the level of adoption by industry in a partial deregulation scenario would be minimal and the ongoing costs of testing would be negligible.

The use of a vaccine

A killed vaccine, like the vaccine that is registered for sheep in Australia, is now also being trialled for cattle. (Animal Health Australia at: http://www.animalhealthaustralia.com.au/programs/johnes-disease/bovine-johnes-disease-in-australia/)

As in sheep, the vaccine is likely to delay or dampen down the rate of development of the infection, the rate of shedding and also the rate of onset of clinical disease.

Current vaccines for Johne's disease are not sufficiently effective to use in non-infected herds in low risk areas in the expectation that they will prevent a herd becoming infected. Australian and overseas research programs will hopefully develop more effective vaccines in the future.

The vaccine is available at $22 per dose and some producers may choose to vaccinate susceptible stock against the disease and effectively negate the impact of having the disease spread in their herd if they purchase stock with the disease.

It is unlikely that beef producers who produce stock for direct sale to abattoirs would adopt a vaccination program as they would gain no economic benefit. Store producers would have to consider the risks to their business of becoming infected but it appears unlikely that many would choose to vaccinate. Most of their sale stock would be processed before the disease became apparent – if it was present. Stud stock producers may vaccinate to slow the potential development of the disease in their stock – but only if they believed they were at risk of purchasing stock with the disease.

Potential impact on production in the dairy industry

The effect of BJD in dairy herds has been widely studied around the world.

Mee and Richardson (2008) found (in Ireland) “there was no significant effect of paratuberculosis sero-status at animal, parity or herd-level on milk yield, milk fat or protein production, somatic cell count score (SCCS) or calving interval. Negative herds tended to have a lower SCCS than positive and non-negative herds (P=0.087). This study could only examine the effects of paratuberculosis sero-status (preclinical Johne’s disease), but not the clinical effects of Johne’s disease at the farm or dairy industry levels”. This finding was supported by Chaffer et al (2002) who also found no impacts for the disease in a preclinical form in Israel.

In Mee and Richardson (2008) it was reported, “a retrospective case study was undertaken on a commercial dairy herd with a documented history of Johne’s disease. Individual animal production records were interrogated to assess the effect of JD on milk yield and somatic cell count and reasons for culling, cull price and changes in herd structure over time. Lactations from all cows in milk from 1994 to 2004 were compared between JD and non-JD cows using clinical signs and test results to define JD status. Six separate multivariate regression models were conducted. There was a significant negative association between clinical JD infection status and milk yield, SCC and culling price in the study herd. In contrast, little effect was noted for sub-clinical infections. These direct effects, in combination with increased culling for infertility and increasing replacement rates, had a negative impact on the economic performance of the farm. The findings confirm those of the previous studies indicating that while clinical Johne’s disease can have a serious economic impact preclinical infection may not”.

Mee and Richardson (2008) also simulated the economic impact of Johne’s disease. “A whole farm bio-economic model has been developed. The predicted effect of disease on a 100-cow dairy herd using international effects of disease on production was to lower farm net profit by €7,693 per year for an infected herd. This is an estimated loss of net profit of 15.2% per year”.

BJD is an endemic disease with many herds infected across all the major temperate dairy production regions. Collins M.T. and Manning E.J.B (undated) state in part that “in all likelihood, Johne's disease is to be found in every country. Being free of the disease is probably more a function of how hard one has looked than a true lack of incidence”.

Brett (1998) identified “from discussions with practitioners working with Johne’s disease infected herds, it is estimated that approximately 60% of NZ dairy herds are infected with Johne’s disease”.

Many regions in Canada and the USA reportedly have 50% to 70% of dairy herds infected with the disease. Sykes (2000) identified the number of infected herds in Australia at the time. Table 11 shows the numbers reported.

Table 11: Prevalence of BJD in Australian dairy herds – May 2000*

ZONE	State	Number of dairy herds	Known infected herds	Known prevalence %
FREE	WA	450	0	0
PROTECTED	NT	2	0	0
	QLD	1650	1	0.06
	NSW	1190	24	2
	Sub Total	2842	25	0. 9
CONTROL	NSW	510	80	15.7
	SA	700	42	6
	VIC	8453	1315	15.5
	Sub Total	9663	1437	14.9
RESIDUAL	TAS	735	20	2.7
	TOTAL	13705	1486	11

*Source: NJDCP Coordinators Quarterly Report, Jan-Mar 2000

An intensive dairy herd appears to be the natural home of BJD disease but Queensland dairy herds are generally subject a wider spread of calving across the year, fewer introductions of high risk cows and less intensive management than those located in more temperate regions. This may limit the incidence of the disease in Queensland dairy herds or at least slow the rate of spread within the herd. If buyers purchase suitable replacement livestock or maintain closed herds and only use AI to improve genetic performance, the incidence of the disease may stabilise at no more than 5% of Queensland dairy herds in a partial deregulation scenario over the longer term.

Stoneham et al (1994) identified that the majority of Victorian herds reporting Johne's cases (67%) had experienced only one clinical case per year. Some 4% had, on average, one case every two years and a further 19% of herds had 2 cases per year. The remaining 10% of herds had more than 2 clinical cases per year. If this incidence of the clinical disease on Victorian dairy farms is repeated over the longer term in Queensland, it appears likely that infected farms will have on average one clinical case per year and may have 5% of cows with the preclinical disease.

Brett (1998) estimated for an economic analysis that sub-clinical infections in New Zealand dairy herds caused milk losses of 6% and 17% per cow for two lactations prior to the animal either showing clinical symptoms or being culled from the herd for other reasons. In the same analysis, milk production from a clinical case detected early was set at 70% of the normal lactation and the salvage value was an average 70% of the normal carcass value. These estimates of impact are higher than those identified in the Irish survey (Mee and Richardson 2008) but are used in this scenario analysis to represent the upper bound of the potential level of impact on Queensland dairy farms.

The 2012 Queensland Dairy Accounting Scheme (QDAS) report (http://www.dairyinfo.biz/default.asp?PageID=39) identifies the number of dairy businesses in

Queensland, the total milk production from those farms and the current profitability of a non-random sample. Table 12 has been extracted from the 2012 QDAS report.

Table 12: Table Dairy farm numbers and annual production for Queensland (2008-09 to 2011-12)

Year	Farms	Annual production (millions of litres)
2008-09	610	512
2009-10	595	529
2010-11	566	485
2011-12	548	485

The dramatic change in the number of dairy farms in Queensland shown in Table 11 and Table 12 is mostly due to the deregulation of the industry and the serious droughts encountered in the intervening period.

The average cow productivity, costs and financial performance of the 62 Queensland dairy farms reported in QDAS were used to construct a model of a representative dairy farm. This model was then adjusted to reflect the estimates of impact used by Brett (1998) in the analysis of economic impact of BJD on New Zealand dairy farms. These production impacts are considered to be above those likely to be encountered on Queensland dairy farms but are used to indicate the upper bound estimate of potential impacts.

The modelled dairy farm achieved a farm gross margin of about $334,609 without the disease and $333,067 with the disease, a reduction of $1,542 per annum or about 0.46%.

Extending this level of loss to approximately 25 infected farms across Queensland (5% of the total) by 2028 indicates that the average annual impact of the disease could be about $40,000 per annum if the rate of spread is sufficient to get to 5% of farms.

Potential impact on exports of embryos, semen and live cattle

Appendix 1 lists the BJD requirements for countries importing cattle semen, embryos and live cattle from Australia.

As the trade in cattle semen and embryos out of Queensland is less than $1 million per annum in value and the destination of exports are largely unknown, little data exits from which to estimate an impact.

A partial deregulation scenario could mean that firms wishing to export semen and embryos from Queensland may have to meet changed requirements of importing countries. The additional costs of meeting any changed requirements are unknown but are potentially greater in many cases than the benefits to be gained through exporting.

Queensland exports of live cattle averaged 107,753 head per annum for the five years to 2011 (Table 13). It is expected that the relatively high value of the Australian dollar together with import restrictions being put in place by Indonesia appear likely to restrict the number exported from Queensland to less than 40,000 head in the current financial year.

Table 13: Numbers of live cattle exported from Australia (from Livecorp website)

Jurisdiction	2007	2008	2009	2010	2011	2012 (to Aug)	Average to 2011
ACT		354					354
NSW	4,881	3,215	4,063	6,830	12,464	1,052	6,291
NT	318,091	388,329	327,328	292,305	282,896	184,367	321,790
Qld	83,698	112,439	198,049	91,515	53,065	25,908	107,753
SA	4,813	1,816	2,388	1,140	14,239	14,943	4,879
Tas				223	1,031		627
Vic	44,513	59,151	60,178	113,752	93,677	50,176	74,254
WA	263,486	303,206	362,137	369,106	236,985	164,207	306,984
	719,482	868,510	954,143	874,871	694,357	440,653	822,932
Re-exports				45	72		
				874916	694429		
% by Queensland	12%	13%	21%	10%	8%	6%	13%

Table 14 indicates that the returns from live exports to Queensland vary greatly in total value but have been falling as a percentage of the total value of Australian live cattle exports.

Table 14: Value of live cattle exports from Queensland and Australia

$A Dollar	Queensland	Year on Year	Australia	Year on Year	
Year	($)	% change	($)	% change	% Queensland
2006/2007	48,399,471	91.6%	496,921,000	23.0%	9.7%
2007/2008	40,157,077	-17.0%	540,670,186	8.8%	7.4%
2008/2009	121,310,182	202.1%	646,006,923	19.5%	18.8%
2009/2010	109,042,448	-10.1%	701,151,278	8.5%	15.6%
2010/2011	44,823,134	-58.9%	659,648,355	-5.9%	6.8%
2011/2012p	23,396,239	-47.8%	650,772,956	-1.3%	3.6%

Source: Australian Bureau of Statistics, 2011-12, SITC codes, 00111, 00119, value, 1991-2012, data obtained from the Office of Economic and Statistical Research, Queensland Treasury

Tables 15 and 16 indicate that Indonesia has been by far the dominant destination of live exports from Queensland, in both number and value. In 2011/12 exports of live cattle from Queensland are comprised of 84% by value and 93% by number of livestock going to Indonesia.

Table 15: Queensland Live Cattle export destinations- $ Value

Country	2007/08	2008/09	2009/10	2010/11	2011/12
Brunei	22,000	0	0	0	0
China	0	0	0	1,149,616	0
Egypt	0	0	14,950,539	11,239,747	0
Indonesia	23,145,028	110,142,174	80,464,368	27,593,966	19,555,169
Japan	13,907,905	10,265,153	11,018,315	2,011,351	2,446,070
Malaysia	2,809,461	86,400	791,301	645,701	420,000
New Zealand	15,000	0	0	0	10,000
Philippines	7,600	0	842,616	153,183	0
Qatar	0	0	0	1,530,000	750,000
Singapore	0	0	580,000	0	0
Thailand	138,000	456,455	160,583	76,000	215,000
Turkey	0	0	0	393,570	0
United Arab Emirates	0	0	234,726	0	0
United States of America	112,083	0	0	30,000	0
Vietnam	0	360,000	0	0	0
All countries	40,157,077	121,310,182	109,042,448	44,823,134	23,396,239

Source: Australian Bureau of Statistics, 2011-12, SITC codes, 00111, 00119, value by destination, 1991-2012, data obtained from the Office of Economic and Statistical Research, Queensland Treasury

Table 16: Queensland Live Cattle export destinations – Number of Head

Country	2007/08	2008/09	2009/10	2010/11	2011/12
Brunei	2	0	0	0	0
China	0	0	0	450	0
Egypt	0	0	17,186	13,750	0
Indonesia	34,218	162,666	129,602	46,605	30,119
Japan	17,604	13,958	12,414	1,210	1,454
Malaysia	4,150	123	1,107	163	630
New Zealand	5	0	0	0	5
Philippines	76	0	1,700	498	0
Qatar	0	0	0	210	163

Country	2007/08	2008/09	2009/10	2010/11	2011/12
Singapore	0	0	274	0	0
Thailand	13	92	27	37	46
Turkey	0	0	0	39	0
United Arab Emirates	0	0	110	0	0
United States of America	19	0	0	3	0
Vietnam	0	20	0	0	0
All countries	56,087	176,859	162,420	62,965	32,417

Source: Australian Bureau of Statistics, 2011-12, SITC codes, 00111, 00119, volume by destination, 1991-2012, data obtained from the Office of Economic and Statistical Research, Queensland Treasury

The data in the above tables indicates that for the five years to 2011, live exports from Queensland:

- averaged about 107,753 head,
- had an average value of about $735 per head,
- earned an average export income of approximately $79 million

Although it would appear to be a low probability outcome, the potential loss of the live export market to Indonesia could be significant and the available data will be used in an attempt to identify the scale of the potential loss if that market closed to Queensland because of a change to its BJD status.

Based on past market specifications and the averaged export data, it appears the average price per kilogram received would have been no more than $2.10.

Over the same period, store steers with a similar weight range at Gracemere saleyards averaged about $1.70 per kilogram suggesting that live exports may have gained a 20% better price than steers sold though local store sales.

This is likely to be a significant overstatement of the price advantage of live exports to Indonesia as the data contains the returns of other live exports of breeding and stud stock that are sold significantly above the average price. There are also likely to be significant differences in the average quality of live export steers and Gracemere store steers.

Even so, Queensland cattle producers who currently sell to live export markets are likely to sell for less in the future if access to the Indonesian market was lost.

Table 21 attached in Appendix 1 indicates that Indonesia requires imports of breeder livestock to be tested free of the disease and feeder stock to be from a herd that has a five year history of no reported clinical cases of the disease. As Queensland has had only had a few clinical cases of the disease on one property associated with the current outbreak, such requirements are unlikely to disrupt the current trade in feeder steers - but some producers and others feel that the requirements may change with a partial deregulation of the disease in Queensland.

One potential impact of a partial deregulation of BJD in Queensland on the live cattle export market would be that Indonesia would require assurance from the livestock owner that their cattle are free of BJD. As cattle of the age normally exported to Indonesia appear to be impossible to test accurately for the presence of the organism and the BJD status of many herds in Queensland could now be questioned by a "difficult" buyer, it is possible that some disruption to this trade could occur in the short to medium term while health and testing protocols for BJD are established at the property level.

Although the vendors of previously exported live steers are likely to sell at a lower value than expected and suffer a loss, the overall Queensland beef cattle industry would be expected to absorb the additional livestock and turn them off as meat to other export markets without impacting the prices received in those sectors. In this way, part of the loss made by the former live export steer vendor may be picked up in profit made by the final seller of the finished steer to the abattoirs.

The net economic impact to Queensland of the loss of live export markets, especially to Indonesia, is difficult to discern without extensive economic modelling but it is likely to be significantly less than the potential losses suffered by the live export sector alone.

Exporters of live cattle from Queensland could have their income reduced by between $10 million and $15 million per annum if access to live export markets was completely lost and the average number and values of the last five years to 2011 were used to estimate the losses.

If estimates of loss by the live export sector are based on the expected number of exports for the current financial year, then losses would be about $3 to $6m per annum to that sector. At current values, the loss of live export markets for steers is unlikely to have a measurable impact at the level of the Queensland beef industry once the steers have been finished through an alternative marketing process.

In most cases it appears likely that exporters of live cattle from Queensland should be able to continue exporting by providing assurances of freedom from BJD unless they are subject to the current quarantine process or have an animal tested as positive in the future.

Potential impact on future access to markets for export beef

Bovine Johne's disease occurs worldwide and is endemic in the cattle populations of Australia's major competitors for exported livestock products, including Europe, North and South America and New Zealand.

BJD is classified by the Office International des Epizooties (OIE) as a List B disease and is a scheduled disease in many countries and States, including all States in Australia. Until recently, few countries other than Australia had initiated major programs to control BJD in cattle. However, there is said to be growing international interest with countries such as USA, Netherlands, UK and Japan implementing or contemplating the implementation of a national BJD Control Program.

It appears that no major trading partner, other than Japan, is seriously contemplating the control of the disease. On this basis, no disruptions to the trade in beef are expected to be caused in the foreseeable future by a partial deregulation of BJD in Queensland – possibly with the exception of the Japanese market.

The recent change in government in Japan may cause a change in direction but both the administration and the Japanese people are now considered to be sensitive to BJD and there is currently a mandatory test and cull program in place for the disease in Japan.

Although the successful control of the disease in any jurisdiction is considered to be a low probability event, Japan could reduce the incidence of the disease to the point where it can be considered to be controlled and then could expect its trading partners to supply beef from herds with a similar health status.

The incubation period for the disease suggests that it may be the best part of a decade before this outcome could arise, even if considerable efforts were put into testing all Japanese beef and dairy herds and immediately culling positive livestock.

The next section considers some characteristics of Queensland's trade in beef with Japan. Table 17 provides a summary of beef production, consumption, imports and prices for the Japanese market for the eight years to 2011.

Although the outbreak of Bovine spongiform encephalopathy (BSE) disrupted imports from the USA and Canada early in the period, it can be seen that Australia is still the dominant exporter of beef to Japan and that beef imports into Japan make up approximately half of the total beef consumption.

The high proportion of imported beef in total Japanese consumption suggests that it would be difficult for Japan to react in a similar way to the BSE response. All trading partners are likely to be assessed as having BJD and Japan would be unable to top up imports from another country (Australia) as was done in the BSE case.

Table 17 also indicates that a significant proportion of Japanese beef production comes from dairy based stock, a risk if BJD contamination became more of a concern to Japan.

Table 17: Summary of Japanese beef and veal statistics

	Unit	2004	2005	2006	2007	2008	2009	2010	2011
Cattle numbers a									
Beef **b**	’000	2788	2747	2755	2806	2890	2923	2892	2763
Dairy **c**	’000	1688	1628	1636	1668	1703	1655	1515	1378
Total	**’000**	**4476**	**4375**	**4391**	**4474**	**4593**	**4578**	**4407**	**4141**
Cattle slaughtering									
Wagyu	’000	464.1	462.9	449.7	447.5	467.0	494.8	510.0	517.6
Dairy	’000	773.2	739.1	740.6	729.1	737.6	702.3	404.8	409.7
Calves	’000	10.1	9.3	7.2	8.2	11.0	10.9	9.6	8.2
Total	**’000**	**1247.4**	**1211.3**	**1197.5**	**1184.8**	**1215.6**	**1208.0**	**924.4**	**935.5**
Production d									
Wagyu beef	kt	188.4	190.9	192.5	190.9	194.6	204.0	206.2	na
Dairy beef	kt	300.5	313.7	297.8	296.8	298.5	304.6	252.4	na
Veal	kt	1.0	1.1	1.0	0.8	0.9	1.2	0.9	na
Total	**kt**	**495.0**	**512.5**	**498.4**	**496.2**	**503.0**	**518.9**	**459.5**	**na**
Imports									
Fresh or chilled beef and veal **e**									
Australia	kt	203.6	222.9	208.2	188.1	159.2	168.6	155.0	139.8
Canada	kt	0.0	0.0	1.7	2.2	2.0	2.5	3.7	2.9
New Zealand	kt	3.7	4.6	5.7	6.1	5.9	6.1	7.3	7.5
United States	kt	0.0	0.0	5.1	17.8	31.1	34.5	44.1	61.9
Other	kt	0.7	2.6	2.5	1.7	1.4	1.1	1.2	1.3
Total	**kt**	**208.1**	**230.1**	**223.2**	**215.9**	**199.6**	**212.8**	**211.4**	**213.4**
Frozen beef and veal **e**									
Australia	kt	190.4	188.5	197.4	205.7	199.1	195.3	196.1	199.0
Canada	kt	0.0	0.0	0.4	1.2	2.7	6.1	9.2	7.3

	Unit	2004	2005	2006	2007	2008	2009	2010	2011
New Zealand	kt	30.2	34.6	31.1	27.2	26.2	23.0	24.3	22.2
United States	kt	1.3	0.0	2.2	16.3	23.0	34.7	47.5	58.7
Other	kt	2.5	8.4	5.0	6.8	8.9	8.7	11.1	16.7
Total	kt	224.4	231.5	236.1	257.2	259.8	267.7	288.1	303.8
Total beef and veal **ef**									
Australia	kt	394.1	411.3	405.6	393.8	358.2	363.9	351.1	339.1
Canada	kt	0.0	0.0	2.1	3.4	4.7	8.5	12.9	10.2
New Zealand	kt	33.9	39.2	36.8	33.3	32.1	29.1	31.6	29.8
United States	kt	1.3	0.0	7.3	34.1	54.1	69.2	91.6	120.6
Other	kt	4.3	11.3	7.7	8.7	10.3	9.8	12.3	18.0
Total	kt	432.5	461.6	459.3	473.1	459.4	480.5	499.5	517.6

a At 1 February. **b** Includes dairy steers. **c** Cows only. **d** Carcass weight. **e** Product weight. **f** Total includes cheek meat, head meat and cooked meat. g Prices for an average of A3–A4 type steers at Tokyo Central Wholesale Meat Market. **h** Prices for an average of B2–B3 type steers at Tokyo Central Wholesale Meat Market. **na** not available.

Sources: Agriculture and Livestock Industries Corporation, Monthly Statistics, Tokyo; Japanese Ministry of Agriculture, Forestry and Fisheries, Meat Statistics in Japan, Tokyo

The major sources of imported beef into Japan other than from Australia are Canada, New Zealand and the United States. All these exporting countries have BJD as an endemic disease across major beef production regions. Table 17 indicates that Australia supplied approximately 65% of beef imported by Japan in 2011, down from more that 75% in 2008. Queensland supplies approximately 70% of the Australian sourced beef sent to Japan (data not shown).

Table 18 indicates that Japan is consistently the largest export market for Queensland beef with approximately 37% of exports out of Queensland during 2011/12 ending up in Japan.

Although it appears very unlikely that Queensland would be singled out for special regulations by Japan if either changed its current BJD management policy, a major disturbance of beef export access to the Japanese market that fell on Queensland alone would be expected to have significant impacts on the profitability of the Queensland beef industry.

Table 18: Queensland export exposure Top 5 destinations (Value $ Australian)

Rank	Country	2007/08	2008/09	2009/10	2010/11	2011/12p	% of 2011/12
1	Japan	1,286,690,620	1,533,301,013	1,175,016,005	1,183,529,568	1,086,700,420	37.2%
2	USA	512,134,634	580,878,910	431,906,142		517,532,761	17.7%
	Korea Republic of				433,992,760		
3	Korea Republic of	477,632,717	361,469,395	379,418,966		406,638,573	13.9%
	USA				416,165,102		
4	Russian Federation	96,053,929	94,852,970		204,402,644		
	Taiwan			91,616,675		146,290,159	5.0%
5	Taiwan	72,823,185	91,892,008		100,470,315		
	Russian Federation			79,451,473		136,101,765	4.7%
	Top 5	2,445,335,085	2,662,394,296	2,157,409,261	2,338,560,389	2,293,263,678	
	Rest	253,280,150	399,480,296	334,680,406	496,089,814	625,919,724	
	Top 5 (% of total)	90.6%	87.0%	86.6%	82.5%	78.6%	

Source: Australian Bureau of Statistics, 2011-12, SITC codes, 011, value by country, 1991-2012, data obtained from the Office of Economic and Statistical Research, Queensland Treasury

There are a number of potential outcomes for the Queensland beef industry if Japan were to insist that imported beef be only sourced from regions or properties substantially free of Bovine Johne's disease.

Identifying the potential economic impact of a change in the BJD requirement for beef imported into Japan would be a highly hypothetical exercise, but on the balance of probabilities, it would appear that Queensland could be significantly better off in either of the main scenarios considered in this analysis.

If the BJD status of Queensland was to be maintained as a protected zone, the current outbreak controlled and Japan changed its requirements for imported beef concerning BJD, Queensland would enjoy a significant market advantage over other regions exporting to the Japanese market.

Conversely, if BJD were to be partly deregulated in Queensland, the expected slow rate of spread of the disease and low incidence in infected herds would allow Queensland to meet the changed import requirements more quickly and easily than most other exporting countries around the world, probably giving it a similar market advantage as previously identified – less the cost of testing herds exporting beef to Japan to provide an assurance of a low incidence of BJD. Queensland would have a substantial head start in reducing the occurrence of the disease in this case.

If BJD spread more rapidly across the Queensland beef industry than expected over the future decades, significant costs could be incurred in meeting a changed market import

requirement by Japan. Similar costs would have to be met by all of the major exporters of beef to Japan.

As previously identified, the costs of testing for the disease at the property level are substantial but would pale into insignificance compared to the benefits of having similar or greater access to the Japanese market as was enjoyed during the BSE outbreak in north America. In such a scenario, a very large market incentive for producers to be free of BJD would be available. This is something that does not currently exist.

Hypothetical advantage of protected status on the Japanese beef market

This component of the analysis has been included at the request of reviewers.

In recent years, Australia supplied around 70% of the beef imported by Japan and 40% of total Japanese consumption. Approximately 20% of beef imports came from the US and the rest from various countries. Queensland's share in Australian beef exports to Japan was around 70% or $1.1 billion in 2011/12. Until the recent discovery of the disease, Queensland was the only major beef exporter to Japan with a BJD-protected status. All other major exporters of beef to Japan have endemic BJD that is managed (or not managed) in a variety of ways.

Although converting Queensland's protected zone status for BJD to a managed status would leave Queensland objectively no worse off than all other exporters to the Japanese market, some Queensland stakeholders perceive an advantage due to maintaining a protected status for the disease. A possible reason may be that although Japan has endemic BJD, it is planning to become free of the disease.

BJD as a trigger for unilateral discrimination against Queensland beef by Japan would not be admissible under international trade rules; especially as it could only be replaced predominately with beef from sources with endemic BJD. Nevertheless, if Queensland were to lose beef sales to Japan after implementing a changed BJD management regime, these exports would need to be reassigned on the world market. As Japan is a high volume market, the industry may suffer a loss from redirecting product to alternative markets.

Table 19 shows the major destinations for Australian beef and veal exports in 2011-12 and the approximate price paid by each market for product. Traditionally, excess Australian beef has been exported to the United States and this market showed overall prices of about 10% less than the Japanese market in 2011-12.

Table 19: Australian beef and veal exports 2011-12

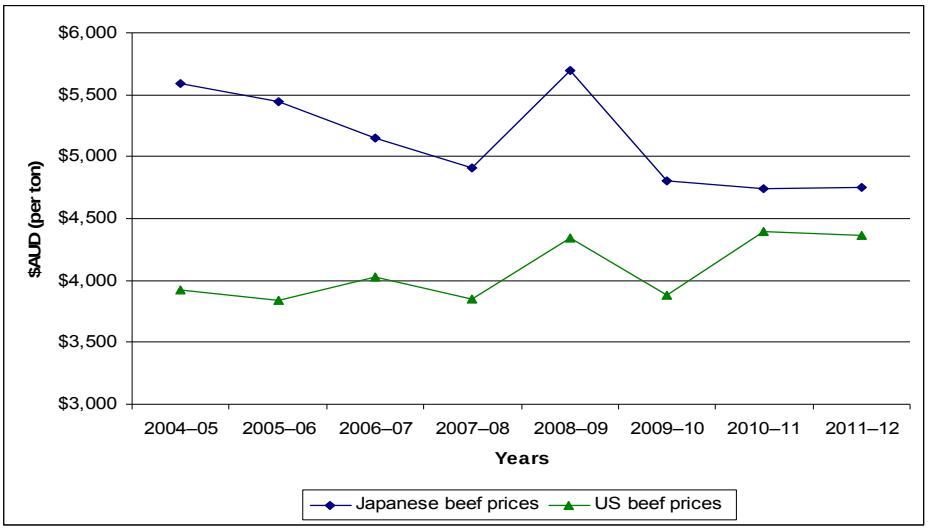
Destination	$m	kt	$/kg
Americas			
Canada	46.0	12.1	$3.80
Central and South	135.4	22.6	$6.00
United States	895.9	205.2	$4.37
Asia			
China	39.6	7.7	$5.12
Hong Kong	59.7	9.6	$6.24

Destination	$m	kt	$/kg
Indonesia	156.2	37.9	$4.13
Japan	1,548.8	325.8	$4.75
Korea, Rep. of	571.8	122.8	$4.66
Malaysia	59.8	15.0	$4.00
Philippines	55.6	19.3	$2.88
Singapore	60.5	11.8	$5.13
Taiwan	201.1	37.8	$5.32
Europe			
CIS	204.8	46.7	$4.39
European Union **a**	125.2	13.4	$9.34
Middle East			
Iran	7.2	1.4	$5.32
Kuwait	14.1	3.0	$4.71
Qatar	17.2	2.4	$7.27
Saudi Arabia	13.9	4.7	$2.98
United Arab Emirates	53.6	7.9	$6.80
Oceania			
New Zealand	6.7	1.6	$4.21
Pacific Isles	9.9	2.4	$4.11
Papua New Guinea	22.3	6.4	$3.47

* source: Sources: Australian Bureau of Statistics, International Trade, Australia, cat. no. 5465.0, Canberra; Department of Agriculture, Fisheries and Forestry, Export Statistics, Livestock Exports, Canberra

On the basis that the next best-paying market (USA) for Australian exported beef is 10% lower in price than that ruling for Japan in 2011-12, the price difference is approximately 40c/kg. This may be an overstatement of impact as Australia is showing rapid increases in beef exports to markets like mainland China and Hong Kong where little price differential to the Japanese markets appears to exist. A minor redirection of exports of Australian beef away from the Japanese market may not have a significant price impact, while a loss of the volume of trade in beef with Japan would be a measureable loss. Figure 3 indicates the shrinkage in price differential between the Japanese and US beef export markets over recent years. The current resurgence of demand for imports in the US beef market may cause this differential to remain stable or continue to shrink in the short term.

Image 3: Prices paid for beef imports from Australia on the Japanese and US markets



Sources: Australian Bureau of Statistics, International Trade, Australia, cat. no. 5465.0, Canberra; Department of Agriculture, Fisheries and Forestry, Export Statistics, Livestock Exports, Canberra

On the basis that Queensland supplies 70% of the Australian beef exported to Japan at similar prices to Australian beef exports, the implication of redirecting varying portions of Queensland beef exports from the Japanese market to alternative destinations are shown in Table 20.

Table 20: Hypothetical value of a redirection of beef exports to Japan from Queensland

Level of redirection of Japanese beef imports from Queensland	10%	20%	50%	70%	100%
Amount redirected (kilo tonnes)	22.8	45.6	114.0	159.7	228.1
Value lost in redirection ($million)	9.1	18.2	45.6	63.9	91.2

Based on current prices and estimated values, the redirection of all Queensland beef exports away from the Japanese market appears likely to reduce the Gross Value of Production[1] of beef by Queensland by less than 3%.

Analysis of variations in trade impact

This component of the scenario analysis quantifies outlines provided by reviewers.

The original analysis of the alternative scenario for the management of Bovine Johne's Disease identified that the complete closure of live exports for Queensland was unlikely (but not impossible) and that if a closure occurred it would not have a measureable economic impact at the level of the Queensland economy.

In the circumstance where access to live export markets was lost, it was predicted that some beef producers may see lower prices for sales but other beef producers would benefit from those lower prices, cancelling out any economic impacts at the level of the State economy.

It has been proposed that there are other potential impacts on the live export of beef animals out of Queensland that may arise from a change to the status of BJD.

[1] See: http://www.daff.qld.gov.au/documents/Corporate/1882-agtrends-oct-12_v5.pdf

The first is that there could be price impacts for all Queensland beef producers if live export markets were lost. The hypothesis presented is that a change to the disease status of BJD in Queensland could lead to a complete loss of live-export markets, potentially leading to an increase in market power for abattoirs and that could result in reduced farm-gate prices paid to all Queensland beef producers. It is also proposed that the Industry Commission's inquiry into meat processing (Industry Commission 1994) should be used to guide to the size of the potential impact on farm gate prices.

The second proposed impact would apply if live cattle exports continued and importers of live cattle from Queensland changed requirements so that all exported cattle had to be vaccinated against the disease as well as meeting the existing import regulations for the disease.

Analysis of market power impacts

The Industry Commission inquiry into meat processing identified (ABARE 2000) that the Australian meat processing sector was far less productive than international best practice and that low capacity utilisation and poor labour productivity were inhibiting economic benefits being gained by both producers and consumers.

The inquiry found that “while the magnitude of the estimated gains varies between studies, reductions in processing costs of at least 8 to 10% are achievable though they could be significantly higher” (Industry Commission 1994).

The Industry Commission did consider the role of market power within the meat processing sector but did not find any real concerns. For example “Producers continue to be concerned about the potential for abuse of market power resulting from further mergers. Nevertheless, this concern needs to be balanced against the need for further rationalisation of meat industry capacity” (page 214) and “In the Commissions assessment foreign investment does not possess a significant threat to the future competitiveness of the Australian industry. While the Commission appreciates that some sectors of the industry may be concerned about further foreign investments, the current mechanisms provide adequate safeguards to any current intractable problems which investment may invoke” (page 231). As a result of the inquiry, the Commission made no recommendations concerning any potential for the abuse of market power in the meat processing industry and did not express concerns for the competitiveness of the industry.

The context of beef exports at the time included quotas or other trade restrictions in force with the important export markets for beef and a heavy reliance on the North American market. Although both the constraints on the productivity of the meat processing sector identified by the Industry Commission and the export market for beef have undergone major liberalisations and transformations since the inquiry (ABARE 2000) it has been proposed that the relationship between coasts and prices identified by the Industry Commission in 1994 could be seen again if live cattle export markets closed to Queensland.

It must also be noted that the live export of cattle from Australia in the early 1990s was minimal with all of the growth of the industry coming after the inquiry.

Table 21 shows the results of an analysis undertaken by ABARE as a part of the 1994 meat processing enquiry. The analysis was undertaken using the EMABA model and calculated the likely impacts of a 20% reduction in processing costs across the total industry by 1996, and further sustainable improvements from then onwards of 3% per year over a ten year time frame.

Table 21: (Table K.1 Industry Assistance inquiry 1994): Simulated effects on beef of a reduction in processing costs

	1992	1993	1994	1995	1996	2000
Decreases in processing costs	4	4	4	4	4	12
(Cumulative decrease)	4	8	12	16	20	32
Production	-0.07	-0.21	-0.37	-0.39	-0.22	1.28
Real producer prices	2.09	4.24	5.96	7.04	6.94	6.66
Real consumer prices	0.04	0.23	0.38	0.31	-0.14	-2.26
Consumption	-0.06	-0.31	-0.56	-0.58	-0.27	1.56
Real value of production	2.09	4.30	5.96	7.04	7.00	6.75

The modelled cumulative decrease in beef processing costs of 32% over the decade led to a maximum 6.6% real increase in producer prices. It appears that each 1% change in processing costs was predicted to lead to a 0.2% change in producer prices. The cost reductions were predicated on the success of the Meat Research Corporations “Beefline” project being undertaken at Kilcoy abattoir at the time. Unfortunately history shows that this project did not achieve many of its aims.

Tables 22 and 23 indicate livestock slaughter and live export numbers for Queensland over recent years. It can be seen that about 3.5 million head on average are turned off to slaughter from the Queensland herd and about 89,000 head on average are exported to overseas destinations from the State as live animals.

On the basis of these figures, the throughput of Queensland abattoirs could increase by about 2.5% per annum on average if all live export stock currently sold overseas were finished and processed in Queensland.

Table 22: Beef slaughter numbers for Queensland

Year	2008	2009	2010	2011	2012	2013	Average
Livestock slaughtering (000’s)	3650	3431.8	3398.1	3462.4	3450.9	3718	3500

Source: Statistical review, July 2012 – June 2013, Editor: Rebecca Matthews Published by Meat & Livestock Australia Limited

Table 23: Live exports by Queensland

	07/08	08/09	09/10	10/11	11/12	12/13	Average
Live exports by Queensland	64,799	177,576	130,618	82,750	47,287	35,956	89,831

Source: Australian livestock export industry statistical review 2012-13 MLA

If the relationship between industry costs and prices revealed by ABARE in 1994 and the potential impact of the application of market power by abattoirs in Queensland was as hypothesised, the increase in throughput due to live export cattle being eventually processed through meatworks may lead to a general decrease in prices paid of about 0.5%.

The latest Agtrends (DAFF 2013) indicates that the gross value of cattle and calves sold for slaughter over recent years for Queensland has been about $3.2 billion per annum. A

reduction in farm gate prices of 0.05% due to abattoirs exercising market power may lead to a reduction in farm gate prices of about $16 million per annum.

This predicted level of economic impact would not be in addition to the potential sectoral costs previously estimated earlier for the closure of live export markets to Queensland beef producers. It is also not an estimate of the net economic impact to Queensland of an increase in market power for meat processors. It is likely that part of the gains by processors will be distributed to shareholders and investors and part will be distributed to beef consumers. The final level of economic impact to the Queensland economy would depend upon how processors allocated the benefits.

This component of the analysis applies the same process as previously applied in the scenario for the alternative management of Bovine Johne's Disease in Queensland. That is, the worst case outcome likely to arise from the selected impact is retained as the expected value.

An analysis of the concentration of the meat processing sector and recent market data may reveal whether the Industry Commission could have underplayed the role of market power in the meat processing industry.

The Industry Commission identified the top 5 meat processors in 1994. Their data has been reproduced in Table 24

Table 24: (Table C.13): The 'Top 25' processors, Australia, 1992

Rank	Company	E.C.W.T. (Mt)	Kill share (%)	Turnover ($m 1994)
1	Australian Meat Holdings	273	9.8	880
2	Smorgon Meat Group	150	5.4	500
3	Metro Meat Ltd	110	3.9	340
4	R J Gilbertson Pty Ltd	105	3.8	300
5	Nippon Meat Packers	96	3.4	297
6	Livestock & Meat Authority of Queensland	81	2.9	30
7	McPhee Export Meats Pty Ltd	77	2.7	147
8	Northern Co-Operative Meats Co Ltd	61	2.2	34
9	Northern Meat Group	58	2	148
10	Teys Brothers (Holdings) Pty Ltd	56	2	192
11	Castricum Brothers Pty Ltd	55	1.9	113
12	Morex Meat Australia	54	1.9	147
13	The Mid Coast Meat Co Pty Ltd	48	1.7	129
14	Gunnedah Shire Council Abattoir	44	1.6	21

Rank	Company	E.C.W.T. (Mt)	Kill share (%)	Turnover ($m 1994)
15	South Australian Meat Corporation	44	1.6	26
16	P D Mulligan (Holdings) Pty Ltd	44	1.5	93
17	South Burnett Meat Works Co-operative	42	1.5	132
18	R J Fletcher & Co	40	1.4	80
19	Cudgegong (Abattoir) County Council	40	1.4	16
20	Louis Dreyfus Services Pty Ltd	36	1.3	70
21	M C Herd Pty Ltd	34	1.3	75
22	E G Green & Sons Pty Ltd	34	1.2	85
23	Cargill Foods (Australia) Pty Ltd	33	1.2	80
24	G & B Gathercole Vic Pty Ltd	29	1	na.
25	Wynnes Pty Ltd	26	1	
	Combined total of top 25	1670	59.6	3935

The top 25 firms processed about 60% of the throughput at the time. A number of publicly owned facilities are evident in the list.

This data can be compared to a summary provided by MLA ten years later. Table 5 shows the top 25 meat processors in 2004.

Table 25: Table 1 (Figure 1) – top 25 red meat processors for 2004

Rank	Company	E.C.W.T. (Mt)	Kill share (%)	No. of plants	Turnover ($m 2005)
1	Australia Meat Holdings Pty Ltd	435,000	16.20%	4	$3,100
2	Teys Bros (Holdings) Pty Ltd	205,000	7.60%	5	$929
3	Nippon Meat Packers Aust Pty Ltd	166,500	6.20%	3	$750
4	Cargill Beef Australia	130,000	4.80%	2	$400
5	Bindaree Beef Pty Ltd	106,000	3.90%	2	na
6	T&R (Murray Bridge) PTY Ltd	96,237	3.60%	2	$350
7	unconfirmed	87,000	3.20%	5	na
8	Fletcher International Exports	74,000	2.80%	2	na
9	Midfield Meats International Pty Ltd	70,000	2.60%	2	$220
10	Southern Meats Pty Ltd	55,000	2.60%	2	$185

Rank	Company	E.C.W.T. (Mt)	Kill share (%)	No. of plants	Turnover ($m 2005)
11	Australian Country Choice Pty Ltd	53,400	2.00%	1	na
12	Rockdale Beef Pty Ltd	52,800	2.00%	1	na
13	HW Greenham & Sons Pty Ltd	52,500	2.00%	2	$230
14	JSA Jackson & Sons Pty Ltd	50,600	1.90%	2	$185
15	EG Green and Sons Pty Ltd	49,800	1.90%	1	na
16	Kilcoy Pastoral Company Pty Ltd	45,600	1.70%	1	$197
17	G&K O'Connor Pty Ltd	40,000	1.50%	1	na
18	unconfirmed	38,200	1.40%	1	na
19	Stanbroke Beef Company Pty Ltd	38,000	1.40%	1	na
19	MC Herd Pty Ltd	38,000	1.40%	1	na
21	G&B Gathercole (Vic) Pty Ltd	35,250	1.30%	3	na
22	V&V Walsh Pty Ltd	34,300	1.30%	1	na
23	Northern Co-operative Meat Company Ltd	33,647	1.30%	1	$80
24	Norvic Food Processing Pty Ltd	32,000	1.20%	1	na
25	Tatiara Meat Company Pty Ltd	31,800	1.20%	1	$189
	Combined total of top 25	2,050,634	76.30%	48	$6,815

Source: MLA Feedback Meat & Livestock Industry Journal Supplement October 1995

In 2004 about 76% of total meat processing was undertaken by 25 processing firms. No publicly owned facilities appear to be present in the top 25.

Since 2004 further aggregation and changes of ownership have occurred with JBS now holding about 11 processing plants across Australia including most of those formerly owned by AMH. JBS has the capacity to process about 40% of the annual turnoff of the Queensland beef herd.

During recent decades action has been taken by government authorities concerned with anti competitive behaviour to prevent the purchase of abattoirs by existing large processing firms in specific regions of Queensland. This action was taken as a potential outcome of market dominance may have been achieved if planned purchases had been allowed to proceed. It appears no action has been taken recently to prevent further rationalisation in the processing sector and the wide variety of ownership of processing capacity shown in Table 25 suggests that competitive behaviour in the processing sector would be the expected norm.

Data for beef cattle live exports from Queensland has been presented in Tables 16 and 23. During recent years, the number exported live has fallen from more than 180,000 head in 2008/09 to about 30,000 currently. It is expected that most of the hundreds of thousands of cattle potentially not exported over that period would have become available for processing

and if any exercise in market power were going to be undertaken due to a collapse in live export markets it could be apparent in processing volume and price data for the period.

Table 26 shows the relationship between total slaughter numbers and saleyard prices for slaughter grade ox in Queensland over recent years.

Table 26: Table 26 Relationship between slaughter numbers and sale yard bullock prices in Queensland

Year	2009	2010	2011	2012	2013
Livestock slaughterings (000's)	3431.8	3398.1	3462.4	3450.9	3718
change (number)		-33.7	64.3	-11.5	267.1
change (%)		-1.0%	1.9%	-0.3%	7.7%
Heavy steer (500-600kg lwt, M/F C4)	321.3	326.6	330.6	337.6	314.8
change (%)		1.6%	1.2%	2.1%	-6.8%

There appears to be a positive relationship between the increase in supply in 2011 and the prices paid for finished steers. If market power were being exercised due to an inflow of steers previously targeted for live export it would be expected that prices paid would fall during that period.

The rapid increase in supply in 2013 is due to the extreme drought conditions that continue to prevail over much of northern and western Queensland. Many properties in those regions have sold all stock suitable for slaughter including breeding stock. The fall in prices is therefore thought to be more due to the extreme oversupply of drought affected cattle than a manipulation of the market due to the availability of cattle for slaughter that would have formerly been destined for live export markets. While the reduction of potential market channels from two to one is a legitimate concern to producers, supply and demand conditions remain major determinants of market outcomes.

Analysis of the cost of vaccinating live beef exports

This proposed impact would only apply if live cattle exports continued and live cattle sourced from Queensland were required to be vaccinated against BJD as well as meeting the existing import requirements for the disease.

Animal Health Australia identify that a vaccine is being trialled in cattle and “is likely to delay or dampen down the rate of development of the infection, the rate of shedding and also the rate of onset of clinical disease. Current vaccines for Johne’s disease are not sufficiently effective to use in non-infected herds in low risk areas in the expectation that they will prevent a herd becoming infected”. (See http://www.animalhealthaustralia.com.au/programs/johnes-disease/bovine-johnes-disease-in-australia/bjd-frequently-asked-questions/#8)

Tables 16 and 23 of this report show numbers for live exports from Queensland from two different sources and for two different periods of time. Recent changes to the Livecorp website have prevented the use of the same source for Table 23 as was used in Table 16. If the estimates of average numbers exported shown in Table 16 and Table 23 are retained as upper and lower bounds, the estimated cost of vaccination would be about $2 to $2.4 million per annum if all exported cattle were vaccinated. The cost would fall to about $0.8 million if the estimated cost of vaccination was limited to the cattle sent to live export during the most recent year.

The estimated vaccine cost of $2 to $2.4 million would be equivalent to receiving about $0.06 per kilogram liveweight less for the typical export steer and would be met by Queensland beef producers. This is about a ½ to a ⅓ of the premium potentially to be received for live export steers.

The net economic cost of vaccination to the economy may be lower than the estimated cost shown above as the cost of the vaccine represents a transfer within the economy. The funds paid for the vaccine by livestock producers are gathered by the maker of the vaccine. If the vaccine is largely manufactured in Australia, the overall economic impact is likely to be minimal.

Recent statistics identify that Victoria sells a significant number of livestock to live export. The MLA statistical review (2012/13) and the MLA Australian livestock export industry statistical review (2012/2013) both indicate that Victoria sent twice as many cattle to live export as Queensland in both 2011/12 and 2012/13. More than 3,500 cattle were exported to Indonesia over the period suggesting that jurisdictions where BJD is managed differently to Queensland can still access live export markets including Indonesia.

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Appendix 1

Table 27: Countries that have a requirement for Johne's disease

Para-tuberculosis for cattle @ December 2012

Importing country	Commodity	Requirement
Argentina	Cattle - semen	90-day freedom
Brazil	Cattle - breeder	60-day freedom
Brunei	Cattle - slaughter	Clinical freedom from major infectious diseases
Canada	Cattle - breeder	Test freedom
Chile	Cattle - breeder	90-day freedom
Chile	Cattle - embryos	Clinical freedom
Chile	Cattle - semen	Test freedom
China	Cattle - breeder	1-year freedom, plus test freedom
Colombia	Cattle - semen	60-day freedom
Costa Rica	Cattle - semen	Clinical freedom
Cuba	Cattle - semen	Centre freedom
Czech Republic	Cattle - semen	5-year freedom
East Timor	Cattle - breeder	Clinical freedom
Ecuador	Cattle - semen	Clinical freedom
Indonesia	Cattle - breeder	Test freedom
Indonesia	Cattle - feeder	5-year freedom
Iraq	Cattle - semen	Clinical freedom
Israel	Cattle - feeder	3-year freedom
Israel	Cattle - semen	3-year freedom
Japan	Cattle - breeder	Test freedom
Japan	Cattle - feeder	5-year freedom
Japan	Cattle - semen	6-month freedom
Kazakhstan	Cattle - breeder	3-year freedom
Korea	Cattle - embryos	Test freedom
Korea	Cattle semen	5-year freedom
Libya	Cattle - breeder	1-year freedom

Importing country	Commodity	Requirement
Malaysia	Cattle - breeder	3-year freedom, plus test freedom
Malaysia	Cattle - feeder	2-year freedom
Malaysia	Cattle - slaughter	2-year freedom
Mauritius	Cattle - slaughter	3-year freedom
Norfolk Island	Cattle - breeder	Test freedom
Oman	Cattle - breeder	2-year freedom
Pakistan	Cattle - embryos	Clinical freedom
Pakistan	Cattle - breeder	Test freedom
Pakistan	Cattle - semen	Clinical freedom
Paraguay	Cattle - semen	60-day freedom
Philippines	Cattle - breeder	5-year freedom
Philippines	Cattle - embryos	6-month freedom
Philippines	Cattle - feeder	1-year freedom
Philippines	Cattle - semen	5-year freedom
Qatar	Cattle - breeder	Clinical freedom
Russian Federation	Cattle - breeder	3-year freedom, plus test freedom
Russian Federation	Cattle - embryos	3-year freedom
Russian Federation	Cattle - feeder	3-year freedom
Russian Federation	Cattle - semen	3-year freedom
Sabah	Cattle - breeder	6-month freedom
Sabah	Cattle - feeder	Clinical freedom
Sabah	Cattle - slaughter	Clinical freedom
Sarawak	Cattle - breeder	Clinical freedom
Sarawak	Cattle - slaughter	Test freedom
Singapore	Cattle - breeder	Clinical freedom
Singapore	Cattle- breeder	Freedom one month before export
Solomon Islands	Cattle - breeder	Clinical freedom
Sri Lanka	Cattle - breeder	Test freedom
Sudan	Cattle - breeder	Clinical freedom

Importing country	Commodity	Requirement
Taiwan	Cattle - embryos	1-year freedom
Taiwan	Cattle - breeder	1-year freedom
Taiwan	Cattle - semen	1-year freedom
Thailand	Cattle - embryos	Test freedom
Thailand	Cattle - semen	1-year freedom
Turkey	Cattle - breeder	5-year freedom
Turkey	Cattle - feeder	Test freedom (not required from JD-free state)
Turkey	Cattle - slaughter	Property not in quarantine
UAE	Cattle - breeder	Clinical freedom
UAE	Cattle - semen	Clinical freedom
Uruguay	Cattle - embryos	2-year freedom
Uruguay	Cattle - semen	Test freedom
USA	Cattle - breeder	5-year freedom
Vanuatu	Cattle - embryos	3-year freedom
Vanuatu	Cattle - semen	3-year freedom
Vietnam	Cattle - feeder	Clinical freedom
Vietnam	Cattle - semen	Centre freedom

Source: Agforce (2012)

Table 28: Table 2 Number of herds by jurisdiction, breed and type listed on the Animal Health Australia CattleMAP database*

	NSW		NSW Total	SA		SA Total	Tas		Tas Total	Vic		Vic Total	Grand Total
Breed	beef	dairy		beef	dairy		beef	dairy		beef	dairy		
Angus	50		50	39		39	18		18	46		46	153
Angus Cross										1		1	1
Australian Red	1		1										1
Ayrshire		1	1		1	1					2	2	4
Belted Galloway				1		1							1
Blonde D Aquitaine				1		1							1
Brahman	2		2	1		1				1		1	4
Brangus	1		1							1		1	2
Braunvieh	1		1										1
Brown Swiss		6	6								1	1	7
Charbray										1		1	1
Charolais	8		8	8		8				10		10	26
Crossbred	2		2	4		4							6
Dexter				2		2	2		2				4

	NSW		NSW Total	SA		SA Total	Tas		Tas Total	Vic		Vic Total	Grand Total
Friesian					3	3					1	1	4
Friesian Holstein		70	70		11	11		2	2		3	3	86
Galloway							1		1				1
Gelbvieh				3		3				1		1	4
Guernsey		4	4		2	2							6
Hereford	5		5	6		6	3		3	24		24	38
Hereford Angus										2		2	2
Highland				3		3				1		1	4
Holstein Friesian					6	6		1	1				7
Illawarra		9	9										9
Jersey		29	29		4	4					1	1	34
Limousin	2		2	5		5	2		2	1		1	10
Lowline	1		1	4		4				3		3	8
Miniature Cattle							1		1				1
Miniature Hereford				1		1	1		1				2
Murray Grey	30		30	25		25	11		11	15		15	81

	NSW	NSW Total	SA	SA Total	Tas	Tas Total	Vic	Vic Total	Grand Total
Other							5	5	5
Pinzgauer	1	1					1	1	2
Poll Hereford	7	7	20	20	7	7	10	10	44
Poll Shorthorn			2	2					2
Red Angus	2	2	12	12			1	1	15
Red Poll	2	2	4	4			1	1	7
Salers			1	1					1
Santa Gertrudis	2	2	7	7					9
Scottish Highland			2	2					2
Senepol	1	1							1
Shorthorn	2	2	11	11	2	2	2	2	17
Simmental	2	2	14	14			8	8	24
South Devon			3	3			1	1	4
Swedish Red And White	2	2							2
Wagyu	1	1					2	2	3

	NSW		NSW Total	SA		SA Total	Tas		Tas Total	Vic		Vic Total	Grand Total
Grand Total	125	119	244	179	27	206	48	3	51	138	8	146	647
Tested herds	125	119	244	179	27	206	48	3	51	138	8	146	647
State total herds**	27,166	1,501	28,667	4,629	401	5,030	2,603	569	3,172	16,020	5,164	21,184	94,922
% tested	0.46%	7.93%	0.85%	3.87%	6.73%	4.10%	1.84%	0.53%	1.61%	0.86%	0.15%	0.69%	0.68%

Source*: http://www.animalhealthaustralia.com.au/programs/johnes-disease/market-assurance-programs-maps/ accessed 16/04/2013

Source**: 71210DO001_201011 Agricultural Commodities, Australia, 2010-11, Released at 11:30 am (Canberra time) Fri 29 Jun 2012
Table 1 Agricultural commodities, National and State–2010-11