BIOSECURITY NEW ZEALAND

Review of the Animal Welfare (Pigs) Code of Welfare

Draft Economic Analysis for Consultation

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1. Executive summary

The current Animal Welfare (Pigs) Code of Welfare (the Code) was issued in 2005 under the Animal Welfare Act 1999. The Code allows dry sow stalls built after 2005 to be used for up to four weeks per reproduction cycle. Stalls built before 2005 can be used without restriction until 2015 when all stall use is restricted to a maximum of four weeks per reproduction cycle. Approximately 16,750 sows are housed in stall farms.

This economic analysis estimates impacts on the New Zealand pigmeat market, including on producers and consumers, from various welfare code options ranging from bringing forward the 2015 dry sow stall restriction to 2013, and banning stall use from 2013, 2017, and 2023. Impacts modelled include:

- capital costs (including Resource Management Act costs) of converting farms;
- additional labour and feed costs;
- productivity decrease (embryonic losses);
- the impact on farm profitability and industry exits;
- the impact on prices for consumers;
- consumers' access to meat;
- premium prices producers may receive by converting farms;
- changes to the number of sows in stalls in New Zealand; and
- changes to the number of sows in stalls overseas (how much sow welfare is exported overseas).

The analysis uses conservative estimates that may overstate the true impacts. It does not calculate a net benefit or recommend an option.

General approach to the model

The model in this analysis uses NZ Pork's example average indoor pig farm that houses 250 sows. Estimates of the costs involved in complying with Codes were also provided by NZ Pork. Other information has been derived from a number of sources including NZ Pork publications, Statistics New Zealand, the World Trade Atlas, and international research.

1.1. KEY ASSUMPTIONS IN THE MODEL

As with all modelling, the estimated results are dependent on the assumptions used. The assumptions are largely based on information provided by NZ Pork in its example average farm, and from NZ Pork publications.

Assumptions that govern all options

Under all options, the following assumptions are used.

There are alternative housing systems available to farms. NZ Pork has indicated that group housing is the likely response to a ban. In 2005, 59 percent of 162 commercial-sized farms (greater than 500 pigs) were not using stalls.

The pork industry has some ability to pass on cost increases to consumers.

Current code (status quo)

With respect to the current Code, it is assumed that all farms will comply with the requirement to limit their use of dry sow stalls to four weeks from 2015.

Key assumptions of the ban options

For the ban options, the following additional assumptions are used.

In the model, it is assumed that by 2013, 46 percent of stall farms will have paid off some debts incurred complying with the four weeks restriction, and will be able to afford the capital costs of a ban. Another 27 percent will still have those debts, and won't have much ability to pass further debts onto consumers. The final 27 percent won't yet have additional debts, but also won't have much ability to pass additional costs incurred as a result of the ban onto the consumer.

In the model, it is assumed that by 2017, 73 percent of stall farms will have paid off some debts incurred complying with the four weeks restriction, and will be able to afford the capital costs of a ban. The final 27 percent will have incurred debts moving to four weeks, but will have some ability to pass on additional costs to the consumer.

In the model, it is assumed that by 2023, 100 percent of stall farms will have paid off some debts incurred complying with the four weeks restriction, and will be able to afford the capital costs of a ban. They will also have an increased ability to pass on additional costs to the consumer as pork will have become embedded in consumers' diets.

We have also modelled alternative sets of assumptions where:

1. the ability to pass on cost increases to consumers does not improve over time; and
2. debts incurred from complying with the four weeks restriction on the use of dry sow stalls are ongoing.

1.2. RESULTS OF THE MODEL

The model estimates impacts of a number of potential changes to the Code. These are:

- bringing forward the 2015 date for the four weeks restriction to 2013; and
- banning dry sow stall use in either 2013, 2017, or 2023.

Bringing forward the 2015 date for four weeks use to 2013

The analysis suggests that there is unlikely to be a significant or measurable impact from bringing forward the four weeks restriction on dry sow stall use for all farms from 2015 to 2013 as compared to what is estimated to occur under the current Code.

Banning dry sow stall use in either 2013, 2017, or 2023

Three ban dates of 2013, 2017, and 2023 were considered against the current Code requirements. The model estimates that banning sow stalls will cause:

- pigmeat price increases of between about 4.4 percent and 4.7 percent; and
- domestic pigmeat production decreases of between about 3.1 percent and 6.7 percent (the equivalent of up to six average-sized farms exiting the industry).

These impacts represent a net cost to New Zealand of up to about $266 per sow per annum (net cost of between $3.4 million and $3.9 million per annum).

The model suggests that the impact will largely be borne by consumers through higher prices and reduced consumption of pork. Stall farms will be negatively affected and some are likely to exit the industry. Non-stall farms will benefit from a higher price for pigmeat.

2. Background on the Code

2.1. RELEVANT REGULATION

The current Animal Welfare (Pigs) Code of Welfare was issued in 2005 under the Animal Welfare Act 1999 (the Act). The Code provides guidance to owners of pigs, and to other people in charge of pigs, about the standards they must achieve to meet their obligations under the Act. The Code applies to all pigs and covers all aspects of managing pigs, including:

- stockmanship;
- food and water;
- shelter and housing facilities;
- providing for behavioural needs;
- handling and husbandry procedures;
- disease and injury control;
- emergency humane destruction; and
- quality management.

The Code allows for:

1. the limited use of dry sow stalls (Minimum Standard 10); and
2. the limited use of farrowing crates (Minimum Standard 9).

The National Animal Welfare Advisory Committee (NAWAC) used the exceptional circumstances provision of the Act (section 73) to limit the period that sows are kept in farrowing crates to six weeks and in dry sow stalls to four weeks on the grounds that keeping sows in crates and stalls for extended periods is contrary to the Act. NAWAC also indicated that it would like to see dry sow stalls phased out, but only when viable alternative management systems are found that result in improved animal welfare overall. NAWAC proposed that research be done to identify alternative systems and the code be reviewed in 2009.

Under section 73 of the Act, NAWAC can recommend minimum standards that do not comply with the obligations of the Act having regard to:

(a) the feasibility and practicality of effecting a transition from current practices to new practices and any adverse effects that may result from such a transition;

(b) the requirements of religious practices or cultural practices or both;

(c) the economic effects of any transition from current practices or both.

2.2. DRY SOW STALLS AND FARROWING CRATES

Dry sow stalls

Dry sow stalls separate sows from each other during gestation. By preventing physical interaction (and aggression) among sows, farmers can better manage individual feeding requirements and reduce embryonic loss. Sows are only able to stand up, and sit or lie down in a barren environment.

Stalls built after 2005 can be used up to four weeks per reproduction cycle. Stalls built before 2005 can be used without restriction until 2015 when all stall use is restricted to a maximum of four weeks per reproduction cycle.

Farrowing crates

Like dry sow stalls, farrowing crates restrict sow movement. By confining the sow during nursing and by providing a bay in which piglets are sheltered from the sow, farrowing crates reduce piglet mortality and improve farm production. The current Code allows for farrowing crates to be used for up to six weeks per reproduction cycle.

Overall

Under the current Code, for stalls built after 2005, sows may be kept in stalls and crates for up to ten weeks per reproduction cycle. Sows have about two reproduction cycles per year. This means that the current Code can allow sows to be kept in stalls and crates for about 20 weeks a year (more for those farms that are not yet required to meet the four weeks restriction for dry sow stalls).

2.3. LEGAL STANDING OF CODES

Non-compliance with a code of welfare is not itself an offence under the Act. Instead, prosecutions are made against alleged failure to meet the obligations of the Act relating to the care of an animal or for ill-treatment of an animal. Non-compliance with minimum standards can, however, be used as evidence in support of a prosecution.

2.4. REASON FOR THE REVIEW

Section 78 of the Act requires NAWAC to review codes no later than every ten years. In 2005, NAWAC stated that it wished to see further research conducted into alternative housing systems, their impact on the welfare of pigs, and ways that negative impacts could be managed. NAWAC undertook to review the code in 2009 when it would review the results of the research.

In response to recent public interest, the Minister has also asked NAWAC to give the review a high priority.

2.5. REGULATORY PROCESS AND ROLES

Anyone can draft a code of welfare. From there the code is guided through the regulatory process by NAWAC and the Ministry of Agriculture and Forestry (MAF). In this case, NAWAC is reviewing the current Code and developing a new one.

NAWAC has asked MAF Biosecurity New Zealand to complete an economic analysis of NAWAC's draft proposals. This analysis is released with the Draft Code for public consultation.

NAWAC must consider all submissions, good practice and scientific knowledge, available technology, and any other relevant matters including economic and other impacts. NAWAC then makes a recommendation to the Minister.

MAF advises the Minister on NAWAC's recommendation, and the Minister decides whether or not to approve the code.

3. Purpose of the analysis

3.1. PURPOSE OF THE ECONOMIC ANALYSIS

This economic analysis aims to serve a number of purposes:

1. To help inform NAWAC's deliberations on what options should be included in the draft Code for consultation.
2. To help inform public discussion on the draft Code.
3. To seek further information from the public to further refine the analysis.
4. To form the basis of MAF's regulatory impact analysis.
5. To help inform NAWAC's decisions on a final Code.
6. To help advise the Minister on NAWAC's final recommendation.

3.2. SCOPE OF THE ECONOMIC ANALYSIS

NAWAC wants to see a progressive shift for indoor housing systems to those in which the lactating sow and piglets have the benefits conferred by farrowing crates while giving the sow increased opportunity to express a greater range of behaviours. Although investigation of alternative systems is being undertaken in many countries, NAWAC is not able to identify, with regards to farrowing crates, viable alternative systems for adoption in New Zealand at this time. The Pork Industry Board have agreed that the requirements of the Minimum Standard 11 proposed in the Draft Code are an interim step in a journey, not an endpoint, and have undertaken to continue their pursuit and adoption of suitable practicable systems that address NAWAC's concerns.

The proposed Minimum Standard 11 would immediately limit the use of farrowing crates from six weeks to four weeks per reproductive cycle, reflecting current industry practice.

This analysis is, therefore, restricted to assessing the impacts of options for dry sow stalls.

Impacts modelled include (using conservative estimates that will potentially overstate the true impacts):

- capital costs (including Resource Management Act costs) of converting farms;
- additional labour and feed costs;
- productivity decrease (embryonic losses);
- the impact on farm profitability and industry exits;
- the impact on prices for consumers;
- consumers' access to meat;
- premium prices producers may receive by converting farms;
- changes to the number of sows in stalls in New Zealand; and
- changes to the number of sows in stalls overseas (how much sow welfare is exported overseas).

The analysis uses a partial-equilibrium model. That is, the analysis estimates impacts on the pigmeat market and does not estimate impacts on the entire economy. In order to use as plain a language as possible, the analysis will be referred to as an 'economic analysis' rather than a "partial-equilibrium model".

The analysis is also only a draft analysis. There are limitations and uncertainties that will be raised throughout the paper. The analysis is intended to stimulate discussion and encourage

improvements to the model and data. It should be kept in mind, however, that conservative assumptions have been used and the limitations of the model mean that the true impacts are likely to be less than have been estimated. Furthermore, although there are uncertainties in the model, the sensitivity analysis shows that, when adjusted, few of the variables (beside the productivity decrease) have large impacts on the results.

4. Method

This chapter broadly outlines the approach taken in assessing the economic impact of changes to the Code. More information on the underlying theory and how this type of analysis differs from some past analyses can be found in Appendix 1.

4.1. OVERALL APPROACH OF THIS ANALYSIS

A model of the domestic pork market has been constructed using data on the New Zealand market and information from overseas where New Zealand data cannot be found. The model incorporates demand and supply curves, and estimates how much prices change by adjusting those curves in response to impacts of changes to the Code.

The analysis uses generally conservative assumptions, that is, assumptions and variables are used that are likely to overestimate the true economic impact.

Information on farm income, costs and profitability has been provided by NZ Pork in the form of an example farm that houses sows indoors. These farm models are used by NZ Pork to monitor farm profitability over time.

Information on cost increases as a result of a farm's move to the four week restriction and to a ban has also been provided by NZ Pork.

The model follows the approach below using NZ Pork's example average farm:

1. Current short term demand and supply curves are estimated using current prices and quantities and estimates of elasticities found in economic studies.
2. Variable costs (including productivity losses, and increases in feed and labour costs – the kinds of costs that a firm can vary in the short term depending on how much it wants to produce) are added to find a new short term supply curve.
3. A new short term equilibrium is identified.
4. Farm profitability is assessed after including increases in fixed costs (the kinds of costs a firm cannot vary in the short term depending on how much it wants to produce, eg capital costs and Resource Management Act costs).
5. If farms are making lower than normal profits, in the longer term some firms will exit the industry. These exits decrease supply and increase the price for farms that remain in the market.
6. Using the demand curve, estimates are found of what quantity reduction (i.e. how many farms would need to exit) to generate a price that would leave the remaining firms with normal profits.
7. The resulting long term equilibrium is found and the results presented.

The key difference between this analysis and past analyses is that prices are allowed to change in response to changes to the Code. If some of the cost increase can be passed onto consumers, producers can limit the impact on farm profitability.

Key Point: The impact on producers of cost increases will be less if producers can pass on some of the cost increase to consumers through higher prices.

4.2. DEMAND AND SUPPLY – PORK MARKET

Pig farms produce pig meat that goes to two destinations. Some meat is sold as fresh pork; the kind you might roast. Some meat is processed and sold as bacon and hams, etc. Domestically produced processed meat has a close substitute with imported processed meat. Domestically produced fresh meat does not have the same very close substitute: there is only a very small volume of fresh pork imports.

Key Point: Fresh pork demand may be less elastic than processed meat demand.

This implies that if the pork industry were to try to pass on additional costs to consumers, they might lose much of the processed meat market, but might not lose as much of the fresh pork market.

Furthermore, the pork industry has been shifting production from the processed meat market to the fresh pork market and, as will be detailed in later chapters, have succeeded in growing fresh pork consumption. However, part of this growth may be new consumers. New customers might still be quite sensitive to price changes. This means that fresh pork demand might be more elastic now than it will be in a number of years when consumers have embedded pork in their diets.

Farmers receive one price for pigmeat irrespective of its final destination. Demand for pigmeat, though, has two sources: demand from parties that would eventually send the meat to the fresh pork market, and demand from parties that would eventually send the meat to the processed meat market.

Pigmeat supply also has two sources: supply from farms that use dry sow stalls ('stall farms') and supply from farms that do not use dry sow stalls ('non-stall farms').

The total demand for pigmeat and total supply of pigmeats are calculated and adjusted according to the impacts modelled.

More detail on the discussion of fresh pork and processed meat can be found in Chapters 5 and 6. Demand and supply curves are constructed for the status quo in Chapter 6. Chapter 7 then models and estimates various effects of changes to the Code including:

- to costs:
  - increased variable costs such as feed and labour costs;
  - decreased productivity;
  - increased capital costs of changing farm systems;
  - the impact on farm profitability and industry exits for stall farms;
  - higher prices for consumers;
  - reduced access to meat for consumers; and
- to benefits:
  - the change in the number of sows housed in stalls;
  - the effect on prices (price premium) producers might receive; and
  - the impact on non-stall farms as they become more competitive relative to stall farms.

The analysis does not attempt to monetise any welfare gain to pigs, that is, convert changes in pig welfare into a dollar value.

5. Cursory analysis

Before getting into the maths, a brief qualitative analysis of the current situation might help set the scene.

5.1. ALTERNATIVE SYSTEMS

Key Point: There are alternative housing systems available to farms.

It may be more costly for some farms to convert to those systems than for other farms, or impossible for some, but alternative systems do exist and are in use by New Zealand farms. Alternative systems range from group housing, where several sows are grouped in indoor pens, to outdoor farming.

Dry sow stalls are mostly used by large, commercial-sized piggeries with 500 pigs or greater. According to surveys of the pork industry[1], 89 producers were using dry sow stalls in 2001. By 2005, the number of producers using dry sow stalls had fallen to 67, representing about 41 percent of commercial-sized farms. 59 percent of commercial-sized farms used alternative housing systems.

In 2005, farms using dry sow stalls housed an average of 258 sows[2].

In 2009, there are 152 commercial-sized piggeries (down 6 percent since 2005 and down 5 percent since 2003). Although there has been a significant decrease in the number of farms using stalls between 2001 and 2005 (down 25 percent), there has not been as strong a decrease in the number of farms continuing to operate.

There has not been another industry survey since 2005, and we have not been able to source non-stall farm budgets. However, that there has not been a significant drop in the number of commercial-sized farms while farms have converted to non-stall, may suggest that non-stall farms are comparatively profitable to stall farms.

However, without knowing the profitability of non-stall farms, it is difficult to make a reliable judgement. For this reason, two scenarios have been constructed. Scenario 1 models the impacts when stall farms are the farms that exit the industry under the status quo. Scenario 2 models the impacts when non-stall farms are the farms that exit the industry under the status quo.

5.2. PASS ON COST INCREASES

Key Point: The pork industry has some ability to pass on cost increases to consumers.

In 2008, large increases in the price of grain put cost pressures on meat producers. In April 2008, NZ Pork indicated that pig meat prices would likely rise[3]. The graph below shows that prices did rise[4].

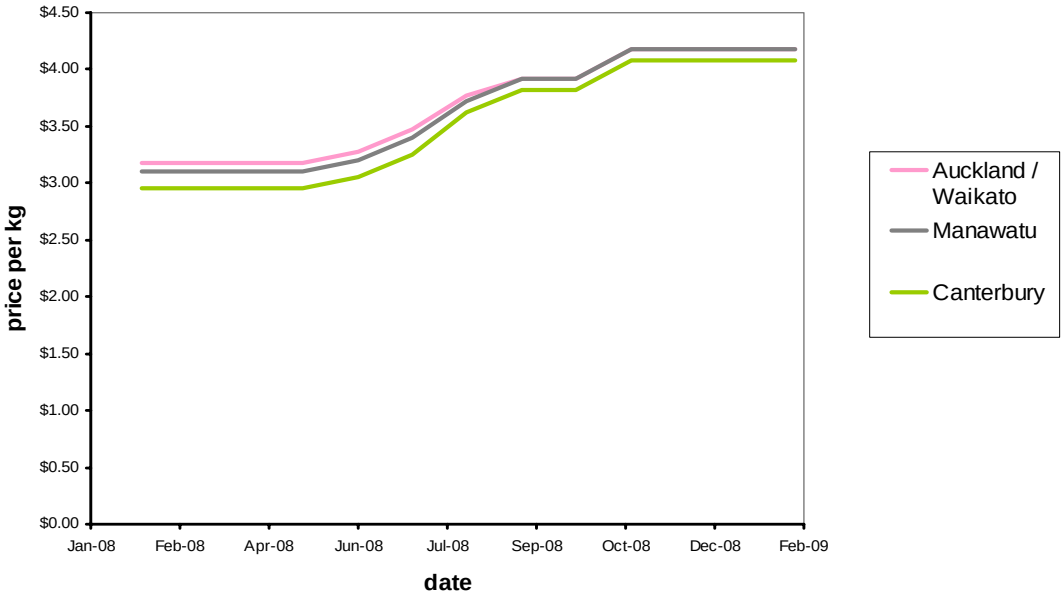
[1] MM Research, March 2005, *Sow Housing Survey for NZ NZ Pork*.

[2] MM Research, March 2005, *Sow Housing Survey for NZ NZ Pork*.

[3] 26 April 2008, *What's going up? Everything*, New Zealand Herald, http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10506354.

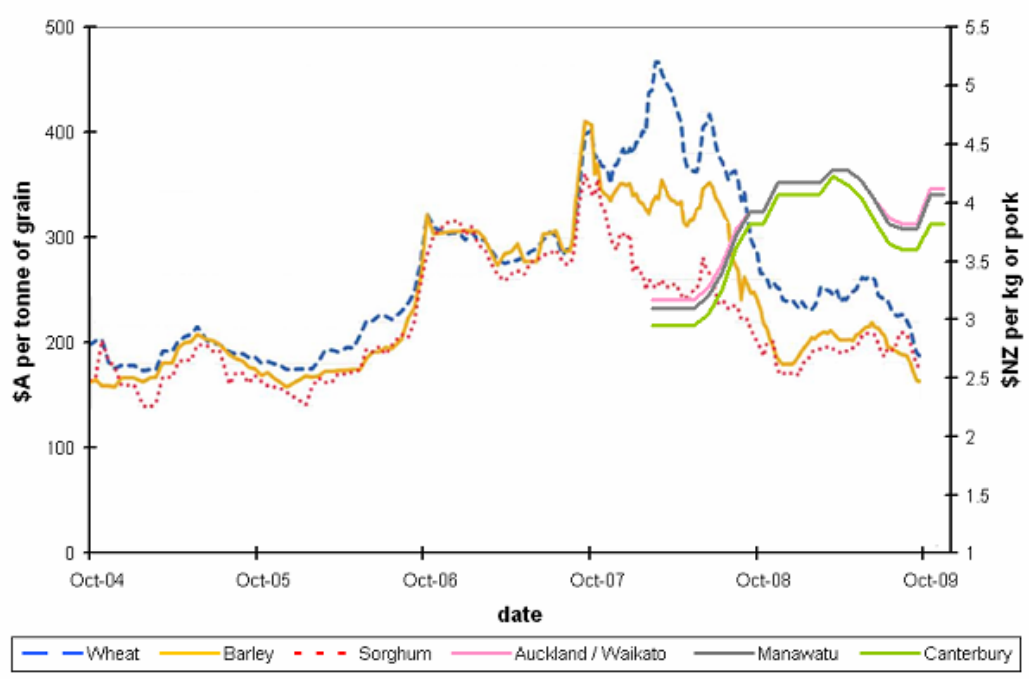
[4] The graphs plot midpoint prices found in Pork Outlook http://www.nzpork.co.nz/Publications/PorkOutlook.aspx.

Figure 5.1: Farm gate pork price per kg



Additionally, the graph[5] below suggests that there is about an 18 month lag between feed price increases and increases in pork prices (likely due to it taking some time for producers to come off existing grain contracts). More importantly, while prices may still yet fall, apart from a temporary fall about the time of swine flu and public attention on welfare issues, they have not fallen nearly 24 months after grain prices began to fall.

Figure 5.2: Grain and pork prices



[5] Taken from http://www.nzpork.co.nz/LinkClick.aspx?fileticket=hHdm7HdgKG8%3d&tabid=133&mid=658 and Pork Outlook.

5.3. FRESH PORK VERSUS PROCESSED MEAT

Key Point: The pork industry is increasingly focussing on production for the fresh pork market.

The pork industry has made a strong effort over many years to grow the fresh pork market. In 2007, NZ Pork said that[6]:

> ***Increasing the demand for New Zealand fresh pork is critical to a sustainable industry**, and is the Board's major investment area. To test the impact of recent marketing initiatives, comprehensive independent consumer research was undertaken by Fast Forward Strategic. The results showed a dramatic and positive change in perception of pork over the last five years, good endorsement of the advertising approach taken. **However the challenge now is to cement pork as part of the weekly meal repertoire**.*

NZ Pork reported in 2008 that[7]:

> *There is no doubt about the effectiveness of the campaign that has seen fresh consumption grow by 0.5kg per capita per year for the last five years. The growth is significant and means that 75 percent of our production goes to fresh market **which should reduce the impact of imported product on pricing**. Feedback from the marketplace also indicates there is increasing value in the "100 percent New Zealand Pork" brand. As we look forward there is no doubt that we can continue to grow consumption, **but the challenge is to lift the return to producers** while ensuring we deliver value to consumers;*

and

> *… given NZ's difficulties in competing with imported processing product on price, specification and consistency of supply, the continued focus on growing the fresh market makes sense, no-one else in the world can produce fresh New Zealand pork.*

So, although the pork industry has moved increasingly towards fresh pork production and away from processed meat, it seems that there is still work to do on establishing a strong, long-term connection with the consumer whereby the pork industry might be able to increase prices without losing too many consumers.[8]

[6] New Zealand Pork, *Annual Report 2007*, p. 2, emphasis added.

[7] New Zealand Pork, *Annual Report 2008*, p. 3, emphasis added.

[8] Some may wonder about the typical finding in economics that elasticities increase with time. *Ceteris paribus*, this is generally true. However, in this case all other things are the same. NZ Pork is actively trying to improve consumers' attachment to pork. When new products enter a market, it could be expected that consumers will be price sensitive. These products don't start very elastic, and get more elastic over time. Instead, producers may set prices lower than desired, getting consumers to try their product, before then increasing the price.

6. Status quo

This chapter sets out what would happen if the current code remained (the status quo) and constructs a model of the New Zealand pig meat market, presenting key points, assumptions and results along the way. From time to time key sensitivity results will be presented in the main body of the paper.

NZ Pork has supplied models of example indoor pig farms: one numbering 250 sows, and another numbering 400 sows. In 2005, there was an average of 258 sows on each stall farm. By 2008, production was about 1 percent higher. By 2009, the number of commercial-sized farms had fallen by 6 percent. This implies some consolidation in the market towards fewer, but bigger farms. Using these numbers, the average commercial-sized stall farm would number about 278 sows. This isn't too different from 250, so the 250 model supplied by industry was used as the basis for the analysis.

Key Model Assumption: Stall farms average 250 sows.

6.1. DRY SOW STALL USE

The current Code allows stalls built after 2005 to be used up to four weeks per reproductive cycle. Stalls built before 2005 can be used without restriction until 2015 when all stall use is restricted to a maximum of four weeks per reproduction cycle.

NZ Pork says that "88 percent of NZ farmers meet the 2015 targets already and over half of those that were required to change have already changed"[9]. It's not clear whether the 88 percent is based on all pig farmers, all registered pig farmers, or all commercial-sized pig farmers, so the following assumptions are based on the 'over half of those that were required to change have already changed' statement.

In 2005, 67 farms used dry sow stalls. 31 of those used sow stalls for up to four weeks and 36 used them for more than four weeks. Therefore, 36 farms were required to change to meet the 2005 Code. If over half of those 36 have already changed, then, at most, 18 (27 percent) are yet to change to the four weeks maximum use.

Key Model Assumption: 67 farms use sow stalls (44 percent of commercial-sized farms). Of those, 49 use stalls for up to four weeks, and 18 use stalls for more than four weeks.

The assumption that there are 67 farms using sow stalls may slightly overestimate the economic impacts. The number of commercial-sized farms has fallen from 162 in 2005 to 152 in 2009. Some of those farms may have been sow stall farms, in which case there would likely be fewer than 67 farms using sow stalls in 2009.

More stall farms than likely combined with fewer sows than likely should combine to a reasonable approximation of the actual situation.

Assumptions about past consolidation within the industry – and whether further consolidation occurs – aren't hugely important in any case, as the cost increases supplied by NZ Pork are proportional to the number of sows housed. That is, the total cost of the change depends on the total number of sows, not whether those sows are housed in smaller commercial-sized farms or larger commercial-sized farms.

What will be affected is the estimate of the number of farms that exit the industry as a result of higher costs (likely to be an overestimate).

[9] New Zealand Pork, *Our response to TV3's Campbell Live, 7.00pm, Monday 02 November 2009*, http://www.nzpork.co.nz/Portals/NZPib/Documents/AboutUs/Media%20Releases/091102%20NZPork%20response%20to%20Campbell%20Live.pdf.

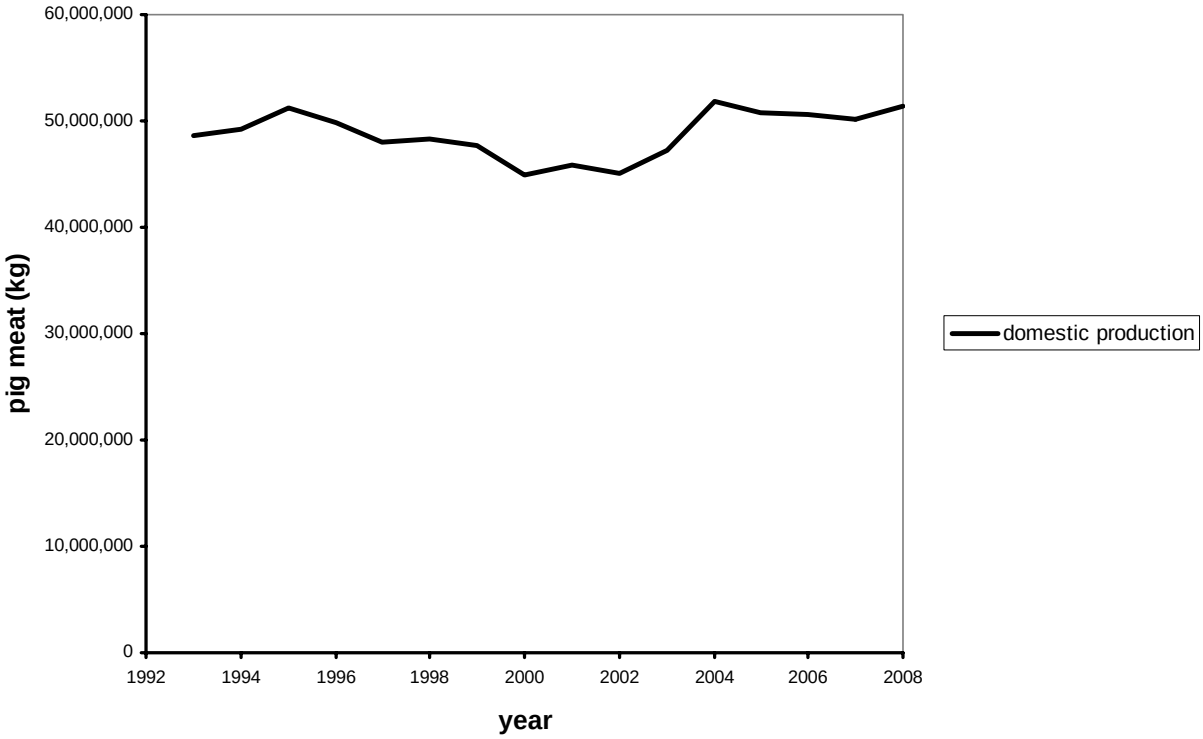
6.2. DEFICIENCIES IN THE CURRENT CODE

NAWAC considers that the extended use of dry sow stalls does not fully meet the obligations of the Act because they constrain the normal behaviour of pigs.

6.3. DOMESTIC PRODUCTION

Domestic pig meat production has been fairly static, averaging 48.81 million kgs per year[10].

Figure 6.1: Domestic production



The proportion of meat destined for the fresh market has changed, however. In 2002, 55 percent of meat was for the fresh pork market. In 2007, 76 percent of meat was for the fresh market.

According to NZ Pork's model for a 250 sow farm, in the six years between 2004 and 2009, farms averaged[11]:

Table 6.1: Key farm information

Value	Variable
$1,145,230.79	Income
$911,117.10	Direct expenses
$214,159.44	Fixed expenses
$1,125,276.55	Total expenses
$19,954.25	Profit
343,557.41	Kgs of meat per annum
$3.33	Per kg of meat sold

[10] New Zealand Pork, *Annual Report 2008*, p. 7.

[11] See Appendix 2 for summary information from each year.

250	Sows
2,501.86	Pigs

These averages are used because, according to NZ Pork's example farm, there has been big variation in farm profitability, with losses in 2007 and 2008 when pig feed costs increased and before the price of meat went up to offset some of the cost increase.

Using this data, it is estimated that 47 percent of domestic meat production is from stall farms, and 53 percent is from non-stall farms. 67 farms averaging 344,000 kgs equals 23.02 million kgs. 23.02 million kgs is 47 percent of 48.81 million kgs.

The remaining 25.79 million kgs comes from non-stall farms.

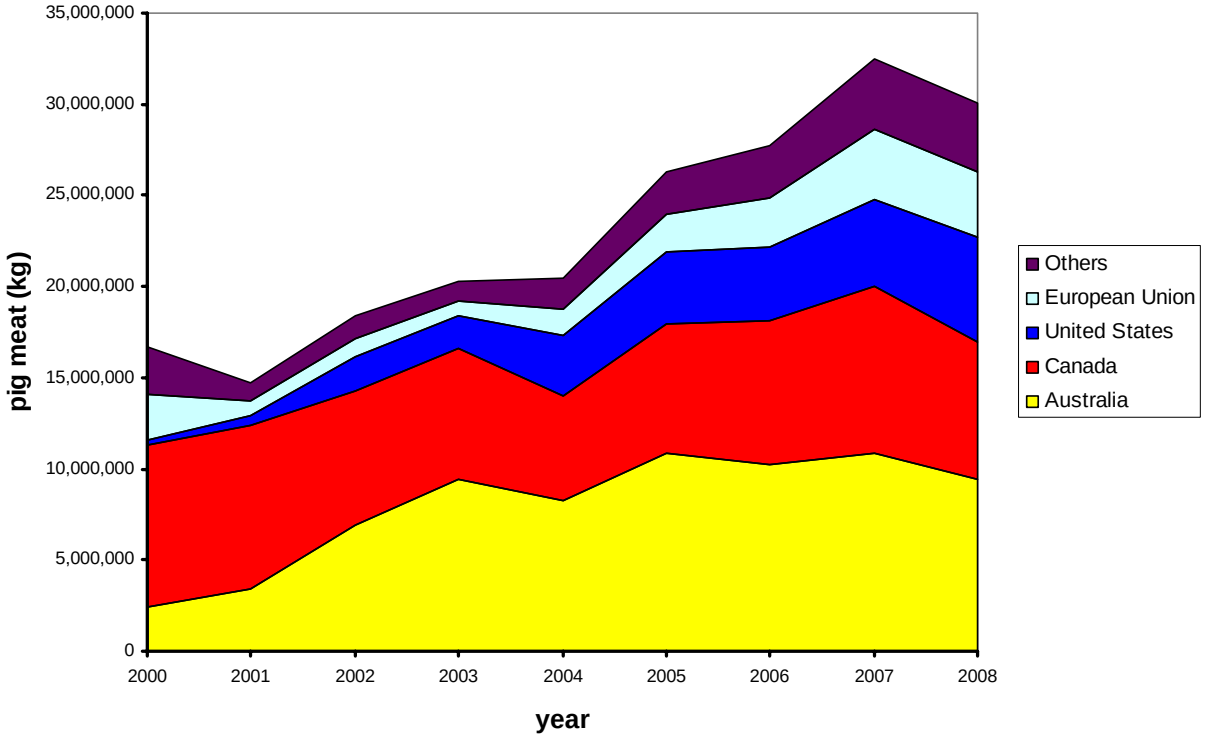
Approximately 16,750 sows (67 farms × 250 sows) are housed in stall farms.

6.4. IMPORTS

Key Point: Countries from which New Zealand import pig meat generally have fewer restrictions on dry sow stall use.

Total imports and major sources of imports are graphed below[12]:

Figure 6.2: Imports



Australia currently allows 16 weeks of dry sow stall use per reproduction cycle, but is lowering that to six weeks from 2017.

Canada allows unrestricted use of dry sow stalls (about 16 weeks per reproduction cycle).

The United States allows unrestricted use at the federal level. A number of states including Florida, California, Oregon, Arizona, and Maine have banned or phased down use of dry sow

[12] World Trade Atlas.

stalls. These states, however, have negligible pork production[13]; production is almost entirely from states without restrictions on dry sow stall use.

The European Union allows unrestricted use, but from 2013 dry sow stall use will be limited to four weeks per reproductive cycle. Member states are allowed to set greater restrictions, like Sweden and Great Britain who have banned dry sow stall use.

Differences in restrictions between New Zealand and countries that export to New Zealand are a concern for the effectiveness of changes to the Code because consumers might switch consumption from domestically produced meat to meat imported from countries that allow greater use of dry sow stalls. This is sometimes described as 'exporting the welfare problem'.

Key Point: Imports of fresh pork are currently negligible. Imports are almost entirely of meat for the processed market.

The pork industry is increasingly moving into the fresh pork market and away from processed meat. This is to, as stated by NZ Pork, reduce the impact of imports on market power. Imports of meat destined for the fresh pork market are negligible as noted by NZ Pork in 2006[14]:

> *Also, whilst the level of frozen imports remains high, imports of chilled pork from Australia, which compete with our own fresh product, have all but ceased for now.*

Between 2000 and 2008, chilled or fresh pork imports were a weighted-average 0.83 percent of all imported pig meat[15]. These imports were entirely from Australia at an average 2.40 percent of imports from Australia.

Table 6.2: Fresh pork imports

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Percentage of all imports	0.00%	0.07%	0.12%	1.27%	0.00%	0.23%	1.83%	2.07%	0.66%
Percentage of imports from Australia	0.00%	0.31%	0.32%	2.75%	0.01%	0.55%	4.96%	6.20%	2.11%

The conclusion that might be drawn from this is that the ability to increase prices is likely to be greater the more the pork industry moves into the fresh market as there is minimal competition from imports. The other conclusion that might be made is that, if consumers are increasing buying processed meat from imports, the exporting of the welfare problem will largely continue anyway. What New Zealand does have some control over, is the welfare of sows housed in systems for the production of fresh pork.

The above represents the current situation where only Australia appears to viably import fresh pork to New Zealand (though in small volumes).

MAF Biosecurity New Zealand's *Review of Submissions on Draft Import Health Standard for Pig Meat and Pig Meat Products*[16] contains some analysis of the anticipated impact on imports should the import health standard be relaxed to mean imports of fresh pork from the US are possible. The Review notes:

[13] National Agricultural Statistics Service, United States Department of Agriculture.

[14] New Zealand Pork, *Annual Report 2006*, p. 2.

[15] World Trade Atlas.

[16] MAF Biosecurity New Zealand, March 2009, *Review of Submissions on Draft Import Health Standard for Pig Meat and Pig Meat Products*, p. 51.

> *It is not known if the proposed import health standards will result in any change to the volume of trade. MAF notes, however, that the chairman of [the New Zealand Pork Industry Board] has publicly commented that he believed there would be no change in market share for the domestic industry associated with a change of the pig meat import health standard*[17].
>
> *Australia currently supplies over 50 percent of Singapore's fresh chilled pork through 'airpork', a brand developed with Australian government assistance to enable its domestic industry to pursue export markets. In contrast, North America and Europe are too far away to land chilled pig meat in Singapore with an acceptable shelf life*[18] *and therefore do not compete with Australia for the lucrative Singapore market. It would therefore be unlikely that there would be an economic incentive for Northern hemisphere exporters to compete with Australia for the small New Zealand market for fresh pork.*

In addition, there were no imports of fresh meat from the US in the year[19] before the application of the current import health standard. No other country was exporting fresh pork to New Zealand either

A report in AgExporter from 1998[20] discussed the potential for exports from the United States to New Zealand as they were negligible at the time. The report noted that the "import product mix is mostly frozen boneless pork cuts. Most of the product is processed further in New Zealand, and this trend is expected to continue".

The US Meat Export Federation wrote in 2003 that[21]:

> *US exporters of pork will also have to either cook or freeze pork to meet Australia's requirement that all pork imported is trichinae free. Canada currently meets the Australian requirement by shipping only frozen pork, and since* ***the market for imported fresh pork is minimal (and should continue to be minimal in the short run)****, the requirement should not be overly burdensome.*

If Australia's demand for imported fresh pork is minimal, New Zealand's is likely to be minimal as well.

Finally, the market for fresh pork from Australia has remained small despite Australian fresh pork prices being significantly lower than New Zealand fresh pork prices[22]. Although, New Zealand prices will rise as a result of additional costs on the pork industry from a potential ban of sow stalls, given the already wide margin between Australian and New Zealand fresh pork and given that Australian farmers will have restricted sow stall use in 2017 (which will negate about half of the increase in New Zealand in price), it seems unlikely that there will be any more than a negligible increase in fresh pork from Australia or other countries.

---

[17] Nine to Noon, 23 August 2007, Radio New Zealand National.

[18] Ronan G, Langberg J and Moore M, 2001, *Evaluating the Export Growth Strategy of the Australian Pork Industry*, Agribusiness Perspectives Papers 2001, Paper 43.

[19] This is the only year we have data for.

[20] Maxine Yule, June 1998, *New Zealand: New Pork Market?*, Ag Exporter, http://www.allbusiness.com/agriculture-forestry-fishing-hunting/688397-1.html.

[21] US Meat Export Federation, October 2003, *An Assessment of Fresh/Frozen US Pork Export Potential to Australia*, p. 22, emphasis added, http://www.usmef.org/Misc_News/MemberPublications/03_Australia_USMEFMktResearch.pdf.

[22] New Zealand Pork, November 2008, *Pork Imports Report,* http://www.nzpork.co.nz/LinkClick.aspx?fileticket=QroGWln%2btZs%3d&tabid=131&mid=654.

Table 6.3: Pork price comparison

	2005	2006	2007
Australia			
Shoulder (boneless)	$3.62	$4.60	$4.69
Belly on loin (bone in)	$4.61	$4.53	
Middle (boneless)	$5.35	$5.74	$6.18
New Zealand			
Shoulder (boneless)	$4.80	$5.32	$5.68
Belly on loin (bone in)	$5.68	$7.36	$7.95
Middle (boneless)	$6.08	$7.73	$8.05

Although it seems unlikely that other countries will be able to find a market for their fresh pork in New Zealand, this paper also presents results even if NZ Pork's efforts to establish a strong market for domestically-produced fresh pork are unsuccessful.

6.5. DEMAND AND SUPPLY – SHORT TERM

This section establishes demand and supply curves for the short-term domestic pig meat market. It uses the New Zealand data above and estimates of price elasticities of demand and of supply from overseas (it does not appear that there are estimates from New Zealand).

The model uses constant elasticity of demand and supply curves[23] with the relationship $Q=AP^{\varepsilon}$, where Q is quantity, P is price, ε is elasticity, and A is a constant.

For demand, ε is generally negative. A value of zero means that as prices increase, the quantity demanded remains the same. A value of -1 means a 1 percent increase in price results in a 1 percent decrease in the quantity demanded. A value of -3 means a 1 percent increase in price results in a 3 percent decrease in the quantity demanded.

For supply, ε is generally positive. A value of zero means that as prices increase, the quantity supplied remains the same. A value of 1 means a 1 percent increase in price results in a 1 percent increase in the quantity supplied. A value of 3 means a 1 percent increase in price results in a 3 percent increase in the quantity supplied.

There have been a number of overseas studies estimating the elasticity of demand and for supply. The first paper in the table below collates many estimates of elasticities from the United States and Canadian studies. The second paper collates estimates of demand elasticities from around the world. The third paper estimated demand and supply elasticities in the United States.

[23] A constant elasticity function means that whatever the quantity, a 1% change in price causes the same percentage change in quantity. There is no particular theoretical reason for this choice of function. The function is convenient for the amount of information available and the sensitivity analysis around elasticities should capture the range of likely results.

Table 6.4: Demand and supply elasticities

Demand elasticity	Supply elasticity
Economic Impact of Reduced Pork Production Associated with the Diagnosis of Actinobacillus pleuropneumoniae on Grower/Finisher Swine Operations in the United States[24]	
-0.47; -0.37; -2.22; -1.26; -0.225; -0.215; -0.709; -0.40	0.89; 0.20; 0.19; 0.10; 0.43; 0.07; 0.06; 0.043; 0.043; 0.041; 0.17
Proposed Model Code of Practice for the Welfare of Animals – Pigs, Regulatory Impact Statement[25]	
-0.241; -0.341; -0.457; -0.511; -0.730; -1.59	
An Economic Analysis of the Effectiveness of the Pork Checkoff Program[26]	
-0.653	0.07 / 0.09

The studies suggest that supply is inelastic. The average elasticity of supply in these studies is 0.19 – that is, a 1 percent increase in prices encourages only another 0.19 percent increase in quantity supplied – and the highest estimated elasticity is 0.89.

Intuitively, this makes sense. Pig production, particularly indoor, requires specific technologies (stalls) not used in many other agriculture production so it is not a matter of easily converting from farming beef to farming pork. Increasing production by increasing the number of pigs farmed is a significant investment in terms of either buying more land, installing more stalls, or both. Increases in production require significant increases in price to make it worthwhile for farmers.

The model uses a value of 0.2 for both stall farm production and non-stall farm production.

Key Point: Studies suggest that pig meat supply is inelastic.

Key Model Assumption: Supply elasticity for stall farm and non-stall farm production is 0.2.

Interestingly, the studies mostly show that pork demand is also inelastic. Only three of the 15 reported elasticities are greater than 1.

It is difficult to know why this may be the case, and there could be several reasons. One reason may be that, when it comes to meat, consumers may not want to eat the same meat every night for dinner just because it is the cheapest. Beef is quite distinct from fish which is distinct from chicken which is distinct from pork. Except for processed meat where there is a fairly close substitute in the form of imported processed meat, there may not be a strong substitute for pork. Consumers' desire for variety in meals may mean that they do not react greatly to changes in prices for meat.

However, if this were the full story, why hasn't the pig industry lifted prices to get better returns already? Part of the answer may be that competition among domestic producers keeps prices low. The other part of the answer is likely to be that, historically, the pork industry has produced a lot of meat for the processed market. Given that bacon from imported sources is a close substitute for bacon from domestic sources, attempts to increase prices would have seen many customers shift to imported product.

[24] Willard C. Losinger, May 2005, *Economic Impact of Reduced Pork Production Associated with the Diagnosis of Actinobacillus pleuropneumoniae on Grower/Finisher Swine Operations in the United States*, Losinger Economic Service.

[25] Primary Industries Standing Committee, 2006, *Proposed Model Code of Practice for the Welfare of Animals – Pigs, Regulatory Impact Statement*, p. 85.

[26] National Pork Board, May 2007, *An Economic Analysis of the Effectiveness of the Pork Checkoff Program*, p. 5-18, p. 5-30.

Fresh pork does not face the same competition from imports, and is differentiated from other domestic meats. Again, this is supported by NZ Pork's strategy to grow and establish the fresh pork market and move away from processed meats.

This suggests that the elasticity for fresh pork may look more like the inelastic figures in the table above, while the elasticity for processed meat may look more like the elastic figures.

The final factor to consider is that the pork industry's move into the fresh market is relatively recent and consumers may not yet have the same attachment to fresh pork as they do to other meats.

Therefore, it seems that if the pork industry was to try to increase prices now, they might see some of the gains in the fresh market disappear, with customers reverting to processed meats or other meats. In a few years, the situation may be different.

The assumptions used for this analysis, then, are that demand elasticities are closer to the higher end for both processed meat and fresh pork now.[27] The elasticities are set at -1.5 in the short term.

There appears to be a lack of information about how long it takes to establish a product with consumers, so this is the greyest part of the analysis. It has taken five years (2002 to 2007) to grow the fresh pork market from 55 percent to 76 percent. It may be reasonable to assume it would take a similar time to establish the market. We have, however, modelled a longer time frame, assuming that it takes until 2023 before fresh pork is fully embedded in diets.

By 2017, it is assumed that the pork industry would have partially embedded fresh pork into consumers' diets so that demand elasticity is now -1.0. By 2023, it is assumed that fresh pork would be fully embedded into consumers' diets, and demand elasticity is -0.5.

Results are also presented for an alternative set of assumptions where the change in elasticity does not occur.

Key Point: Most studies show that pork demand is inelastic, some show it to be elastic.

Key Model Assumption: From 2009, demand elasticity for fresh pork and processed meat is -1.5. From In 2017, demand elasticity is -1.0 for fresh pork and -1.5 for processed meat. From 2023, demand elasticity is -0.5 for fresh pork and -1.5 for processed meat.

Alternative Key Model Assumption: Demand elasticity remains at -1.5 for both fresh pork and processed meat over time.

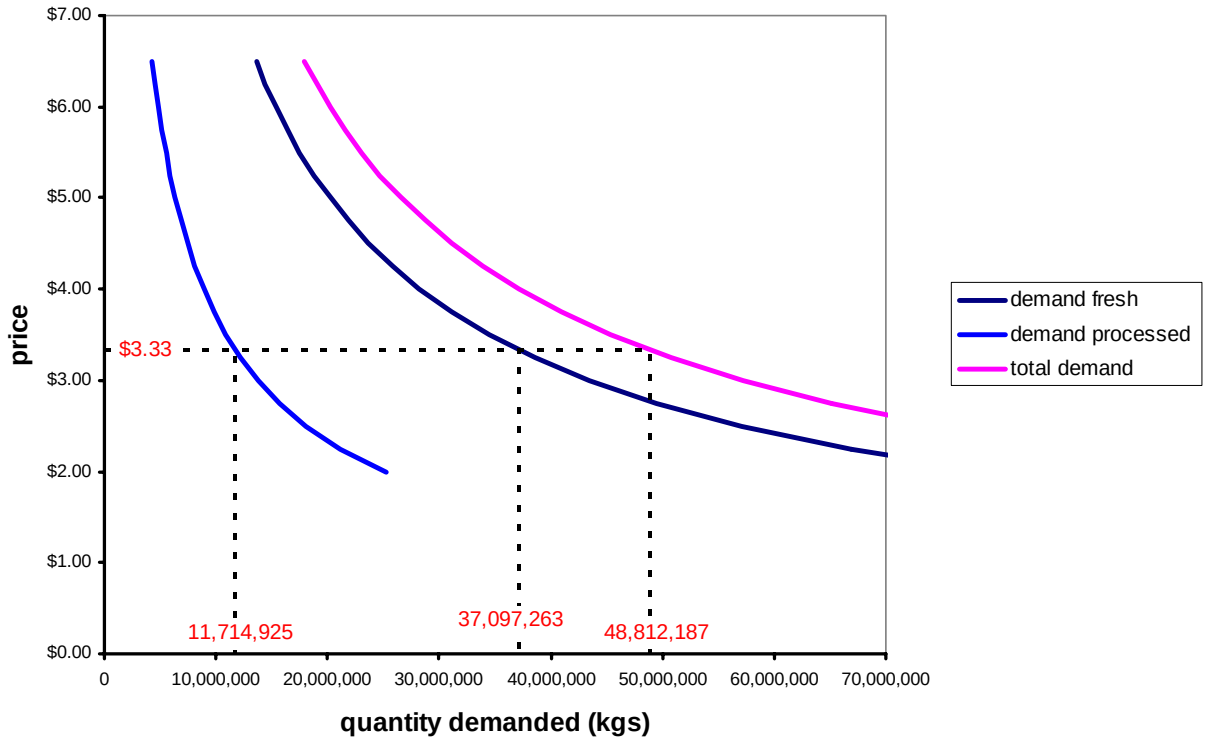
Demand curves

Average consumption of domestically-produced meat is 48.81 million kgs per year.
76 percent of that, or 37.10 million kgs, is for fresh pork and 24 percent, or 11.71 million kgs, is for processed meat. Using these quantities (Q), the elasticity values above (ε), and the price of $3.33 per kg (P), and the demand curve relationship, $Q=AP^{\varepsilon}$, the demand curves are estimated and plotted in the graph below.[28]

[27] This analysis does not use a 'world price' for imports. Where there is a world price and there are imports, demand for domestically-produced product is effectively perfectly elastic. There doesn't appear to be a world price for imported processed meat. The price of imported meat for processing from Australia is much higher than the price of imported meat from the US or from Canada (see http://www.nzpork.co.nz/LinkClick.aspx?fileticket=QroGWln%2btZs%3d&tabid=131&mid=654). That Australian meat is still purchased suggests that there is differentiation even between processed meats from different sources. Because there doesn't appear to be a world price, the effect of imports on demand for domestically-produced meat is modelled as affecting the elasticity of demand.

[28] The functions of the demand and supply curves are in Appendix 2.

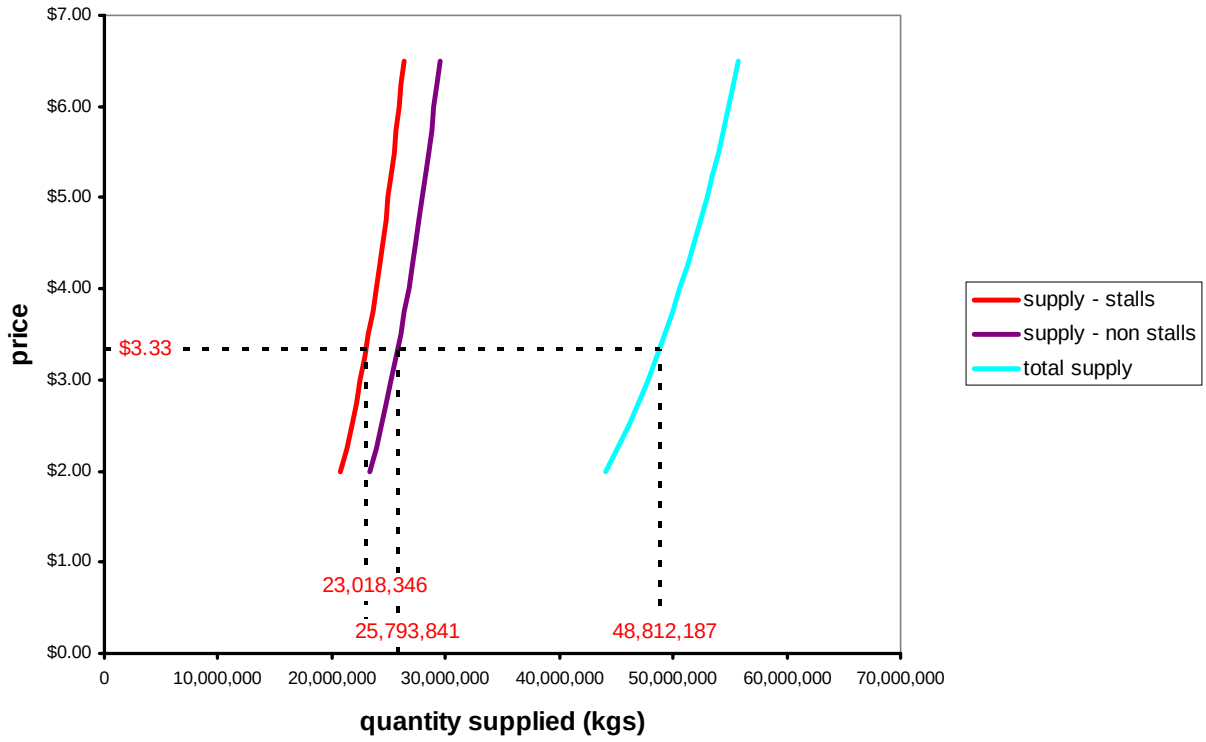
Figure 6.3: Pig meat market – demand 2008



Supply curves

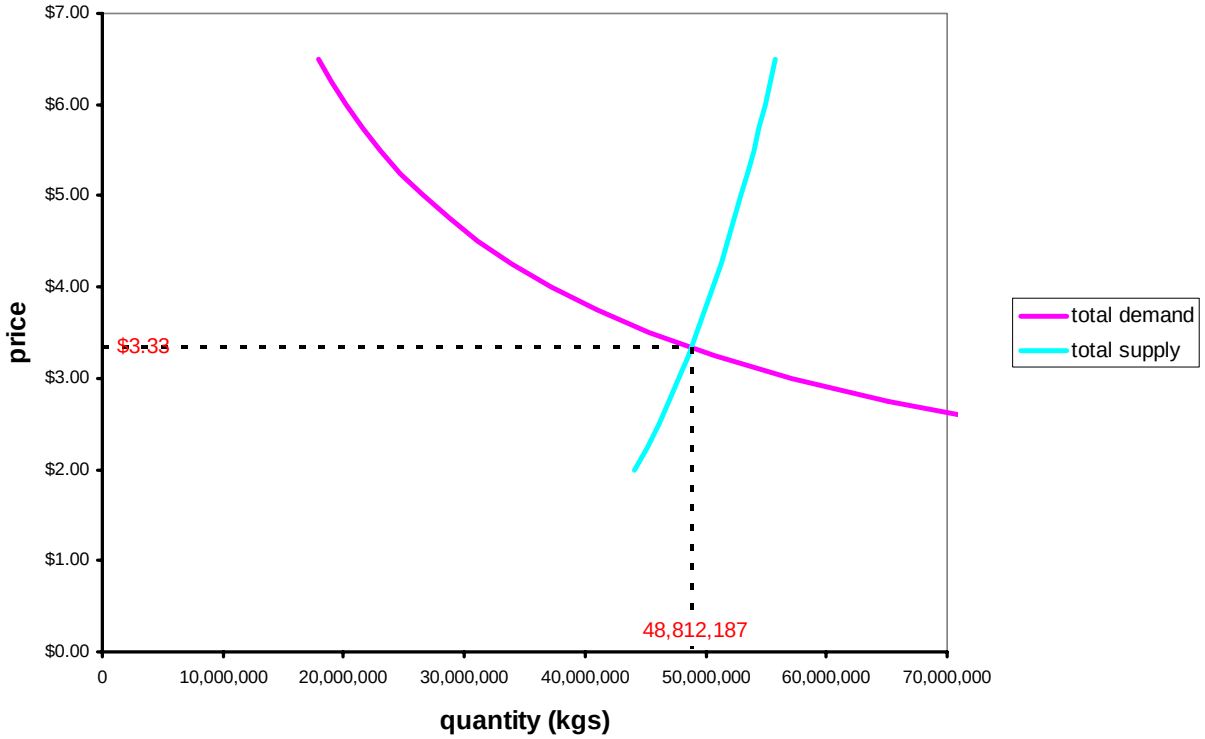
Average production of domestic meat is 48.81 million kgs per year. 23.02 million kgs is produced on stall farms and 25.79 million kgs is produced on non-stall farms. Using these quantities (Q), the elasticity values above (ε), and the price of $3.33 per kg (P), and the supply curve relationship, $Q=AP^{\varepsilon}$, the supply curves are estimated and plotted in the graph below.

Figure 6.4: Pig meat market – supply 2008



Together, the total demand and total supply give a market that looks like this:

Figure 6.5: Pig meat market - 2008



6.6. FARM PROFITABILITY

Key Point: According to NZ Pork's example average farm, farm profits appear to be low. If this is the case, it is likely that there will be exits from the industry even without changes to the Code.

The previous section constructed a market for 2008 based on data on production from recent years. This chapter noted earlier that the average profit for average-sized stall farms over the last six years has been $20,000 (see the table on page 22). This is farm profit before tax and before owners have drawn money for their own living expenses

The model assumes that profits need to be about $86,000 for a farmer to be earning enough to make staying in the business worthwhile. This would leave after tax profits of $60,000 to draw from.

Some farmers will likely exit the industry because profits are too low.

When a farm exits, the quantity supplied at the current price is less. The supply curve moves inwards. At the current price, there is a shortage of pigmeat – there is more pigmeat demanded than is being supplied. As a result, the price increases. For farmers that remain in the market, the higher price increases their profits.

Farmers continue to exit the market – decreasing the supply – until the price reaches a level where farmers are making $86,000 in profit. Two scenarios are considered. Scenario 1 (more fully described below) assumes that it stall farms are the most marginal, and exit under the status quo. Scenario 2 assumes that it is non-stall farms that are the most marginal, and exit under the status quo.

Key Model Assumption: Two scenarios are modelled. Scenario 1 assumes that it is stall farms that may exit under the status quo. Scenario 2 assumes that it is non-stall farms that may exit under the status quo.

The price needed to get that profit is estimated at $3.52; an increase of $0.19. To generate that price increase, supply must fall to 44.89 million kgs; a fall of 3.92 million kgs. As stall farms exit and the price increases, this encourages non-stall farms to produce a bit more (assumed to be picked up by existing farms), further hurting stall farms. The fall of 3.92 million kgs is made up of a 4.21 million kgs decrease in production by stall farms and 0.29 million kgs increase in production by non stall farms.

At 344,000 kgs per stall farm, this would represent 12 average stall farms exiting the industry, leaving 55 stall farms.

In the 2005 industry survey, four farms indicated that they would exit the industry rather than make the change to four weeks use. Eight farms also indicated that they would have problems securing new, or renewing existing, resource consents due to such issues as not having enough space, urban encroachment and objections from neighbours. Some of those eight may be some of the four that were intending to exit anyway. At a maximum, the 2005 survey suggested that the twelve farms might exit the industry as a result of the four weeks restriction.

Key Point: The 2005 survey suggested that up to twelve farms might exit the industry as a result of the four weeks maximum use of dry sow stalls.

Given that these farms may have been vulnerable it may be that they will be the ones exiting the industry in any case. Other farms that have already made the move to four weeks, or that can afford the change to four weeks, will wait for those that can't to exit the industry. The remaining firms would then be profitable.

Despite this, under Scenario 1, the model uses a conservative assumption that industry exits affect all stall farms equally, that is, stall farms already operating at four weeks use are just as likely to exit the industry stall farms that are currently unrestricted in their stall use.

Table 6.5: Scenario 1: Stall farms exit under the status quo

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork[29]	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

[29] Note that the quantity of meat for fresh pork market falls by the same percentage as the fall in quantity of meat for the processed meat market. This is because demand for fresh pork is assumed to be just as elastic as the demand for processed meat in the short term.

Under Scenario 2, it is non-stall farms that exit.

Table 6.5: Scenario 2: Non-stall farms exit under the status quo

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

The above results are what is estimated to happen before changes to the Code. Given the profit levels suggested by NZ Pork's example average farm, industry exits are also likely to occur before the 2015 requirement for all stall farms to comply with the four weeks restriction. The next section estimates the impact of the final part of the status quo: the transition to four weeks by those stall farms that haven't yet made the move.

Key Model Result: Even without further changes to the Code and excluding the impact of the already scheduled four week restriction for all farms from 2015, the price of pig meat will rise 5.74 percent to $3.52 per kg. The price increase is driven by an 8.03 percent fall in the quantity of domestically-produced pig meat.

Key Model Result: Even without further changes to the Code and excluding the impact of the already scheduled four week restriction for all farms from 2015, 12.26 farms under Scenario 1 or 18.26 farms under Scenario 2 are estimated to exit the industry.

Key Point: Under Scenario 1, it may be that the farms are the same ones that indicated vulnerability in the 2005 survey.

Key Model Assumption: Despite the Key Point above, the model assumes, under Scenario 1, that the proportion of farms that exit the industry is the same for farms that already use stalls for up to four weeks and for farms that use stalls for more than four weeks.

6.7. "EXPORTING" WELFARE

A decrease in access to domestically-produced pork is not going to mean that consumers decrease their meat consumption by the same amount. The decrease in access to domestically-produced processed meat is likely to be replaced with purchases of imported processed meat. The decrease in access to domestically-produced meat for fresh pork is likely to be replaced with purchases of other kinds of meat, including processed pigmeat.

It is assumed that all of the decrease in consumption of domestically produced processed meat is picked up by imports of processed meat. It is also assumed that the decrease in consumption of domestically produced fresh pork is replaced with increased consumption of other meats in the same proportion as other meats are consumed today.

In 2009, meat consumption is[30]:

Table 6.6: Meat consumption

[30] http://www.nzpork.co.nz/Portals/NZPib/Documents/porkOutlook/OCTOBER09_%20PorkOutlook%20A4-4%20pgs.pdf with the pigmeat proportion split into fresh pork and processed meat using the 76%/24% split of domestic production and the 99.17%/0.83% split of imports.

Meat type	Percentage of all meat consumed
Sheep	12%
Beef	30%
Poultry	36%
Fresh pork	10%
Processed pig meat	12%

Apportioning fresh pork consumption to other meats gives:

Meat type	Percentage of all meat consumed
Sheep	13%
Beef	33%
Poultry	40%
Processed pig meat	13%

Thus, for every 1kg decrease in domestically-produced fresh pork, there is assumed to be a 0.13kg increase in purchases of imported processed meat.

The total increase in imported processed meat is then calculated, and divided by the quantity of meat produced per sow in stalls[31] to give the increase in sows housed in stalls overseas.

6.8. DEMAND AND SUPPLY – 2015

By 2015, stall farms that haven't already done so will need to change systems so that they are using dry sow stalls for no longer than four weeks. 27 percent of stall farms currently need to convert. 73 percent have already made the change.

It is assumed that NZ Pork's model for a 250 sow farm already accounts for the proportion of farms using stalls for up to four weeks and the proportion using stalls for greater than four weeks.

NZ Pork says that moving from unlimited use of dry sow stalls to four weeks does not decrease pork production, but does result in increased costs. Converting from unlimited use to four week use means partially converting premises into group housing. According to NZ Pork, group housing requires greater labour time monitoring sows, and more feed. Group housing also requires existing stalls to be removed and sow places renovated and, because group housing can house fewer sows per area than stalls, additional housing to be built. NZ Pork estimates these costs as:

- direct costs of:
  - 0.75 extra hours per day per 200 sows at $14.63 per hour;
  - 5.25 percent increase in feed per sow; and
- capital costs of:
  - renovating 43 sow places per 100 sows at $500 each sow place;
  - building 16 new sow places per 100 sows at $1,050 each sow place; and
  - Resource Management Act costs of $2,000 (assumes the consents are not publicly notified).

[31] Using the kgs produced per sow in stalls in New Zealand (1,374.23 kgs) as an estimate.

Except for Resource Management Act costs, we have taken NZ Pork's estimates of costs at face value. We have compared the Resource Management Act costs to council charging policies and consider that the $2,000 estimate is a fair estimate.

The increase in direct costs was apportioned to the 27 percent of stall farms it applies to and a per kg increase in price calculated that would be needed to offset the cost increase. The cost increase per kg is $0.01 under both Scenarios, increasing the marginal cost of supply and shifting the supply curve to the left slightly. A new short term equilibrium is found.

The weighted-increase in capital costs for stall farms is $26,300 per stall farm.

The Inland Revenue Department[32] uses a straight-line depreciation rate of 13.5 percent for pig crates. This implies that stalls will take 7.41 years to fully depreciate. It is assumed that banks will make loans for the capital costs for a term of 7.41 years. If the term of the loan is longer, banks will be lending for longer than the asset has value and the farm will have outstanding debts for stalls that need replacing (for which a further loan is sought).

Using the $26,300, a loan term of 7.41 years, and an interest rate of 8 percent, the monthly repayment is a bit less than $400. Annual repayments are $4,700.

In the short term, the increase in direct and capital costs is estimated to decrease stall farm profit by about $8,000 under both Scenarios[33] to $78,000.

Under both Scenarios, prices need to rise from $3.52 to $3.55 to restore profits to $86,000 in the long term. To generate that price increase, supply must fall to an estimated 44.44 million kgs; a fall of 0.45 million kgs.

This quantity change is equivalent to a further decrease of 1.38 stall farms under Scenario 1 and 1.36 stall farms under Scenario 2.

Despite more stall farms existing under Scenario 2 to be impacted by the current Code, slightly fewer stall farms exit (1.36 compared with 1.38). This result appears to be because with non-stall farms exiting due to low profits, there are fewer non-stall farms to pick up increased production when the price increases from the Code impacting on stall farms. Instead, remaining stall farms pick up more production under Scenario 2 than in Scenario 1, leading to greater profits and a decreased likelihood of exiting the industry.

Table 6.7: Scenario 1: Stall farms exit under the status quo

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.77	-1.00%
No. of farms	139.74	138.36	-0.99%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	13,685.65	13,333.76	-2.57%
No. of sows on stall farms (overseas)			+110.74
Total change in stall sows			-241.16

Table 6.8: Scenario 2: Non-stall farms exit under the status quo

[32] https://interact1.ird.govt.nz/forms/depnrates/.

[33] The results are slightly different, but not large enough that they are visible when rounding.

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.68%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.01%
Quantity – fresh pork	34.12	33.78	-1.01%
No. of farms	133.74	132.38	-1.02%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,938.09	16,590.79	-2.05%
No. of sows on stall farms (overseas)			+110.67
Total change in stall sows			+236.63

Key Model Result: The estimated price increase is about 0.7 percent. The estimated quantity decrease is about 1.0 percent.

Key Model Result: The estimated quantity fall is the equivalent of a further 1.38 or 1.36 stall farms exiting the industry because of the 2015 restriction on dry sow stalls.

Key Model Result: About 10 percent of the total estimated impact on the market price and quantity under the status quo arises from the 2015 restriction. About 90 percent of the total estimated impact is due to low profits in the past.

6.9. OVERALL: 2008 VERSUS 2015

Table 6.9: Scenario 1: Stall farms exit under the status quo

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.77	-8.96%
No. of farms	152.00	138.36	-8.97%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	16,750.00	13,333.76	-20.40%
No. of sows on stall farms (overseas)			+1,075.86
Total change in stall sows			-2,340.38

Table 6.10: Scenario 2: Non-stall farms exit under the status quo

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.78	-8.96%
No. of farms	152.00	132.38	-12.91%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,750.00	16,590.79	-0.95%
No. of sows on stall farms (overseas)			+1,075.79
Total change in stall sows			+916.58

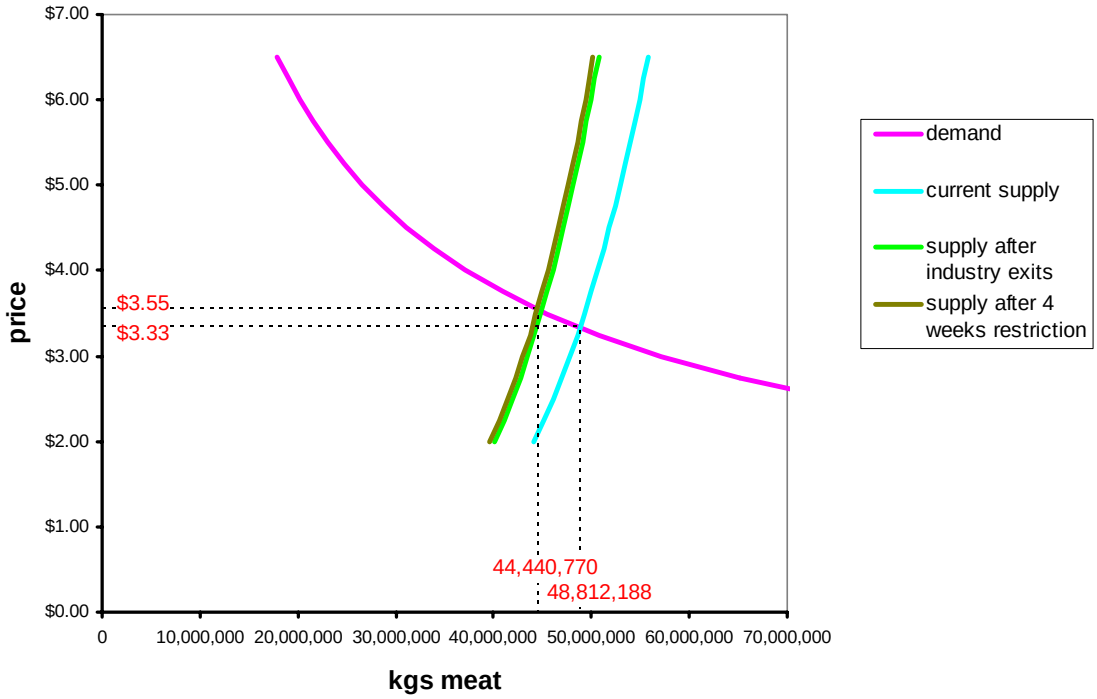
The final status quo situation is the data under 'all stall farms at four weeks' in the tables above, and in the graph of 'supply after 4 weeks restriction' below. It accounts for industry exits due to low profits and for remaining farms to limit dry sow stall use to four weeks per reproductive cycle.

Key Model Result: It is estimated that pig meat prices rise by about 6.5 percent, and domestic production falls by about 9.0 percent. This is equivalent to an estimated 13.64 farms exiting the industry under Scenario 1 or by 19.62 farms under Scenario 2. Of those exits, 1.38 farms and 1.36 farms are due to costs arising from remaining farms complying with the 2015 restriction.

Key Model Result: The number of sows on stall farms in New Zealand is estimated to fall by 20.4 percent under Scenario 1 or 1.0 percent under Scenario 2, offset by an estimated increase of about 1,000 sows in stalls overseas. The total change in sows in stalls is about a 2,300 fall under Scenario 1 and a 900 increase under Scenario 2.

The decrease in sows in stalls in New Zealand under Scenario 1 is almost entirely due to stall farms exiting the industry (with a small amount of decrease due to increased costs of housing sows). The increase in sows under Scenario 2 is because the exits of non-stall farms pushes up the price which encourages stall farms to produce more.

Figure 6.6: Pig meat market – long run Scenario 1



6.10. WHAT'S HAPPENED IN 2009?

Given NZ Pork's information on the average stall farm profitability over the last six years, it seems that there will be decreases in domestic production. The same example average farm data suggests profits have been low for a while so that exits could be expected to happen soon.

In a report on Radio New Zealand National in January 2009[34], NZ Pork indicated as such, saying that they expected productive capacity to fall by 10 percent and that 'the anticipated drop in the supply of pork this year is likely to see prices rise further'.

On 28 November 2009, NZ Pork released domestic production data for the year ended September 2009[35]. The data showed a 9 percent fall in production in 2009 compared to 2008. This compares to the 8.96 percent fall estimated by this model. It may be that there are further exits to come, but this recent data suggests that the model is unlikely to be too far off.

The data also showed that the decrease in the number of pigs killed in the South Island were several times greater than the decrease in pig kills in the North Island. Pig kills fell 3.3 percent in the North Island versus 13.3 percent in the South Island. The South Island has a greater proportion of non-stall farms than the North Island. This may suggest that Scenario 2 is the more accurate of the two scenarios.

[34] Morning Report, 27 January 2009, Radio New Zealand National, http://www.radionz.co.nz/audio/national/mnr/2009/01/27/the_price_of_pork.

[35] New Zealand Pork, September 2009, *Pork Industry Review*.

7. Alternative options within a Code

7.1. ASSUMPTIONS FOR ALL OPTIONS

Costs

NZ Pork provided estimates of the costs of restricting dry sow stall use to four weeks and a ban on sow stall use as follows:

- For the transition from unlimited use to four weeks use:
  - direct costs of:
    - 0.75 extra hours per day per 200 sows at $14.63 per hour;
    - 5.25 percent increase in feed per sow; and
  - calpital costs of:
    - renovating 43 sow places per 100 sows at $500 each sow place;
    - building 16 new sow places per 100 sows at $1,050 each sow place; and
    - Resource Management Act costs of $2,000 (assumes the consents are not publicly notified).
- For the transition from unlimited use to a ban:
  - direct costs of:
    - one extra hour per day per 200 sows at $14.63 per hour;
    - 7 percent increase in feed per sow;
    - a 7 percent drop in productivity due to increased embryonic losses; and
  - capital costs of:
    - renovating 57 sow places per 100 sows at $500 each sow place;
    - building 20 new sow places per 100 sows at $1,050 each sow place; and
    - Resource Management Act costs of $2,000.

The estimated capital costs for converting a 250 sow farm are detailed in the table below:

Table 7.1: Estimated capital costs for converting a 250 sow farm

Cost	Unlimited use to four weeks use	Unlimited use to ban	Four weeks use to ban
Renovation	$53,750.00	$71,250.00	$17,500.00
Building	$42,000.00	$52,500.00	$10,500.00
Resource consents	$2,000.00	$2,000.00	$2,000.00
Total	$97,750.00	$125,750.00	$30,000.00

The capital costs of transitioning from four weeks use to a ban are much less than the costs of transitioning from unlimited use to four weeks use. Most stall farms (73 percent) have already transitioned to four weeks use, and face an additional $30,000 increase in capital costs with a ban of dry sow stalls. 27 percent of stall farms face an increase in capital costs of $125,750.

According to the 2005 survey, 46 percent (31 of the 67 farms) were already limiting sow stall use to four weeks or less.

Costs of replacing new facilities built to comply with the code (e.g. $52,500 for 20 new places) are assumed to be incurred each time the facilities fully depreciate (every 7.41 years). The costs of renovation, however, appear to be a one-off cost. Once the debt from these is paid off, stall farms will have more cash at their disposal. The cost of renovating to comply with four weeks use is $53,750. The cost of transitioning from four weeks use to a ban is $30,000. Therefore, the reduction in debt from having paid off renovation costs will outweigh the cost of a ban.

With loan terms of 7.41 years, the model indicates that:

- 46 percent of farms should have paid off debts relating to renovation by 2013 and may be able to afford the capital costs of a ban;
- a further 27 percent should have paid off renovation debts by 2017 and may be able to afford the capital costs of a ban; and
- the final 27 percent should have paid off renovation debts by 2023 and may be able to afford the capital costs of a ban.

With a useful life of 7.41 years, any stalls installed immediately prior to 2005 (and which can continue to have unlimited use until 2015 under the current code) will be fully depreciated by 2013.

With regards to elasticity, one set of assumptions assumes that, as consumers embed pork in their diets, fresh pork elasticity decreases over time with values of:

- -1.5 from 2009.
- -1.0 from 2017; and
- -0.5 from 2023.

An alternative set of assumptions assumes that fresh pork elasticity is -1.5 through time.

Benefits

The reduction in the number of sows in stalls is calculated net of an increase in sows housed in stalls overseas. The method of calculating an increase in sows in stalls overseas is as detailed in the *"Exporting" welfare* section of Chapter 6.

It is assumed that by transitioning from stall farms to group housing under a ban, farmers do not receive a premium price for their meat.

Although there is a perceptible and visual difference between indoor and outdoor farms that may cause some consumers to pay a premium price, there is not the same vivid distinction between stall farming and group housing. It may be that there is some premium price increase, but given the lack of information in this area, and in the interests of not underestimating the impact of changes to the Code, it is assumed that stall farms do not receive a premium price for their product.

The analysis also takes the current split between fresh pork and processed meat (76 percent/24 percent) as constant and the current demand as constant, even though both are likely to increase over time.

7.2. BRINGING FORWARD THE 2015 DATE FOR FOUR WEEKS USE TO 2013

The effects of this should be very similar to those estimated under the status quo (2015 date). There is unlikely to be any capital redundancy (stalls renovated before farms have had the opportunity to use them for the full 7.14 years) as those farms that replaced stalls immediately prior to the current Code will have fully depreciated those stalls by 2013. The 46 percent of farms that were already using stalls for no more than four weeks will also have paid off renovation costs by 2013.

7.3. BAN OF DRY SOW STALLS IN 2013, IN 2017, AND IN 2023

The key long term estimates of the model of a ban of sow stalls in 2013, in 2017, and in 2023[36] compared to what is going to happen under the status quo are presented below.

Table 7.2: Scenario 1: Stall farms exit under the status quo

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.70
		(+4.70%)	(+4.55%)	(+4.38%)
Quantity (mil. kg) – total domestic production	44.44	41.48	42.28	43.06
		(-6.65%)	(-4.86%)	(-3.11%)
Quantity – fresh pork	33.77	31.53	32.30	33.06
		(-6.65%)	(-4.36%)	(-2.12%)
No. of farms	138.36	132.57	135.05	137.43
		(-5.79 farms)	(-3.31 farms)	(-0.93 farms)
		(-4.18%)	(-2.39%)	(-0.67%)
Sows in stalls NZ	13,333.76	0	0	0
		(-13,333.76)	(-13,333.76)	(-13,333.76)
Change in sows in stalls overseas		+727.85	+639.87	+550.70
Total change in stall sows		-12,605.92	-12,693.89	-12,783.06

Table 7.3: Scenario 2: Non-stall farms exit under the status quo

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.71	$3.71	$3.70
		(+4.68%)	(+4.53%)	(+4.34%)
Quantity (mil. kg) – domestic production	44.44	41.50	42.29	43.07
		(-6.63%)	(-4.83%)	(-3.08%)
Quantity – fresh pork	33.78	31.54	32.31	33.07
		(-6.63%)	(-4.33%)	(-2.10%)
No. of farms	132.38	127.75	130.20	132.50
		(-4.63 farms)	(-2.19 farms)	(+0.12 farms)
		(-3.50%)	(-1.65%)	(+0.09%)
Sows in stalls NZ	16,590.79	0	0	0
		(-16,590.79)	(-16,590.79)	(-16,590.79)
Change in sows in stalls overseas		+724.73	+636.15	+545.90
Total change in stall sows		-15,866.06	-15,954.64	-16,044.89

The longer stall farms have before dry sow stalls are banned, the lower the impact on domestic quantity produced and consumed, the lower the number of industry exits, and the

[36] Diagrammatical representations of the bans can be found in Appendix 4.

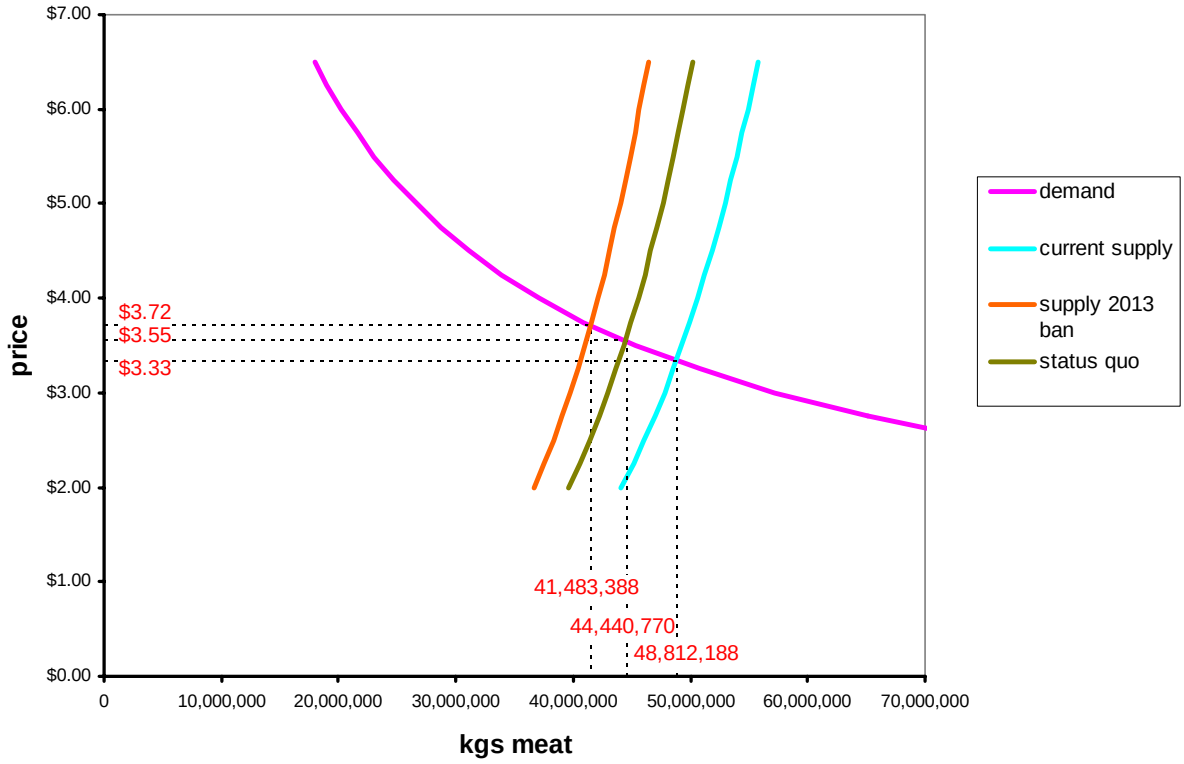
larger the number of sows kept out of dry sow stalls (though the difference on this one is small).

Other ban dates (e.g. a ban in 2020) will have impacts between those of a ban in 2017 and a ban in 2023.

The Key Model Assumptions driving these results are that:

- in 2013, producers lose many consumers when passing on cost increases, and only 46 percent of stall farms may be able to afford the capital costs of a ban;
- by 2017, consumers have embedded pork more in their diets so don't decrease consumption as much when producers pass on cost increases, and 73 percent of stall farms may be able to afford the capital costs of a ban;
- by 2023, consumers have fully embedded pork in their diets so producers can pass on costs increases with little decrease in consumption, and 100 percent of stall farms may be able to afford the capital costs of a ban.

Figure 7.1: Pig meat market – long run, Scenario 1, 2013 ban



7.4. OTHER ASSUMPTIONS

Even if the above assumptions do not hold, the estimated impacts do not vary hugely.

If NZ Pork's campaign to improve consumers' attachment to fresh pork is unsuccessful for whatever reason and the elasticity of demand for fresh pork remains at -1.5, the estimated impacts of a 2017 ban and of a 2023 ban are closer to that of a ban in 2013:

Table 7.4: Scenario 1: Stall farms exit under the status quo

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.71
		(+4.70%)	(+4.58%)	(+4.45%)
Quantity (mil. kg) – total domestic production	44.44	41.48	41.55	41.63
		(-6.65%)	(-6.50%)	(-6.32%)
Quantity – fresh pork	33.77	31.53	31.58	31..64
		(-6.65%)	(-6.50%)	(-6.32%)
No. of farms	138.36	132.57	132.82	133.08
		(-5.79 farms)	(-5.54 farms)	(-5.28 farms)
		(-4.18%)	(-4.01%)	(-3.82%)
Sows in stalls NZ	13,333.76	0	0	0
		(-13,333.76)	(-13,333.76)	(-13,333.76)
Change in sows in stalls overseas		+727.85	+710.68	+691.73
Total change in stall sows		-12,605.92	-12,623.08	-12,642.03

Table 7.5: Scenario 2: Non-stall farms exit under the status quo

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.71	$3.71	$3.71
		(+4.68%)	(+4.56%)	(+4.43%)
Quantity (mil. kg) – domestic production	44.44	41.50	41.57	41.64
		(-6.63%)	(-6.47%)	(-6.30%)
Quantity – fresh pork	33.78	31.54	31.59	31.65
		(-6.63%)	(-6.47%)	(-6.30%)
No. of farms	132.38	127.75	128.00	128.25
		(-4.63 farms)	(-4.39 farms)	(-4.13 farms)
		(-3.50%)	(-3.31%)	(-3.12%)
Sows in stalls NZ	16,590.79	0	0	0
		(-16,590.79)	(-16,590.79)	(-16,590.79)
Change in sows in stalls overseas		+724.73	+707.37	+688.53
Total change in stall sows		-15,866.06	-15,883.42	-15,902.26

If, instead, the renovation costs quoted by NZ Pork are incurred each time stalls need to be replaced, instead of being a one-off cost, then the estimated impacts are:

Table 7.6: Scenario 1: Stall farms exit under the status quo

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.72	$3.72
		(+4.92%)	(+4.90%)	(+4.86%)
Quantity (mil. kg) – total	44.44	41.35	42.12	42.92

domestic production		(-6.95%)	(-5.22%)	(-3.43%)
Quantity – fresh pork	33.77	31.43	32.20	32.98
		(-6.95%)	(-4.67%)	(-2.34%)
No. of farms	138.36	132.12	134.50	136.90
		(-6.24 farms)	(-3.86 farms)	(-1.46 farms)
		(-4.51%)	(-2.79%)	(-1.05%)
Sows in stalls NZ	13,333.76	0	0	0
		(-13,333.76)	(-13,333.76)	(-13,333.76)
Change in sows in stalls overseas		+760.04	+686.09	+607.19
Total change in stall sows		-12,573.72	-12,647.67	-12,726.57

Table 7.7: Scenario 2: Non-stall farms exit under the status quo

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.72	$3.72
		(+4.90%)	(+4.87%)	(+4.81%)
Quantity (mil. kg) – domestic production	44.44	41.37	42.14	42.93
		(-6.92%)	(-5.19%)	(-3.40%)
Quantity – fresh pork	33.78	31.44	32.21	32.99
		(-6.92%)	(-4.65%)	(-2.32%)
No. of farms	132.38	127.32	129.66	131.99
		(-5.07 farms)	(-2.72 farms)	(-0.39 farms)
		(-3.83%)	(-2.06%)	(-0.30%)
Sows in stalls NZ	16,590.79	0	0	0
		(-16,590.79)	(-16,590.79)	(-16,590.79)
Change in sows in stalls overseas		+756.91	+682.33	+602.34
Total change in stall sows		-15,833.88	-15,908.45	-15,988.45

7.5. CONSUMER SURPLUS, PRODUCER SURPLUS, AND TOTAL IMPACT

The preceding results present impacts on the price and quantity of pigmeat at the farm level as they are fairly easily digestible pieces of information. For example, under Scenario 1, a 2017 ban is estimated to restrict the quantity of fresh pork available to purchase by about 4.36 percent, and to push up the farm gate price by about 4.56 percent.

If the percentage increase in farm gate prices filtered through to the same percentage increase in retail pork prices, 1 kg of pork loin chops would increase in price from the current price of $16.91[37] to approximately:

- $18.00 under the status quo (a 6.45 percent increase); and
- $18.82 following a 2017 ban (a further 4.56 percent increase).

[37] Statistics New Zealand, August 2009, *Food Price Index*.

Consumer surplus

A measure of the total impact on consumers in terms of higher prices and restricted access to meat is the 'consumer surplus'. It measures the difference between what consumers are prepared to pay for each kg of meat (the price on the demand curve) and what they actually pay (the market price). This is the additional value consumers put on the meat above what they pay.

Under Scenario 1's 2013 ban – the biggest impact option – the loss of consumer surplus (total cost to consumers of pigmeat at the farm level) is approximately:

- $3,086,000 per annum in the short term; and
- $8,218,000 per annum in the long term as farms exit the industry, decreasing supply and increasing the price.

This compares to a loss of consumer surplus if the status quo is maintained of:

- $22,000 per annum in the short term; and
- $1,061,000 per annum in the long term.

Producer surplus

A measure of the total impact on producers is the difference between what price producers are willing to sell each kg of meat (the price on the supply curve) and the price they actually receive (the market price). Without more information about farm costs, it is difficult to accurately estimate the producer surplus.

Instead, changes in profits are approximated. For non-stall farms, the increase in profit is approximated by multiplying current production[38] by the change in price. For stall farms, profit is calculated as the number of farms remaining multiplied by the per farm profit received.

Under Scenario 1's 2013 ban, the change in per annum total farm profit is approximately[39]:

Table 7.8: Profit change under Scenario 1

	2013 ban	Status quo
Short term profit change	-$301,000	-$425,000
Stall farm	-$2,101,000	-$437,000
Non-stall farm	+$1,800,000	+$13,000
Long term profit change	+$4,298,000	+$494,000
Stall farm	-$615,000	-$119,000
Non-stall farm	+$4,913,000	+$613,000

Profits for non-stall farms increase because they receive a higher market price, but do not face increased costs as a result of a change to the Code.

Total impact and interpretation

Compared to the status quo, a 2013 ban is estimated to have a total cost (consumer impact plus producer impact) in the long term of:

- $3,354,000 per annum under Scenario 1; and
- $3,936,000 per annum under Scenario 2.

[38] Production by non-stall farms is estimated to increase by about 2% under the 2013 ban option.

[39] In the short term, decreases in profits of stall farms are due to cost increases. In the long term, prices increase with industry exits, and the decrease in profit is due to those exits (remaining farms make normal profits).

This is equivalent to an estimated cost per sow no longer being confined in stalls for four weeks' per reproductive cycle of:

- $266.04 under Scenario 1; and
- $248.08 under Scenario 2.

Readers may want to consider whether the benefit per sow of no longer being in stalls approximately eight weeks of the year is more or less than the estimated $300 net cost to the country.

Key Model Result: The estimated cost to New Zealand of decreasing the time sows spend in dry sow stalls from eight weeks per annum to zero weeks is between about $300 and $350 per sow per annum.

Appendix 1: Economic theory

METHODS OF PAST ECONOMIC ASSESSMENTS

"Economic impact analyses" are often quite limited in how accurately they analyse what is likely to happen as a result of a regulatory change. The main cause of this limitation is an explicit assumption that prices do not change, that is, when faced with additional costs, firms cannot pass on any of the cost increase to consumers. As a result, analyses can be little more than an accounting exercise.[40] This has been true of past economic analyses for previous Animal Welfare (Pigs) Code of Welfare reviews[41][42].

These analyses typically:

(A) consider the current profitability or welfare of affected firms or parties;

(B) total up the cost of complying with amended regulation; and

(C) subtract (B) from (A) to find a new level of profitability or welfare.

This approach can lead to a number of strange conclusions, as demonstrated in some illustrative examples below.

Example 1: profitable firms

If firms were making profits, and then incur costs from a regulatory change that leaves the firms profitable, the likely future state is often described as just that: firms making lower profits. The economic impact is the cost firms incur from the regulatory change.

Example 1: profitable firms

Number of firms	100
Current profit per firm	$100,000
Additional cost from amended regulation	$20,000
New profit per firm	$80,000

Here, all firms still make a profit, the per firm impact is $20,000, and the total economic impact is $2,000,000 ($20,000 per firm × 100 firms). Because prices are assumed not to change, the impact is borne by firms, with no impact on consumers.

Example 2: marginally profitable firms

If firms were making profits, and then incur costs from a regulatory change that leaves the firms unprofitable, the likely future state is described as all or some firms being unsustainable and eventually ceasing operation. Again, the assumption that prices do not change prevents firms from trying to recoup losses and avoid insolvency. This will result in an overestimate of the number of firms that exit the industry. Furthermore, although there is sometimes discussion of which firms are most likely to exit the industry, there is seldom analysis of what effect this will have on remaining firms, that is, whether fewer competitors means that the profitability of remaining firms is improved.

[40] This is not meant to be critical of the work done in these assessments, as they were consistent with the terms outlined. However, their scope does limit the usefulness of the assessments.

[41] AgFirst, 2004, *Analysis of the impact on pig farmers profitability of adopting a transitional 10 week step in the maximum use of dry sow stalls*

[42] PricewaterhouseCoopers, January 2004, *Adopting Group Housing and Minimum Space Requirements: Financial and Aggregate Analysis*

Example 2: marginally profitable firms

Number of firms	100
Current profit per firm	$15,000
Additional cost from amended regulation	$20,000
New profit per firm	-$5,000

The economic impact in this situation is generally the total of the cost of change to firms that remain (as in example 1), and some commentary about the proportion of firms or production lost from the market.

Example 3: unprofitable firms

If firms were making losses, and then incur costs from a regulatory change that leaves the firms even less profitable, the likely future state is often described as all firms being unsustainable and eventually ceasing operation. This suffers from the same problems as in example 2, but with an additional strange conclusion. Because firms were making losses, and are likely to exit the market as a result of the regulatory change, the loss of those firms is counted as a benefit to the economy (fewer negative profits in the economy).

Example 3: unprofitable firms

Number of firms	100
Current profit per firm	-$20,000
Additional cost from amended regulation	$20,000
New profit per firm	-$40,000

OVERALL APPROACH OF THIS ANALYSIS

The key difference between this analysis and some past analyses is that prices are allowed to change in response to changes to the Code. By passing on some of the cost increase to consumers, producers can limit the impact on farm profitability.

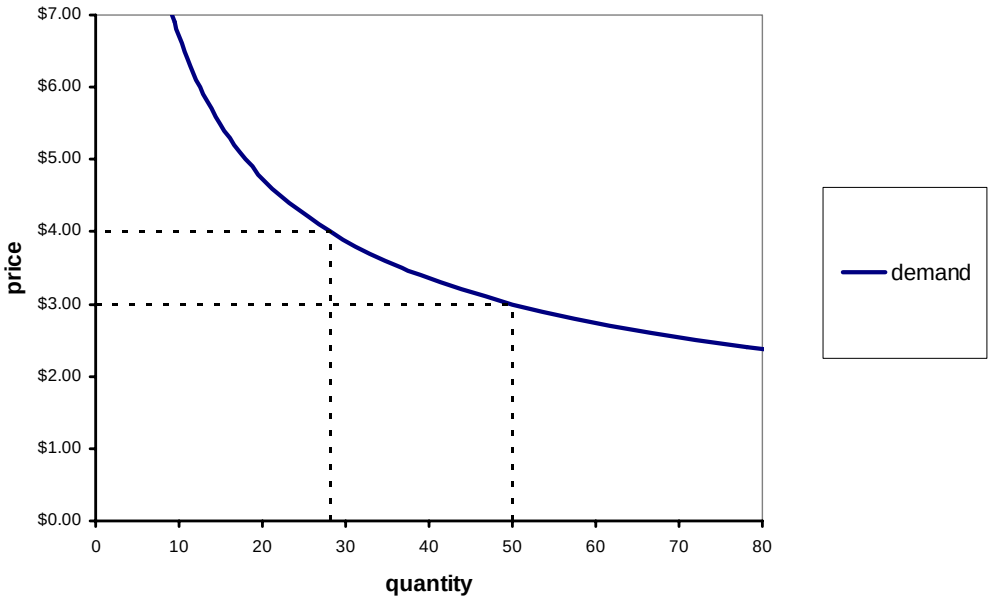
Key Point: The impact on producers of cost increases will be less if producers can pass on some of the cost increase to consumers through higher prices.

DEMAND AND SUPPLY – THEORY

Demand curves slope downwards. The higher the price, the less consumers are prepared to buy of that product. The lower the price, the more consumers are prepared to buy. In the sketch below, at a price of $4.00 consumers want to buy 28 items. If the price falls to $3.00, consumers want to buy 50 items.

When the price of one product increases, consumers want to buy less of that product, and generally more of other products (or save more). For example, if the price of pork increases, fewer people would buy pork, instead perhaps buying more chicken or beef, or maybe eating less meat overall and buying completely different products.

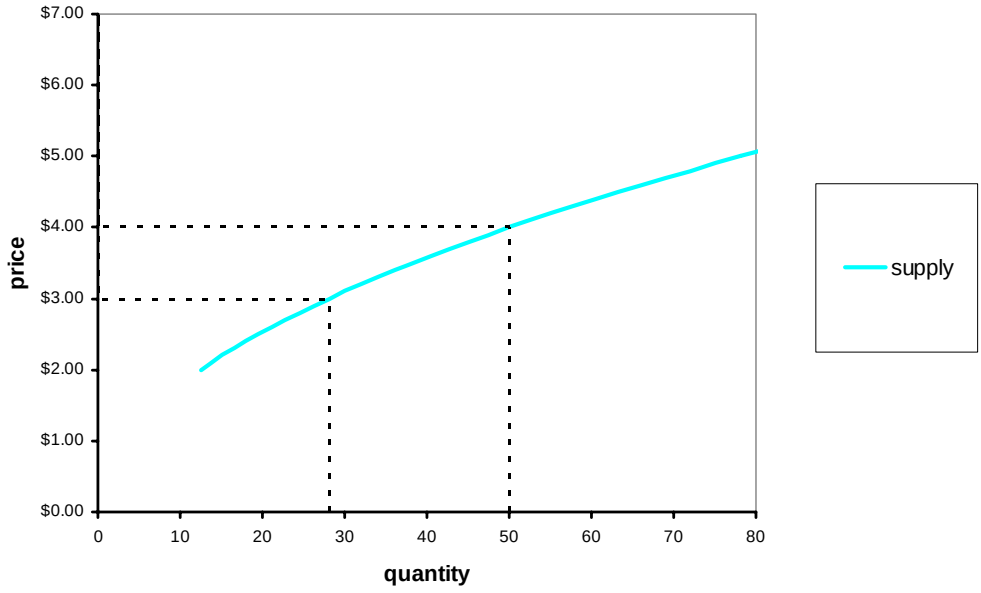
Demand



Supply curves slope upwards. The higher the price, the more producers are prepared to sell of that product. The lower the price, the less producers are prepared to sell. In the sketch below, at a price of $4.00 producers want to sell 50 items. If the price falls to $3.00, producers want to sell 28 items.

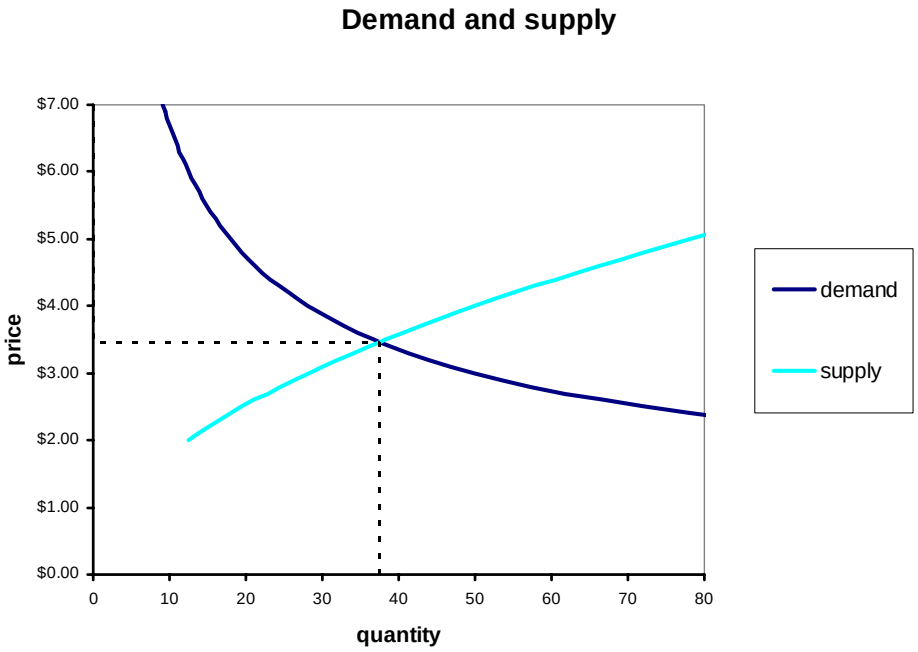
When the price of one product increases, producers want to sell more of that product. For example, if the price of pork increases, existing producers will be enticed to produce more, or new producers will enter the market.

Supply



In a market, prices tend to adjust to change the amount consumers want to buy and producers want to sell until producers are producing the amount consumers want to buy until there is equilibrium. At a price of $4.00, producers want to sell 50 items, but consumers only want to buy 28 items. The excess supply drives the price down, encouraging consumers to buy more and producers to sell less. At a price of $3.00, producers want to sell 28 items, but consumers want to buy 50 items. The excess demand drives the price up, encouraging producers to

produce more and consumers to buy less. An equilibrium price and quantity is found where the demand and supply curves intersect. In this example, the equilibrium price is $3.46 and the equilibrium quantity is 37.5 items.



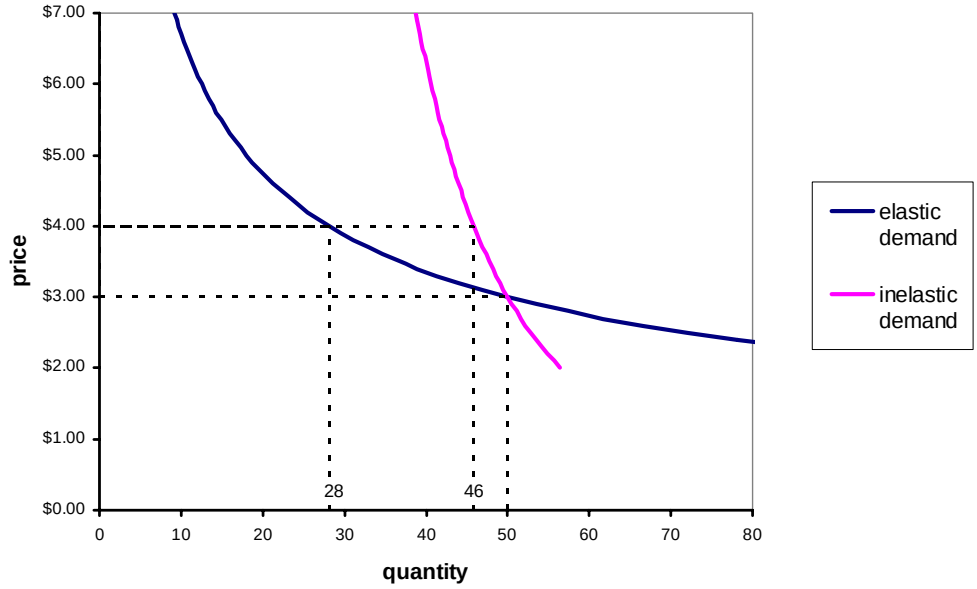
ELASTICITY OF DEMAND AND ELASTICITY OF SUPPLY

Where a price increase causes a relatively large reduction in the quantity demanded by consumers, demand is "elastic". When a price increase causes a relatively small reduction in the quantity demanded by consumers, demand is 'inelastic'. For example, products with easily accessible substitutes are likely to have elastic demand curves.

In the sketch below, an increase in the price from $3.00 to $4.00 causes the quantity demanded to decrease from 50 items to 46 items with the inelastic demand curve, and from 50 items to 28 items with the elastic demand curve.

The implication of this is that producers can increase prices without losing many sales when demand is inelastic. When demand is elastic, producers lose many sales if they attempt to increase prices.

Elastic and inelastic demand



The same applies to supply curves. Where a price increase causes a relatively large increase in the quantity supplied by producers, supply is elastic. Where a price increase causes a relatively small increase in the quantity supplied by producers, supply is inelastic.

Appendix 2: Farm income and expenditure

The table below presents summary income and expenditure before tax and drawings of NZ Pork's 250 sow farm model between 2004 and 2009.

Variable	Average	2004	2005	2006
Income	$1,145,230.79	$1,001,105.28	$1,094,339.54	$1,136,982.61
Direct expenses	$911,117.10	$806,315.70	$798,491.33	$891,284.83
Fixed expenses	$234,113.69	$202,535.33	$202,535.33	$231,564.00
Total expenses	$1,125,276.55	$1,008,851.03	$1,001,026.66	$1,122,848.83
Profit	$19,954.25	-$7,745.75	$93,312.88	$14,133.78
Price per kg	$3.33	$3.05	$3.32	$3.24

Variable	2007	2008	2009
Income	$1,135,262.71	$1,159,602.99	$1,344,091.64
Direct expenses	$935,041.77	$1,008,852.14	$1,026,716.84
Fixed expenses	$231,564.00	$222,554.00	$194,204.00
Total expenses	$1,166,605.77	$1,231,406.14	$1,125,276.55
Profit	-$31,343.06	-$71,803.16	$123,170.80
Price per kg	$3.24	$3.43	$4.02

Appendix 3: Estimated demand and supply curves

DEMAND

Using the 37.10 million kgs of fresh pork, 11.71 million kgs of processed meat, the price of $3.33 per kg, the assumed elasticities of -1.5, and the and the demand curve relationship, $Q=AP\varepsilon$, the demand curves can be estimated as:

- $Q = 225{,}780{,}000(P)^{-1.5}$ for domestically-produced fresh pork; and
- $Q = 71{,}300{,}000(P)^{-1.5}$ for domestically-produced processed meat.

SUPPLY

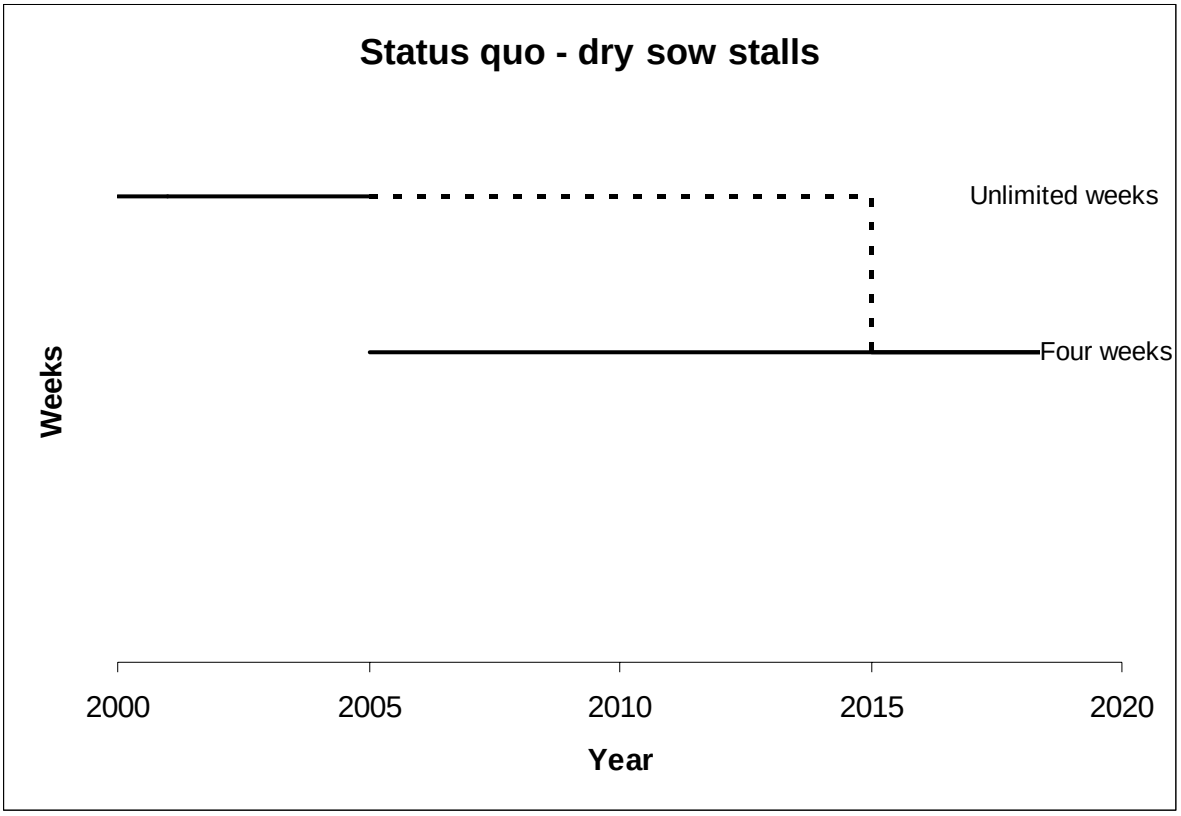
Using the 23.02 million kgs of fresh pork, 25.79 million kgs of processed meat, the price of $3.33 per kg, the assumed elasticities of 0.2, and the and the supply curve relationship, $Q=AP^{\varepsilon}$, the supply curves can be estimated as:

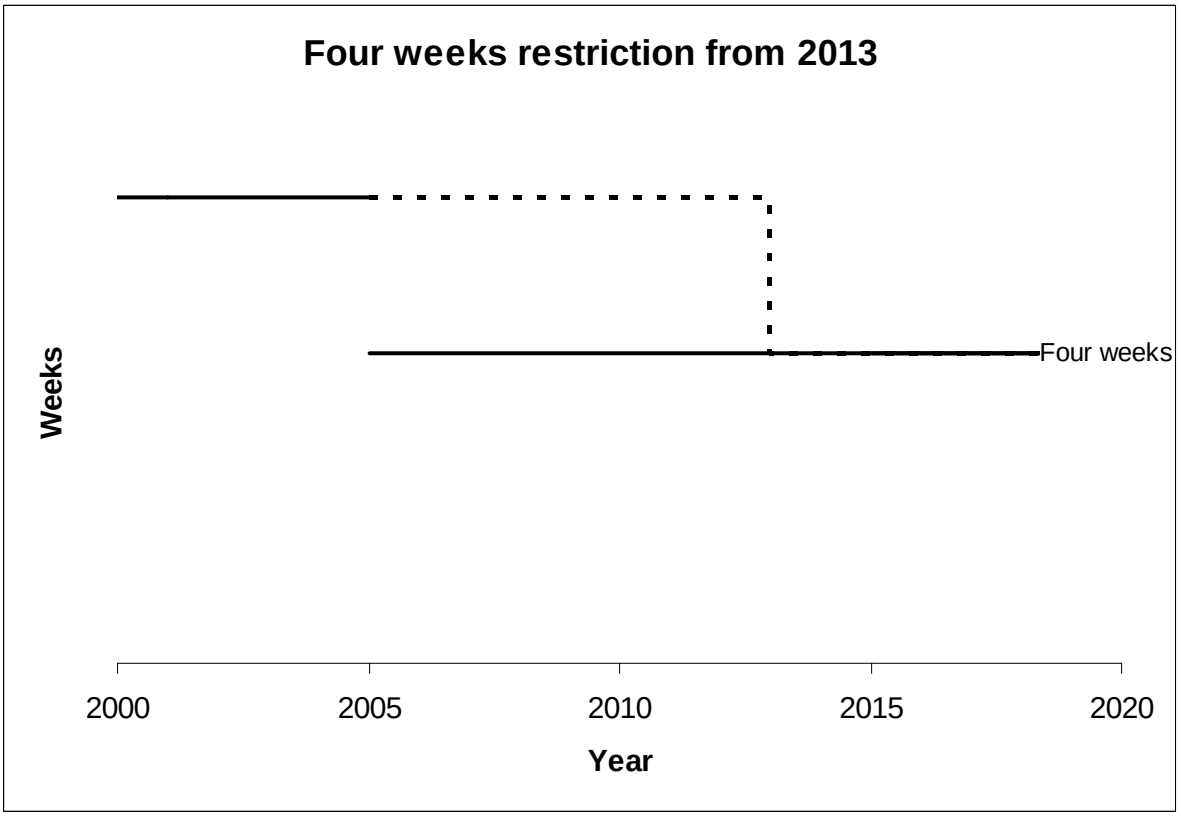
- $Q = 18{,}090{,}000(P)^{0.2}$ for stall farm production; and
- $Q = 20{,}270{,}000(P)^{0.2}$ for non-stall farm production.

Appendix 4: Diagrammatical representation of Code options

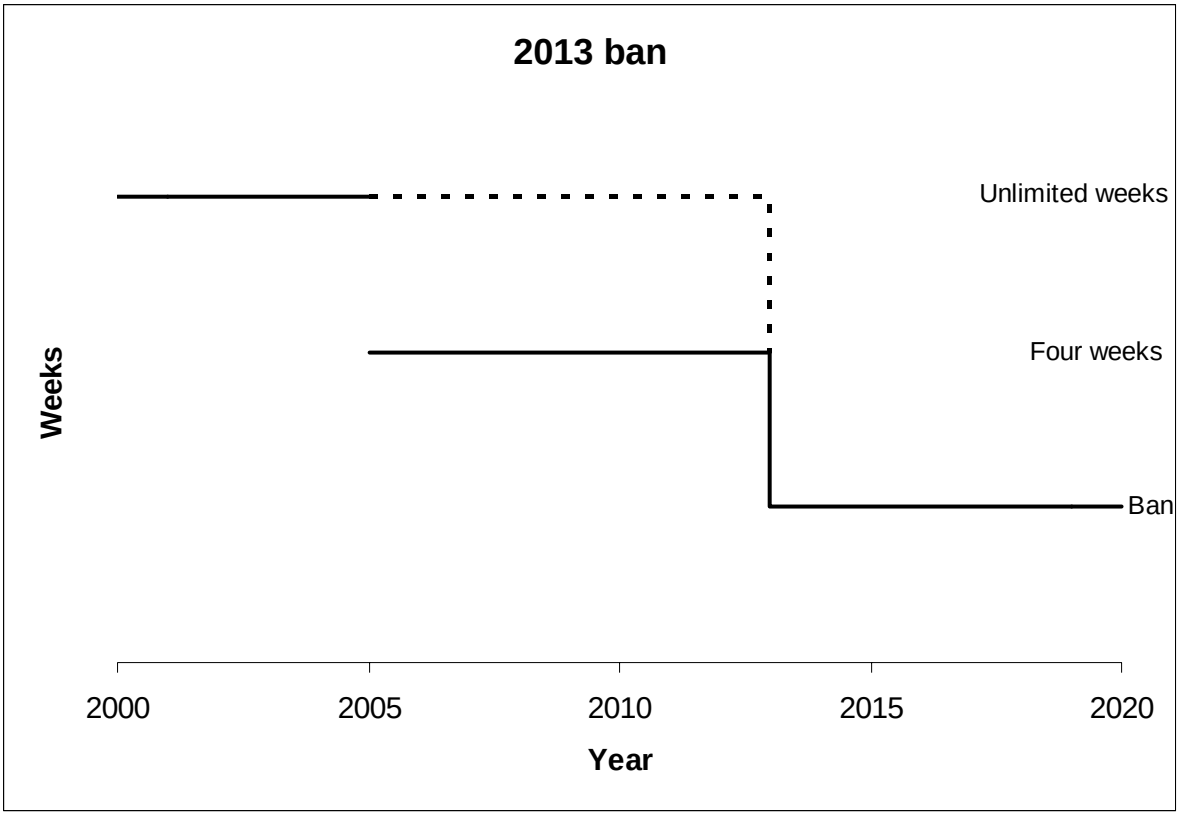
This appendix represents the Code options diagrammatically.

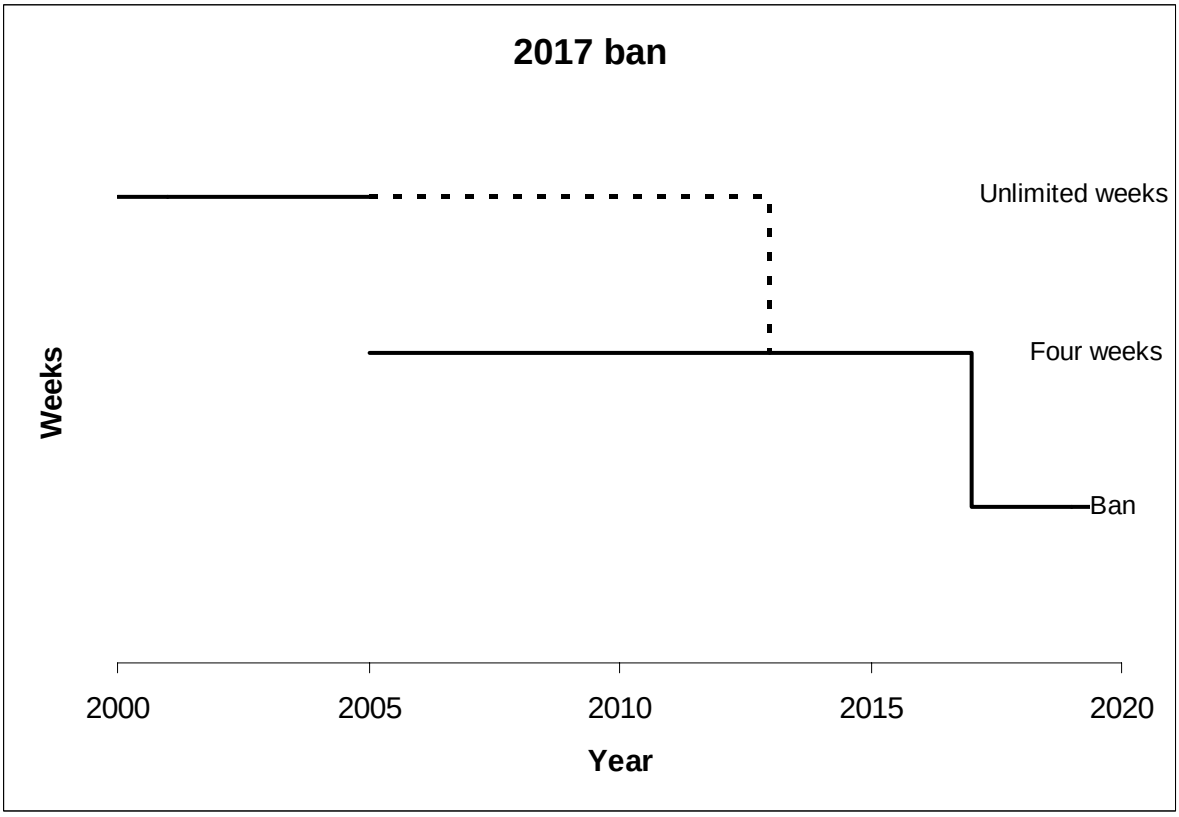
Under the current code, stalls built after before 2005 can be used without restriction until 2015 when all stall use is restricted to a maximum of four weeks per reproduction cylce. Stalls built after 2005 can be used up to four weeks per reproduction cycle.

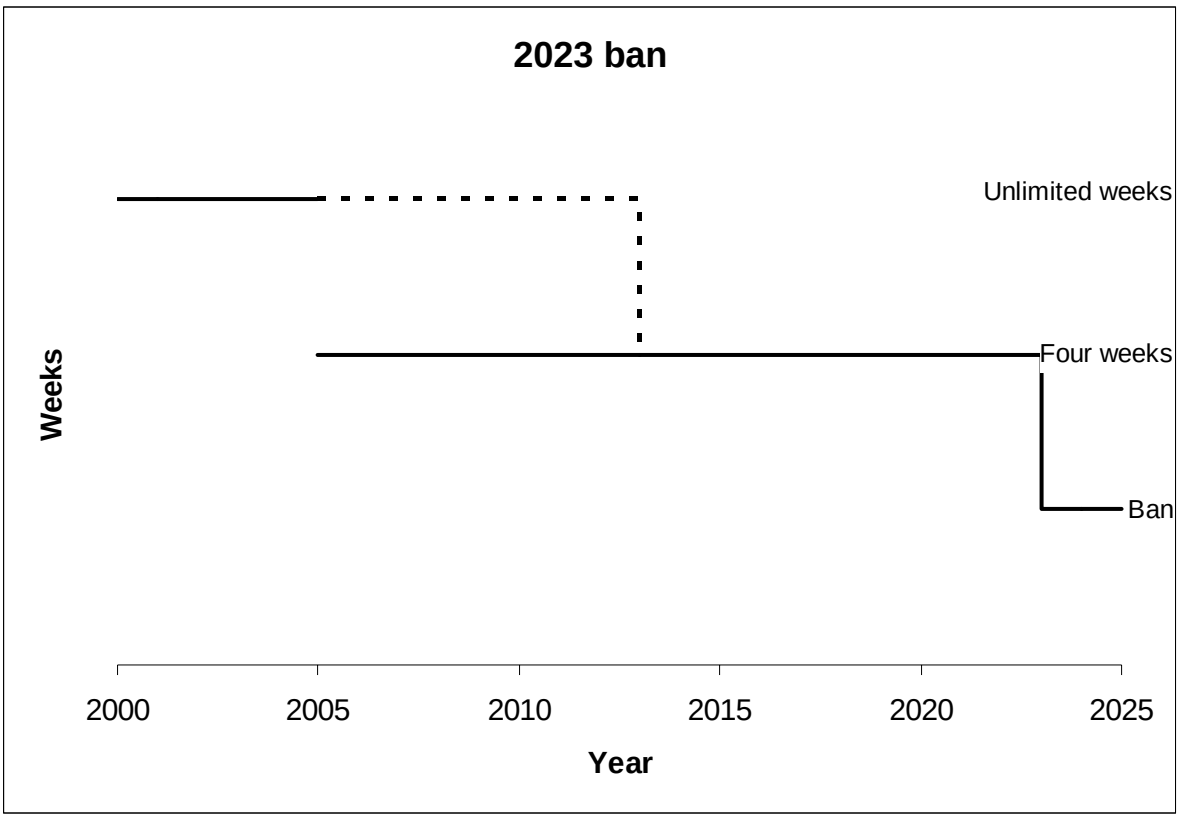




The diagrams below illustrate the three ban options. Each includes a 2013 date for the four weeks' restriction.






2023 ban
Unlimited weeks
Four weeks
Ban
Weeks
2000
2005
2010
2015
2020
2025
Year

Appendix 5: Sensitivity analysis

MAIN ASSUMPTIONS

The estimated results where the elasticity of demand for fresh pork changes from -1.5 to -1.0 by 2017 and -0.5 by 2023 and where renovation costs are a one-off cost are presented in the tables below. The results from changes to assumptions are then presented.

The results are most sensitive to assumptions about elasticity of demand and about the productivity impact of moving to group housing.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.77	-1.00%
No. of farms	139.74	138.36	-0.99%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	13,685.65	13,333.76	-2.57%
No. of sows on stall farms (overseas)			+110.74
Total change in stall sows			-241.16

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.77	-8.96%
No. of farms	152.00	138.36	-8.97%
No. of farms that exit due to the four weeks restriction			1.38

No. of sows on stall farms (NZ)	16,750.00	13,333.76	-20.40%
No. of sows on stall farms (overseas)			+1,075.86
Total change in stall sows			-2,340.38

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.70
		(+4.70%)	(+4.55%)	(+4.38%)
Quantity (mil. kg) – total domestic production	44.44	41.48	42.28	43.06
		(-6.65%)	(-4.86%)	(-3.11%)
Quantity – fresh pork	33.77	31.53	32.30	33.06
		(-6.65%)	(-4.36%)	(-2.12%)
No. of farms	138.36	132.57	135.05	137.43
		(-5.79 farms)	(-3.31 farms)	(-0.93 farms)
		(-4.18%)	(-2.39%)	(-0.67%)
Sows in stalls NZ	13,333.76	0.00	0.00	0.00
		(-13,333.76)	(-13,333.76)	(-13,333.76)
Change in sows in stalls overseas		+727.85	+639.87	+550.70
Total change in stall sows		-12,605.92	-12,693.89	-12,783.06

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.68%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.01%
Quantity – fresh pork	34.12	33.78	-1.01%
No. of farms	133.74	132.38	-1.02%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,938.09	16,590.79	-2.05%
No. of sows on stall farms (overseas)			+110.67

Total change in stall sows	-236.63

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.78	-8.96%
No. of farms	152.00	132.38	-12.91%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,750.00	16,590.79	-0.95%
No. of sows on stall farms (overseas)			+1,075.79
Total change in stall sows			+916.58

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.71	$3.71	$3.70
		(+4.68%)	(+4.53%)	(+4.34%)
Quantity (mil. kg) – domestic production	44.44	41.50	42.29	43.07
		(-6.63%)	(-4.83%)	(-3.08%)
Quantity – fresh pork	33.78	31.54	32.31	33.07
		(-6.63%)	(-4.33%)	(-2.10%)
No. of farms	132.38	127.75	130.20	132.50
		(-4.63 farms)	(-2.19 farms)	(+0.12 farms)
		(-3.50%)	(-1.65%)	(+0.09%)
Sows in stalls NZ	16,590.79	0.00	0.00	0.00
		(-16,590.79)	(-16,590.79)	(-16,590.79)
Change in sows in stalls overseas		+724.73	+636.15	+545.90
Total change in stall sows		-15,866.06	-15,954.64	-16,044.89

ELASTICITY OF DEMAND REMAINS AT -1.5

If the elasticity of demand for fresh pork remains at -1.5 over time, the estimated impacts of a 2017 ban are:

- prices increasing by 4.58 percent (compared to 4.55 percent) and quantity decreasing by 6.50 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 4.56 percent (compared to 4.53 percent) and quantity decreasing by 6.47 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.77	-1.00%
No. of farms	139.74	138.36	-0.99%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	13,685.65	13,333.76	-2.57%
No. of sows on stall farms (overseas)			+110.74
Total change in stall sows			-241.16

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.77	-8.96%
No. of farms	152.00	138.36	-8.97%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	16,750.00	13,333.76	-20.40%
No. of sows on stall farms (overseas)			+1,075.86
Total change in stall sows			-2,340.38

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.71
		(+4.70%)	(+4.58%)	(+4.45%)
Quantity (mil. kg) – total domestic production	44.44	41.48	41.55	41.63
		(-6.65%)	(-6.50%)	(-6.32%)
Quantity – fresh pork	33.77	31.53	31.58	31.64
		(-6.65%)	(-6.50%)	(-6.32%)
No. of farms	138.36	132.57	132.82	133.08
		(-5.79 farms)	(-5.54 farms)	(-5.28 farms)
		(-4.18%)	(-4.01%)	(-3.82%)
Sows in stalls NZ	13,333.76	0.00	0.00	0.00
		(-13,333.76)	(-13,333.76)	(-13,333.76)
Change in sows in stalls overseas		727.85	710.68	691.73
Total change in stall sows		-12,605.92	-12,623.08	-12,642.03

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.78	-1.00%
No. of farms	133.74	132.38	-1.02%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,938.09	16,590.79	-2.05%
No. of sows on stall farms (overseas)			+110.67
Total change in stall sows			-236.63

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.78	-8.96%
No. of farms	152.00	132.38	-12.91%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,750.00	16,590.79	-0.95%
No. of sows on stall farms (overseas)			+1,075.79
Total change in stall sows			+916.58

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.71	$3.71	$3.70
		(+4.68%)	(+4.56%)	(+4.43%)
Quantity (mil. kg) – domestic production	44.44	41.50	41.57	41.64
		(-6.63%)	(-6.47%)	(-6.30%)
Quantity – fresh pork	33.78	31.54	31.59	31.65
		(-6.63%)	(-6.47%)	(-6.30%)
No. of farms	132.38	127.75	128.00	128.25
		(-4.63 farms)	(-4.39 farms)	(-4.13 farms)
		(-3.50%)	(-3.31%)	(-3.12%)
Sows in stalls NZ	16,590.79	0.00	0.00	0.00
		(-16,590.79)	(-16,590.79)	(-16,590.79)
Change in sows in stalls overseas		+724.73	+707.37	+688.53
Total change in stall sows		-15,866.06	-15,883.42	-15,902.26

RENOVATION COSTS INCURRED EACH TIME

If renovation costs are incurred each time stalls are replaced, instead of being a one-off cost, the estimated impacts of a 2017 ban are:

- prices increasing by 4.90% (compared to 4.55%) and quantity decreasing by 5.21% (compared to 4.86%) under Scenario 1; and
- prices increasing by 4.87% (compared to 4.53%) and quantity decreasing by 5.19% (compared to 4.83%) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.77	-1.00%
No. of farms	139.74	138.36	-0.99%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	13,685.65	13,333.76	-2.57%
No. of sows on stall farms (overseas)			+110.74
Total change in stall sows			-241.16

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.77	-8.96%
No. of farms	152.00	138.36	-8.97%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	16,750.00	13,333.76	-20.40%
No. of sows on stall farms (overseas)			+1,075.86
Total change in stall sows			-2,340.38

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.71
		(+4.92%)	(+4.90%)	(+4.86%)
Quantity (mil. kg) – total domestic production	44.44	41.35	42.12	42.92
		(-6.95%)	(-5.21%)	(-3.43%)
Quantity – fresh pork	33.77	31.43	32.20	32.98
		(-6.95%)	(-4.67%)	(-2.34%)
No. of farms	138.36	132.12	134.50	136.90
		(-6.24 farms)	(-3.86 farms)	(-1.46 farms)
		(-4.51%)	(-2.79%)	(-1.05%)
Sows in stalls NZ	13,333.76	0.00	0.00	0.00
		(-13,333.76)	(-13,333.76)	(-13,333.76)
Change in sows in stalls overseas		760.04	686.09	607.19
Total change in stall sows		-12,573.72	-12,647.67	-12,726.57

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.78	-1.00%
No. of farms	133.74	132.38	-1.02%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,938.09	16,590.79	-2.05%
No. of sows on stall farms (overseas)			+110.67
Total change in stall sows			-236.63

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.78	-8.96%
No. of farms	152	132.38	-12.91%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,750.00	16,590.79	-0.95%
No. of sows on stall farms (overseas)			+1,075.79
Total change in stall sows			+916.58

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.72	$3.72
		(+4.90%)	(+4.87%)	(+4.81%)
Quantity (mil. kg) – domestic production	44.44	41.37	42.14	42.93
		(-6.92%)	(-5.19%)	(-3.40%)
Quantity – fresh pork	33.78	31.44	31.59	32.99
		(-6.92%)	(-4.65%)	(-2.32%)
No. of farms	132.38	127.32	129.66	131.99
		(-5.07 farms)	(-2.72 farms)	(-0.39 farms)
		(-3.83%)	(-2.06%)	(-0.30%)
Sows in stalls NZ	16,590.79	0.00	0.00	0.00
		(-16,590.79)	(-16,590.79)	(-16,590.79)
Change in sows in stalls overseas		+756.91	+682.33	+602.34
Total change in stall sows		-15,833.88	-15,908.45	-15,988.45

ELASTICITY OF DEMAND REMAINS AT -1.5 AND RENOVATION COSTS ARE INCURRED EACH TIME

If the elasticity of demand remains at -1.5 and renovation costs are incurred each time stalls are replaced, the estimated impacts of a 2017 ban are:

- prices increasing by 4.93 percent (compared to 4.55 percent) and quantity decreasing by 6.96 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 4.91 percent (compared to 4.53 percent) and quantity decreasing by 6.93 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.77	-1.00%
No. of farms	139.74	138.36	-0.99%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	13,685.65	13,333.76	-2.57%
No. of sows on stall farms (overseas)			+110.74
Total change in stall sows			-241.16

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.77	-8.96%
No. of farms	152.00	138.36	-8.97%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	16,750.00	13,333.76	-20.40%
No. of sows on stall farms (overseas)			+1,075.86
Total change in stall sows			-2,340.38

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.72	$3.72
		(+4.92%)	(+4.93%)	(+4.93%)
Quantity (mil. kg) – total domestic production	44.44	41.35	41.35	41.35
		(-6.95%)	(-6.96%)	(-6.96%)
Quantity – fresh pork	33.77	31.43	31.42	31.42
		(-6.95%)	(-6.96%)	(-6.96%)
No. of farms	138.36	132.12	131.42	132.11
		(-6.24 farms)	(-6.25 farms)	(-6.25 farms)
		(-4.51%)	(-4.52%)	(-4.52%)
Sows in stalls NZ	13,333.76	0.00	0.00	0.00
		(-13,333.76)	(-13,333.76)	(-13,333.76)
Change in sows in stalls overseas		760.04	761.61	761.49
Total change in stall sows		-12,573.72	-12,572.15	-12,572.27

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.78	-1.00%
No. of farms	133.74	132.38	-1.02%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,938.09	16,590.79	-2.05%
No. of sows on stall farms (overseas)			+110.67
Total change in stall sows			-236.63

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.78	-8.96%
No. of farms	152.00	132.38	-12.91%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,750.00	16,590.79	-0.95%
No. of sows on stall farms (overseas)			+1,075.79
Total change in stall sows			+916.58

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.72	$3.72
		(+4.90%)	(+4.91%)	(+4.91%)
Quantity (mil. kg) – domestic production	44.44	41.37	41.36	41.36
		(-6.92%)	(-6.93%)	(-6.93%)
Quantity – fresh pork	33.78	31.44	31.43	31.43
		(-6.92%)	(-6.93%)	(-6.93%)
No. of farms	132.38	127.32	127.30	127.30
		(-5.07 farms)	(-5.08 farms)	(-5.08 farms)
		(-3.83%)	(-3.84%)	(-3.84%)
Sows in stalls NZ	16,590.79	0.00	0.00	0.00
		(-16,590.79)	(-16,590.79)	(-16,590.79)
Change in sows in stalls overseas		+756.91	+758.29	+758.26
Total change in stall sows		-15,833.88	-15,832.50	-15,832.53

VERY ELASTIC DEMAND FOR PROCESSED MEAT

Setting the elasticity of demand for processed meat to -100 results in a similar proportional impact from bans including, for a 2017 ban:

- prices increasing by 4.60 percent (compared to 4.55 percent) and quantity decreasing by 4.46 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 4.46 percent (compared to 4.53 percent) and quantity decreasing by 4.34 percent (compared to 4.83 percent) under Scenario 2.

The impact under the status quo is much greater. This is because increasing the price of meat to achieve sustainable profits causes demand for domestically produced processed meat to reduce significantly.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	34.16	-30.02%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	108.51	-28.61%
No. of sows on stall farms (NZ)	16,750.00	5,877.85	-64.91%
No. of sows on stall farms (overseas)			+8,772.93
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	34.16	33.80	-1.06%
Quantity – fresh pork	34.12	33.77	-1.00%
No. of farms	108.51	107.36	-1.06%
No. of farms that exit due to the four weeks restriction			1.15
No. of sows on stall farms (NZ)	5,877.85	5,588.24	-4.93%
No. of sows on stall farms (overseas)			+47.85
Total change in stall sows			-241.75

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	33.80	-30.76%
Quantity – fresh pork	37.10	33.77	-8.96%
No. of farms	152.00	107.36	-29.37%
No. of farms that exit due to the four weeks restriction			1.15

No. of sows on stall farms (NZ)	16,750.00	5,588.24	-66.64%
No. of sows on stall farms (overseas)			+8,820.78
Total change in stall sows			-2,340.98

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.71
		(+4.74%)	(+4.60%)	(+4.43%)
Quantity (mil. kg) – total domestic production	33.80	31.51	32.29	33.05
		(-6.77%)	(-4.46%)	(-2.21%)
Quantity – fresh pork	33.77	31.51	32.29	33.05
		(-6.71%)	(-4.40%)	(-2.14%)
No. of farms	107.36	101.22	103.69	106.07
		(-6.15 farms)	(-3.68 farms)	(-1.29 farms)
		(-5.72%)	(-3.42%)	(-1.20%)
Sows in stalls NZ	5,588.24	0.00	0.00	0.00
		(-5,588.24)	(-5,588.24)	(-5,588.24)
Change in sows in stalls overseas		229.37	155.91	84.20
Total change in stall sows		-5,358.87	-5,432.33	-5,504.05

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	34.16	-30.02%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	84.95	-44.11%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+8,772.93
Total change in stall sows			+8,961.01

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	34.16	33.80	-1.06%
Quantity – fresh pork	34.12	33.78	-1.00%
No. of farms	84.95	83.88	-1.25%
No. of farms that exit due to the four weeks restriction			1.07
No. of sows on stall farms (NZ)	16,938.09	16,663.85	-1.62%
No. of sows on stall farms (overseas)			+47.79

Total change in stall sows	-226.45

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	33.80	-30.76%
Quantity – fresh pork	37.10	33.78	-8.95%
No. of farms	152.00	83.88	-44.82%
No. of farms that exit due to the four weeks restriction			1.07
No. of sows on stall farms (NZ)	16,750.00	16,590.79	-0.95%
No. of sows on stall farms (overseas)			+8,820.72
Total change in stall sows			+8,734.57

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.71	$3.71	$3.70
		(+4.64%)	(+4.46%)	(+4.19%)
Quantity (mil. kg) – domestic production	33.80	31.55	32.33	33.09
		(-6.64%)	(-4.34%)	(-2.10%)
Quantity – fresh pork	33.78	31.55	32.33	33.09
		(-6.58%)	(-4.27%)	(-2.03%)
No. of farms	83.88	81.69	83.98	85.94
		(-2.19 farms)	(+0.10 farms)	(+2.06 farms)
		(-2.61%)	(+0.12%)	(+2.46%)
Sows in stalls NZ	16,663.85	0.00	0.00	0.00
		(-16,663.85)	(-16,663.85)	(-16,663.85)
Change in sows in stalls overseas		+225.26	+151.88	+80.65
Total change in stall sows		-16,438.59	-16,511.97	-16,583.20

HIGHER RESOURCE MANAGEMENT ACT COSTS 1

If Resource Management Act costs are $10,000, rather than $2,000, the estimated impacts of a 2017 ban are:

- prices increasing by 4.59 percent (compared to 4.55 percent) and quantity decreasing by 4.90 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 4.56 percent (compared to 4.53 percent) and quantity decreasing by 4.87 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.71%
Quantity (mil. kg) – total domestic production	44.89	44.42	-1.05%
Quantity – fresh pork	34.12	33.76	-1.05%
No. of farms	139.74	138.29	-1.04%
No. of farms that exit due to the four weeks restriction			1.45
No. of sows on stall farms (NZ)	13,685.65	13,317.24	-2.69%
No. of sows on stall farms (overseas)			+115.92
Total change in stall sows			-252.50

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.49%
Quantity (mil. kg) – total domestic production	48.81	44.42	-9.00%
Quantity – fresh pork	37.10	33.76	-9.00%
No. of farms	152.00	138.29	-9.02%
No. of farms that exit due to the four weeks restriction			1.45
No. of sows on stall farms (NZ)	16,750.00	13,317.24	-20.49%
No. of sows on stall farms (overseas)			+1,081.04
Total change in stall sows			-2,351.73

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.71
		(+4.73%)	(+4.59%)	(+4.38%)
Quantity (mil. kg) – total domestic production	44.42	41.44	42.24	43.04
		(-6.70%)	(-4.90%)	(-3.11%)
Quantity – fresh pork	33.76	31.50	32.28	33.04
		(-6.70%)	(-4.39%)	(-2.12%)
No. of farms	138.29	132.43	134.93	137.36
		(-5.86 farms)	(-3.37 farms)	(-0.94 farms)
		(-4.24%)	(-2.43%)	(-0.68%)
Sows in stalls NZ	13,317.24	0.00	0.00	0.00
		(-13,317.24)	(-13,317.24)	(-13,317.24)
Change in sows in stalls overseas		732.65	644.32	550.66
Total change in stall sows		-12,584.58	-12,672.92	-12,766.58

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.71%
Quantity (mil. kg) – total domestic production	44.89	44.42	-1.05%
Quantity – fresh pork	34.12	33.76	-1.05%
No. of farms	133.74	132.32	-1.06%
No. of farms that exit due to the four weeks restriction			1.42
No. of sows on stall farms (NZ)	16,938.09	16,574.45	-2.15%
No. of sows on stall farms (overseas)			+115.86
Total change in stall sows			-247.78

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.49%
Quantity (mil. kg) – total domestic production	48.81	44.42	-9.00%
Quantity – fresh pork	37.10	33.76	-9.00%
No. of farms	152.00	132.32	-12.95%
No. of farms that exit due to the four weeks restriction			1.42
No. of sows on stall farms (NZ)	16,750.00	16,574.45	-1.05%
No. of sows on stall farms (overseas)			+1,080.98
Total change in stall sows			+905.43

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.70
		(+4.71%)	(+4.56%)	(+4.34%)
Quantity (mil. kg) – domestic production	44.42	41.46	42.26	43.05
		(-6.67%)	(-4.87%)	(-3.08%)
Quantity – fresh pork	33.76	31.51	32.29	33.05
		(-6.67%)	(-4.36%)	(-2.10%)
No. of farms	132.32	127.62	130.08	132.44
		(-4.70 farms)	(-2.24 farms)	(+0.12 farms)
		(-3.55%)	(-1.69%)	(+0.09%)
Sows in stalls NZ	16,574.45	0.00	0.00	0.00
		(-16,574.45)	(-16,574.45)	(-16,574.45)
Change in sows in stalls overseas		+729.52	+640.68	+545.96
Total change in stall sows		-15,844.92	-15,933.77	-16,028.49

HIGHER RESOURCE MANAGEMENT ACT COSTS 2

If Resource Management Act costs are $13,256, rather than $2,000, the estimated impacts of a 2017 ban are:

- prices increasing by 4.60 percent (compared to 4.55 percent) and quantity decreasing by 4.91 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 4.58 percent (compared to 4.53 percent) and quantity decreasing by 4.88 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.72%
Quantity (mil. kg) – total domestic production	44.89	44.41	-1.07%
Quantity – fresh pork	34.12	33.75	-1.07%
No. of farms	139.74	138.27	-1.06%
No. of farms that exit due to the four weeks restriction			1.48
No. of sows on stall farms (NZ)	13,685.65	13,310.49	-2.74%
No. of sows on stall farms (overseas)			+118.04
Total change in stall sows			-257.13

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.50%
Quantity (mil. kg) – total domestic production	48.81	44.41	-9.02%
Quantity – fresh pork	37.10	33.75	-9.02%
No. of farms	152.00	138.27	-9.04%
No. of farms that exit due to the four weeks restriction			1.48
No. of sows on stall farms (NZ)	16,750.00	13,310.49	-20.53%
No. of sows on stall farms (overseas)			+1,083.15
Total change in stall sows			-2,356.36

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.71
		(+4.75%)	(+4.60%)	(+4.38%)
Quantity (mil. kg) – total domestic production	44.41	41.43	42.23	43.03
		(-6.72%)	(-4.91%)	(-3.11%)
Quantity – fresh pork	33.75	31.48	32.27	33.04
		(-6.72%)	(-4.40%)	(-2.12%)
No. of farms	138.27	132.38	134.88	137.33
		(-5.89 farms)	(-3.39 farms)	(-0.94 farms)
		(-4.26%)	(-2.45%)	(-0.68%)
Sows in stalls NZ	13,310.49	0.00	0.00	0.00
		(-13,310.49)	(-13,310.49)	(-13,310.49)
Change in sows in stalls overseas		734.59	646.09	550.73
Total change in stall sows		-12,575.89	-12,664.40	-12,759.76

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.72%
Quantity (mil. kg) – total domestic production	44.89	44.41	-1.07%
Quantity – fresh pork	34.12	33.75	-1.07%
No. of farms	133.74	132.29	-1.08%
No. of farms that exit due to the four weeks restriction			1.45
No. of sows on stall farms (NZ)	16,938.09	16,567.80	-2.19%
No. of sows on stall farms (overseas)			+117.97
Total change in stall sows			-252.32

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.50%
Quantity (mil. kg) – total domestic production	48.81	44.41	-9.02%
Quantity – fresh pork	37.10	33.75	-9.02%
No. of farms	152.00	132.29	-12.97%
No. of farms that exit due to the four weeks restriction			1.45
No. of sows on stall farms (NZ)	16,750.00	16,567.80	-1.09%
No. of sows on stall farms (overseas)			+1,083.09
Total change in stall sows			+900.89

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.70
		(+4.73%)	(+4.58%)	(+4.34%)
Quantity (mil. kg) – domestic production	44.41	41.44	42.24	43.04
		(-6.69%)	(-4.88%)	(-3.08%)
Quantity – fresh pork	33.75	31.49	32.28	33.04
		(-6.69%)	(-4.38%)	(-2.10%)
No. of farms	132.29	127.56	130.03	132.41
		(-4.73 farms)	(-2.27 farms)	(+0.12 farms)
		(-3.57%)	(-1.71%)	(+0.09%)
Sows in stalls NZ	16,567.80	0.00	0.00	0.00
		(-16,567.80)	(-16,567.80)	(-16,567.80)
Change in sows in stalls overseas		+721.47	+642.32	+545.93
Total change in stall sows		-15,836.33	-15,925.48	-16,021.88

NON-STALL FARM ELASTICITY OF SUPPLY IS 0.8

If the elasticity of supply of non-stall farms is 0.8, rather than 0.2, the estimated impacts of a 2017 ban are:

- prices increasing by 4.59 percent (compared to 4.55 percent) and quantity decreasing by 4.89 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 4.55 percent (compared to 4.53 percent) and quantity decreasing by 4.86 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	137.16	-9.77%
No. of sows on stall farms (NZ)	16,750.00	13,039.05	-22.15%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,745.83

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.77	-1.00%
No. of farms	137.16	135.45	-1.24%
No. of farms that exit due to the four weeks restriction			1.71
No. of sows on stall farms (NZ)	13,039.05	12,609.19	-3.30%
No. of sows on stall farms (overseas)			+110.74
Total change in stall sows			-319.12

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.42	-8.96%
Quantity – fresh pork	37.10	33.77	-8.96%
No. of farms	152.00	135.45	-8.96%
No. of farms that exit due to the four weeks restriction			1.71
No. of sows on stall farms (NZ)	16,750.00	12,609.19	-24.72%
No. of sows on stall farms (overseas)			+1,075.86
Total change in stall sows			-3,064.95

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.71
		(+4.72%)	(+4.59%)	(+4.43%)
Quantity (mil. kg) – total domestic production	44.44	41.47	42.27	43.04
		(-6.68%)	(-4.89%)	(-3.14%)
Quantity – fresh pork	33.77	31.52	32.29	33.05
		(-6.68%)	(-4.38%)	(-2.15%)
No. of farms	135.45	126.98	129.55	132.05
		(-8.47 farms)	(-5.90 farms)	(-3.40 farms)
		(-6.25%)	(-4.36%)	(-2.51%)
Sows in stalls NZ	12,609.19	0.00	0.00	0.00
		(-12,609.19)	(-12,609.19)	(-12,609.19)
Change in sows in stalls overseas		730.76	644.04	557.00
Total change in stall sows		-11,878.43	-11,965.15	-12,052.19

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.78	-1.00%
No. of farms	133.74	132.13	-1.21%
No. of farms that exit due to the four weeks restriction			1.61
No. of sows on stall farms (NZ)	16,938.09	16,529.70	-2.41%
No. of sows on stall farms (overseas)			+110.68
Total change in stall sows			-297.71

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.78	-8.96%
No. of farms	152.00	132.13	-13.07%
No. of farms that exit due to the four weeks restriction			1.61
No. of sows on stall farms (NZ)	16,750.00	16,529.70	-1.32%
No. of sows on stall farms (overseas)			+1,075.80
Total change in stall sows			+855.50

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.70
		(+4.69%)	(+4.55%)	(+4.39%)
Quantity (mil. kg) – domestic production	44.42	41.49	42.28	43.06
		(-6.65%)	(-4.86%)	(-3.11%)
Quantity – fresh pork	33.76	31.53	32.30	33.06
		(-6.65%)	(-4.36%)	(-2.13%)
No. of farms	132.32	125.56	128.09	130.52
		(-6.57 farms)	(-4.04 farms)	(-1.61 farms)
		(-4.97%)	(-3.06%)	(-1.22%)
Sows in stalls NZ	16,529.70	0.00	0.00	0.00
		(-16,529.70)	(-16,529.70)	(-16,529.70)
Change in sows in stalls overseas		+727.31	+639.83	+551.97
Total change in stall sows		-15,802.39	-15,889.87	-15,977.73

NON-STALL FARM ELASTICITY OF SUPPLY IS 1.5

If the elasticity of supply of non-stall farms is 1.5, rather than 0.2, the estimated impacts of a 2017 ban are:

- prices increasing by 4.61 percent (compared to 4.55 percent) and quantity decreasing by 4.92 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 4.58 percent (compared to 4.53 percent) and quantity decreasing by 4.88 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	134.03	-11.82%
No. of sows on stall farms (NZ)	16,750.00	12,256.78	-26.83%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-3,528.10

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.77	-1.00%
No. of farms	134.03	131.92	-1.58%
No. of farms that exit due to the four weeks restriction			2.11
No. of sows on stall farms (NZ)	12,256.78	11,727.47	-4.32%
No. of sows on stall farms (overseas)			+110.78
Total change in stall sows			-418.52

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.77	-8.96%
No. of farms	152.00	131.92	-13.21%
No. of farms that exit due to the four weeks restriction			2.11
No. of sows on stall farms (NZ)	16,750.00	11,727.47	-29.99%
No. of sows on stall farms (overseas)			+1,075.90
Total change in stall sows			-3,946.63

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.71
		(+4.73%)	(+4.61%)	(+4.47%)
Quantity (mil. kg) – total domestic production	44.44	41.46	42.26	43.03
		(-6.70%)	(-4.92%)	(-3.17%)
Quantity – fresh pork	33.77	31.51	32.29	33.04
		(-6.70%)	(-4.40%)	(-2.16%)
No. of farms	131.92	119.95	122.62	125.24
		(-11.96 farms)	(-9.30 farms)	(-6.68 farms)
		(-9.07%)	(-7.05%)	(-5.06%)
Sows in stalls NZ	11,727.47	0.00	0.00	0.00
		(-11,727.47)	(-11,727.47)	(-11,727.47)
Change in sows in stalls overseas		733.14	647.00	561.13
Total change in stall sows		-10,994.34	-11,080.47	-11,166.35

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.78	-1.00%
No. of farms	133.74	131.83	-1.43%
No. of farms that exit due to the four weeks restriction			1.91
No. of sows on stall farms (NZ)	16,938.09	16,457.25	-2.84%
No. of sows on stall farms (overseas)			+110.70
Total change in stall sows			-370.14

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.78	-8.96%
No. of farms	152.00	131.83	-13.27%
No. of farms that exit due to the four weeks restriction			1.91
No. of sows on stall farms (NZ)	16,750.00	16,457.25	-1.75%
No. of sows on stall farms (overseas)			+1,075.82
Total change in stall sows			+783.07

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.71	$3.71
		(+4.71%)	(+4.58%)	(+4.42%)
Quantity (mil. kg) – domestic production	44.44	41.48	42.27	43.05
		(-6.67%)	(-4.88%)	(-3.14%)
Quantity – fresh pork	33.78	31.52	32.30	33.05
		(-6.67%)	(-4.38%)	(-2.14%)
No. of farms	131.83	122.90	125.50	128.04
		(-8.93 farms)	(-6.33 farms)	(-3.79 farms)
		(-6.78%)	(-4.80%)	(-2.87%)
Sows in stalls NZ	16,457.25	0.00	0.00	0.00
		(-16,457.25)	(-16,457.25)	(-16,457.25)
Change in sows in stalls overseas		+729.26	+642.74	+556.07
Total change in stall sows		-15,727.99	-15,81451	-15,901.18

HIGHER PROFITS

If farmers require an 8 percent return on equity in addition to $60,000 in drawings, the pre-tax profit needed to stay in business is $203,312.60[43], rather than $85,714.29 and the estimated impacts of a 2017 ban are:

- prices increasing by 4.90 percent (compared to 4.55 percent) and quantity decreasing by 5.21 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 4.79 percent (compared to 4.53 percent) and quantity decreasing by 5.10 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.87	+16.01%
Quantity (mil. kg) – total domestic production	48.81	39.06	-19.97%
Quantity – fresh pork	37.10	29.69	-19.97%
No. of farms	152.00	121.36	-20.16%
No. of sows on stall farms (NZ)	16,750.00	9,090.90	-45.73%
No. of sows on stall farms (overseas)			+2,399.03
Total change in stall sows			-5,260.07

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.87	$3.89	+0.62%
Quantity (mil. kg) – total domestic production	39.06	38.71	-0.92%
Quantity – fresh pork	29.69	29.42	-0.92%
No. of farms	121.36	120.24	-0.92%
No. of farms that exit due to the four weeks restriction			1.12
No. of sows on stall farms (NZ)	9,090.90	8,807.03	-3.12%
No. of sows on stall farms (overseas)			+88.20
Total change in stall sows			-195.66

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.89	+16.73%
Quantity (mil. kg) – total domestic production	48.81	38.71	-20.70%
Quantity – fresh pork	37.10	29.42	-20.70%
No. of farms	152.00	120.24	-20.89%
No. of farms that exit due to the four weeks			1.45

[43] Calculated using the $71,000 after tax profit and 6.9% return on equity for a 300 sow farm reported in AgFirst, 2004, *Analysis of the impact on pig farmers profitability of adopting a transitional 10 week step in the maximum use of dry sow stalls*, p. 15.

restriction			
No. of sows on stall farms (NZ)	16,750.00	8,807.03	-47.42%
No. of sows on stall farms (overseas)			+2,487.23
Total change in stall sows			-5,455.73

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.89	$4.09	$4.08	$4.08
		(+5.03%)	(+4.90%)	(+4.74%)
Quantity (mil. kg) – total domestic production	38.71	35.96	36.69	34.41
		(-7.10%)	(-5.21%)	(-3.35%)
Quantity – fresh pork	29.42	27.33	28.04	28.74
		(-7.10%)	(-4.67%)	(-2.29%)
No. of farms	120.24	113.63	115.93	118.18
		(-6.61 farms)	(-4.31 farms)	(-2.06 farms)
		(-5.50%)	(-3.58%)	(-1.71%)
Sows in stalls NZ	8,807.03	0.00	0.00	0.00
		(-8,807.03)	(-8,807.03)	(-8,807.03)
Change in sows in stalls overseas		676.63	597.35	516.65
Total change in stall sows		-8,130.40	-8,209.68	-8,290.39

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.87	+16.01%
Quantity (mil. kg) – total domestic production	48.81	39.06	-19.97%
Quantity – fresh pork	37.10	29.69	-19.97%
No. of farms	152.00	106.53	-29.91%
No. of sows on stall farms (NZ)	16,750.00	17,254.98	+3.01%
No. of sows on stall farms (overseas)			+2,399.03
Total change in stall sows			+2,904.00

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.87	$3.89	+0.62%
Quantity (mil. kg) – total domestic production	39.06	38.71	-0.92%
Quantity – fresh pork	29.69	29.42	-0.92%
No. of farms	106.53	105.47	-1.00%
No. of farms that exit due to the four weeks restriction			1.07

No. of sows on stall farms (NZ)	17,254.98	16,981.08	-1.59%
No. of sows on stall farms (overseas)			+88.25
Total change in stall sows			-185.64

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.89	+16.73%
Quantity (mil. kg) – total domestic production	48.81	38.71	-20.70%
Quantity – fresh pork	37.10	29.42	-20.70%
No. of farms	152.00	105.47	-30.61%
No. of farms that exit due to the four weeks restriction			1.07
No. of sows on stall farms (NZ)	16,750.00	16,981.08	-1.38%
No. of sows on stall farms (overseas)			+2,487.28
Total change in stall sows			+2,718.36

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.89	$4.08	$4.08	$4.07
		(+4.95%)	(+4.79%)	(+4.59%)
Quantity (mil. kg) – domestic production	38.71	36.00	36.73	37.45
		(-6.99%)	(-5.10%)	(-3.25%)
Quantity – fresh pork	29.42	27.36	28.07	28.76
		(-6.99%)	(-4.57%)	(-2.22%)
No. of farms	105.47	101.85	104.05	106.12
		(-3.62 farms)	(-1.41 farms)	(+0.66 farms)
		(-3.43%)	(-1.34%)	(+0.63%)
Sows in stalls NZ	16,981.08	0.00	0.00	0.00
		(-16,981.08)	(-16,981.08)	(-16,981.08)
Change in sows in stalls overseas		+665.86	+584.91	+500.97
Total change in stall sows		-16,315.22	-16,396.18	-16,480.11

HIGHER EXTRA FEED

If the amount of extra feed needed with group housing is 50% higher than NZ Pork estimates (a 10.5 percent increase rather than a 7 percent increase), the estimated impacts of a 2017 ban are:

- prices increasing by 4.67 percent (compared to 4.55 percent) and quantity decreasing by 4.98 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 4.64 percent (compared to 4.53 percent) and quantity decreasing by 4.95 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.76%
Quantity (mil. kg) – total domestic production	44.89	44.39	-1.13%
Quantity – fresh pork	34.12	33.73	-1.13%
No. of farms	139.74	138.19	-1.11%
No. of farms that exit due to the four weeks restriction			1.55
No. of sows on stall farms (NZ)	13,685.65	13,290.69	-2.89%
No. of sows on stall farms (overseas)			+115.92
Total change in stall sows			-252.50

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.54%
Quantity (mil. kg) – total domestic production	48.81	44.39	-9.07%
Quantity – fresh pork	37.10	33.73	-9.07%
No. of farms	152.00	138.19	-9.08%
No. of farms that exit due to the four weeks restriction			1.55
No. of sows on stall farms (NZ)	16,750.00	13,290.69	-20.65%
No. of sows on stall farms (overseas)			+1,089.44

Total change in stall sows	-2,369.87

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.72	$3.71
		(+4.81%)	(+4.67%)	(+4.50%)
Quantity (mil. kg) – total domestic production	44.39	41.36	42.18	42.97
		(-6.81%)	(-4.98%)	(-3.18%)
Quantity – fresh pork	33.73	31.44	32.23	33.00
		(-6.81%)	(-4.46%)	(-2.17%)
No. of farms	138.19	132.18	134.71	137.14
		(-6.02 farms)	(-3.48 farms)	(-1.06 farms)
		(-4.35%)	(-2.52%)	(-0.77%)
Sows in stalls NZ	13,290.69	0.00	0.00	0.00
		(-13,290.69)	(-13,290.69)	(-13,290.69)
Change in sows in stalls overseas		743.77	654.46	563.74
Total change in stall sows		-12,546.92	-12,636.23	-12,726.95

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.76%
Quantity (mil. kg) – total domestic production	44.89	44.39	-1.12%
Quantity – fresh pork	34.12	33.73	-1.12%
No. of farms	133.74	132.22	-1.14%
No. of farms that exit due to the four weeks restriction			1.52
No. of sows on stall farms (NZ)	16,938.09	16,548.55	-2.30%
No. of sows on stall farms (overseas)			+124.17
Total change in stall sows			-265.37

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.54%
Quantity (mil. kg) – total domestic production	48.81	44.39	-9.07%
Quantity – fresh pork	37.10	33.73	-9.07%
No. of farms	152.00	132.22	-13.01%
No. of farms that exit due to the four weeks restriction			1.52
No. of sows on stall farms (NZ)	16,750.00	16,548.55	-1.20%
No. of sows on stall farms (overseas)			+1,089.29
Total change in stall sows			+887.84

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.72	$3.72	$3.71
		(+4.79%)	(+4.64%)	(+4.46%)
Quantity (mil. kg) – domestic production	44.39	41.38	42.19	42.98
		(-6.78%)	(-4.95%)	(-3.16%)
Quantity – fresh pork	33.73	31.45	32.24	33.01
		(-6.78%)	(-4.43%)	(-2.16%)
No. of farms	132.22	127.37	129.87	132.22
		(-4.85 farms)	(-2.36 farms)	(-0.00 farms)
		(-3.67%)	(-1.78%)	(-0.00%)
Sows in stalls NZ	16,548.55	0.00	0.00	0.00
		(-16,548.55)	(-16,548.55)	(-16,548.55)
Change in sows in stalls overseas		+740.71	+650.58	+559.07
Total change in stall sows		-15,807.84	-15,897.97	-15,989.48

LOWER EXTRA FEED

If the amount of extra feed needed with group housing is 50 percent lower than NZ Pork estimates (a 3.5 percent increase rather than a 7 percent increase), the estimated impacts of a 2017 ban are:

- prices increasing by 4.44 percent (compared to 4.55 percent) and quantity decreasing by 4.75 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 4.41 percent (compared to 4.53 percent) and quantity decreasing by 4.72 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.59%
Quantity (mil. kg) – total domestic production	44.89	44.50	-0.88%
Quantity – fresh pork	34.12	33.82	-0.88%
No. of farms	139.74	138.53	-0.87%
No. of farms that exit due to the four weeks restriction			1.22
No. of sows on stall farms (NZ)	13,685.65	13,377.12	-2.25%
No. of sows on stall farms (overseas)			+97.05
Total change in stall sows			-211.49

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.37%
Quantity (mil. kg) – total domestic production	48.81	44.50	-8.84%
Quantity – fresh pork	37.10	33.82	-8.84%
No. of farms	152.00	138.53	-8.86%
No. of farms that exit due to the four weeks restriction			1.22
No. of sows on stall farms (NZ)	16,750.00	13,377.12	-20.14%
No. of sows on stall farms (overseas)			+1,062.17

Total change in stall sows	-2,310.71

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.71	$3.70	$3.70
		(+4.58%)	(+4.44%)	(+4.27%)
Quantity (mil. kg) – total domestic production	44.50	41.60	42.38	43.15
		(-6.50%)	(-4.75%)	(-3.03%)
Quantity – fresh pork	33.82	31.62	32.38	33.12
		(-6.70%)	(-4.25%)	(-2.07%)
No. of farms	138.53	132.96	135.39	137.72
		(-5.56 farms)	(-3.13 farms)	(-0.81 farms)
		(-4.02%)	(-2.26%)	(-0.58%)
Sows in stalls NZ	13,377.12	0.00	0.00	0.00
		(-13,317.24)	(-13,317.24)	(-13,317.24)
Change in sows in stalls overseas		711.93	625.46	537.74
Total change in stall sows		-12,665.19	-12,751.66	-12,839.38

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.59%
Quantity (mil. kg) – total domestic production	44.89	44.50	-0.88%
Quantity – fresh pork	34.12	33.82	-0.88%
No. of farms	133.74	132.55	-0.89%
No. of farms that exit due to the four weeks restriction			1.19
No. of sows on stall farms (NZ)	16,938.09	16,634.02	-1.80%
No. of sows on stall farms (overseas)			+96.84
Total change in stall sows			-207.23

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.36%
Quantity (mil. kg) – total domestic production	48.81	44.50	-8.84%
Quantity – fresh pork	37.10	33.82	-8.84%
No. of farms	152.00	132.55	-12.80%
No. of farms that exit due to the four weeks restriction			1.19
No. of sows on stall farms (NZ)	16,750.00	16,634.02	-0.69%
No. of sows on stall farms (overseas)			+1,061.96
Total change in stall sows			+945.98

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.71	$3.70	$3.70
		(+4.56%)	(+4.41%)	(+4.23%)
Quantity (mil. kg) – domestic production	44.50	41.62	42.40	43.16
		(-6.48%)	(-4.72%)	(-3.00%)
Quantity – fresh pork	33.82	31.63	32.39	33.12
		(-6.48%)	(-4.23%)	(-2.05%)
No. of farms	132.55	128.14	130.53	132.79
		(-4.41 farms)	(-2.02 farms)	(+0.24 farms)
		(-3.33%)	(-1.52%)	(+0.18%)
Sows in stalls NZ	16,634.02	0.00	0.00	0.00
		(-16,634.02)	(-16,634.02)	(-16,634.02)
Change in sows in stalls overseas		+709.10	+621.68	+533.13
Total change in stall sows		-15,924.92	-16,012.33	-16,100.89

HIGHER PRODUCTIVITY IMPACTS

If the productivity impact of changing to group housing is 50 percent higher than NZ Pork estimates (a 10.5 percent decrease rather than a 7 percent decrease), the estimated impacts of a 2017 ban are:

- prices increasing by 6.83 percent (compared to 4.55 percent) and quantity decreasing by 7.13 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 6.79 percent (compared to 4.53 percent) and quantity decreasing by 7.09 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.78	-1.00%
No. of farms	139.74	138.36	-0.99%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	13,685.65	13,333.88	-2.57%
No. of sows on stall farms (overseas)			+110.69
Total change in stall sows			-241.08

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.78	-8.96%
No. of farms	152.00	138.36	-8.97%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	16,750.00	13,333.88	-20.39%
No. of sows on stall farms (overseas)			+1,075.81
Total change in stall sows			-2,340.31

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.80	$3.79	$3.78
		(+6.99%)	(+6.83%)	(+6.63%)
Quantity (mil. kg) – total domestic production	44.44	40.16	41.27	42.39
		(-9.64%)	(-7.13%)	(-4.61%)
Quantity – fresh pork	33.78	30.52	31.61	32.71
		(-9.64%)	(-6.40%)	(-3.16%)
No. of farms	138.36	129.81	133.43	136.97
		(-8.55 farms)	(-4.93 farms)	(-1.39 farms)
		(-6.18%)	(-3.57%)	(-1.00%)
Sows in stalls NZ	13,333.88	0.00	0.00	0.00
		(-13,333.88)	(-13,333.88)	(-13,333.88)
Change in sows in stalls overseas		1,054.58	935.75	813.35
Total change in stall sows		-12,279.31	-12,398.14	-12,520.53

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.78	-1.00%
No. of farms	133.74	132.39	-1.01%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,938.09	16,591.33	-2.05%
No. of sows on stall farms (overseas)			+110.49
Total change in stall sows			-236.27

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.95%
Quantity – fresh pork	37.10	33.78	-8.95%
No. of farms	152.00	132.39	-12.90%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,750.00	16,591.33	-0.95%
No. of sows on stall farms (overseas)			+1,075.61
Total change in stall sows			+916.94

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.80	$3.79	$3.78
		(+6.96%)	(+6.79%)	(+6.58%)
Quantity (mil. kg) – domestic production	44.44	40.17	41.29	42.41
		(-9.60%)	(-7.09%)	(-4.57%)
Quantity – fresh pork	33.78	30.53	31.63	32.72
		(-9.60%)	(-6.36%)	(-3.14%)
No. of farms	132.32	125.64	129.20	132.64
		(-6.75 farms)	(-3.18 farms)	(+0.25 farms)
		(-5.10%)	(-2.41%)	(+0.19%)
Sows in stalls NZ	16,591.33	0.00	0.00	0.00
		(-16,591.33)	(-16,591.33)	(-16,591.33)
Change in sows in stalls overseas		+1,050.35	+930.67	+806.97
Total change in stall sows		-15,540.98	-15,660.67	-15,784.37

LOWER PRODUCTIVITY IMPACTS

If the productivity impact of changing to group housing is 50 percent lower than NZ Pork estimates (a 3.5 percent decrease rather than a 7 percent decrease), the estimated impacts of a 2017 ban are:

- prices increasing by 2.44 percent (compared to 4.55 percent) and quantity decreasing by 2.66 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 2.42 percent (compared to 4.53 percent) and quantity decreasing by 2.65 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.78	-1.00%
No. of farms	139.74	138.36	-0.99%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	13,685.65	13,333.88	-2.57%
No. of sows on stall farms (overseas)			+110.69
Total change in stall sows			-241.08

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.96%
Quantity – fresh pork	37.10	33.78	-8.96%
No. of farms	152.00	138.36	-8.97%
No. of farms that exit due to the four weeks restriction			1.38
No. of sows on stall farms (NZ)	16,750.00	13,333.88	-20.39%
No. of sows on stall farms (overseas)			+1,075.81
Total change in stall sows			-2,340.31

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.64	$3.64	$3.63
		(+2.57%)	(+2.44%)	(+2.29%)
Quantity (mil. kg) – total domestic production	44.44	42.78	43.26	43.70
		(-3.73%)	(-2.66%)	(-1.66%)
Quantity – fresh pork	33.78	32.52	32.97	33.39
		(-3.73%)	(-2.38%)	(-1.13%)
No. of farms	138.36	135.02	136.45	137.77
		(-3.34 farms)	(-1.91 farms)	(-0.59 farms)
		(-2.42%)	(-1.38%)	(-0.43%)
Sows in stalls NZ	13,333.88	0.00	0.00	0.00
		(-13,333.88)	(-13,333.88)	(-13,333.88)
Change in sows in stalls overseas		407.92	351.12	295.15
Total change in stall sows		-12,925.96	-12,982.76	-13,038.74

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.67%
Quantity (mil. kg) – total domestic production	44.89	44.44	-1.00%
Quantity – fresh pork	34.12	33.78	-1.00%
No. of farms	133.74	132.39	-1.01%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,938.09	16,591.33	-2.05%
No. of sows on stall farms (overseas)			+110.49
Total change in stall sows			-236.27

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.45%
Quantity (mil. kg) – total domestic production	48.81	44.44	-8.95%
Quantity – fresh pork	37.10	33.78	-8.95%
No. of farms	152.00	132.39	-12.90%
No. of farms that exit due to the four weeks restriction			1.36
No. of sows on stall farms (NZ)	16,750.00	16,591.33	-0.95%
No. of sows on stall farms (overseas)			+1,075.61
Total change in stall sows			+916.94

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.64	$3.63	$3.63
		(+2.56%)	(+2.42%)	(+2.27%)
Quantity (mil. kg) – domestic production	44.44	42.79	43.27	43.71
		(-3.72%)	(-2.65%)	(-1.64%)
Quantity – fresh pork	33.78	32.52	32.98	33.40
		(-3.72%)	(-2.37%)	(-1.12%)
No. of farms	132.39	129.61	131.02	132.31
		(-2.78 farms)	(-1.36 farms)	(-0.08farms)
		(-2.10%)	(-1.03%)	(-0.06%)
Sows in stalls NZ	16,591.33	0.00	0.00	0.00
		(-16,591.33)	(-16,591.33)	(-16,591.33)
Change in sows in stalls overseas		+406.37	+349.10	+292.72
Total change in stall sows		-16,184.96	-16,242.24	-16,298.61

HIGHER INTEREST RATE

If the interest rate paid by farmers to lenders is 20 percent rather than 8 percent, the estimated impacts of a 2017 ban are:

- prices increasing by 4.61 percent (compared to 4.55 percent) and quantity decreasing by 4.93 percent (compared to 4.86 percent) under Scenario 1; and
- prices increasing by 4.59 percent (compared to 4.53 percent) and quantity decreasing by 4.90 percent (compared to 4.83 percent) under Scenario 2.

Scenario 1: Stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	139.74	-8.06%
No. of sows on stall farms (NZ)	16,750.00	13,685.65	-18.29%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			-2,099.23

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.85%
Quantity (mil. kg) – total domestic production	44.89	44.33	-1.26%
Quantity – fresh pork	34.12	33.69	-1.26%
No. of farms	139.74	138.00	-1.25%
No. of farms that exit due to the four weeks restriction			1.75
No. of sows on stall farms (NZ)	13,685.65	13,243.29	-3.23%
No. of sows on stall farms (overseas)			+139.11
Total change in stall sows			-303.26

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.64%
Quantity (mil. kg) – total domestic production	48.81	44.33	-9.19%
Quantity – fresh pork	37.10	33.69	-9.19%
No. of farms	152.00	138.00	-9.21%
No. of farms that exit due to the four weeks restriction			1.75
No. of sows on stall farms (NZ)	16,750.00	13,243.29	-3.23%
No. of sows on stall farms (overseas)			+1,104.23
Total change in stall sows			-2,402.48

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.73	$3.72	$3.71
		(+4.81%)	(+4.62%)	(+4.39%)
Quantity (mil. kg) – total domestic production	44.33	41.31	42.14	42.95
		(-6.81%)	(-4.93%)	(-3.11%)
Quantity – fresh pork	33.69	31.39	32.20	32.97
		(-6.81%)	(-4.41%)	(-2.12%)
No. of farms	138.00	131.97	134.58	137.04
		(-6.03 farms)	(-3.42 farms)	(-0.96 farms)
		(-4.37%)	(-2.48%)	(-0.69%)
Sows in stalls NZ	13,243.29	0.00	0.00	0.00
		(-13,243.29)	(-13,243.29)	(-13,243.29)
Change in sows in stalls overseas		742.94	646.67	550.12
Total change in stall sows		-12,500.35	-12,596.62	-12,693.17

Scenario 2: Non-stall farms exit under the status quo

Status quo impact: industry exits

Variable	2008	After industry exits	
Farm gate price	$3.33	$3.52	+5.74%
Quantity (mil. kg) – total domestic production	48.81	44.89	-8.03%
Quantity – fresh pork	37.10	34.12	-8.03%
No. of farms	152.00	133.74	-12.01%
No. of sows on stall farms (NZ)	16,750.00	16,938.09	+1.12%
No. of sows on stall farms (overseas)			+965.12
Total change in stall sows			+1,153.21

Status quo impact: four weeks restriction

Variable	After industry exits	All stall farms at four weeks	
Farm gate price	$3.52	$3.55	+0.85%
Quantity (mil. kg) – total domestic production	44.89	44.33	-9.19%
Quantity – fresh pork	34.12	33.69	-9.19%
No. of farms	133.74	132.03	-13.14%
No. of farms that exit due to the four weeks restriction			1.72
No. of sows on stall farms (NZ)	16,938.09	16,501.45	-2.58%
No. of sows on stall farms (overseas)			+139.04
Total change in stall sows			-297.60

Status quo impact: total

Variable	2008	All stall farms at four weeks	
Farm gate price	$3.33	$3.55	+6.64%
Quantity (mil. kg) – total domestic production	48.81	44.33	-9.19%
Quantity – fresh pork	37.10	33.69	-9.19%
No. of farms	152.00	132.03	-13.14%
No. of farms that exit due to the four weeks restriction			1.72
No. of sows on stall farms (NZ)	16,750.00	16,501.45	-1.48%
No. of sows on stall farms (overseas)			+1,104.16
Total change in stall sows			+855.61

Ban options impact

Variable	Status quo	2013 ban	2017 ban	2023 ban
Farm gate price (per kg)	$3.55	$3.73	$3.72	$3.71
		(+4.79%)	(+4.59%)	(+4.35%)
Quantity (mil. kg) – domestic production	44.33	41.32	42.16	42.96
		(-6.78%)	(-4.90%)	(-3.08%)
Quantity – fresh pork	33.69	31.40	32.21	32.98
		(-6.78%)	(-4.90%)	(-2.11%)
No. of farms	132.03	127.16	129.73	132.13
		(-4.87 farms)	(-2.29 farms)	(+0.10 farms)
		(-3.69%)	(-1.74%)	(+0.08%)
Sows in stalls NZ	16,501.45	0.00	0.00	0.00
		(-16,501.45)	(-16,501.45)	(-16,501.45)
Change in sows in stalls overseas		+739.81	+642.91	+545.34
Total change in stall sows		-15,761.64	-15,858.54	-15,956.10