FOOD STANDARDS Australia New Zealand
Te Mana Kounga Kai – Ahitereiria me Aotearoa

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Supporting document 4

Consideration of costs and benefits

P1060 – Egg food safety and primary production requirements

Executive summary

This Supporting Document (SD) contains the consideration of costs and benefits for the proposed changes to the Code in relation to P1060.

The SD 4:
- summarises the findings that current regulatory and non-regulatory measures inadequately manage the risks posed by the emergence of *Salmonella* Enteritidis (SE) in the Australian environment and do not protect public health and safety.
- outlines why government action is required to address the problem.
- summarises the proposed approach and how it meets P1060's objectives.
- identifies the costs and potential benefits that may arise from the proposed options.

The proposed changes aim to improve food safety measures to detect SE early to reduce foodborne illness and reduce *Salmonella* related illness generally and are likely to also prevent the spread of SE.

The SD4 analyses three options to address the identified problem:
- Option 1 - Maintaining status quo (rejecting the draft variations)
- Option 2 – Introducing a combination of regulatory and non-regulatory measures (preferred option). Some of these measures include:
    - introducing environmental monitoring of poultry houses for the presence of SE
    - strengthening traceability requirements
    - temperature control during storage and transport of eggs and egg product
- Option 3 - Measures proposed in option 2 including mandatory refrigeration requirements for eggs

This analysis considers illnesses avoided as a result of improved food safety measures for very small, small and medium egg producers from option 2 and option 3.

Additional measures to manage SE will involve increased compliance costs for egg businesses to implement proposed measures (if not already implemented), such as routine environmental monitoring for SE and meeting prescribed traceability system requirements. Large and some medium sized egg producers are likely to have measures in place that meet the proposed requirements through participation in voluntary schemes and therefore were not costed.

Benefits and costs are quantified where possible. However, it is difficult to fully quantify all the benefits from the potential interventions that limit the future spread of SE across the national flock.

FSANZ's initial assessment is that option 2 is likely to deliver a positive net benefit over the status quo. It is of the view that option 2 should be preferred to option 3 on the basis of the best available evidence at the time of preparing the proposed draft variation to the Code. However, information received from this CFS may result in FSANZ arriving at a different conclusion.

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1. Introduction

Proposal P1060 – Egg Food Safety & Primary Production Requirements is considering amending the Australia New Zealand Food Standards Code (the Code) to strengthen the food safety management of eggs and egg product during primary production and processing.

The specific detail of the proposed change is discussed in section 2 of the Call for Submissions (CFS). In assessing this proposal and in making its decision to prepare the proposed draft variation to the Code, FSANZ is required by section 59 of the *Food Standards Australia New Zealand Act 1991* (the FSANZ Act) to have regard to, among other things, whether the costs that would arise from a proposed measure outweigh their benefits. This Supporting Document (SD) considers the potential costs and benefits of the proposal.

The assessment was based on the best available information at the time of preparing the proposed draft variation to the Code, including information from stakeholders.

The Office of Impact Analysis (OIA) agreed to exempt FSANZ from formal consultation RIS requirements for Proposal P1060, recognising FSANZ's consultation and that its statutory consultation processes meet OIA exemption criteria (reference number: OIA24-08429).

FSANZ will review its assessment of costs and benefits following feedback received in response to this CFS and then prepare a Decision Regulation Impact Statement (DRIS). The DRIS will inform a final decision on whether to approve, amend or reject the draft variation proposed in this CFS. Before that final decision is made, the DRIS will be submitted to the OIA to confirm the quality and adequacy of the DRIS's analysis, and to review the DRIS for compliance under the *Regulatory Impact Analysis Guide for Ministers' Meetings and National Standards Setting Bodies* (the Guide; OIA, 2024).

1.1. Australian egg industry

The Australian egg industry produced 6.98 billion eggs with a gross production value of approximately $1.37 billion for the 2023-24 financial year (Australian Eggs 2024).

Supply chains for eggs vary considerably. For small layer farms, eggs may be collected and then sold at the local farmers market or at the farm gate. Medium and large egg producers may supply independent grading floors that then distribute graded and packed eggs to retail and food service. Eggs may be transported significant distances to meet demand in locations where there may be current short supply. Some large egg producers may also have short supply chains where the eggs are laid, fed into their on-site grading floors and within a couple of days be on sale on retail supermarket shelves.

Further detail can be found in SD 5 – Overview of the egg industry in Australia.

2. What is the problem?

Australia has one of the highest rates of foodborne illness caused by *Salmonella* per 100,000 population when compared to similar countries, with rates having significantly increased over the past 20 years. The annual cost of *Salmonella* foodborne illness associated with eggs is estimated to be $34.94 million (Glass et al. 2024; inflation-adjusted to June 2024).

The dominant serovar in Australia responsible for illness associated with eggs is *Salmonella* Typhimurium (ST). When Standard 4.2.5 – Primary Production and Processing Standard for Eggs and Egg Product was introduced in 2011, *Salmonella* Enteritidis (SE) was considered to be absent from the Australian egg laying flock. The risk associated with SE and its ability

to be transmitted from the hen into the egg during formation, enabling the direct internal contamination of eggs with *Salmonella* (vertical transmission) was assessed. However, no measures were included in the standard to manage SE specific risk.

SE flock prevalence in Australia is no longer zero. With the emergence of SE, there is a significantly heightened risk associated with the consumption of raw and undercooked eggs and egg product. Current risk management activities such as managing inputs, waste disposal, bird health, visual inspection of eggs for cracks and leakage, traceability of eggs back one step and forward in the supply chain and prohibiting the sale of cracked and dirty eggs are not sufficient to manage SE risks.

While this Proposal considers managing the present SE risk, it also considers reducing the likelihood of SE becoming more prevalent and established across the Australian flock which has flow on net benefits.

Current food safety requirements for egg production in Australia are inadequate to effectively manage the additional risks posed by SE

While FSANZ assessed the potential risk of internal contamination of eggs with SE, no measures were included in the standard in 2012 as vertically transmittable SE was not detected in Australian flocks at that time.

Government

In response to the 2018-19 outbreak, some jurisdictions have since taken additional biosecurity action to control the spread of SE; these measures differ across states and territories.

Food safety legislation and jurisdiction-level biosecurity requirements converge on several aspects of egg production. Biosecurity focuses on poultry health, flock movement and breeding to prevent and control the spread of disease some of which also impact on food safety. FSANZ notes reports of low adoption of biosecurity practices in different egg production systems in Australia, including practices such as equipment sharing between sheds and limited disinfection of shared equipment (Scott et al. 2018). Properties involved in the 2018-19 SE incident were interconnected in that people, eggs or equipment were moving between them.

Voluntary industry measures

The egg industry has introduced a range of guidance materials and procedures to manage the risks associated with *Salmonella* on layer farms. While not all are SE specific, these measures will provide for SE management and include:

- investing in research and development, and developing *Salmonella* monitoring programs and SE response plans to improve *Salmonella* risk management.
- providing tools to assist producers and processors with traceability.
- providing accreditation programs for operators to participate in.

FSANZ notes large and some medium egg producers are participating in voluntary industry schemes, estimated to be 18% of producers (Egg Farmers personal communication). This means the majority of eggs (estimated at 82%, Australian Eggs, 2024b) are produced under these schemes (i.e. those produced by the accredited large and many medium size layer farms and processing facilities to meet commercial arrangements). Participation may be a requirement to supply to large food retail chains and for exporting purposes. However, consultation indicated there remains a considerable number of egg producers that do not use

these voluntary materials or take the recommended steps to monitor and minimise the presence and potential spread of SE.

Initial FSANZ review: the problem is SE risks are not managed

At the request of the Food Regulation Standing Committee (FRSC) following the 2018-19 SE outbreak, FSANZ reviewed Standard 4.2.5 and the existing government and voluntary measures for managing egg food safety in Australia. The review concluded that current regulatory and non-regulatory measures are not adequately safeguarding public health and safety from the risk of salmonellosis from consuming eggs and egg product in Australia.

The review confirmed an absence of requirements in the Code to manage unique SE risks and observed other requirements to be potentially inadequate to effectively manage SE. It recommended FSANZ consider amending the Code through a proposal and consider the effectiveness of a range of measures such as bird health and farm hygiene, environmental monitoring, through-chain requirements, temperature control and egg traceability.

The spread of SE overseas led to many foodborne illness outbreaks and required the introduction of a variety of highly prescriptive and costly measures to adequately protect public health and safety

If the spread of SE can be limited across the Australian flock, the need for more costly interventions in the longer-term, such as those other countries implemented as described below, may be avoided.

SE is the predominant serovar in other countries such as the UK, EU and USA. EU requirements mandate a durability date (i.e. a use-by and a sell-by date). The USA mandate refrigeration within 36 hours of lay. Canada mandate a gradual temperature control regime achieving refrigeration by the time eggs reach retail. All countries have prescribed sampling programs to detect SE (see SD 3 for further detail).

In the UK, SE accounted for approximately 10% of human *Salmonella* illness in 1981 (around 2,000 reports of illness). By 1993 this rose to nearly 70% of cases (23,230 cases; ACMSF 2016). The increase was associated with contaminated chicken meat and eggs.

The reporting of egg-associated outbreaks did not start to decline until 1997 after:

- the introduction of SE vaccination and a flock hygiene programme targeted at larger laying flocks.
- interventions introduced by the UK egg industry, largely under the Lion Code quality assurance scheme.[1]
- changes in the handling of eggs in catering environments and the increased use of pasteurised or heat-treated liquid egg also assisted in reducing the numbers of outbreaks reported associated with eggs.
- changes in the UK population's food habits, such as avoiding dishes involving raw egg (ACMSF 2016).

The UK presently requires sampling of flocks for *Salmonella* and prescriptive requirements for a defined shelf-life.

[1] The Lion Code comprises a suite of measures including vaccination for SE and ST, a cool chain from farm to retail outlets, enhanced testing for *Salmonella*, improved farm hygiene, effective rodent control, independent auditing, date stamping on each individual egg and traceability.

Recent SE outbreaks in Australia highlight the potential for significant impacts if SE were to become established in the Australian laying flock

Australia has experienced a series of foodborne illness outbreaks due to SE linked to eggs. Most significant multi-jurisdictional outbreak of SE linked to eggs happened in 2018-19 and was associated with 245 human cases identified across New South Wales, Victoria, Queensland and Tasmania (see SD 1 for further detail).

Glass et al. (2022) estimated the cost of the foodborne illness of this outbreak at $7 million (inflation-adjusted to June 2024) (Glass et al. 2022), including:

- 426 general practitioner visits
- 144 emergency department presentations
- 58 hospitalisations
- a further 945 unnotified cases of salmonellosis.

However, this estimate significantly underestimates the cost of the outbreak as it does not include all costs. For example, the investigation resulted in a large recall of eggs and a significant biosecurity response involving culling birds and closing egg farms. There have also been sporadic notifications of illnesses linked to the outbreak strain since the initial outbreak investigation. Outbreaks and subsequent recalls also damage the reputation of and consumer confidence in the egg industry as safe food producers.

Without interventions to sufficiently manage SE risks, it is possible a similar emergence of SE in Australia as there was in the UK may occur, where the UK went from 1,099 notified illnesses to 23,000 after 15 years. Given Australia's current passive human surveillance (PHS; epidemiological investigation in response to notified cases of human illness), it would be unlikely to result in such large numbers of illness. However, in a scenario where there is a 30-50% increase of egg-related *Salmonella* cases in Australia, this translates to an additional 38,000-63,500 cases over 10 years (assuming the number of illness cases each year is constant over the 10 years).

As illustrated above, notified reports only represent a small proportion of the total cases that would occur. Such a scenario would entail significant additional costs associated with outbreak management with more farms and more flocks likely requiring depopulation, impacting the egg supply chain and Australian consumers. An alternate approach to eradicating SE may be considered, involving additional costly interventions to manage food safety risks, as significant spread would make the egg industry unable to supply consumer demand for eggs and egg product.

3. Why is government action needed?

Amendments to Standards 2.2.2 and 4.2.5 are required as current regulatory and non-regulatory measures do not manage the public health and safety risk of foodborne illness due to *Salmonella*, particularly SE.

Until recently, PHS has been the primary means of detecting SE on farms. While flock infection with SE is sporadic, using human illnesses as a means of detecting SE on farm is fraught and does not protect public health and safety. Further, it relies on people seeking medical support coupled with effective traceback to a source farm.

It has been reported that in Australia only 68% of *Salmonella* traceback investigations result in identifying a specific farm from which the implicated eggs had been produced (Moffatt et al. 2016).

While the present system is able to identify outbreaks, FSANZ's quantitative microbiological risk assessment (QMRA) modelling added it may be challenging to identify outbreaks in smaller farms as there is less SE illness to trigger epidemiological traceback investigations.

Proposed amendments aim to meet the following objectives:

1. early detection and preventing the distribution of contaminated eggs as well as spread of SE on-farm and in Australia
2. rapid traceback to an infected farm during a foodborne illness incident
3. minimising SE microbial growth if present in an egg.

Amendments to manage the risk of SE spread in layer flocks across Australia will also improve egg food safety measures to support efforts in reducing other *Salmonella*.

3.1. Early detection and preventing the spread of SE on-farm and in Australia

SE-infected flocks are often asymptomatic, complicating detection and control. Relying on traceback following human illness to trigger action is not effective at protecting public health. FSANZ's risk assessment concludes effective sampling programs are crucial for detecting *Salmonella,* particularly SE, in poultry flocks.

QMRA modelling illustrates that implementing on-farm environmental monitoring significantly reduces the number of illnesses associated with SE-positive egg layer farms in small and medium sized farms.

In the case of small farms, QMRA modelling finds the majority of SE-positive farms go undetected during the first and second production cycles when relying on PHS alone. While human illness cases may be lower for small farms, the farm remains a source of SE with the potential for spread to other layer farms or egg handling businesses. This means without environmental monitoring, small farms may only be detected when there is a major foodborne illness outbreak.

Risk assessment also demonstrates that multiple strategies are needed to control SE risks, particularly on-farm monitoring for SE, temperature control of eggs and enhanced on-farm hygiene and biosecurity.

Early SE detection allows egg businesses and food authorities to implement corrective actions to prevent further distribution of contaminated eggs as well as spread of SE among other layer flocks. Such measures could be cost saving to the egg supply chain as a whole, given the significant costs involved when SE is detected – see Box 1 for further detail.

Box 1. Response to detection of SE on farm

A positive SE detection on farm will trigger response activity to determine whether the flock is infected. Currently in Australia, where the flock is infected with SE, as a mandatory notifiable biosecurity disease under jurisdictional biosecurity legislation, biosecurity controls are implemented to prevent the spread of SE.

The following incident response actions, as appropriate to the specific situation, may occur:

- cease supply of eggs from the farm to market.
- farm placed under quarantine notice with movement restrictions on eggs, hens and equipment to prevent the further spread of SE.
- eggs, birds, other livestock, equipment and litter may only be removed under a permit to a licensed or approved facility.

- the governing jurisdiction may issue a permit for eggs on the SE-positive farm to go to pasteurisation to render the egg product safe for sale.
- tracing of facilities or other businesses in recent contact with the farm. Samples from these properties may be collected and investigated.
- infected poultry farms are subject to a long process of depopulation, disposal, decontamination and sanitation processes.
- to return to egg producing, a business must demonstrate successful decontamination or begin production on a new property.
- to return to business, affected facilities such as egg processors undergo decontamination processes and may be subject to enhanced surveillance.

Past experience from SE incidents in Australia have found some infected farms facing nearly $2 million in costs, comprising of flock depopulation, property cleaning, loss of capital, and loss of income.

The management of an SE incident by food authorities amounts to around $50,000, including initial response, site visits, recall costs, briefings, and resource development. Jurisdictions may also cover the costs of the additional sampling required to verify the absence of SE on farm, in facilities and neighbouring properties.

Industry food safety schemes such as the National *Salmonella* Enteritidis Monitoring and Accreditation Program (NSEMAP) are available for egg businesses to undertake activities on farm including routine SE monitoring that aim to keep the farm free of SE. Approximately 75% of the national flock is covered by NSEMAP. However, FSANZ understands the level of adoption of these schemes by small egg producers is low. FSANZ also observed through industry site visits that adoption is often by larger egg producers. This may be in part due to large businesses exporting and having to demonstrate SE-free status (Department of Agriculture, Forestry and Fisheries n.d.).

Queensland and New South Wales have implemented their own mandatory requirements for egg producers to monitor the layer flock for infection with SE.[2]

Stakeholder consultation indicated 85-95% of Australia's national flock (i.e. the number of laying hens) is tested for SE. This is driven by either voluntary use of an industry scheme or a regulatory requirement in the jurisdiction concerned (Australian Eggs, personal communication April 2023). However, testing coverage may also capture SE testing on a one-off basis.

Introducing a requirement for regular environmental monitoring in the Code will provide a national approach to flock monitoring. This will allow for greater coverage of the egg industry than the current voluntary uptake of these measures and delivers clearly identifiable outcomes to reduce foodborne illness.

Establishing measures across the egg supply chain now to reduce the risk of SE spread in layer flocks across Australia while SE prevalence is low and sporadic, may also avoid the costly situations for the egg industry, consumers, and government observed overseas (as described in section 2 above).

There is a likelihood that other *Salmonella* will be detected by undertaking environmental monitoring on-farm. Implementing such a measure may also offer a reduction of other *Salmonella* illness widely prevalent and costly in Australia, such as ST.

[2] E.g. Biosecurity (*Salmonella* Enteritidis) Control Order 2024 has effect until June 2025.

3.2. Effectively identifying an infected farm in a foodborne illness incident

Eggs are required to be individually marked with a unique identifier as a traceability measure. This mark assists with identifying the source of eggs in the event of a foodborne illness investigation. Producers and processors must also have a system in place to identify where their eggs have been sold or have come from.

Current requirements have not been adequate to rapidly trace back to the source farm. Where an egg is marked with the egg processor's unique identification as permitted under the Code, foodborne illness outbreak investigations have been hampered in tracing eggs back to the producer.

The challenge is heightened where multiple egg producers are supplying to an egg processor and eggs are 'co-mingled' before stamping. Information that can identify the farm of origin is usually available on the egg carton. However, the Scientific Advisory Group for Eggs assisting with FSANZ risk assessment indicated that consumers may discard or no longer have the egg carton. Egg cartons may also be re-used, such as at farmers markets, and the information on the carton may no longer reflect the true source of the eggs.

Furthermore, different interpretations of Standard 4.2.5 has led to the movement of unmarked eggs via 'egg traders'; the production source of these eggs has not been clear.[3]

To improve the rapid traceback during a foodborne illness incident the marking applied to the egg must enable identification of the egg producer without the need to refer to other information, such as on the egg carton or processing records. Other changes to the Code are required to strengthen traceability systems and ensure all entities are captured under the standard.

Experiences of recent SE incidents and FSANZ risk assessment findings demonstrate the importance of having strong traceability across the supply chain to rapidly traceback to a SE-positive farm, of which egg marking is an important aspect.

3.3. Minimising SE microbial growth in eggs if present

Findings from the risk assessment demonstrate the importance of temperature control in preventing SE (and other microbial) growth if present in the egg contents. *Salmonella* in and on eggs is influenced by storage and transport temperature. The growth of most *Salmonella* is substantially reduced below 15°C and prevented below 7°C. For SE growth potential to be effectively reduced, cold storage (below 7°C) would need to be imposed from shortly after lay until immediately before cooking and consuming an egg.

QMRA modelling finds significant decreases in SE human illness when refrigeration through-chain was applied. When implemented in tandem, environmental monitoring and refrigeration show the greatest decrease in SE illness.

In Australia, voluntary industry code of practice and food safety schemes require eggs to be stored below 15°C as soon as possible and at all stages of the supply chain (Australian Eggs 2010). Egg producers under an industry food safety scheme may be cooling eggs to a lower temperature, such as under refrigerated conditions.

There are no prescriptive guidelines or legislation on egg storage on supermarket shelves and it is not uncommon to find eggs kept at ambient temperature in stores. Current industry

[3] The intended outcome of the current standard allows for eggs to be sold to another egg producer or processor who must then mark the eggs. These egg producers may only sell eggs to other entities where those eggs are marked with their identification.

practice is to label cartons with the recommendation that eggs should be stored under refrigeration once purchased (see SD 1).

Should SE become more prevalent across the Australian laying flock in the future, refrigeration will be an important measure in minimising SE microbial growth and to protect public health.

4. What options are to be considered?

This section presents the regulatory options under consideration in this Proposal. The following analysis identifies the costs and benefits to the community, government, and industry that may arise from these options.

Introduction of non-regulatory measures alone to support existing regulatory measures would not provide the necessary framework for regulators or industry to have assurances that food safety risks are being managed. Non-regulatory activities are not legislated and there is no mandated requirement for industry to participate in these activities.

Voluntary measures are already available with limited adoption by egg producers, particularly smaller farms. Given the consequences if these risks continue unmanaged, as observed during the 2018-19 outbreak, relying solely on non-regulatory measures does not sufficiently protect public health and safety. Both regulatory measures and non-regulatory strategies are likely to be required to control *Salmonella* in eggs.

Further, FSANZ considered measures to manage risks unique to SE were not required in the Standard when it was first developed as SE was not detected at the time (see SD 1). This is no longer the situation and additional regulatory measures are required to manage the unique SE risks.

FSANZ is considering three options to address the identified problems:

1. Maintaining status quo
2. Introducing a combination of regulatory and non-regulatory measures (preferred option)
3. Introducing a combination of regulatory and non-regulatory measures including mandatory refrigeration requirements for eggs

These options are briefly discussed below. For more detail, refer to Section 2.3 of the CFS.

4.1. Option 1 – Maintaining status quo

When considering any changes to regulation, FSANZ includes the status quo to compare other options against. If FSANZ's assessment leads to the decision to maintain the status quo, Proposal P1060 would be abandoned.

Consideration of the status quo in this instance is complicated as we must not only have regards to the present risks and harms but also what they may be in future in the absence of applying these additional interventions now.

4.2. Option 2 – Introducing a combination of regulatory and non-regulatory measures (preferred option)

Under this option, FSANZ would amend existing standards, as relevant to egg and egg product, within the Code to introduce new measures to manage the emerging food safety risks associated with SE and other *Salmonella*.

Some of these measures include:

- introducing environmental monitoring of poultry houses for the presence of SE
- strengthening traceability requirements
- temperature control during storage and transport of eggs and egg product

As no single measure will adequately manage SE and other *Salmonella* risks other proposed measures will be introduced or clarified into the standard, enhancing a systematic approach to risk management on-farm. Refer to section 2 of the CFS.

This would be supported by other non-regulatory measures such as guidance material to assist with nationally consistent implementation of the new requirements and educate industry on how to comply.

4.3. Option 3 – Introducing a combination of regulatory and non-regulatory measures including mandatory refrigeration requirements for eggs

Under this option, FSANZ would make amendments to the existing standard as detailed in option 2, and would also require refrigeration of eggs and egg product throughout the supply chain.

5. What is the likely net benefit of the proposal?

The net benefit of the status quo option (option 1) by definition is zero as it involves no change. If no other options are likely to achieve a net benefit, option 1 would be the preferred option.

However, in this case, consideration of status quo also needs to consider the potential growth in illness if no action is taken. Section 2 describes a possible future scenario if SE food safety risks continue to be unmanaged in Australia under status quo option.

This section sets out the quantitative analysis, where possible, of the proposed regulatory measures under option 2 and 3. The analysis compares the direct benefits to the community from a potential reduction in foodborne illness and greater food safety management of *Salmonella* infection, against the costs associated with the regulatory measures to the egg industry and jurisdictional government agencies.

Impacts associated with the proposed amendments are illustrated in Table 1.

Table 1. Impact on different stakeholder groups arising from option 2 and 3

Stakeholder group	Option 2 (preferred option)	Option 3
Egg industry	Increased compliance costs (e.g. environmental monitoring, record-keeping), where relevant measures are not already in place. Reduced risk of SE spread across Australian layer flock. Improved traceability when managing an outbreak. Potential benefits from improved reputation from food safety	As described in option 2. Additional costs associated with refrigerating eggs through-chain (e.g. constructing cool rooms, investing in refrigerated transport, and increased energy usage). Effective prevention of microbial growth across the supply chain. A high degree of confidence egg safety is managed.

Stakeholder group	Option 2 (preferred option)	Option 3
	measures.	
Retailers	No identified costs associated with retailers.	Where not already in place, additional costs associated with refrigerating eggs through-chain (e.g. purchasing display fridges and increased energy usage). A high degree of confidence egg safety is managed. Potential reputational benefits of providing safer eggs at retail.
Consumers	Improved food safety of eggs reducing likelihood of illness. Potentially increased cost of eggs if additional costs of compliance get transferred to the consumer.	As described in option 2. Additional illness avoided from minimised pathogen growth. A high degree of confidence in egg food safety.
Government	Potentially increased implementation and enforcement costs for new requirements. Improved capacity to effectively and efficiently manage an outbreak, including reduced cost associated with investigation time. Savings in healthcare expenditure.	As described in option 2. Additional costs associated with enforcing through-chain refrigeration. Further savings in healthcare expenditure from additional illness cases avoided. A high degree of confidence in egg food safety.

Of the impacts listed in Table 2, FSANZ has identified quantifiable impacts and those where the impacts are discussed qualitatively.

Table 2. Quantified and unquantified impacts arising from option 2 and 3

	Stakeholder group	Impact
Quantified cost	Industry	Increased compliance costs.
	Government	One-off implementation costs and potentially increased enforcement costs.
Unquantified cost	Industry and consumers	Potential price increases (this is a transfer of additional compliance costs partially or fully to consumers).
	Industry	Costs incurred from implementing refrigeration to store and sell eggs.
Quantified benefit	Consumers	Avoided foodborne illness.
	Government	Avoided healthcare costs.
Unquantified benefit	Industry	Improved management of SE food safety risks on farm, minimising the likelihood of infection.
		Identifying SE on-farm early to cease supply of potentially contaminated eggs and take corrective actions.
		Limit the spread of SE to egg producers in close proximity as a result of identifying SE early.
		Strengthened traceability systems to enable rapid traceback to the source of infection.
		A high degree of confidence in egg safety and potential benefits from improved reputation from food safety measures.
	Government	Improved capacity to manage a foodborne illness incident from improved traceability systems.
		Potentially less resources required to manage an SE outbreak if SE spread is limited and controlled due to early detection.
	Other	Cost avoided by limiting the spread of SE now.
		A prepared egg supply chain in the event that SE does become established in the Australian laying flock.
		Avoided *Salmonella* illness costs from improved egg food safety management generally.

Consultation question 1: Have all the major impacts to industry, consumers and government from the proposed options been identified in the Table 1 of SD 4? Please provide evidence (where possible) to support the inclusion and magnitude of other impacts.

Consultation question 2: Do you have information to provide to assist FSANZ in quantifying the costs and benefits currently identified as unquantified in Table 2 of SD 4? Please provide data and evidence to support the inclusion of such information.

The measures proposed in option 2 and 3 are expected to mostly affect small and medium egg producers and the analysis therefore focusses on these producers. As stated above, large producers are likely to have measures in place that meet the proposed requirements

through participation in voluntary schemes such as Egg Standards of Australia (ESA) and NSEMAP. FSANZ is aware that there may be around 20 medium egg businesses that may also be covered under ESA and currently meet the proposed requirements.

The analysis indicates where the proposed measures are likely to impact egg processors.

There is great variation from business to business in their egg supply chain. It is therefore difficult to accurately estimate the costs that each business will encounter from the proposed measures, as each egg producer may experience these impacts differently.

Detail of the underlying assumptions used in this analysis are outlined in Appendix A.

5.1. Cost of the proposed regulatory measures

Egg producers will have administrative costs involved in reviewing, updating and maintaining ongoing record-keeping of their food safety management statement to include new activities such as verification, pest control, egg cleaning processes, if not already documented.

The presence of animals and pests is expected to have been considered by egg producers and processors as a biosecurity measure. Some egg producers may need to implement additional measures to prevent or restrict the access of these animals to layer hens.

Egg producers may incur costs when considering the impact of time and temperature on the food safety of eggs. This may include how a producer collects their eggs and where they are stored. A producer may also consider how eggs might be presented for sale at farmgate or markets and how they will be transported to ensure actions do not make eggs unsafe or unsuitable.

The estimated costs of amendments relating to administrative processes are highlighted in Table 3 and include costs to undergo initial activities and ongoing record-keeping (see Appendix A for further detail).

Table 3. Cost estimates of implementing administrative changes from the proposed measures

	First year	Ongoing (p.a.)
Small egg producer	$2,823	$1,329
Medium egg producer	$3,237	$2,214

Given some of these measures are likely to overlap with biosecurity considerations, FSANZ has conservatively assumed 10% of very small and small businesses, and 25% of medium businesses may be meeting these requirements under status quo.

Egg businesses that incur increased cost of complying with the Code as a result of the proposed amendments may decide to transfer this cost through increased price of eggs which may impact consumers. Proposed amendments to Standard 4.2.5 are not expected to impact the supply of eggs. Stakeholder consultation has indicated that many egg producers and processors are already undertaking the activities proposed.

Option 2 and 3 also propose additional ongoing regulatory measures. These measures are discussed in the following sections.

5.2. Environmental sampling to monitor bird health

Costs involved in implementing regular environmental monitoring include material and time costs of sampling and training for both small and medium producers to enable effective sampling. It may also include administrative costs of implementing a system to maintain

records of monitoring activities. Egg producers inexperienced in environmental monitoring may need to seek expert advice from industry professionals or veterinarians before conducting sampling and testing to ensure they comply with this requirement.

Table 4 presents the estimated cost associated with this proposed measure, assuming a farm takes one sample of each flock in a year[4]. Flocks that have multiple poultry houses will encounter additional material and time costs (see Appendix A for further detail).

Table 4. Cost estimates of implementing regular environmental monitoring for SE (one annual test)

	First year	Ongoing (p.a.)
Very small egg producer	$614	$351
Small egg producer	$706	$444
Medium egg producer	$904	$536

Proposed amendments to the Code do not prescribe the frequency of sampling and testing, but FSANZ notes monitoring every 13 weeks yields the greatest reduction in foodborne illness (see SD 1). Jurisdiction food regulation agencies may determine frequencies, based on the combination of measures an individual farm may implement. While the analysis assumes an egg producer will take a minimum of one sample a year, the cost associated with testing on a quarterly basis has been covered in Appendix A (see Table 19 to 22) as this is a requirement under the NSEMAP and is effective in detecting SE. Depending on the frequency, ongoing environmental monitoring costs may range from $351-1,405 for very small producers, $444-1,775 for small producers, and $536-2,145 for medium producers.

5.3. Strengthening traceability systems

The proposed strengthening of traceability requirements may involve staff training, administrative costs of implementing or updating traceability systems, and ongoing costs of record-keeping.

An egg producer or processor could set-up or strengthen their traceability system using technology-assisted data collection applications, such as the free tool EggTrace developed by Australian Eggs for egg producers. As described above, implementing such a system may involve upfront costs such as staff training and familiarisation with these tools, and the ongoing cost of data entry to maintain strong traceability records.

Egg producers that top-up their egg supply with eggs from other producers will need to ensure eggs are identified as coming from another source under the proposed amendments. This is not expected to be a significant cost. A producer may choose to meet this measure by purchasing additional hand stamps to identify the supplemented eggs.

An egg processor that receives eggs from a number of different layer farms is likely to use automated ink jet printers to mark eggs (information received though stakeholder engagement). To identify the egg source, an egg processor will have to reconfigure the identification settings between batches to reflect the source of the eggs. Reprogramming is expected to be a reasonably quick process, estimated at 30 minutes between batches. Egg processors already stop processing between different farms and egg production systems. This proposed measure may create additional regulatory burden for egg processors but is not expected to cause delays in their processes.

Estimated costs are provided in Table 5 (see Appendix A for further detail).

[4] Flock means all the birds that share a contained area (such as a range area or a poultry house), consisting of all the layer hens that inter-mingle and have direct contact with one another.

Table 5. Cost estimates of strengthened traceability systems

	First year	Ongoing (p.a.)
Small and medium egg producer	$3,156	$2,730

In response to stakeholder consultation that the proposed traceability system requirements may be business as usual for some egg businesses, FSANZ has conservatively assumed 10% of very small and small businesses, and 25% of medium businesses may be meeting these requirements under status quo.

5.4. Mandatory refrigeration of eggs (option 3)

Option 3 considers requiring eggs to be refrigerated from grading through to transportation to retail and foodservice storage and sale. This would involve significant costs across the egg supply chain.

As discussed in section 3, common Australian industry practice is to store eggs at or below 15°C. It is understood that many large farms and egg processors already practice temperature control and would partially or fully fulfil this requirement. Some farms would need to decrease their storage temperature, incurring increased electricity costs and/or purchase of additional refrigeration units.

Under this option, small and medium egg producers would likely incur costs involved with installing cool rooms on-farm capable of storing eggs around 7°C degrees and purchasing additional equipment. Small egg producers may also need to purchase mobile refrigeration equipment for selling eggs at farmers markets.

The initial cost to small egg producers to implement on-farm refrigeration is estimated to be $26,500, and $55,000 for medium egg producers. The life expectancy of refrigeration infrastructure may range from 15 to 30 years. Annualised using a 7% discount rate, the cost of installing new refrigeration is $2,780 for small producers, and $5,890 for medium producers (see Appendix A for further detail)[5]. Producers will also need to use refrigerated or insulated transportation to move eggs through the supply chain if not already doing so. This cost has not been estimated.

As this option would also require eggs to be refrigerated at retail, this would impact numerous small retailers which may not currently have the capability or capacity to store eggs under temperature control. This measure would also impact medium and large retailers, primarily attributed to the display of eggs for sale. This impact has not been quantified but is expected to present a significant cost.

Implementing mandatory refrigeration across the supply chain will also require ongoing cost of increased energy usage to power refrigeration units and ongoing maintenance of these units. This cost has not been quantified.

5.5. Cost of the proposed regulatory measures to government

State and territory food authorities may incur additional costs from the proposed measures in terms of adding additional measures to consider when conducting regular audits of egg businesses. Authorities already regularly audit egg businesses and it is not a new cost.

[5] Above costs of implementing an on-farm refrigeration have been estimated using web search of business that offer commercial refrigeration sales and installation. Therefore, they might not be generalizable and they have not been scaled up to estimate total cost of implementing an on-farm refrigeration for small and medium egg producers.

For the additional staff time required to audit these additional measures, food authorities are estimated to incur $165 for each small and medium egg producer audit (half an hour), and $330 for each large egg producer and egg processor audit (one hour) based on estimated salary cost provided by jurisdictions. The total cost of proposed measures to government has not been calculated as FSANZ does not have an estimated number of audits and inspections that occur each year and this may depend on the jurisdiction.

Consultation question 3: Do you agree with the estimated cost of the proposed interventions as outlined in section 5 and Appendix A of SD 4? Please provide data or evidence to support the inclusion of alternative estimates.

Consultation question 4: Do you have any information to assist with estimating the proportion of egg producers already undertaking the proposed interventions discussed in section 5 of SD 4? Please provide data or evidence to support the inclusion of alternative estimates.

5.6. Benefits of the proposed regulatory measures

The proposed interventions will improve Australian egg food safety. These interventions are expected to benefit consumers, the egg industry, and government.

In the event that a farm is SE-positive, the environmental monitoring under option 2 reduces the number of illnesses associated with SE-positive egg layer farms compared to status quo. The cost savings from illness avoided can be quantified in monetary terms and is discussed in the following section.

As illustrated in Table 2, many benefits are unable to be monetised.

The combination of measures proposed under option 2 will address SE-specific on-farm risks and improve the food safety management of eggs. This aims to minimise the likelihood of SE infection. Box 1 above describes the costs that some egg producers might encounter if they become SE-positive and similarly the incident response costs to government. Please note that a significant outbreak may involve a number of farms where SE has managed to spread between them.

Routine environmental monitoring will enable an SE-positive farm to be identified early, compared to status quo where identified human illness cases are relied upon to trigger epidemiological investigations. As under status quo, detection of SE via environmental monitoring will trigger follow up activity and if linked to illnesses, recall and/or incident response procedures.

Testing that detects a SE-positive farm earlier than would occur via reliance on PHS (and effective traceback) will also limit the spread of SE to egg producers in close proximity. QMRA modelling identifies that where a small farm is SE-positive, it may go undetected under status quo as there is a likelihood that there may be too few notified illnesses to trigger epidemiological investigations. Environmental monitoring will be particularly beneficial in these cases where the wider spread of SE may otherwise go undetected for some time.

Where a human illness case triggers epidemiological investigation under option 2, the food and public health system may benefit from the proposed strengthening of traceability requirements. The prescribed traceability system requirements and additional measures, such as egg marking to identify the source will benefit the egg industry and state and territory authorities by enabling rapid traceback to the source of contamination.

Finding the source of contamination quickly will enable eggs at foodservice or retail level to

be identified and removed from the supply chain, benefiting consumers. Transparent and accurate traceability systems may also benefit the wider Australian egg industry in the event of a recall, where contaminated eggs are easily identifiable and unnecessary product withdrawals can be avoided.

Proposed traceability system requirements may also incentivise egg businesses to comply with the Code. For example, an egg producer may take extra steps to ensure eggs that are cracked and/or dirty do not reach retail given the intended ease to trace back to the farm source.

The proposed measures will provide a set of national measures addressing the emerged SE risk, which supports nationally consistent implementation of egg food safety measures across jurisdictions.

Overall, the egg industry may benefit from improved reputation as food producers as a result of implementing enhanced food safety measures.

Implementing controls to strengthen egg food safety management and protecting public health and safety may benefit state and territory authorities by reducing the risk of SE spreading within a flock or to other properties. This may benefit state and territory authorities by requiring less resources (both food safety and biosecurity) to manage an SE outbreak.

5.7. Benefits from illnesses avoided due to improved egg food safety

Consumers may benefit from less illness due to preventative measures on-farm, environmental monitoring for SE, and improvements to rapidly traceback to the source of infection. Benefits to government include avoided healthcare costs from illness avoided from the proposed food safety measures.

FSANZ used the QMRA model to estimate the value of illness avoided from the proposed measures. For more detail on the model refer to SD 1 and 2.

Due to the current sporadic nature of SE in Australia leading to infrequent cases of human illness the model looks at an individual farm rather than on a national flock basis.[6] Refer to section 1.4 of the CFS.

To quantify the estimated SE illness avoided FSANZ used the per case cost for *Salmonella* illness of $2,760 (inflation-adjusted to June 2024) from Glass et al. (2022), a project commissioned by FSANZ to estimate the cost of foodborne illness in Australia.

Table 6 presents the mean illness avoided by a small and medium farm under option 2 and 3 if SE is detected on the small or medium farm via one environmental test rather than solely relying on PHS.

[6] However, when consideration of the status quo is extended across a longer timeframe without interventions, it is possible that the spread and rate of illness may begin to more closely resemble those experienced overseas.

Table 6. Mean SE illness avoided from QMRA modelling (one farm model)

	Estimated SE illness avoided		Estimated savings from SE illness avoided	
	Small farm	Medium farm	Small farm	Medium farm
Option 2	7	32	$19,360	$88,480
Option 3	24	143	$66,360	$395,400

5.8. Long term benefits

The egg supply chain will benefit in the long term by implementing SE prevention measures now, before SE could become more prevalent. The proposed measures will ensure Australian egg producers and processors have adequate measures in place to protect public health and safety and minimise egg supply chain disruption in the event that SE becomes established in the Australian laying flock.

If SE prevention measures are able to limit the spread of SE to the wider Australian laying flock, additional expensive interventions could be avoided that would otherwise be required to protect public health and safety. Avoided costs could include:

- prohibition orders to food service or retail on the sale and supply of runny eggs to minimise illness where there are many potentially contaminated eggs and a recall is not feasible.
- different supply lines created for eggs certified as SE-free and eggs not certified.
- investment in pasteurisation facilities for SE positive farms to divert their eggs through prior to being offered for sale
- consumers impacted by higher prices of eggs at retail and food service.

Furthermore, while the proposed preventative measures are targeted at managing SE, improved food safety measures will support the food system in reducing costs associated with other *Salmonella* widely prevalent in Australia, such as ST.

5.9. Comparison of options and conclusion

As mentioned in above, option 1 will not result in a net benefit as it involves no change but would be the preferred option if no other options are likely to achieve a net benefit.

If SE were to become more prevalent in the Australian laying flock under status quo without sufficient measures in place to manage the SE-specific risks the egg industry would likely encounter significantly greater costs to manage the spread of SE and result in significantly higher rates of illness.

Option 2 proposes amending and introducing new requirements to the Code to manage food safety risks associated with SE and eggs across the supply chain.

Due to the current sporadic nature of SE in Australia, it is not possible to estimate how many or how frequently egg producers will become SE-positive over the 10-year period of the analysis. However, based on the prevalence in other countries in which SE is endemic, it is likely that a significant number of egg producers will become SE positive if it is not further managed. It is therefore challenging to calculate a generalisable net present value.[7] Therefore, the options have been compared through a break-even analysis presenting how many illnesses would need to be prevented to balance the cost of the proposed measures.

[7] A net present value obtains a discounted net value of the benefits and costs to account for the present day value of benefits and costs that will be received or incurred in the future. This is unable to be quantified at this stage as it is difficult to predict how many farms may avoid becoming SE-positive and how many illnesses may be avoided as a result of the proposed measures.

Doing this calculation gives a comparison of the magnitude of possible costs and benefits but is a highly limited measure given many of the benefits, for example, extend beyond only avoiding cost of illness.

In order for industry, government and the community to break-even on the costs associated with the proposed measures, the measures would need to achieve a benefit of a 17% reduction of illnesses over ten years. However, this assumes that there would be no change in the annual egg-related *Salmonella* illnesses (12,700 cases; Glass et al. 2024). Please note once again this is a highly limited measure given many of the benefits, for example, extend beyond just avoidance of illness costs which means a much smaller percentage reduction in illness would be needed in fact.

As noted throughout the report, maintaining status quo may result in significant costs if SE were to become more prevalent without sufficient measures in place to manage its spread. In a scenario where there is a 30-50% increase of egg-related *Salmonella* cases in Australia could see an additional 38,000-63,500 cases over 10 years (noting this is assuming the amount of illness is constant over the 10 years). In this scenario, measures proposed would only need to achieve a 11-13% reduction in these illnesses to completely offset costs. Again, please note the limits of this measure.

The purpose of the break-even analysis is to merely compare the magnitude of the costs and the class of benefit we have been able to quantify (reduced illness). As already mentioned the break-even analysis does not take into account the unquantified benefits of option 2. These are:

- minimising the likelihood of infection and spread through preventative measures on-farm to manage the SE food safety risks.

- identifying SE on-farm early to limit the spread of SE to egg producers in close proximity.

These will both benefit egg producers by avoiding a costly SE incident response for all parties (see Box 1).

- enabling rapid traceback to the source of infection by strengthening traceability systems.

This will benefit consumers by easily identifying and recalling infected eggs from the food supply, reducing likelihood of foodborne illness and triggering a timely incident response on-farm to limit the spread of SE.

- a prepared egg supply chain in the event that SE does become established in the Australian laying flock.

This will potentially limit the costliness of such an event happening under status quo.

- the reduction of costs associated with other *Salmonella* widely prevalent in Australia.

While the proposed measures are targeted at SE, there is a likelihood that environmental monitoring may detect other *Salmonella* that are widely prevalent and costly in Australia, such as ST. Many of the proposed measures will also improve egg food safety management in general.

It is highly likely that sufficient benefit will be achieved to offset and exceed the costs.

Option 3 considers the mandatory refrigeration of eggs. Option 3 is not expected to result in as large a net benefit as option 2 in the immediate future as SE is not occurring in flocks

frequently. The total cost associated with option 3 has not been comprehensively quantified but is expected to be substantially larger than option 2 given operational costs for refrigeration (capital and running costs). If the SE situation is Australia were to change, this option would need further analysis. Costs such as procuring refrigerated storage units (on farm, distribution centres, back of retail), transport, and refrigeration for retail display and ongoing cost of maintenance and increased energy usage would need to be quantified and included in the total cost of option 3. Also, cost of implementing this option in large farms and retailers would need to be considered.

In conclusion, FSANZ's assessment is that the quantified and unquantified benefits that would arise from the measures proposed in option 2 are expected to outweigh the costs and return a greater net benefit than option 3. However, information received from this CFS may result in FSANZ arriving at a different conclusion.

6. Who was consulted and how was their feedback incorporated?

Consultation is a key part of FSANZ's standard development process. Prior to this CFS, FSANZ has consulted with the Egg Standard Development Advisory Group (SDAG), consisting of representatives from industry and government. FSANZ has further consulted with the Egg Implementation Working Group (EIWG), established by the Implementation Subcommittee for Food Regulation to ensure any proposed amendments to the Code, if approved, could be consistently implemented at a national level.

Further detail on the consultation undertaken to date for Proposal P1060 can be found in section 2.4.1 of the CFS.

The proposed approach (and the cost benefit analysis) has been presented for stakeholder feedback in this CFS. Additionally, the CFS includes a copy of the draft variation with proposed changes to the Code, as well as the accompanying draft explanatory statement (see Attachments A and B of the CFS).

Submissions received will be considered when developing the final approach. FSANZ will also finalise the impact analysis in light of the feedback received in the form of a DRIS.

7. What is the best option from those considered and how will it be implemented?

FSANZ considers the best available option to be option 2.

Option 2 meets the objectives described in section 3 by:

- requiring environmental monitoring of SE on-farm as a measure of identifying SE infection, rather than solely relying on human illness cases and successful traceback to identify an infected farm.
- enabling the early detection of SE to limit the spread of SE to nearby farms thereby avoiding additional depopulation and decontamination costs.
- prescribing traceability system requirements and clarifying other traceability measures to support the rapid traceback to the egg producer in the event of a foodborne illness incident.
- emphasising the importance of temperature control in egg production by ensuring egg producers are aware of the temperatures that eggs are exposed to and the amount of time that eggs spend in storage and/or transport at that temperature.

While option 3 also meets these objectives, this option is not expected to return as larger net

benefit.

Refrigeration is a well-known and understood measure that prevents microbial growth. It is unsurprising the QMRA modelling confirmed refrigeration of eggs (option 3) to be effective in minimising SE growth and reducing foodborne illness. However, mandating this measure would involve significant investment and change to the way the Australian egg industry operates.

Though option 2 does not propose to prescribe a temperature at which eggs and egg product must be stored and transported, it requires temperature control to ensure eggs and egg product remain safe and suitable. This requirement also provides flexibility and may result in jurisdictions using temperature control as a mitigation measure in response to local flock infections of SE or during periods of high temperatures.

Option 2 also does not propose to prescribe a frequency for regular environmental monitoring. Jurisdiction food regulation agencies may determine alternative frequencies. While the cost benefit analysis is based on an egg producer taking a minimum of one sample a year, the cost associated with testing on a quarterly basis has been covered in Appendix A (see Table 18 to 21) as this is a requirement under the NSEMAP and is known to be effective in detecting SE in flocks.

The QMRA modelling shows a single test during a production cycle shows a decrease in SE illness, while more costly, the most effective testing schedule is at regular 13-week periods between tests. This is because a single environmental test at peak production will only detect farms which were SE positive prior to the single test. For example, an egg producer might take an environmental test around peak production (week 26) and SE could enter the layer environment at week 27. The single environmental test would be too early and the test in the following cycle would be the time that the farm would be detected as being SE-positive.

It should also be noted that very small egg producers (categorised as a layer farm with less than 1000 birds) are responsible for most of the total cost of option 2 (see Table 18 in Appendix A). The large number is due to the many egg producers in this category among the Australian egg industry.

7.1. How the proposed changes will be implemented

If the changes to the Code are approved and endorsed by the FMM, implementation and enforcement of the variation to the Code is the responsibility of Australian state and territory food regulation agencies.

As mentioned in section 6 above, FSANZ has consulted with the EIWG to ensure any proposed amendments to the Code could be consistently implemented at a national level. The EIWG has prepared a draft guidance plan that provides detail on how the amendments to the Code would be implemented and monitored if approved. Further detail on how FSANZ is assisting with consistent implementation can be found in section 3 of the CFS.

For this variation, FSANZ is proposing a commencement date 12 months after gazettal of the draft variation (if approved). See section 3 of the CFS for further detail.

8. How will the chosen option be evaluated?

Across Australia's food regulatory system, multiple agencies have responsibility for actively monitoring and evaluating food standards including FSANZ and other Commonwealth agencies and the jurisdictions.

Under the food regulatory system, the Commonwealth and jurisdictions develop the policy principles against which FSANZ consider when developing food standards. This structure also provides for reviewing the outcomes of the standards against their policy principles. Agencies with responsibility for food policy or implementation or standards development could act individually or in concert to evaluate and/or monitor the standards. Such monitoring and evaluation can be coordinated either through FRSC or ISFR.

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Appendix A – Cost benefit analysis

Introduction

This appendix provides the underlying assumptions of the costs and benefits included in the SD. The analysis is sensitive to a number of these assumptions, including the estimated number of SE illness cases avoided and the cost of those illnesses, and the proportion of businesses that already undergo the activities proposed.

Number and size of egg producers and processors

FSANZ received estimates from jurisdictions of the number of layer farms (Table 7) and egg processors (Table 8). The size of an egg producer has been categorised by the number of layer birds.

Table 7. Number and size of egg producers by jurisdiction[8]

Jurisdiction	Layer farm size				
	Very Small	Small	Medium	Large	Very Large
NSW	111	66	43	34	5
Victoria	677	112	63	50	13
Queensland	33	41	21	13	4
South Australia	54	19	4	3	1
Western Australia	50	12	8	4	5
Tasmania	8	7	3	1	1
ACT	-	3	1	0	0
Total	**933**	**260**	**143**	**105**	**29**

Note: Very small: less than 1,000 layers; Small: 1,000 to 10,000 layers; Medium: 10,000 to 50,000 layers; Large: 50,000 to 250,000 layers; Very Large: more than 250,000 layers.

Table 8. Number and type of egg processors by jurisdiction

Jurisdiction	Third party grading floor	Pasteurisation and processing
NSW	6	15
Victoria[9]	-	-
Queensland	8	3
South Australia	1	1
Western Australia	1	1
Tasmania	0	0
ACT	1	0
Total	**17**	**20**

In the regulatory analysis, to be consistent with FSANZ's risk assessment, a small egg producer was assumed to have a farm of 1,000 hens (3 flocks), and a medium producer was assumed to have a farm of 20,000 hens (5 flocks). Where the proposed regulatory measure is expected to impact a very small egg producer differently, the analysis assumes these

[8] Due to available data, the number of egg producers do not include farms selling less than 20 dozen eggs in Tasmania and New South Wales, along with producers with less than 50 layers in Victoria. There are no large commercial poultry farms in the Northern Territory, but a few small producers do sell free-range eggs. However, FSANZ does not have a numeric estimate of these farms to include in this analysis.

[9] Department of Health Victoria could not advise of the number of egg processors in this jurisdiction as these businesses fall under local government.

producers have less than 1000 birds (1 flock).

Cost of proposed regulatory measures

Costs presented in the following tables have been rounded to the nearest whole number.

The implementation of proposed regulatory measures is likely to incur one-off administrative costs, staff training and upgrades to infrastructure, and ongoing record-keeping costs.

Administrative proposed measures

The costs captured in Table 9 and Table 10 have been derived by FSANZ based on consultation with the Egg SDAG.

Administrative costs include:
- five hours of updating a food safety management statement (six hours for medium-sized)
- two hours of assessing risks associated with range and housing areas (additional half an hour for medium-sized)
- two and a half hours of documenting egg cleaning processes.

Record-keeping costs include five minutes when grading and packing is undertaken (assumed twice a week) to monitor egg cleaning processes (half an hour a week for medium-sized).

Table 9. Initial and on-going cost to small egg producers for administrative proposed measures

Initial cost	
Training (hr)	1
Administration (hr)	9.5
Infrastructure upgrades	$600
Egg producer wage	$48.67[10]
Wage on-costs	75%[11]
Total cost	**$1,494**
Ongoing cost (p.a.)	
Recordkeeping (hr)	15.6
Total cost	**$1,327**

Table 10. Initial and on-going cost to medium egg producers for administrative proposed measures

Initial cost	
Training (hr)	1
Administration (hr)	11
Egg producer wage	$48.67
Wage on-costs	75%
Total cost	**$1,022**
Ongoing cost (p.a.)	
Recordkeeping (hr)	26
Total cost	**$2,214**

Environmental sampling to monitor bird health

Queensland egg producers have been excluded from the analysis of environmental

[10] The default hourly cost recommended by the OIA Regulatory Burden Measurement Framework where labour rates are unknown.
[11] On-cost multiplier recommended by the OIA Regulatory Burden Framework.

monitoring for SE. The NSW *Biosecurity (Salmonella Enteritidis) Control Order 2024* is in place until 30 June 2025. If approved, the proposed regulatory measures are likely to come into effect after the Control Order has expired. The analysis assumes small and medium egg producers in NSW will only incur ongoing costs associated with routine SE monitoring as these producers are expected to have already undertaken initial activities such as record management and training.

Costs presented in Table 11 and Table 12, unless noted otherwise, have been derived by FSANZ based on consultation with the Egg SDAG. Administrative costs include two hours of engaging with laboratories and one hour of setting up record-keeping systems.

Table 11. Initial cost to small egg producers to implement regular environmental monitoring for SE

Training (hr)	2
Administration (hr)	3
Farm hand wage	$30
Wage on-costs	75%
Total cost	**$263**

Table 12. Initial cost to medium egg producers to implement regular environmental monitoring for SE

Number of staff	2
Training (hr)	2
Administration (hr)	3
Farm hand wage	$30
Wage on-costs	75%
Total cost	**$368**

Table 13 outlines the cost of conducting one sample test. Administration costs include half an hour of liaising with the laboratory, and one and a half hours of filing and organising sample courier.

Table 13. Cost to an egg producer of undertaking one SE sample test

Material (per sample)	$20
Time (per sample) (hr)	0.5
Farm hand wage	$30
Wage on-costs	75%
Material and time cost	**$46**
Laboratory and analysis	$100
Packaging and transport	$100
Administration (hr)	2
Administrative cost	**$305**
Total cost of one sample	**$351**

Note: Material cost assumes five swabs per shed at $4 each from NSW DPI (personal communication, 1 June 2023); Staff time to collect sample, time to complete paperwork, and cost of farm hand wage estimates from WA Health (personal communication, 1 August 2024). Laboratory and courier costs are an average estimate to transport and analyse SE sample tests. Swabs are assumed to be composited together for one test.

Strengthened traceability systems

Table 14 presents the cost of implementing and maintaining strengthened traceability systems for small and medium egg producers. These costs have been derived by FSANZ based on consultation with the Egg SDAG. Record-keeping costs include one hour total of data entry and balancing figures a week.

Table 14. Initial and on-going cost to egg producers to strengthen traceability systems

Initial cost	
Training (hr)	3
System set-up (hr)	2
Producer wage	$48.67
Wage on-costs	75%
Total cost	**$576**
On-going cost (p.a.)	
Record-keeping (hr)	52
Farm hand wage	$30
Wage on-costs	75%
Total ongoing	**$2,730**

Mandatory refrigeration of eggs

Mandatory refrigeration of eggs throughout the supply chain would include cost such as procuring refrigerated transport, implementing refrigeration at farms and in retail spaces and ongoing cost of maintenance and increased energy usage.

Analysis here focusses only on the costs of implementing an on-farm refrigeration for small and medium egg producers. Some medium egg producers may partially fulfil a requirement to refrigerate eggs. However, it is expected that most may not. To account for this uncertainty, this measure is assumed to be a new risk management measure for all small and medium egg producers.

For both small and medium egg producers, cool rooms are assumed to be installed in existing on-farm structures.

Refrigeration units are assumed to have a life expectancy of 15 years, and insulation and other equipment are assumed to last 30 years.

Table 15 and Table 16 outlines the estimated initial cost of implementing mandatory refrigeration of eggs measures for small and medium egg producers. These costs are based on internet searches of business that offer commercial refrigeration sales and installation. Those cost estimates have not been check for generalizability and therefore have not been scaled up to estimate total cost of implementing an on-farm refrigeration for small and medium egg producers.

Table 15. Initial cost to small producers to implement mandatory refrigeration of eggs

	Initial	Annualised cost (discounted at 7%)
Refrigeration units	$9,000	$988
Insulation	$1,000	$81
Mobile cool room	$13,000	$161
Additional equipment	$2,000	$1,427
Refrigeration at farm gate	$1,500	$121
Total cost	**$26,500**	$2,778

Table 16. Initial cost to medium producers to implement mandatory refrigeration of eggs

	Initial	Annualised cost (discounted at 7%)
Refrigeration units	$50,000	$5,490
Insulation	$5,000	$403
Total cost	**$55,000**	$5,894

Summary of costs

Table 17 summarises the total cost across very small, small and medium farms of implementing the measures proposed in option 2 and 3 assuming 10% of very small and small producers and 25% of medium producers are already meeting the proposed traceability and other administrative measures (as described in section 5).

Table 17. Summary of costs for option 2 and 3

		Very small farms	Small farms	Medium farms
Option 2	First year	$5,539,505	$1,536,398	$773,925
	Ongoing	$3,721,367	$1,046,915	$591,801
Option 3	First year	$30,012,305	$8,356,198	$8,638,925
	Ongoing*	$3,721,367	$1,046,915	$591,801

**Total costs are expected to be higher than estimated therefore net benefit will be lower than presented.*
EM = environmental monitoring

Routine environmental monitoring on a quarterly basis

To illustrate the cost of quarterly environmental monitoring (every 13 weeks), the following tables have been provided.

Table 18. Cost estimates of implementing regular environmental monitoring for SE (quarterly basis)

	First year	Ongoing (p.a.)
Very small egg producer	$1,668	$1,405
Small egg producer	$2,038	$1,775
Medium egg producer	$2,513	$2,145

Table 19. Summary of costs for option 2 (quarterly testing)

		Very small farms	Small farms	Medium farms
Option 2 (quarterly testing)	First year	$6,522,654	$1,882,523	$1,012,020
	Ongoing	$4,705,516	$1,393,040	$829,896

Table 21. Mean SE illness avoided from QMRA modelling (one farm model) for option 2 (quarterly testing)

	Estimated SE illness avoided		Estimated savings from SE illness avoided	
	Small farm	Medium farm	Small farm	Medium farm
Option 2 (quarterly testing)	24	91	$66,360	$251,620