NSW GOVERNMENT Food Authority

Baseline evaluation of the NSW Egg Food Safety Scheme

Survey of NSW egg businesses – industry profile and observed practices

January 2013

NSW/FA/CP065/1212

About this document

This document reports the onsite survey results of egg businesses in NSW.

It is one of two descriptive reports prepared as part of the baseline evaluation study of the NSW Egg Food Safety Scheme undertaken by the NSW Food Authority (the Authority) in 2010–11.

Baseline microbiological survey results of egg businesses in NSW are reported in the *Baseline evaluation of the NSW Egg Food Safety Scheme: Microbiological survey of egg farms in NSW* (2012).

If you have any questions about this document, please contact the NSW Food Authority helpline on 1300 552 406 or contact@foodauthority.nsw.gov.au.

Acknowledgements

The NSW Food Authority would like to thank its Authorised officers for their help in conducting this study and Dr. David Jordan, NSW Department of Primary Industries, for his advice on the sampling plan.

Contents

Executive summary

Overview

In June 2010, the Egg Food Safety Scheme (Egg Regulation) was introduced in NSW. First regulatory visits of egg businesses commenced four months later in October 2010.

The Egg Regulation covers businesses producing, grading or processing eggs and includes egg products for sale. Under the Regulation, egg businesses are required to be licensed with the NSW Food Authority (the Authority) if they produce or grade more than twenty dozen eggs for sale in any week.

By 30 November 2011, there were 199 licensed egg businesses comprising:

- 74 licensed egg primary production businesses (egg producers), and
- 125 licensed egg primary production businesses with additional activities such as grading and washing (egg producers/graders).

The Authority undertook a number of activities supporting the implementation of the Egg Regulation. This included preparing industry-specific assistance materials and conducting specialist training for Authority officers engaged in the audit and inspection program. When regulatory visits first commenced in October 2010, all licensed egg businesses received coaching from Authority officers on the new requirements.

In 2010–11, the Authority undertook a baseline evaluation study of the businesses covered by the Egg Regulation.

The evaluation study objectives were to:

- gather information on common practices and industry details of egg businesses in NSW in order to help the Authority further develop industry assistance and regulatory (audit/inspection) assistance that are most useful for businesses,
- construct baseline data and establish first audit/inspection food safety performance and compliance benchmarks against which the impacts of the Regulation can be measured over time,
- assess how effectively the Authority introduced the new requirements to demonstrate best practice implementation, and
- identify areas (if any) where industry may need further assistance in complying with the new requirements.

Authority officers collected data from most egg businesses

A representative number of egg businesses from regional areas across NSW were randomly selected for inclusion in the study. At the initial regulatory visit, Authority officers collected industry baseline data from approximately 140 of the 160 egg businesses that were inspected/audited by the Authority during the evaluation period (1 December 2010 to 30 November 2011). Overall, the size of the sample represented about 70% of the total number of licensed egg businesses at the time[1].

[1] Businesses licensed by 30 November 2011 (n=199)

A comprehensive NSW egg industry profile is an important component of effective regulation

The NSW egg industry profile provides a solid point of reference against which to compare the impact of the Regulation over time and a way to identify potential areas of high food safety risk. Summary evaluation findings are included below. The findings represent about 70% of the total egg businesses licensed at the time.

Location, size and production systems

- The greater Sydney (about one-third) followed by the Hunter (20%) were identified as the two regions with the highest concentration of egg businesses.
- Egg businesses in the study produced on average over 2.5 million eggs per day.
- Just over three-quarters (77%) of the businesses in the study were categorised as 'small' by the licensing system[2] but production volumes of eggs produced by the businesses in the 'small' licence category ranged from 180 to 250,000 eggs/day. (This potentially limits the Authority's ability to accurately target and provide assistance to those egg businesses producing low numbers of eggs.)
- Most egg businesses in the study stated they were free-range operators (about two-thirds). According to self-reported production volumes, on average these free-range businesses are smaller, producing fewer eggs than cage and barn systems. Approximately half (49%) the volume of eggs produced by businesses in this study were from free-range production systems. Authority officers observed two distinct types of free-range systems in operation in NSW—paddock-based with moveable laying sheds and barn-based with access to an outdoor range.
- One-quarter of businesses in the study were cage-based operators producing about half (47%) the total volume of eggs. Compared to other production systems (barn and free-range), fewer businesses were cage-based (25%), but on average produced approximately the same amount of eggs as the free-range system (49% of the overall egg production in this study). Differences in cage systems were mainly limited to the number of cage tiers (single tier up to a maximum of eight tiers was observed). Authority officers observed higher levels of automation for multi-tier sheds compared with single-tier cage systems.
- A limited number of businesses indicated they were barn-based egg producers (representing only 5% of those in the study). Correspondingly, egg production volumes represented less than 4% of the total amount of eggs produced by the businesses in the study. Authority officers noted that barn production systems were often very similar to free-range (barn-based) systems but without access to an outdoor range.
- Over three-quarters (50/65) of egg businesses in the study collected and graded eggs 'by hand'. Fully automated egg collection systems were limited to less than 10% of those evaluated. This highlights the importance of food handler hygiene in relation to egg collection practices. Information about egg handling and levels of automation provide insight into likely levels of industry food safety risk as well as informing egg labelling policy work.

[2] Based on full time equivalents (FTE) egg handling employees

Understanding industry food safety practices and system inputs is necessary for best practice implementation

Authority officers examined the management of system inputs (stock feed, water) and a number of selected farm operating practices as part of the evaluation study.

Assessing the safety of stock feed and hen drinking water – important production system inputs

- Businesses usually purchased stock feed from external sources and employed correct onsite handling practices. Just over 80% (87/106) of egg businesses in the study purchased stock feed from an external supplier and almost 90% (54/61) of businesses were found to be adequately covering their stock feed, preventing contamination from rodents and birds. The Authority's officers will continue to monitor stock feed handling practices as part of their routine compliance visits. Microbiological results for the stock feed samples are included in the Authority's micro report[3].
- For half of the egg producers in the study (73/139), hen drinking water was from a non-reticulated source, with one-third (45/73) of these businesses testing the bore/dam water for indicators of faecal hygiene (a recommended practice but not a requirement under the Egg Regulation). At this time, the Authority does not intend to extend non-reticulated water testing requirements to include hen drinking water. However, in order to supply birds with clean, good quality drinking water, the Authority reminds businesses to clean drinking lines of any fouling, ensure water tanks are covered and encourage businesses to routinely treat non-reticulated water with disinfectants (eg chlorine).

Egg storage practices – most businesses minimise storage periods prior to crack detection

- The study found that 12% (14/116) of businesses practised extended storage periods of more than two days before grading (ie crack detection). The Authority recommends that businesses either minimise pre-grading storage periods at ambient temperatures or store ungraded eggs at 8°C or less for extended periods.

Better crack detection practices needed for 15% of egg businesses in the study

- Hairline crack detection systems (eg visible crack detection with a backlight) are needed for 15% (11/60) of egg producers/graders in the study. For these businesses, crack detection practices were limited to checking for visible cracks only (without backlight). In future, increased level of compliance with the Egg Regulation's crack detection requirements is expected as these findings represent industry baseline levels at first audit.
- Less than one-fifth (13/77) of egg businesses in the study handled cracked eggs or pulp for further processing, representing about 13% of total volume of eggs produced by the businesses in the study. The remaining 80% (63/77) of businesses indicated they voluntarily exclude cracked eggs from sale as human food.

Identifying and assessing industry egg cleaning practice is a key food safety management step

According to the Egg Regulation, only visibly clean shell eggs can be sold and, therefore, dirty eggs must be either cleaned or discarded. At the initial regulatory visit Authority officers observed variable egg cleaning practices across egg businesses in NSW.

- Abrasive removal was the most common egg cleaning method observed. Approximately two-thirds (60/88) of the businesses in the study used abrasive methods to clean eggs by hand. A variety of materials were used, including cloth eg kitchen grade wipes (27%, 4/88), plastic kitchen scouring pad (22%, 15/66), paper towel (18%, 12/66), and sand paper (5%, 3/66). One business used a razor blade.
- Almost one-third (28/88) of businesses in the study 'wet wash' eggs (relating to about 12% of the total number of eggs produced by the businesses in this study). Under the Egg Regulation, businesses that 'wet wash' are required to implement and document additional food safety related procedures.

[3] *Baseline evaluation of the NSW Egg Food Safety Scheme: Microbiological survey of NSW egg farms (2012)* includes the microbiological analysis of stock feed used by egg producers in this study

The study found that of the businesses who 'wet wash' eggs, nearly two-thirds (18/28) treated their wash water with sanitiser and one-fifth (6/28) did not add sanitiser to the wash water. (Adding sanitiser is a required practice). A small proportion (14%) of businesses in the study were observed using a range of unorthodox methods to 'wet wash' eggs, including using boiled wash water, adding dishwashing detergent to the wash water (not regarded as an acceptable practice according to the Food Standards Code) and using vinegar as a wash water sanitiser. One business was observed soaking eggs in wash water. This unacceptable practice was immediately rectified and the Authority officers provided education on acceptable egg washing procedures.

- Almost half (13/28) of the businesses who 'wet wash' dirty eggs used non-reticulated water with or without sanitiser. Audit findings revealed that about 85% (11/13) of these businesses did not comply with the wash water testing requirements resulting in the issuance of corrective action requests by Authority officers. Under the Regulation, egg businesses must test non-treated, non-reticulated wash water for *E. coli* every month, or every six months if treated. If water is treated, businesses must also monitor daily residual chlorine levels and maintain appropriate records.

After considering the observed egg cleaning practices and their potential risks, the Authority reiterates its preference for dry cleaning methods. Compared with wet washing, dry cleaning methods are inherently less risky due to the reduced likelihood of cross contamination. Dry cleaning is also an easier process to perform in a safe manner as it does not require the same level of food safety management controls and monitoring.

Food safety performance scores are an effective way of targeting industry assistance in the future

At the first regulatory visit, Authority officers assessed food safety performance of egg producers and producers/graders against a standardised checklist. Accordingly, high levels of audit/inspection consistency were achieved. Over 85% (137/160) of businesses audited/inspected during the evaluation period were included in the study, representing almost 70% of all egg businesses licensed at the time. Overall performance scores were calculated as a percentage of correct answers.

At the first regulatory inspection/audit under the Egg Regulation, Authority officers took on an important advisory role, employing an incremental compliance approach in response to any observed non-compliances. However, if a direct food safety risk was observed, Authority officers took appropriate enforcement action.

Below is a summary of key food safety and compliance results for selected audit/inspection elements.

- On average, facility and equipment hygiene and sanitation were the highest performing areas.
- Large variations in overall industry performance scores were recorded for 'construction/maintenance', 'product identification/traceability' and 'pre-requisite programs for egg producers/graders'.
- Overall, 84% of businesses scored an 'A' audit/inspection rating while 10% scored a 'B' rating. As expected at this first regulatory visit, compliance was slightly lower for egg producers/graders than for egg producers, reflecting the increased number of food safety requirements for managing higher risk processes (eg crack detection, egg cleaning etc).
- One in ten egg producers/graders failed their first audit but all passed their follow-up visit.
- For egg producers/graders, almost one-quarter of all defects raised at the first audit were for noncompliant food safety programs. This was to be expected as many businesses needed to implement a food safety program in order to comply with the new requirements. Other commonly raised defects are listed below. Defects were managed through the audit/inspection process as 'minor' or 'major' Corrective Action Requests (CARs), depending on the severity or the potential food safety risk.

Commonly raised defects included:

Construction and maintenance

- egg grading areas not complying with Food Safety Standard 3.2.3 – *Food premises and equipment*

Process controls

- no monitoring records for cracked egg detection
- no temperature monitoring records for cracked egg storage

Pre-requisite programs

- inadequate pest control programs
- inadequately identified hazards associated with chemical use
- inadequate approved supplier programs

Authority's implementation of the Egg Regulation based on best practice approach

As indicated previously, Authority officers dedicated the first part of each regulatory visit to help businesses understand the new requirements. The officers took each business step by step through the compliance information pack that had been supplied as a hard copy well before the first regulatory visit.

Approximately 90% (125/139) of businesses in the study were provided with information while the remaining 10% indicated they had already received the compliance assistance material at another facility's regulatory visit.

Afterwards, on average, businesses gave a 4.5 out of 5 level of confidence rating in their ability to comply with the new requirements.

Recommendations

The evaluation findings provide a baseline for use as a point of comparison for assessing future impacts of the Egg Regulation including measuring any changes to composition and activities of the NSW egg industry.

Overall, the evaluation findings highlight areas where businesses perform well and where improvements are needed. Key audit elements identified as needing sector-wide improvements include 'food safety program' implementation, 'construction and maintenance', 'process control' and 'product identification/traceability'.

In light of these findings, the Authority will consider:

- continuing to collect industry production data as part of routine audits and inspections,
- preparing clear audit criteria for Authority officers on egg washing practices,
- providing clear advice to businesses on acceptable egg cleaning practices (specifically 'dry' abrasive cleaning) via a factsheet,
- providing further industry information on storage of ungraded eggs where businesses will be encouraged to minimise pre-grading storage periods or refrigerate ungraded (potentially cracked) eggs at 8^{o}C or less for extended periods,
- publishing guidance information for industry that targets cleaning and maintenance of egg farm/grading room facilities and equipment, and
- raising awareness of the *National biosecurity manual*[4] and the *NSW biosecurity guidelines for free-range poultry farms*[5].

[4] Australian Government (2009) National Farm Biosecurity Manual for Poultry Production. Available at: http://www.daff.gov.au/animal-plant-health/pests-diseases-weeds/biosecurity/animal_biosecurity/bird-owners/poultry_biosecurity_manual. Accessed 17 Sept 2012.

1. Introduction

1.1 Food safety requirements for egg businesses in NSW were introduced in June 2010

The Egg Food Safety Scheme (Egg Regulation) was introduced in NSW on 18 June 2010. The Regulation covers businesses producing, grading or processing eggs and egg related products for sale.

Under the Egg Regulation, businesses that produce or grade more than twenty dozen eggs for sale in any week are required to be licensed with the NSW Food Authority (the Authority), implement certain documented food safety procedures and receive inspections or audits from the Authority's food safety officers.

Businesses licensed as egg producers produce eggs only, and do not perform any critical food safety processes such as crack detection or egg washing. Egg producers must adhere to prescribed food safety requirements and are inspected every three years (providing no compliance issues are identified). Regulatory inspections for egg producers began in October 2010.

Businesses licensed as egg producers/graders undertake additional processes to ensure eggs are free from cracks and dirt prior to sale. These businesses are required to develop and implement a documented food safety program in accordance with Standard 3.2.1 – *Food safety programs* of the Food Standards Code. The Authority audits these businesses once every two or three years depending on business size and audit performance. Audits of egg producers/graders began in March 2011.

To support the implementation of the Regulation, the Authority undertook a number of comprehensive implementation activities. The Authority prepared industry-specific assistance materials and undertook specialist training for Authority officers engaged in the audit/inspection program, who then provided coaching to all egg businesses on the new requirements at the first regulatory visit.

1.2 Evaluation objectives included establishing industry food safety and profiling baselines

In 2010–11, the Authority undertook a comprehensive survey of egg businesses so it would be able to evaluate the new Egg Regulation.

The objectives of the evaluation study were to:

- collect industry profile information on common practices to help the Authority develop industry assistance and regulatory (audit/inspection) assistance that are most useful for businesses,
- establish a first audit/inspection baseline, against which the impacts of the Regulation can be compared over time, by assessing the NSW egg industry's overall food safety performance, analysing audit/inspection outcomes, looking at egg-related foodborne illness data and assessing the hygiene and safety of the egg laying environment and other system inputs (stock feed and water), by establishing apparent prevalence levels of *Salmonella* and *E. coli* (water only),
- assess how effectively the Authority has implemented the new requirements, and
- identify areas (if any) where industry may need further assistance in complying with the requirements.

[5] NSW DPI (2007) *NSW biosecurity guidelines for free range poultry farms*. Available at: http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/154704/nsw-biosecurity-guidelines-for-free-range-poultry-farms.pdf. Accessed 17 Sept 2012.

1.3 Survey design included a large, representative sample

Over a twelve-month period, during first inspections and audits, Authority officers collected industry baseline data for the evaluation study.

Using standard assessment tools, industry profile and food safety performance data was collected from approximately 85% (135–139/165) of egg businesses receiving a regulatory visit between 1 December 2010 and 30 November 2011. Appendix 1 includes further details on sample sizes.

The Authority used SurveyMonkey™, a web-based database program, to manage the survey data.

Businesses were randomly sampled in accordance with the Authority's routine inspection/audit schedule. An analysis of the location of sampled businesses found that, overall, a representative sample of egg businesses across twelve regional areas in NSW was achieved. In all but three regions, sample sizes were proportionately representative (within +/- 2% variance) of the total number of egg businesses licensed in that region. The Northern Rivers region was the only region under-sampled by 7% and the Hunter and Sydney regions were oversampled by 4% and 6% respectively.

2. A comprehensive profile of egg businesses was established

At first regulatory visit, Authority officers collected profiling data from 58 egg producers and 81 egg producers/graders. In total, this represented about 70% (139/199) of the total number of licensed businesses identified at the time of study.

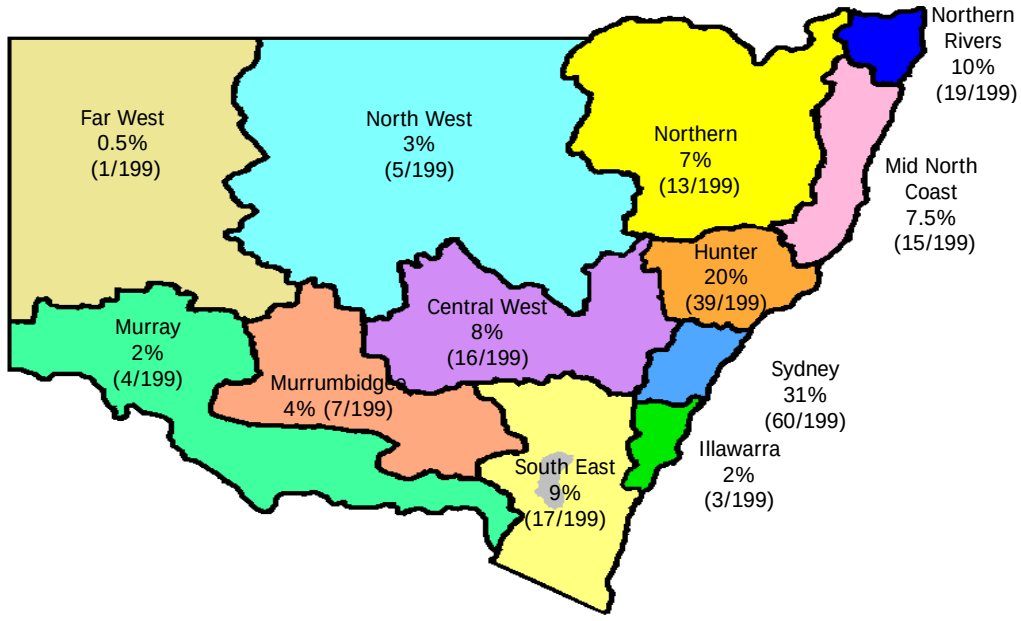
The profiling survey tool included specific questions for both egg producers and egg producers/graders. Questions focussed on collecting information about:

- farm production practices (8 questions),
- farm/grading processes and inputs (egg producers – 17 questions; egg producers/graders – 34 questions), and
- industry's understanding of the new requirements (10 questions).

2.1 Most egg businesses were located in the greater Sydney region

Figure 1 presents a regional map of NSW showing the proportion of licensed egg businesses per region. Almost one-third (31%, 60/199) of licensed businesses at the time of the study were located in the Sydney region, followed by the Hunter (20%).

Figure 1. Regional location of licensed egg businesses in NSW at the time of the study



2.3 Egg businesses included in this study produced over 2.5 million eggs per day

The study found that profiled businesses produced approximately 2.5 million eggs per day. This figure is likely to be slightly inflated as some producers/graders also grade eggs for other producers, so some eggs may have been counted twice.

2.4 Egg production volumes varied within and between licence categories

As part of the evaluation study, egg businesses were asked about their egg production volumes. A comparison was then drawn between production volume and licence category.

Consistent with other food safety schemes the Authority administers, categories for licensed egg businesses are based on the number of full time equivalent (FTE) food handlers. Table 1 below lists the proportion of profiled businesses in each licence category size (by size) [6] and (as per the evaluation data) the stated industry maximum and minimum daily production volumes for businesses within each category.

In 2010–11, the 'small' category represented just over three-quarters of egg businesses licensed at the time, while 14% were 'very small' and 9% held licenses for 'medium' sized businesses. None were licensed as a 'large' sized business. For each licence category, it is apparent that egg production volumes vary greatly within and between the categories.

Data in Table 1 highlights the fact that just over three-quarters (77%) of egg businesses in the study were categorised as 'small' by the licensing system, with production volumes ranging from 180 to 250,000 eggs produced per day. This wide range makes it difficult to accurately target businesses producing small volumes of eggs for industry assistance and compliance purposes. Therefore, it is important for the Authority to collect production data on an ad-hoc basis in order to tailor the assistance materials specifically for the very small businesses.

Table 1. NSW egg industry profile included in this study – licence category and egg production volume

Licence category	FTE	% of licensed businesses (n=132)	Minimum (eggs/day)	Maximum (eggs/day)
Very small*	1-5	14%	60	200
Small	1-5	77%	180	250,000
Medium	6-50	9%	14,000	341,000
Large	>50	0%	--	--

*a licence category for businesses that produce between 34and 171 eggs per day

2.5 More free-range businesses but fewer eggs produced

To help guide the development of industry assistance materials and to inform any future enforcement efforts relating to industry labelling practices, the Authority required a better understanding of the composition of the NSW egg industry as it related to egg production systems. As part of the study, Authority officers recorded information on egg production systems observed during the first regulatory visit (ie free-range, cage or barn) as well as noting key defining characteristics and egg production volumes for each business.

Two-thirds of egg businesses in the study were free-range producers

Almost all (93%, 122/132) businesses produced eggs under a single production system. Two-thirds (83/132) of egg businesses were identified as using a free-range system, one-quarter (33/132) were cage-based and only 5% (7/132) produced eggs under the barn system.

Figure 2 presents a profile of the egg industry by production system and size (based on eggs produced per day). As indicated above, the most common egg production system for businesses included in the study

[6] Very small (1-5 FTE producing 34-171 eggs/day), Small (1-5 FTE), Medium (6-50 FTE), Large (>50 FTE)

was free-range but almost 40% of these businesses produced fewer than 1000 eggs per day (small volumes). Compared to the two other production systems, there were many more free-range businesses producing small volumes of eggs at fewer than 1000 per day.

Evaluation findings revealed that while only 25% of businesses produced cage eggs, the majority (52%) of these were businesses producing medium sized volumes of between 1000 and 10,000 eggs per day, with another quarter producing larger quantities of eggs—approximately between 30,000 and 100,000 eggs per day.

Figure 2 also depicts the production profile of barn-based businesses. Only seven barn-based businesses were included in the study but, in general, egg production levels were on a larger scale (43% produced between 10,000 and 30,000 eggs per day).

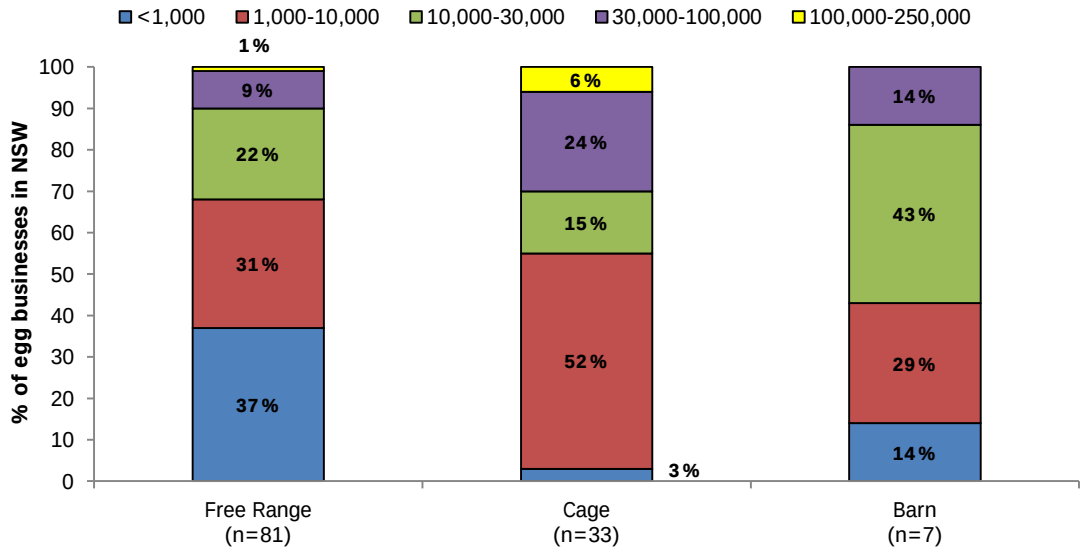
Free-range and cage eggs produced in roughly equal quantities

Further analysis of the data found that, overall, free-range and cage eggs were produced in roughly equal quantities, 49% (~1,222,518 eggs/day) and 47% (~1,157,612 eggs/day) respectively. Barn-laid egg production volumes were much lower, representing less than 4% (~98,450 eggs/day) of the total number of eggs produced in this study.

Two types of free-range systems were observed

Additional observations made by Authority officers revealed a number of key differences within free-range and cage-based production systems. Two types of free-range systems were observed—paddock with moveable sheds, and barn-based with access to an outside range. Onsite reports of cage production systems observed differences in the number of cage tiers. These ranged from single-tier systems up to eight tiers per shed. Again, different practices, different levels of automation and risk management controls are associated with multi-tier systems compared with single-tier sheds.

Figure 2. NSW egg industry profile[7] – production system and daily egg production volumes



[7] Of the businesses included in the study – representing about 70% of the total number of licensed businesses at the time (n=199)

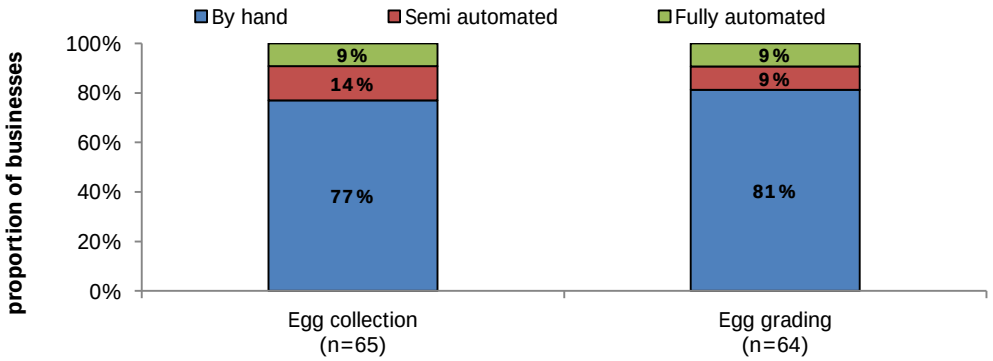
2.6 Egg industry practices and processes profiled

Authority officers observed selected farm operating practices (biosecurity, egg collection and packing methods) and the management of certain system inputs (stock feed and water) as part of the evaluation study.

A risk-based industry profile was established as follows:

- **Biosecurity** – about three-quarters (104/139) of businesses indicated that they had adopted a minimum level of biosecurity management. The Authority's officers complied with each farm's biosecurity arrangements at the time of the visit, which were mostly limited to restricting person access to farms (usually staff only), followed by insisting on a 48 to 72 hours delay in between farm visits. A small number of businesses were observed to have adopted additional practices such as vehicle wheel wash, sanitised foot baths and hand wash at the entrance to each laying shed. There is potential for increased levels of industry awareness and adoption of practices identified in the *National Farm Biosecurity Manual* and the *NSW biosecurity guidelines for free range poultry farms*.
- **Stock feed –** just over 80% (87/106) of egg businesses purchased stock feed from a manufacturer or supplier while the remainder indicated they assembled dry mash or pelleted feed on site. Authority officers assessed the bulk storage of stock feed in silos or bays for potential for rodent and pest access. Almost 90% (54/61) of businesses were observed to adequately cover their stock feed to prevent contamination from rodents and birds. The microbiological results of stock feed are included in the Authority's micro report[8].
- **Water sources and current levels of testing –** just over half (73/139) of egg producers were using non-reticulated water (bore or dam water) for their hen drinking water. Approximately one-third (45/73) of the businesses using non-reticulated water exceeded the requirements by routinely testing water for indicators of faecal contamination (*E. coli*)[9]. In addition, almost 60% (43/75) of egg producers/graders used non-reticulated water as their primary water source but only six (14%) monitored their water for *E. coli*[10]. Grading facilities that do not 'wet wash' eggs are not required to test non-reticulated water.
- **Overall level of automation –** over three-quarters (50/65) of egg businesses collected eggs 'by hand'. A similar proportion (81%, 51/64) of businesses grade eggs 'by hand' (Figure 3). Fully automated collection and grading systems were limited to less than 10% of those evaluated. Information about egg handling and levels of automation provide insight into likely levels of industry food safety risk as well as informing the policy work on egg labelling.

Figure 3. Egg collection and grading / packing methods used by egg businesses in this study



[8] *Baseline evaluation of the NSW Egg Food Safety Scheme: Microbiological survey of NSW egg farms* (2012)
[9] Egg producers are not required to test non-reticulated hen drinking water for *E.coli*
[10] 5 out of 19 non-reticulated water source (tank) samples tested positive for detectable levels of *E.coli* (LOD = 1 CFU/mL). See Microbiological Survey Report for more details.

2.7 Cracked egg handling practices benchmarked

Restricting the movement of dirty, cracked and broken eggs through the supply chain is a principle food safety management objective of the Egg Regulation. Therefore, as part of the evaluation study, Authority officers observed and documented egg storage and crack detection (ie candling) practices in the NSW egg industry.

Storage periods of more than two days before grading were observed for 12% of businesses

Authority officers reported that just over 60% (72/116) of egg businesses undertook egg grading within 24 hours of collection. About one-quarter (29/116) of businesses stored eggs for up to 48 hours before grading, with the remaining 12% (14/116) storing their eggs from 49 to 96 hours before grading. Processes must therefore be modified when pasteurising pulp from cracked eggs (to account for possible increased growth of foodborne illness bacteria) if eggs have been stored for extended periods at ambient conditions. The Authority expects businesses to consider these hazards when preparing their food safety programs and recommends businesses to minimise pre-grading ambient storage periods or store ungraded eggs at 8°C or less if storage periods are lengthy.

Hairline crack detection systems needed for 15% of businesses

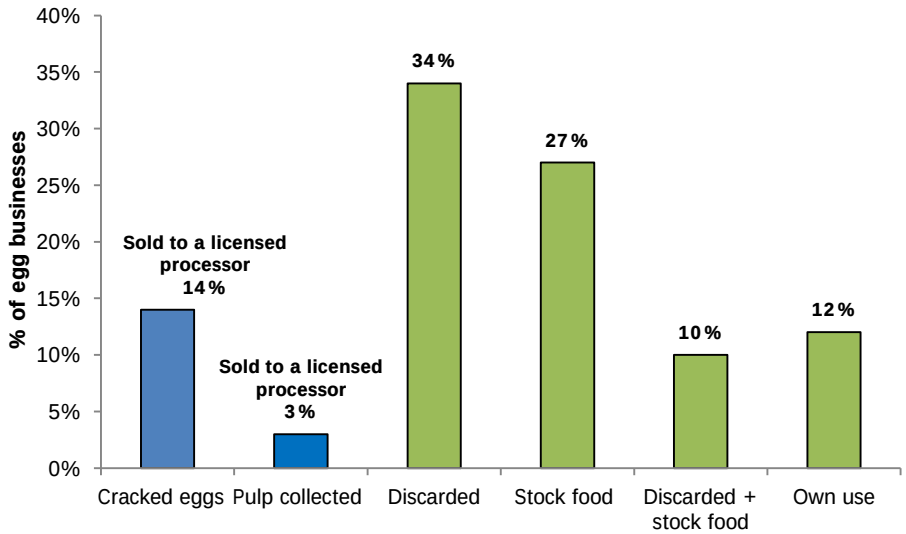
Under the Egg Regulation, egg producers/graders must check eggs for cracks using candling or an equivalent demonstrated method. Visual crack detection without a backlight is not acceptable. For nearly 15% (11/60) of egg businesses in the study, crack detection practices were limited to checking for visible cracks only (no backlight). In addition, Authority officers observed that over 80% (49/60) of businesses candle their eggs using a manual system. Only a small number (5%, 4/60) of businesses operated with fully automated crack detection systems.

Less than one-fifth of egg businesses (in the study) sold cracked eggs and/or pulp

The Egg Regulation includes food safety requirements for managing unpasteurised egg pulp and cracked eggs throughout the human food supply chain. For example, cracked eggs and pulp can only be sold to a licensed egg processing business for pasteurisation. In order to assess any future impacts of the Regulation, baseline industry cracked egg handling practices were documented (Figure 4).

The study found that less than one-fifth (17%, 13/77) of businesses handled cracked eggs/pulp for further processing either by selling cracked eggs to a licensed processor (14%) or collecting pulp themselves (3%) and then selling it. These businesses produced about 12.8% of the total volume of eggs in this study, and of the eggs destined for further processing all were graded within 48 hours after lay. For over 80% (63/77) of businesses, cracked eggs were excluded from sale or the human food supply. As seen in Figure 4, discarding cracked eggs as garbage is the most likely disposition for cracked eggs (44%).

Figure 4. NSW egg industry profile included in this study – cracked egg handling practices



2.8 Egg cleaning practices in NSW

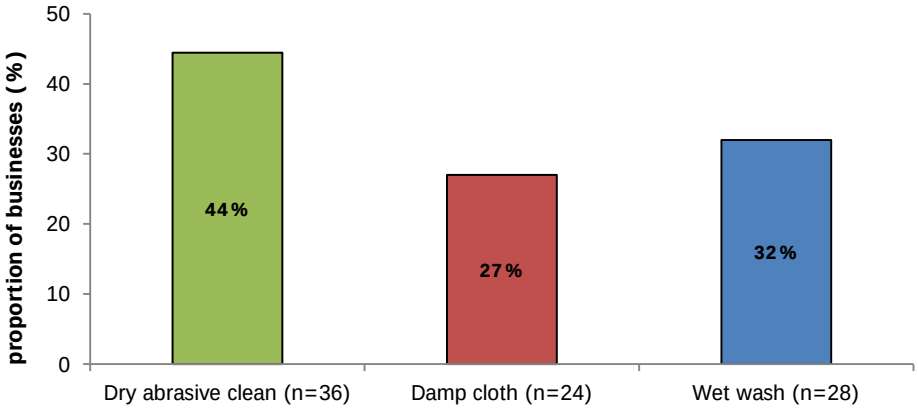
In accordance with the Egg Regulation, shell eggs can only be sold for retail sale if they are visibly clean. The Authority was therefore interested in gathering information on how egg producers/graders in NSW typically clean eggs in order to assess their methods from a food safety perspective.

Cleaning with abrasive material was the most common method observed

The study found that approximately two-thirds of the businesses (68%, 60/88) manually cleaned dirty eggs using either a damp cloth (27%, 24/88) or another abrasive material/tool (44%, 36/88). Alternatively, wet washing was practised by the remaining 32% (28/88) of businesses (Figure 5).

Further investigation into the type of materials used found that they varied and that, at times, businesses used more than one method. Two-thirds (27/66) of businesses used cloth (eg kitchen-grade wipes), almost one-quarter (22%, 15/66) used a plastic kitchen scouring pad, and followed by 18% (12/66) that used paper towel. Less commonly, steel wool (8%, 5/66), sand paper (5%, 3/66) and plastic brushes (2%, 1/66) were also used. One business used a razor blade.

Figure 5. NSW egg industry profile included in this study – egg cleaning methods



Almost one-third of egg businesses 'wet wash' dirty eggs

As with abrasive egg cleaning methods, washing eggs in water can be performed in a multitude of ways. However, businesses that 'wet wash' eggs (almost 33% or 28/88 of egg producers/graders) are required to implement additional food safety procedures. For industry profiling purposes and to inform any fine-tuning of the egg washing compliance requirements, detailed information on egg washing was collected.

The Authority recommends that wash water is treated with sanitiser. At the time of the study, it was found that 20% (6/28) of wet washers did not add sanitiser to wash water. While nearly two-thirds (18/28) of businesses treated their wash water with sanitiser, a small number of businesses (14%, 4/28) were identified as having adopted unusual wash water treatment practices. These included using boiled water to wash the eggs, sanitising wash water with vinegar or adding dishwashing detergent. The latter was deemed an unacceptable practice according to the Food Standards Code.

The study found that chlorine was the most commonly used sanitiser (~90%) followed by quaternary ammonium. One business used UV light to treat wash water.

Overall, only one business was observed soaking eggs in wash water (an unacceptable practice).

Under the Egg Regulation, businesses using non-reticulated (dam or bore) wash water must conduct tests for indicators of faecal contamination (*E. coli*)[11]. Evaluation findings revealed that about half of the

[11] Monthly for untreated water and six-monthly for treated water

producers/graders (13/28) washed eggs using non-reticulated water, with 85% (11/13) of these businesses not complying with *E. coli* testing requirements. The Authority expects to see improvements in compliance over time as water monitoring requirements are implemented in accordance with the Egg Regulation.

3. NSW egg businesses food safety performance benchmarked

3.1 Standard checklists helped achieve high levels of audit/inspection consistency

Over the twelve-month sampling period (1 December 2010 to 30 November 2011), the Authority's officers used standardised assessment checklists to record first audit/inspection findings.

In this way, high levels of consistency were achieved across all audits/inspections and meaningful industry performance scores were able to be calculated. Additionally, checklist data was used to generate overall industry scores for a number of identified high risk areas, eg crack detection, stock feed storage and egg cleaning practices.

The checklists included criteria for assessing general food safety performance and industry-specific processes in eight standard areas:

1. Food safety program (egg producers/graders only)
2. Construction and maintenance
3. Hygiene and sanitation
4. Process controls
5. Product identification, traceability and recall
6. Analytical testing
7. Pre-requisite programs and
8. Corrective action (egg producers/graders only)

3.2 Food safety performances benchmarked for almost 70% of licensed egg businesses

Food safety performance was benchmarked using the standardised assessment checklist for over 86% (137/160) of egg businesses that were inspected or audited during this period. Data was collected at the first inspection from 60 licensed egg producers, and at first audit from a further 77 egg producers/graders. Overall, this represented 69% of egg businesses licensed at the time of the study (n=199).

An overall egg industry food safety performance score was calculated. It was an average of all the total scores earned by individual businesses.

For each business, food safety performance scores were calculated as a percentage of correct answers over the total number of questions answered. For egg producers, the overall food safety performance score was made up of 27 questions covering five inspection elements. For egg producers/graders, the overall food safety performance score comprised of 72 questions covering six[12] audit elements. Further detail on how the data was analysed is included in Appendix 2 (p24).

[12] Two elements were excluded from the analysis: 'Analytical testing' and 'Corrective action'. Most responses to the Analytical testing' element was N/A as most businesses did not wash eggs and therefore did not need to test wash water. At first audit, most businesses were in the process of implementing their food safety program and therefore had not yet to issue an internal 'Corrective action' or had conducted an internal review.

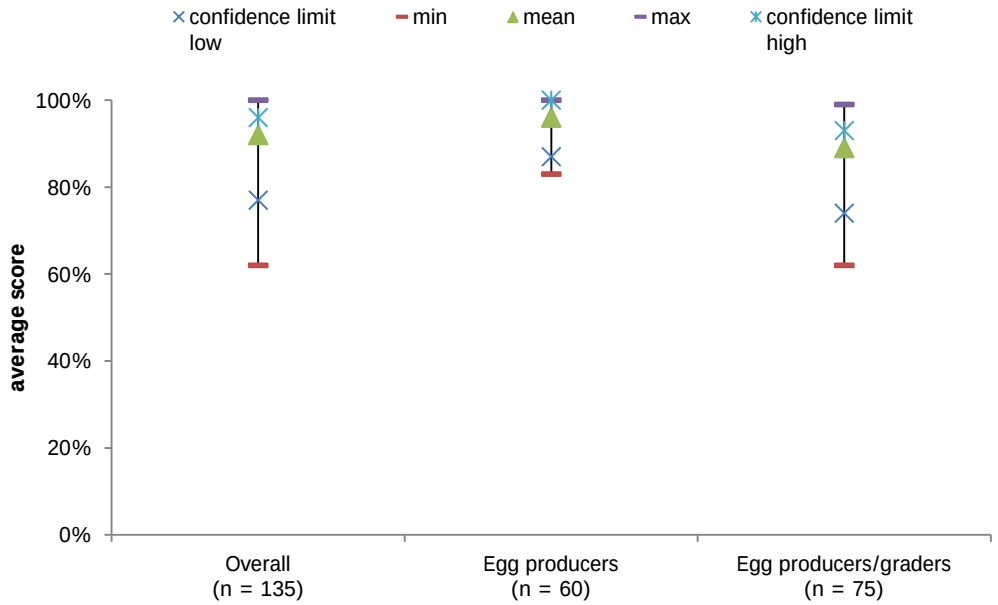
3.3 Overall food safety performance was benchmarked at 92%

As shown in Figure 6, the overall food safety performance score for the NSW egg industry included in this study was 92% (n=137, 95%CL[13] 77–96%). This high industry score is most likely due to the fact that at the first regulatory visit, Authority officers employed an incremental approach to noncompliance, focussing on education and assistance. However, whenever a direct food safety risk was observed, Authority officers took appropriate enforcement action.

A slight variation in performance scores was observed between the two licence permissions. The 'egg producers' score was slightly higher than the 'egg producers/graders' score, ie 96% (n=60, 95% CL 87–100%) compared to 88% (n=77, 95% CL 74–93%). This was not unexpected given that egg producers/graders undertake additional processing steps requiring documented monitoring via a food safety program. Full details of egg industry performance scorecards are listed in Appendices 3 and 4.

In the future, the 2010–11 study will serve as a baseline against which changes in food safety performance can be measured. Based on evidence from other regulated industries, the Authority expects that, overall performance scores will improve as businesses become more proficient at managing food safety, resulting in a narrowing of confidence limits.

Figure 6. Food safety performance benchmark scorecard for egg businesses in NSW[14]



[13] In this case, confidence limits (CL) tell us that there is a 95% chance that the average scores for all egg license holders in NSW are within those two limits.

[14] Businesses included in the food safety performance section of the study represented about 70% of businesses licensed at the time (n=199).

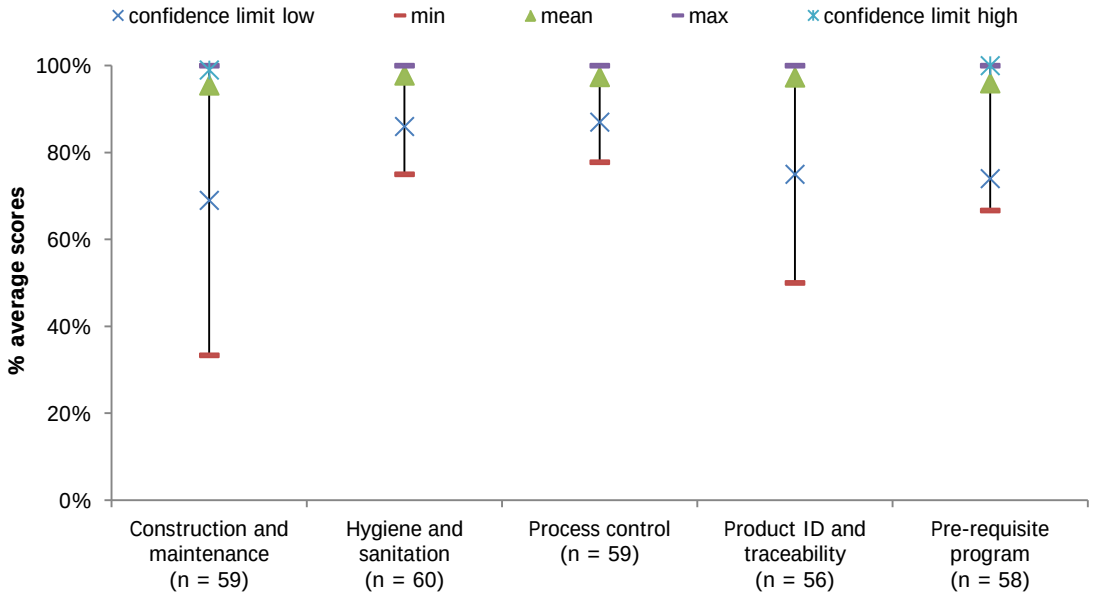
3.4 Hygiene and sanitation scores at high levels for egg businesses in this study

Baseline food safety scores established for egg producers in NSW

Figure 7 presents an overall performance scorecard for egg producers. As shown by a wide variation in business performance scores 'construction/maintenance' and 'product identification/traceability' are two areas that might benefit from industry-wide assistance. However, it is worth noting that, in future, improvements in industry 'product identification/traceability 'scores are expected in response to the introduction of egg stamping[15] in NSW.

Figure 7 also shows that, on average, comparable performance scores for egg producers were achieved across all inspection elements, with 'hygiene and sanitation' as the area with the highest score at 98% (n=60, 95% CL 86–100%).

Figure 7. Food safety performance scorecard for egg producers in NSW



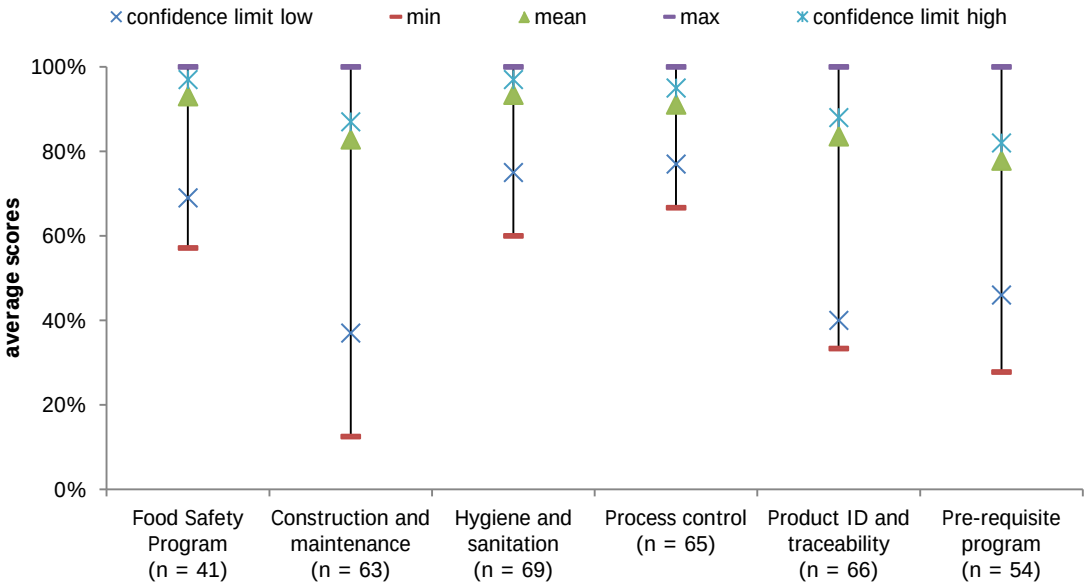
[15] From 26 November 2012, in accordance with Standard 4.2.5 – *Primary production and processing standard for eggs and egg product*, eggs must be uniquely and individually stamped so that they can be traced back to the producer.

Egg producers/graders baseline food safety scorecard

Figure 8 depicts overall performance scores by audit element for egg producers/graders included in this study. From an industry perspective, Figure 8 highlights three audit areas needing further improvement—'construction/maintenance', 'product identification/traceability' and 'pre-requisite programs.

The two strongest audit elements for egg producers/graders were 'hygiene/sanitation' (93%, n=69, 95% CL 75–97%) and 'food safety program' (93%, n=41, 95% CL 69–97%).

Figure 8. Food safety performance scorecard for egg producers/graders in NSW



In general, lower average performance scores and greater variability within scores for each audit element were observed for egg producers/graders compared with egg producers[16]. However, performance scores for both producers and producers/graders in this study showed a high level of variability in core food safety elements such as 'construction/maintenance', 'product identification/traceability', and 'pre-requisite programs'.

Over time, as businesses become more proficient food safety managers, the Authority expects to see improvements in overall food safety performance scores, accompanied by a narrowing of confidence limit ranges.

[16] Direct comparison between the two license categories must be limited to observing large differences as assessment checklists vary

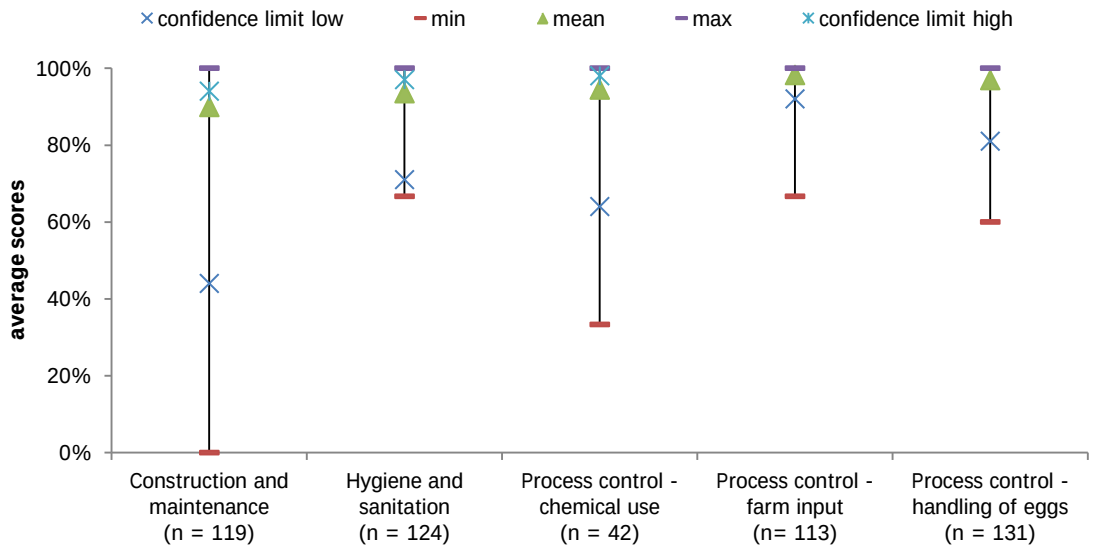
3.5 Good food safety practices observed for farm input

Inspection and audit checklists vary in accordance with the different activities undertaken by egg producers and producers/graders. However, the checklists do have some common elements including:

- Construction and maintenance
- Hygiene and sanitation
- Process control – chemical use (pesticides and veterinary medicine use)
- Process control – farm input (water source and feed storage)
- Process control – handling of eggs (handling leakers and dirty eggs and storage of eggs)

Figure 9 presents the baseline food safety performance scorecard for activities mentioned above. Overall, egg businesses included in this study were found to have high scores on controlling farm inputs (98%, n=113, 95% CL 92 – 102%). As seen by the wide confidence limit ranges, construction/maintenance is an area requiring ongoing attention. Again, in relation to construction/maintenance and process control (chemical use), high levels of variability were observed between egg businesses.

Figure 9. Performance scorecard for common elements for egg producers and egg producers/graders included in NSW



4. Industry compliance was benchmarked, calculated from audit/inspection outcomes

When undertaking audits/inspections, Authority officers managed food safety compliance by issuing Corrective Action Requests (CARs) for defects, designating a severity rating for each which, in turn, contributes to the businesses' audit/inspection outcome.

Egg industry compliance information (audit/inspection outcomes) was extracted from the Authority's Audit and Compliance database and benchmark scores were calculated as overall industry averages. Further information on audit outcomes is presented in Appendix 5.

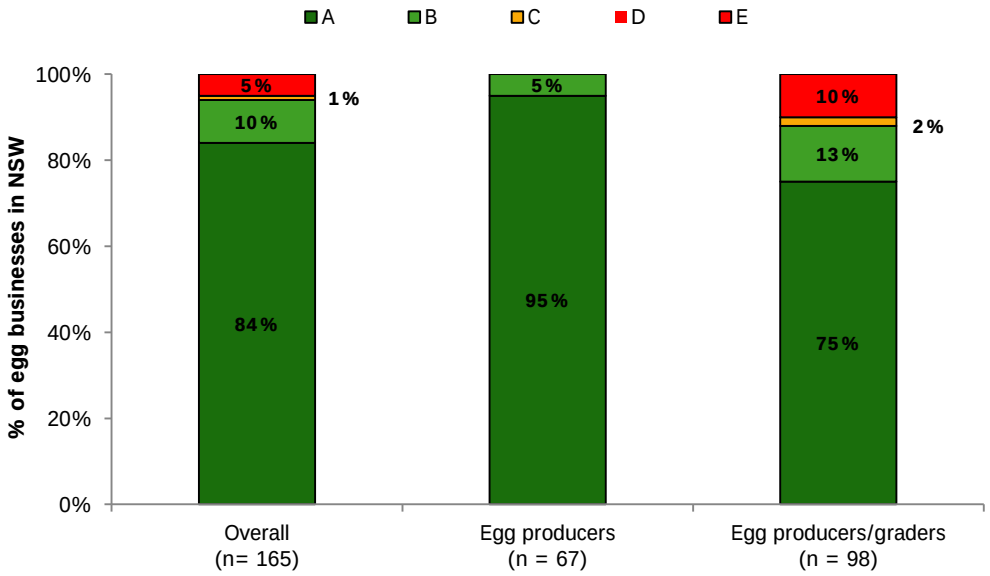
This compliance data has been used in conjunction with the food safety performance data (from the standardised checklists) to benchmark the egg industry in this study at first audit/inspection. It also provides a meaningful insight into the Authority's success in implementing the new requirements while highlighting areas needing further assistance.

4.1 Nine in ten egg producers/graders passed their first audit

For first audits/inspections completed during the sampling period, the overall failure rate was 5% (9/165[17]). However, all 'failed' businesses passed their follow up visit.

Overall, 84% (139/165) of businesses scored an 'A' rating, while one in ten (10%) scored a 'B' rating (Figure 10). Consistent with food safety performance scores, compliance was lower for egg producers/graders. This was expected as increased food safety requirements are commensurate with high risk practices. As mentioned above, Authority officers at the first regulatory visit focussed on education rather than compliance. Therefore, it is expected that compliance scores earned at the next regulatory visit are more likely to reflect true compliance levels. Over time, the Authority expects compliance rates to improve, showing decreasing numbers of businesses with unacceptable (D and E) audit ratings.

Figure 10. First inspection and audit compliance ratings for egg businesses in NSW



[17] Data obtained from the Authority's database (BYTE)

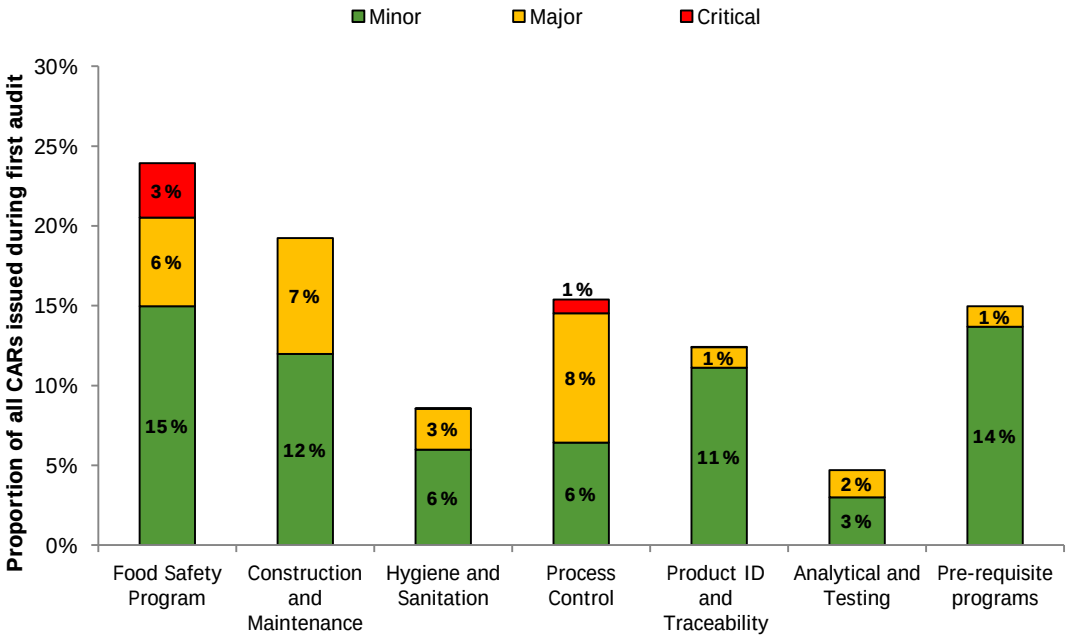
4.2 Almost one-quarter of all defects raised at first audit were for non-compliant food safety programs

Data presented in Figure 11 indicates that almost one-quarter of the CAR issues raised related to food safety program non-compliances—greater than any other audit element. This was to be expected given the fact this data represents first audit outcomes.

The audit defect industry scorecard provides a good baseline against which to measure any future improvements in food safety management by egg producers/graders in NSW. As businesses become practised food safety program managers, the Authority expects to see a decrease in the rate and severity of CAR issues reported under the 'food safety program', 'pre-requisite program' and 'product identification/traceability' audit elements.

However, in the first instance, an increase in CAR issues is likely for those audit elements that relate mostly to monitoring and maintaining food safety programs (corrective actions and process control). Appendix 6 includes a summary of the number of CAR issues identified under each audit element.

Figure 11. Egg producers/graders – Corrective Action Request issues raised at first audit



Other commonly raised defects for resolution by the business, either immediately or within a set time frame, include the issues listed below:

Construction and maintenance

- grading areas not complying with Food Safety Standard 3.2.3 – *Food premises and equipment*

Process controls

- no monitoring records for cracked egg detection
- non-temperature monitoring records for cracked egg storage

Pre-requisite programs

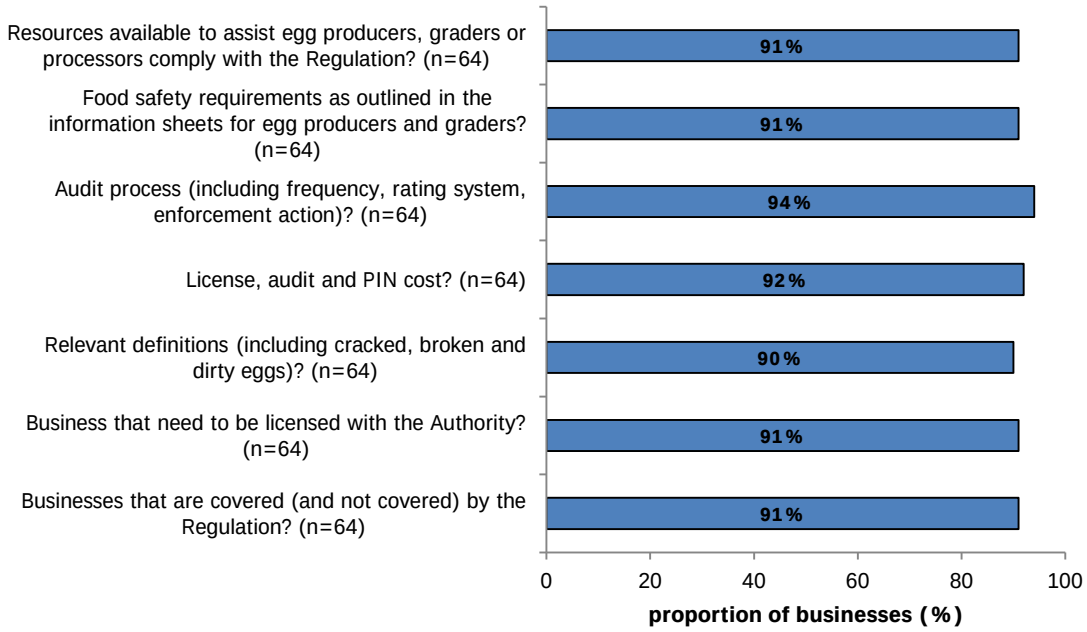
- inadequate pest control programs
- inadequate identification of the hazards associated with chemical use
- inadequate approved supplier programs

5. Egg businesses successfully educated in the Egg Regulation requirements

As part of the implementation of the Egg Regulation, Authority officers spent time providing compliance information to each business at the first audit/inspection. On average, 90% of businesses were provided information about the areas listed below in Figure 12. The remaining 10% of businesses indicated that additional information was not needed.

On average, egg businesses rated their confidence in complying with the Regulation as 4.5 out of 5.

Figure 12. Egg businesses understanding to education component of implementation



6. Recommendations for improving egg industry compliance

The evaluation findings provide a baseline for use as a point of comparison for assessing future impacts of the Egg Regulation including measuring any changes to composition and activities of the NSW egg industry.

At the time of the evaluation, many smaller, isolated egg businesses had limited experience with regulatory bodies. The study found that egg businesses in NSW used a number of different production systems and many had adopted varying practices and processes. Identifying these and determining their acceptability under the legislation has proven to be an ongoing process.

Overall, the evaluation findings highlighted specific areas where businesses performed well and other areas where improvements are required. Some of the key areas for improvement include 'food safety program', 'construction/maintenance', 'process control' and 'product identification/traceability'.

In light of these findings, the Authority will consider:

- continuing to collect industry production data as part of routine audits and inspections,
- preparing clear audit criteria for Authority officers on egg washing practices,
- providing clear advice to businesses on acceptable egg cleaning practices (specifically 'dry' abrasive cleaning) via a factsheet,
- providing further industry information on storage of ungraded eggs where businesses will be encouraged to minimise pre-grading storage periods or refrigerate ungraded (potentially cracked) eggs at 8°C or less for extended periods,
- publishing guidance information for industry that targets cleaning and maintenance of egg farm/grading room facilities and equipment facility, and
- raising awareness of the *National Biosecurity Manual*[18] and the *NSW biosecurity guidelines for free range poultry farms*. [19]

[18] Australian Government (2009) National Farm Biosecurity Manual for Poultry Production. Available at: http://www.daff.gov.au/animal-plant-health/pests-diseases-weeds/biosecurity/animal_biosecurity/bird-owners/poultry_biosecurity_manual. Accessed on: 17 Sep 2012

[19] NSW DPI (2007) *NSW biosecurity guidelines for free range poultry farms*. Available at: http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/154704/nsw-biosecurity-guidelines-for-free-range-poultry-farms.pdf. Accessed on: 17 Sep 2012

Appendix 1. Baseline evaluation of Egg Regulation – sample sizes

Facility type	No. licensed businesses*	Total no. of inspection/audits conducted** (% of total number licensed)	No. profiled (% of total no. licensed)	No. inspection/ audit checklists (% of total no. licensed)
Egg producers (Egg primary production)	74	67 (91%)	58 (78%)	60 (81%)
Egg producers/graders (Egg primary production with additional activities)	125	98 (78%)	81 (65%)	75 (60%)
Total	199	165 (83%)	139 (70%)	135 (68%)

*As at 30 November 2011 (the close of the sampling period)

** Sampling period: 1 December 2010 to 30 November 2011

Appendix 2. Further notes on data analysis methods

Confidence limits were calculated which enabled inferences to be made about the average performance score for both licence categories and the overall egg industry. The confidence limits were determined from the mean for continuous, normally distributed data at a confidence width of 95%. Critical values were calculated from the 't-distribution' having n-1 degrees of freedom.

The Authority used SurveyMonkey™, a web-based database program, to manage the survey data.

Before final scores were calculated, missing observational data arising from incomplete assessment checklists was managed in the following way. For each question, audit element or business, the assessment tool completion rates were determined. Where the completion rate was less than 50% for a question, audit element or business, the information was deleted from the data set. Consequently, for each audit element where there was a different number of businesses included in the average score, any remaining missing data was replaced by the modal response for that question, eg 'yes', 'no', or 'N/A'.

Appendix 3. Food safety performance scorecard for egg producers

Audit element	Total no. of licence holders	No. of licence holders assessed	% of licence holders assessed	Average performance score	Max	Min	+CL	-CL	No. of questions in tool
Construction and maintenance	74	59	80%	95%	100%	33%	99%	69%	3
Hygiene and sanitation		60	81%	98%	100%	75%	102%	86%	7
Process controls		59	80%	97%	100%	78%	101%	87%	12
Product identification and traceability		56	76%	97%	100%	50%	101%	75%	2
Pre-requisite programs		58	78%	96%	100%	67%	100%	74%	3
Overall food safety performance score		60	81%	96%	100%	83%	100%	87%	27

Appendix 4. Food safety performance scorecard for egg producers/graders

Audit element	Total no. of licence holders	No. of licence holders assessed	% of licence holders assessed	Average performance score	Max	Min	+CL	-CL	No. of questions in tool
Food safety program	125	41	33%	93%	100%	57%	97%	69%	22
Construction and maintenance		63	50%	83%	100%	13%	87%	37%	8
Hygiene and sanitation		69	55%	93%	100%	60%	97%	75%	15
Process controls		65	52%	91%	100%	67%	95%	77%	23
Product identification and traceability		66	53%	84%	100%	33%	88%	40%	4
Pre-requisite programs		54	43%	78%	100%	28%	82%	46%	19
Overall food safety performance score		75	60%	89%	99%	62%	93%	74%	72

Appendix 5. Further notes on audit ratings

For each business, the inspection/audit rating (A–E) is based on the number of defect points earned during the regulatory visit. Outcomes of 'D' (48–63 points) and 'E' (64 and above points) are considered unacceptable (fail).

The number of points allocated depends on whether the defects are rated 'critical', 'major' or 'minor' by the Authority's Officers. Officers then document defects as issues which are then managed as part of a Critical Action Report.

Appendix 6. Total number of CARs issued by audit element and type

Audit element	Minor CARs	Major CARs	Critical CARs	Total CARs
Food safety program	37	15	3	55
Maintenance and construction	25	15	0	40
Hygiene and sanitation	14	7	0	21
Process control	18	19	1	38
Product ID and traceability	33	4	0	37
Analytical testing	8	2	0	10
Pre-requisite programs	29	3	0	32
Corrective action	1	0	0	1
Total	**165**	**65**	**4**	**234**

NSW Food Authority
6 Avenue of the Americas
Newington NSW 2127
PO Box 6682 Silverwater NSW 1811
Phone 1300 552 406
Fax 02 9647 0026
www.foodauthority.nsw.gov.au