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Structure and Dynamics of Australia's Commercial Poultry and Ratite Industries

Prepared for:

Australian Government
Department of Agriculture, Fisheries and Forestry

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Report prepared for:

The Department of Agriculture, Fisheries and Forestry

Office of the Chief Veterinary Officer

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Published in June 2005
Updated December 2009

Acknowledgements

All those involved in this consultancy would like to thank the various industry bodies and individuals who kindly gave their time to provide information about their industry, company or property.

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Executive Summary

This report was commissioned by the Department of Agriculture, Fisheries and Forestry (DAFF) to compile information on the structure, husbandry and movement patterns associated with the Australian commercial poultry industry, including ratites.

This report looks at the basic structure of each poultry industry and the various physical, market and regulatory aspects that affect the dynamics of that industry. Horizontal contacts (which include such things as cartage contractors, vaccination crews and manure disposal) are also examined for each industry in order to determine how each could potentially impact on the spread of disease.

The chicken, duck and turkey industries use global genetics by importing livestock from international breeding companies. These imported birds enter Australia as great grandparent hatching eggs either through Torrens Island quarantine facility or industry owned quarantine facilities. Imports at regular intervals of six months to two years allow these industries to obtain genetically improved livestock and to correct any disease or negative production traits.

The chicken meat and egg layer industries established themselves either around capital cities or major provincial centres that were close to cereal grain cropping areas. Urban expansion has resulted in some conflict between local communities and existing poultry farms. Rural residential living has also increased land values significantly and resulted in councils and community members being less supportive of poultry farm developments. Environmental impact statements, community objections and council reluctance to approve new poultry facilities are making investment in the poultry industries more difficult. Access to regional land for further development has also proved difficult because of the limited availability of services such as water and power. The shortage of qualified trades people and labour has also impeded development in regional areas.

The livestock and product movements for the chicken industries are extensive with large numbers of live birds and eggs moving large distances all over Australia on a daily basis.

In the chicken industries, there are a growing number of free-range producers of various sizes that constitute a significant number of properties.

For turkeys, the number of producers remains stable but, in general, farm sizes are increasing.

For the other poultry industries, production is in the hands of relatively small producers who operate in varied locations but usually close to grain growing areas.

Most poultry enterprises farm only one species of poultry. The game bird, quail and speciality poultry operators are the most likelysectors to farm a variety of poultry species.

The chicken, turkey and duck industries all manage and house their breeding stock under biosecure conditions which reflects the value of the stock. All meat chicken and around 85% of turkey grow-out farms are single age. The duck industry, while generally having multi-age farm sites, is now recognising the health advantages of having single-age grow out farms.

The egg layer industry still has a large number of multi-age farms. Typically these layer farms rear pullets on site and have a birds of different ages in production to enable them to achieve a uniform supply of eggs to the market. These sites may also have a grading floor and a small mash feed mill.

With the emergence of several large integrators in the egg industry, there has been a progressive move to single-age farms with off-site rearing. The high incidence of Marek's disease in the early 1990s was one of the factors that influenced this change away from multi-age farms. Other poultry sectors operate multi-age farms and in some cases multi-age sheds.

The chicken meat, turkey and duck industries predominantly use processed pelleted feed, while the layer industry uses almost entirely unprocessed mash feed. The independent commercial feed mills usually have certified quality assurance programs which include a biosecurity policy.

There is no particular geographical pattern to poultry livestock and product movements within Australia. While records are kept by the chicken meat, layer and turkey industries on their livestock movements which readily allow traceability, such information for the niche industries is less readily available. The exception is the ostrich industry which keeps detailed records as this is an export requirement of the European Union.

Most live bird cartage in the chicken meat or egg layer industries is either undertaken by the integrator or by contractors who are closely aligned with a particular company, and generally well versed in the principles of biosecurity. There are some contractors that cart different types of chickens such as layer pullets, spent layers hens and spent breeder hens but they usually do not carry other poultry species.

The chicken meat industry and the egg layer industry are the only two poultry sectors that have significant vaccination programs. The chicken meat industry more commonly uses in-house vaccination crews while the more fragmented nature of the layer industry means that there are various vaccination crews that undertake vaccination on some independent layer farms.

Suppliers of fresh litter are numerous but as shortages of litter occur it is expected that the variety of materials used will increase, as will the diversity of the suppliers.

Manure and used-litter disposal is undertaken by numerous contractors, and different companies service different species. The destination of this material includes market gardens, cropping land and pastures, mushroom growers and various domestic uses.

Dead bird disposal is becoming more controlled because of Environmental Protection Authority and local council requirements. Burial on site is less common now in urban fringe areas, with most dead birds being removed by contractors and disposed of in landfill. In more rural areas, burial still remains the main means of disposal.

The adequate supply of potable water is an emerging problem for the poultry industry. In regional areas, particularly, there is greater dependence on surface water or bore water. While the technology is available to ensure surface water is effectively sanitised, the level of compliance with effective treatment varies, particularly among the smaller egg producers and other poultry industries.

The chicken meat and layer industries have significant industry representative bodies that liaise with industry members and government. The Australian turkey industry has its own federation, and both emus and ostriches also have representative industry organisations. The specialist market areas involving free range and organic poultry have codes of practice.

Summary of industry change since 2005

The salient changes within the Australian poultry industry since 2005 are summarised for each of the industry sectors.

- ## Chicken Meat

Since 2005 there has been an increase in the proportion of birds grown and processed by independent farms. This is due to both acquisition of some market share from the main integrators, and an increased proportion of market growth. Since 2005 there have been no notable changes in the acquisition of the smaller producers by any of the larger integrators.

One large international breeder of poultry (including broilers, layers and turkeys) has formed a company that oversees the post-arrival quarantine (PAQ) and breeding facilities for a broiler breeder in Australia and New Zealand (NZ).

While in 2005 three large integrators accounted for 70% of chicken meat production, there are now only two large companies (also accounting for 70% of production).

The level of live poultry or poultry product movements within national companies between states, between different companies or between processing plants has remained relatively unchanged.

In 2008 there were estimated to be 6.5 to 7 million adult breeder birds (Meat GGPs, GPs and Parents) in Australia.

The ongoing problem of obtaining planning approvals for new broiler farms continues to be one of the major difficulties for the chicken meat industry, particularly in Victoria, NSW and Queensland. The high cost of building sheds; the difficulties, delays and costs in getting permits; and some limitations in getting finance; all coupled with lower returns for growers, are resulting in declining quality broiler shed numbers.

There is a trend for the closure of farms in peri-urban areas such as the Mornington peninsula near Melbourne and loss of broiler farm contracts in the Mangrove Mountain area in NSW. Because of the increase in rural residential living, new broiler farms and complexes are being built on larger landholdings and further away from processing plants

Free range broiler production has continued to increase since 2005. Most major broiler integrators now produce free range birds.

Raw material availability and feed costs have been affected by ongoing drought conditions. Broiler ration costs for 2006 to 2008 have been at historically high levels, and the availability of cheaper raw materials limited.

The availability of potable water is still a major problem in the southern states. Reduced flows from bores, the absence of rain to fill dams and the reduction of allocations from irrigation systems by the water authorities, have affected the operation and running costs of many broiler farms.

- ## Egg Layer

Egg consumption has continued to increase across all sectors from whole shelled eggs, to further processed eggs and takeaway food. During 2007-08 there was an estimated annual production of 312 million dozen eggs from a national flock size of 18.931 million hens. This

national flock size includes all laying stock (including that in rear), commercial production, and back yard poultry on 30 June 2008. The gross value of production at the farm gate was $459.4 million per annum for 2006-07.

Under the *Commonwealth Primary Industries Standing Committee Model Code of Practice For the Welfare of Animals, Domestic Poultry 4th Edition* all cages not meeting particular standards as outlined were to be decommissioned by 1 January 2008.

The growth of non-caged layer systems has increased every year since 2005. Some estimates indicate that as many as 32% of all Australian layers are housed under free range or barn systems of management.

The production locations of the egg industry remain similar 2005, except for an increased closure of peri-urban farms for redevelopment, and newer farms being established in regional areas.

- **Turkey**

There have been no fundamental changes in the Australian turkey sector since 2005. In 2009, turkey stocks were estimated to be: 1200 Grand Parents; 4500 Parents; and commercials (around 3.9 million in late 2008) around 4.2 million. There have been some minor changes to the structure of the turkey industry in Australia since 2005.

- **Duck**

The duck industry established a peak industry body in 2008 to enable industry representation. The Australian Duck Meat Industry Association was formed in May 2008 and this body has obtained membership of Animal Health Australia alongside the chicken meat and egg layer industries.

- **Ratite**

Between 2005 and 2009, the emu industry has seen no new commercial farms starting up, and some existing commercial farms either leaving the industry or scaling back their flock size to non-commercial numbers. In some states, commercial farming has ceased due to the difficulty in accessing processing facilities. There are a few farms which still farm emus commercially. Data from the Ratite Slaughter Levy indicates that 5344 emus were slaughtered in processing plants in Australia in 2007-08 (DAFF, 2009).

Emu oil is still the most valuable commodity produced by the industry. Emu oil is registered with the Therapeutic Goods Administration and can be listed as an active ingredient in cosmetic products and over the counter remedies in Australia. Oil is also exported to the European Union and into Asia. Some producers market their oil from the farm gate or on the internet.

In 2007-08, the Ratite Slaughter Levy reported that 4165 ostriches were processed in Australia (DAFF, 2009). This is a decrease in the number of birds processed in 2005, with 8330 ostriches processed in the first 9 months of the period July 2004 to April 2005.

- **Squab**

The squab sector remains similar to that in 2005.

- **Quail**

There have been only minor changes in quail industry since 2005. The quail producers interviewed around Australia in 2009 report that there has been no significant change in the

size of their flocks in the last three years. Some producers, as they near retirement, are producing fewer birds per week than they did three years ago.

- ## Game Bird

In 2009, producers involved in the game bird industry reported that the market demand for game bird products was strong. Distribution of game bird farms is still concentrated in the eastern states of Australia.

- ## Geese

There were no identifiable changes in this small industry sector.

- ## Specific Pathogen Free

One company remains the single Australian producer of SPF eggs. The Australian SPF company operates under the European Pharmacopeia 5.2.2 standard which excludes CAV positive eggs from its "Premium Plus" SPF eggs.

- ## Live Bird Sales and Auctions

In a recent study by University of Sydney researchers, 51 bird sales venues were identified in Australia, with NSW holding more sales (15) than other states. Most bird sales were held regularly (from twice a year to weekly sales), with only ten markets being held annually. There are no continuously populated live bird markets in Australia, and slaughter of birds on site is not permitted.

- ## Small and Mixed poultry Enterprises (Niche)

The structure of the industry remains essentially unaltered from 2005. There has been no importation of any specialist type birds for any of these niche markets. Much of the grow out stock is obtained from external suppliers and the uniqueness of the bird is primarily determined by the way it is housed, grown and fed rather than by genetics. Increasing feed prices have put financial pressure on the niche market sector.

Chapter 1: The Chicken Meat Sector

1.1 Introduction

Consumption of chicken meat in Australia during 2006-07 is estimated to be around 811 591 tonnes which is equivalent to around 454 million birds. This is equivalent to approximately 37.4 kilogram consumption per capita or the processing of around 8.73 million broiler chickens per week. This is an increase in consumption from 2004-5, when approximately 687 960 tonnes, equivalent to around 430 million birds, were consumed. (32.7 kilograms per capita consumption or the processing of around 8.3 million broiler chickens per week).

The Australian Bureau of Agricultural and Resource Economics (ABARE) figures for chicken meat are based on the formula that chicken meat consumption is 94.9% of all poultry meat consumption.

Consumption was predicted to increase around 0.2 kilogram per year.

Obtaining planning approvals for new broiler farms continues to be one of the major difficulties for the chicken meat industry. This is particularly so for Victoria, NSW and Queensland. The high cost of shedding, the difficulties, delays and costs in getting permits and some limitations in getting finance all coupled with lower returns for growers is resulting in declining quality broiler shed numbers. Production localities principally remain unaltered to those described in 2005 and are shown in Figures 1.1 and 1.2. There is, however, a trend for the general loss of farms in peri-urban areas such as the Mornington peninsular in Melbourne and loss of broiler farm contracts in the Mangrove Mountain area in NSW. Because of the issues of rural residential living new broiler farms and complexes as has been discussed above and being built on larger land holdings and more distant to the processing plants

1.2 Background

Before the 1990s, chicken meat strains were all of Australians origin and the Australian chicken meat lines (broilers) were variable in both performance and carcass quality. Liveability in growing stock was generally acceptable where operators maintained their breeding stock free of disease agents such as *Mycoplasma gallisepticum.* Fertile egg production and day old production was generally poor by international standards.

New genetic material in the form of hatching eggs imported through Torrens Island quarantine station in South Australia gave the industry an opportunity to upgrade the genetics of the Australian broiler bird.

Two key factors prompted the importation of international strains of meat chickens. One was the increasing commercial pressure on the smaller less vertically integrated companies for the supply of breeder birds, fertile eggs and day old chickens. The other was the recognition that the small Australian gene pool was limiting the rate of genetic improvement. The initial outcomes of these importations were varied. While advantages were seen in egg production, hatchability and better growth rate, the carcass conformation (particularly fat content) was not viewed favourably by some processors and customers.

There was also need for improvement in both husbandry and housing if the level of performance of these new strains was to approach their genetic potential. Two major disease episodes also dramatically affected certainty about whether new breeding stock should be imported into Australia. These were Marek's Disease (MDV) which seriously affected both imported strains and saw batch mortalities exceeding 50%, and J-Leucosis which predominantly affected the Ross strain. During these times there was a move back to the utilisation of the only indigenous broiler breeder strain left, the Bartter bird.

Productivity losses were high which necessitated a total review of husbandry practices as well as the importation and registration of the type 1 Rispens Marek's vaccine. J-Leucosis was only resolved after further importation of J-Leucosis free stock. While J-Leucosis testing is not mandatory, most importing companies now test their stock for J-Leucosis.

1.3 Genetic Breeding Stock

Importation through the Torrens Island post-arrival quarantine (PAQ) facility created problems due to limited positions available to competing importers. The government-owned Torrens PAQ facility is operated under government supervision by a consortium of Australian poultry companies. Other poultry species including commercial layers, ducks and turkeys were also using Torrens Island. The large gap of up to five years between importations meant that there was limited ability to take advantage of the continued genetic improvements of the meat chickens seen overseas. Also, when problems occurred such as J-Leucosis, the time taken to correct this stock deficiency was prolonged. Two of the major chicken meat integrators decided to construct their own private importation facilities in line with government regulations. This allowed the more economical importation of larger numbers of great grand parent birds (GGPs) as frequently as every six months. This has enabled Australian producers to maintain their chicken meat genetic gain at a level comparable with that of other international companies to Australia.

Despite the construction of two privately owned PAQ importation facilities, and the recentreduction of the quarantine period from 12 weeks to 9 weeks for chickens and turkeys, there are limited positions in the Torrens Island quarantine station available to competing importers, with requirements allocated out until 2015. This means that the opportunities for the importation of new lines of birds, particularly those competing with existing available genetic stock are limited without the development of existing or other PAQ importation facilities.

Today there are no longer any indigenous broiler strains used by the major meat chicken producers. There are, however, remnants of these strains within alternate system producers. Invariably, either through take-overs or direct purchases of parent breeder stock, most integrators have a number of strains within their operation.

The smaller operators see the option of running several parent strains as an advantage to establish business relationships with the breeder suppliers, to offset concerns about negative changes in the performance of particular strains and finally as a buffer against limited access to certain breeder stock. Limited access has occurred during previous episodes of emergency diseases such as Newcastle Disease (ND) and Avian Influenza (AI).

Imported stock is brought in as GGPs usually every six to twelve months in privately owned facilities and every two or more years through Torrens Island PAQ facility. GGP and Grand parent (GP) facilities are usually located in the same region as designated hatcheries. Day old parent breeders (PBs) are then distributed by road transport and occasionally by air transport to parent facilities located in Victoria, NSW, South Australia, Queensland and

WA. There are no parent breeders in the Northern Territory and ACT. Parent broiler facilities for each integrator generally supply fertile hatching eggs to state based hatcheries from which day old chicks (DOC's) are delivered to regional broiler (grow out) farms. Historically, processing plants and grow outs were centred around and relatively close (in distance terms) to the major metropolitan cities, with outlying farms no further than 50 kilometres away. However, rural residential living and community concerns about poultry sheds have necessitated changes to the traditional location of parent breeder farms and broiler farms.

Australia is viewed favourably by the international poultry genetic companies as a location for genetic stock for the following reasons. Australia is considered politically stable, has well structured and implemented animal health programs including quarantine and biosecurity, and is considered at a lower risk of terrorism activities (physical or biological) which can immediately close borders and restrict all movements. With this favourable consideration of Australia, one large international breeder of poultry (including broilers, layers and turkeys) has formed a company to supply domestic and international markets. This company oversees the PAQ and breeding facilities for broiler breeders in Australia and New Zealand (NZ).

1.4 Levels of Integration and Live Sales

In 2005, the degree of vertical integration between the various chicken meat companies varied considerably and the majority of meat chickens (70%) were produced by three main integrators. In 2009, however, there were only two large vertically integrated companies producing around 70% of meat chickens. The remaining 30% of meat chickens are produced by smaller vertically integrated companies and small processors. Growers contracted to processing companies produce the majority of meat chickens. Since 2005 there has been an increase in the proportion of birds grown and processed by independent companies. This has occurred through both acquisition of some market share from the main integrators and also an increased proportion of market growth.

There has been constant activity by smaller processors and grow-outs looking for more independence in the supply of livestock, in particular, live birds and DOCs. This has been driven by the tighter margins at all level of the industry. Such activity may involve small independent poultry processors, grower groups or non-aligned individual chicken meat growers who have moved out of a contracted relationship with a major company. The limited ability to get a reliable independent source of DOCs, the absence of available excess breeder facilities and hatchery space, limited availability of quality grow out shedding, and the high capital entry cost, has meant that none of these interests have progressed.

Completely integrated companies have their own genetic breeding stock, parent breeders, hatcheries, broiler grow out, processing plants, rendering facilities and feed mills.

The next level of integration is seen with companies who purchase parent breeders but other than that are vertically integrated. Feed supply may come from an independent commercial supplier. Some companies also purchase fertile hatching eggs and/or DOC's.

In contrast, live sales customers purchase live grown broilers for processing in their own plants and distribution to customers. This is not a small sector of the market, being in some states responsible for over 10% of all processed broilers. While paying a premium price for the live bird these small processor are generally able to buy specific weight birds and in a weight profile that suits their particular market type. This enables a greater utilisation of all

birds for the fresh market, reduces the requirement to sell excess stock or portions at reduced prices and, most importantly, the need to freeze birds or portions. The freezing of processed chicken meat in Australia dramatically reduces the commercial value of this stock and its profitability.

The nature of the Australian chicken meat industry, where two companies can be both customers of each other and at the same time competitors, can sometimes create strained trading relationships. It is in part for this reason that there has been a trend for the smaller producers to try and obtain independence via a greater level of vertical integration. Outcomes here have been varied with some companies growing substantially to become major industry players while others ceased operation as a consequence of unsustainable economics.

Where the economic margin on parent breeders, fertile eggs and DOCs is always profitable, the wholesale price of processed chicken meat can vary dramatically (by in excess of 50%). Profitability over the last decade, consequentially, has been unreliable and this in part has resulted in the consolidation of the number of industry players. Between 1990-95, six or more small to medium sized integrators have exited the chicken meat industry. While some have had financial difficulties an equal number have evaluated the long term economics of the poultry industry from an investment risk aspect and have decided to exit the industry to seek higher and more reliable returns.

Since 2005, profitability in the chicken meat industry continues to be unreliable and this has further been pressured by the high prices of feed and fuel over the last few years. Compliance costs including those for food safety, occupational health and safety and human resources have also increased directly and indirectly through the employment of more staff dedicated to these areas. The ability to pass these costs on to the retailer or consumer has been limited. Where it has been passed on to the live sale customers this has placed profit margin pressures on the viability of their businesses.

In 2009, one large international breeder of poultry (including broilers, layers and turkeys) formed a company to oversee the PAQ and breeding facilities for a broiler breeder in Australia and New Zealand (NZ).

1.5 Chicken Meat Markets and Product Movements

The level of live poultry or poultry product movements within national companies between states, between different companies or between processing plants is quite extensive in the Australian market. This is in general driven by supply and demand imbalances within individual companies created by livestock performance variations or market fluctuations.

Since 2005, there has been a greater expansion of chicken meat production in South Australia in part associated with some local government support and also a more expedited planning approval process.

The most difficult task of any company is planning for future chicken meat sales. As lead times are extremely long, increasing projected sale volumes requires capital investment and significant outgoing cash flow before any returns are realised. As an example, if a company decides that they wish to increase their sales volume long term by 10% (normal annual industry growth is around 2 to 5%) based on predicted increased sales and new market growth there is a need to increase breeding stock numbers and acquire all the necessary infrastructure for handling these increased numbers.

There will be a requirement for new rearing and breeding facilities, transport upgrades, hatchery upgrades, increased broiler grow out and processing capability expansion. The

capital required for this is substantial and this is added to by cash costs which include livestock, labour, disposables, feed and services. The final processed product will then be invariably sold on 30 day terms. The time between capital expenditure on expanding the rearer breeder facility until the first increased sales can be 11 to 12 months. The failure at the end of this period to realise sales expectations can (and does) cause serious financial pressure on chicken meat companies. Oversupply in the market has serious negative consequences for the entire industry because processed chicken meat has a short shelf life and has to be sold quickly. There is also the need to meet the cash costs associated with items like feed, grower fees, labour costs etc. thus necessitating low price selling in an over supplied market.

For the reasons above, a five year strategic plan is difficult to develop in the poultry industry. This produces what is now seen as the cyclic to variable patterns of growth in the industry ranging from limited maintenance and capital expenditure to aggressive growth and acquisition.

The finished product profile is continually changing in the Australian market. Demand was initially for whole frozen chickens, then fresh whole chickens and then increasingly for takeaway, portions and ready to cook products. As a consequence of this, economics have demanded the growing of larger live birds in the field. This pressure on grow-out densities resulted in companies lowering placement densities, typically by around two birds per square meter. Contracted growers then increased their fees to offset the resulting productivity loss. Larger killing weights also necessitated processing line upgrades and greater processing plant productivity.

Further processed cooked product, while requiring substantial capital to set up, does allow the use of excess portions during fluctuations of fresh product demand. It can also allow the use of recovered meat products and improve returns.

Typically most processing plants do their first live bird catching and transport (pick-up) at around 1.60 to 1.70 kilograms live weight and these birds process out at around a 70% yield to produce a size 11 to 12 bird. These birds are typically used for the take away market.

Next pick-up is around 2.2 kilograms and these bird can be sold as bagged whole birds or tray packed. Finally, the last pick-up is for birds around 2.9 to 3.4 kilograms and these birds are used primarily for de-boned products such as breast and thigh fillets. These larger processed birds are often on sold to what are commonly known as de-boners who specialise in preparing not only the fresh portions but also further processed products such as Chicken Kievs. These products not only get distributed to consumers through such groups as specialist chicken retailers but also supply the restaurant and catering trade.

The supermarkets are a major purchaser of chicken products in Australia. However, company branding of chicken is still limited for those trading through the supermarkets and producers wishing to market products with specific branding claims generally need to expand their market outside the supermarket chains.

The next prominent area of sales is butchers, who often do their own de-boning.

Meat recovered from de-boned carcasses is used for products such as sausages, chicken loaf and chicken nuggets. Skin is also a valuable recovered product that is used primarily to enhance the taste of some products. Hard offal, which includes de-boned carcasses and necks, is sold in limited quantities to the direct retail market but is more commonly used in the manufacture of pet food. Some companies have their own pet food plants and these can contribute significantly to the profitability of a company. Soft offal and chicken heads can be used for pet food but are more often rendered into poultry offal meal by company-owned

or outside rendering plants. Feathers are rendered into feather meal by a process which includes enzyme digestion.

Poultry offal has a high protein and moderately high fat content making it highly sought after by the international markets, particularly Asia, for livestock feed. This demand currently exceeds supply. Poultry offal is less often used in Australian poultry rations and feather meal, while a good source of sulphur containing amino acids, is now also not commonly used. Both products trade on the commodity market as a premium alternative to normal ruminant meat meal.

The reader is referred to a book titled "The Changing Chicken" by Jane Dixon, UNSW Press in order to obtain an overview of change in the chicken meat industry in Australia since World War Two.

Export of chicken meat is not significant. The expected increase of export sales as a consequence of concerns about AI in Asia did not materialise. However, the export of genetic stock from Australia to Asia is seen as a potential expanding market. There are limited exports into the Oceania, SE Asia and South Africa.

1.6 Typical Structure of Chicken Meat Flocks

Great Grand Parent (GGP) and Grand Parent (GP) Flocks

In 2008, there were an estimated 6.5 to 7 million adult breeder birds (Meat GGPs, GPs and Parents) in Australia.

Since 2005, the importance of these elite flocks as repositories for overseas breeding stock has increased. The number of GP's and parent breeders exported out of Australia is expected to increase significantly over the next few years. This is particularly so with the recent acquisition of a PAQ facility and GGP and GP facilities by a large international company. The increase is also likely now that two of the three Australian producers of broiler breeder stock are independent of the chicken meat producers. There are currently no specific health issues affecting Australian breeding stock, unlike the health issues associated with J-Leucosis in the early 1990s. All strains of breeders, however, have experienced increased difficulties with male fertility and hatchability under increased husbandry requirements.

After importation through either Torrens Island or private quarantine facilities, the small GGP flocks are maintained in facilities under a high level of husbandry and biosecurity. Typically, in the GGP import there will be one male line and two female lines. Within each of these lines there are both male and female lines. Genetic selection for growth and meat yield in the broiler has put significant pressure for reproductive performance on the meat breeder. Hence, while the male line is essentially selected for broiler traits, the female lines still maintain some selection pressures for egg production and hatchability. Despite this, there is still the need for specialised husbandry practices with chicken meat lines in order to achieve reasonable reproductive performance. Because of the high value of individual birds, facility quality and husbandry inputs are optimal. Vaccinations are usually typical of what all levels of breeder stock obtain but in some cases certain vaccines like those for Mycoplasma may be excluded to assist avian disease serological monitoring programs where vaccination could make differential from wild type infection difficult.

Where limited exports occur with breeding stock, this may also restrict the ability to use

certain vaccines. While vaccination for Newcastle disease (NDV) is obligatory in most states in Australia, some companies are seeking to implement strict biosecurity practices at their GGP facilities. This stock is also usually maintained under tight physical security to avoid theft of valuable genetic material and when flocks are depopulated they are invariably slaughtered under strict agreements.

Where imports are not regular, GGP birds must be generated from existing GGP stock. The disease status of these GGP birds is critical as the multiplier effect from GGP to GP to Parent Breeder to progeny is substantial. Similarly, undesirable genetic traits in individual birds can have a major impact.

GP flocks are usually located in the same locality as the GGP and they are maintained under similar husbandry conditions. There are two GGP facilities in New South Wales, one in South Australia and one in Victoria.

A designated hatchery is used for the hatching of parent breeders (PBs). These PBs are the source of broiler progeny and are transported as day olds to the various PB rearer farms that are located in most states in Australia. This may be to company farms or those of other integrated chicken meat companies.

While all feed supplied to the mainstream chicken meat companies is heat treated pellet feed, there is some interest in using vegetable based protein ration for GGP and GP flocks based on concerns about salmonella in meat and bone meal; however, sterility may be affected more by the milling process than the source of the protein.

Parent Breeders (PBs)

Physical treatment of birds may include trimming of the back toe of males at one day of age and beak tipping of male and females at around five days of age. Females are less commonly beak-tipped as the incidence of cannibalism and egg picking has been reduced by improved facilitation and management. Males are still commonly beak-trimmed to reduce the amount of neck scruffing damage done to females during mating. Back toe removal in the male is to similarly avoid damage to the female during mating.

The vaccination program in PBs is quite extensive. The value of stock justifies this investment against disease and to boost maternally transferred antibody levels to protect the young broiler chick against immunosuppressive disease such as Infectious Bursal Disease (IBD). More recently, to avoid loss of uniformity during rearing due to challenges with coccidiosis, most breeder rearing is done using a coccidial vaccination program. Killed NDV vaccination is not mandatory in broiler breeders but live NDV (V4) with monitoring serology must be undertaken. A new imported coccidial vaccine has been introduced onto the market and now industry may choose between using the imported or locally produced product. Salmonella vaccination is undertaken by some operators using autogenous killed products.

PBs can be reared either in “day old to death” facilities or in designated rearing facilities where birds are moved to designated breeder facilities at around 20 weeks of age, referred to as “rear and move”. Since 2005, the latter is becoming more common due to changes in production shed design. New designs use slats and automated nest box systems rather than the older style deep litter sheds with manual collect nest boxes. Each approach has its advantages and the choice is influenced by available company facilities, time requirements, disease control programs and available staffing. Shed designs are varied but include the three major types which include natural ventilation, fan-assisted and controlled environment (CE). All housing is based on floor rearing referred to as the barn or deep litter system. This

is distinct from the trend in commercial layers for colony cage rearing. Preferably young birds are reared in light controlled sheds which can be blacked out in the newer controlled environment type sheds or dimmed in the case of the older style fan-assisted sheds. All new shedding has automatic nest box collection systems with partially slatted floors in the sheds. While these systems benefit from a lower labour cost and greater hatching egg recovery, there are some losses in hatching egg fertility.

Ambient light control is required to reduce the birds' activity while being reared on significantly controlled feed intakes. PBs have the genetic growth potential of broilers and if allowed to eat ad lib, the males will approach weights of 3.0 kilograms at 7 weeks of age and the females 2.3 kilograms. For successful reproductive performance these weights need to be reached at closer to 20 weeks of age. Such strict weight control necessitates ambient light control of around 10 to 12 hours per day, low density feeds and automated feeder systems that allow rapid distribution of prescribed quantities of feed to all birds almost simultaneously. Compared to ad lib feeding times with broilers and commercial layers, feed times for rearer breeders are between 30 and 120 minutes. Under these specific husbandry conditions, the manager must also ensure that the young breeders maintain the correct body weight to age profiles, correct conformation and, most importantly, flock uniformity. The weekly weighing of a sample population of birds is required to allow quantitative feed adjustments and the grading of birds into various pens containing particular weight profiles is common.

From around 20 weeks of age the light intensity and period for PBs are increased in order to stimulate laying. In a rear and move system, the PBs are moved across to the production (laying) farm at around 21 weeks of age. Light hours are further increased as are the feed quantities (up to around 16 to 17 hours light at 27 weeks of age or around 70% production). Peak production of around 85% hen day production is achieved at around 30 weeks and on a peak feed intake of around 155 to 175 grams (this compares to commercial layers which peak around 95% on 110 grams of feed). The male to female ratio is around eight to ten per cent males and a female breeder hen will produce around 150 fertile hatching eggs by 64 weeks of age. At this age the flocks are usually depopulated. As in rearing, the monitoring of body weights and maintaining the correct body weight profile against net nutrient intake is critical if a producer is to achieve optimal breeder performance and hatchability.

Sheds of breeder farms usually contain between 7000 to 10 000 birds and each single age farm unit has between 20 000 to 40 000 PBs. The actual farm size is dependent on the company's weekly hatching egg requirement. As the hatchability of fertile eggs declines rapidly after eggs have been stored in a cool room for ten days, it is critical that production outputs match hatching egg requirements. This again emphasises the importance of planning in the chicken meat industry where shortages or over production can be economically damaging.

Breeder farms are generally located away from broiler grow outs and other types of poultry. Since 2006, a number of new broiler breeder facilities have been built in South Australia, Queensland and Victoria. Some operations, as a consequence of historical growth, still have breeder facilities located regionally near broiler farms or hatcheries. New expansions are generally undertaken on breeder farm complexes where there may be several rearing and breeding farms located within eyesight of each other but usually at least 500 metres distance. These complexes are multi-age.

The majority of breeder farms are maintained under biosecure conditions which include perimeter fences, shower on facilities and mechanisms by which hatching eggs and (in some cases) feed and other services can interact with the farm without entering the farm proper. Water supplies are not uncommonly derived from non-main water supplies because of the

isolation of some of these farms. Underground or surface water is used as an alternative, the later sanitised using chlorine or chlorine dioxide. Feed is always processed pelleted feed and delivered in sealed transport vehicles. Inside sheds, feed delivery systems are both trough or pan feeders and the majority of farms have nipple drinkers.

Egg collection systems are progressively moving away from the traditional single or double tiered manual collect nest box to automated egg collection systems. While the cost of labour and its availability is the driving force here, aspects related to occupational health and safety (OH&S) are also considerations. Such systems consist of a percentage of the floor being slatted with the rest consisting of deep litter. Nest boxes are either of the single hole or colony nest type with an automated egg belt running back into the centralised collection point in a partitioned area at the end of the shed. Variations on this include the inter connection of a number of sheds with anacondas (egg conveyors) as seen in commercial egg laying farms.

Egg collection costs range from around four to six cents per egg for manual collection systems, to two cents for automated systems. Manual floor collections are still generally required for the small number of eggs that are laid on the floor and / or slats and this is undertaken between eight to four times a day depending on the production time cycle. Nest box or egg belt collection occurs three to four times a day. Recovery of useable settable eggs is around 95% with the remaining rejects and double-yolkers being utilised in a number of ways, including egg pulp, through the commercial laying company grading and processing plants.

There are also new style broiler breeder facilities which are certified to European standards with colony cages. These are the most modern type of PB facilities developed in Europe.

Breeder hens are depopulated around 64 weeks of age and are taken to either company processing plants or to specific poultry processing plants that specialise in processing spent breeder and layer hens. Recently, the trend has been for the owners of spent broiler breeder hens to slaughter birds, rather than independent processors. The meat from these birds is used in further processed products such as chicken loaf and soups.

Transport contractors involved in spent hens movements pose a potential biosecurity risk.

1.7 Fertile Egg Movements and Hatcheries

Movement of fertile chicken meat eggs is extensive throughout Australia both within and between companies. Some chicken meat producers, despite having their own breeding stock, are dependent on other domestic producers to supplement their production to assist them to achieve a relatively constant output of processed chicken meat. This occurs because of the difficulties of aligning breeder production with hatching egg requirements. This is particularly evident for Christmas placements in October, where several weeks of high fertile egg demand alone does not justify incremental increases in breeder numbers for this short period.

The increase in broiler demand has resulted in some significant hatchery developments in Australia. The recognition that chick quality not only affects first week mortalities but also broiler performance and carcass quality has encouraged producers to invest large amounts of capital in modern hatchery buildings and technology. All the equipment and technology is acquired and imported from overseas. The majority of hatcheries have moved way from multistage machines to single stage machines, where batches of eggs of similar characteristics are incubated in conditions precisely suited to those eggs. Hatcheries have traditionally used what are termed ‘multistage machines’ where each incubator has six rows

(two trolleys in each) of eggs at different stages of incubation and average incubation settings are used for each stage. At 18 days the two trolleys of incubated eggs are then transferred into hatchers where they are incubated for a further three days, and chickens taken off at day 21.

While hatchability and liveability are important criteria for chick quality, early growth and conformation are also becoming of significant importance. Hatchability peaks are usually around 90% and decline to 70% at the time of the breeder flock depopulation.

Broiler hatcheries within Australia can range in capacity from around 500 000 to well over one million DOCs per week. Treatments in broiler hatcheries usually includes aerosol spray for Infectious Bronchitis (IBV) and MDV. Most MDV vaccination is now by in-ovo technology at the 18 day transfer from setters (incubators) to the hatchers. As the undertaking of MDV vaccination of day olds is considered a significant cost, the industry is always monitoring the return on funds for this procedure. This is measured in improved Feed Conversion Efficiency (FCR) and liveability. NDV vaccination is now more commonly undertaken as a day old spray in conjunction with IBV.

Control of the disposal of hatchery waste and effluent from the hatchery wash-down still remain costly activities. Disposal of hatchery waste can be problematic with significant quantities of egg shell, yolk material and unhatched chickens being produced daily. This material may go to rendering, local waste collection or, less frequently, burial. Effluent from the hatchery wash-down is usually (under licence) directly into sewer or into effluent treatment systems, particularly those involving settlement ponds. Wash-down and sanitation of hatchery buildings and equipment are significant operating costs. Total operating costs per DOC are around 10 cents. Consistent with the entire poultry industry, procuring staff to work in hatcheries can be difficult. This can be complicated by atypical work hours (5.00AM to 2.00PM).

Water use in the southern states like Victoria has also come under pressure from the local water authorities with industries using over 10ML per year required to submit water savings plans to reduce water consumption by around 10%.

Egg hygiene followed by hatchery hygiene remains critical in all hatchery operations. Fumigation is still normal operating procedure in many hatcheries providing there are detailed standard operating procedures (SOP) in place with monitoring.

Eggs are normally palletised, shrink wrapped and carted by independent refrigerated transported companies. Efforts are made by the purchasing company to ascertain the health status of suppliers' donor flocks,. The pressures on management to maintain product supply are dominant. The cardboard egg fillers used for the transport of these eggs can be a potential source of contamination if used elsewhere in the system.

Broiler hatcheries are generally regionally located near the broiler grow outs with DOCs transported in transport vehicles that are mechanically ventilated with heated or cooled air. The design of these trucks is important, particularly when chicks are transported long distances or under extreme weather conditions. While the majority of DOCs are carted only within states, companies may move chickens interstate to accommodate for planning changes, or sell DOCs to other interstate companies. In some cases DOCs are air transported. There are also small numbers of hatchery door sales of DOCs to anyone from free range farmers to schools. Broiler hatcheries within Australia can range in capacity from around 100 000 to 800 000 DOCs per week. Hatching is usually done on Mondays, Tuesdays, Thursdays and Fridays.

Again, to obtain competent qualified staff to manage hatcheries is increasingly difficult in

Australia. The work requires a unique expertise in chicken physiology and equipment operation as well as significant managerial and human resources skills. Coupled with this is the need for long hours and constant on-site presence.

1.8 Broiler Grow Outs

Farm Structure and Type

The high cost of shedding, difficulties in getting permits, and some limitations in getting finance coupled with lower returns is resulting in a net deficiency in quality broiler shed numbers. Some of this has been accommodated for by increased broiler growth rate performance and decreased batch times, but a net deficiency of broiler sheds seems likely if the growth in population and chicken meat consumption continues.

In Australia the majority of broiler farms are independent contractors, some are company owned and, more recently, farms are being bought or built and operated by investment groups. This is a new concept in broiler growing in Australia and has in part been driven by the desire of processors to realise the capital of company owned farms, to establish relationships with parties who will grow for lower grow fees and to diminish some of the difficulties of staffing broiler farms.

Another important factor is the growing concern of the typical independent contractor about costs of building and operating a modern broiler farm. Firstly obtaining suitable land for building sheds has become difficult due to a shortage of low cost land with the services and infrastructure (especially water) required by broiler farms. This difficulty is enhanced by the growth of residential development in rural areas. The objections from neighbouring residents of broiler farms to alleged odour, dust and toxic effluents have made councils reluctant to support broiler farm applications.

The ongoing problem of obtaining planning approvals for new broiler farms continues to be one of the major difficulties for the chicken meat industry. This is particularly so for Victoria, NSW and Queensland. The developments of broiler codes such as those implemented in Victoria did not significantly resolve the pre-existing problems with the processing of broiler farm applications. Despite these planning and objector issues many applications were still granted permits. Permit conditions, however, are often considered onerous by the applicants and yet inadequate by objectors. Odour, whether real or perceived, continues to be the main cause for the objections against broiler farm applications. The role of environmental risk assessments is playing an increasing role in applications.

Some councils and responsible authorities, experiencing a decline in rural sector activities and, correspondingly, rate revenue, are providing in-kind assistance to facilitate broiler applications. However, this does not negate the right of appeal from local residents or assist with the need for major infrastructure like roads and services, including power and water.

The inconsistency between states in planning and environmental requirements frustrates the industry's attempts at long-term planning. With the growth of chicken meat consumption by two to five per cent per year, and the need for substantial shedding expansion to meet these numbers, the chicken meat industry is facing both a dilemma and an uncertain future.

With regards to the structure of farms, the current Australian broiler single age farm is a mix of smaller farms utilising old technology (20 000 bird sheds and total farm size of 60 000 birds) and larger, more modern farms (50 000 bird sheds with over 300 000 birds in total) with shedding that meets world best practice standards. There are also several larger farms that are or were originally processor farms.

There are pressures on farmers to increase the size of sheds and farms (in order to improve the economy of scale) but limitations as to how many birds of a single age a processor can handle. In general, processors would avoid having more than thirty per cent of their birds in any one week coming from a single farm.

Farm complexes are becoming more common as the need to purchase land in rural locations and spend large amounts of capital for services such as power, water and roads requires larger numbers of birds at the one site. The complex structure also assists with logistical issues of feed delivery using B-Doubles, live bird catching crews and shed cleanout and wash-down crews.

Older style shedding is of the 'natural ventilation' type, with a curtain or flap side wall design and a ventilation ridge, a fogging or misting system for cooling in the hot weather, mixing fans and general manual controllers. These sheds, while economical to run, have limitations in ventilation, temperature and light control. The latter is becoming important if processors undertake daytime pick-ups and for some strains where behavioural patterns can lead to back scratching. Generally, in hot weather after continued fogging, litter moisture control becomes difficult in such sheds and general biosecurity control of wild birds is more difficult. While competent growers can get good performance out of these sheds, the high labour input generally restricts the size of the farm and bird numbers. Stocking densities in such sheds are generally low and enforced under state and territory animal welfare legislation.

Older technology farms such as natural ventilated and fan assisted sheds are gradually exiting the industry. Some of these are losing contracts because of suboptimal performance, inefficiencies and costs of upgrading the facilities. To remain profitable, some older style broiler farms have started producing free range broilers or layers, or rearing pullets for commercial layer industry. Others farms are taking advantage of the alternative to redevelop the site for rural residential housing. In Victoria this option has been limited due to changes in the planning laws involving what are known as 'Green Wedge' zones.

The next level of shedding is referred to as 'fan assisted', where a number of extraction fans are incorporated to assist in the early brooding and weaning of birds from early growing conditions. This style of shedding proliferated in the late 1980s and up to the mid 1990s when growers were trying to reduce running, power and building costs.

All new shedding constructed for intensively housed broilers is now of the combi–tunnel design, incorporating the principle of transitional minimal ventilation. The cost of each one of these modern facilitated sheds is around AU$700 000 without land, housing, earthworks and other infrastructure costs. New sheds are designed to accommodate around 50 000 to 60 000 birds placed at a density of 21.5 birds per square meter with farm size around 300 000 birds being incorporated in 6 sheds.

"Controlled environment" shedding is as described, giving the grower the ability to grow chickens with less impact from ambient conditions. While earlier controlled environment sheds built in the 1970s and 80s were of a cross flow design with high construction and energy costs, current designs use a tunnel ventilation design. This has the majority of fans at one end of the shed and an air inlet either coming through small vents along the wall (mini-vents) or air coming in through large shutters at the other end of the shed. Incorporated into these shutters are cooling pads designed to provide evaporative cooling in the summer.

The design of sheds with fans predominantly at one end and large free span sheds has some economic advantages. The principle of tunnelling air under negative static pressure provides a chill factor to the birds, enabling improved ventilation and cooling in hot weather without the need to introduce cooling. Generally, these sheds run at a static pressure between 20 and

25 pascal with an air speed of three metres per second. These sheds are also controlled by sophisticated electronic controllers with ventilation and temperatures profiles, alarms etc. These can allow the shed to make intelligent decisions depending on ambient conditions and allow remote access to point of time shed operation anywhere in the world. Such modern shed design and facilitation has allowed individual growers to operate more birds (up to 300 000) with some part time assistance.

Shed dimensions are around 15.25 by 130 metres (50 x 425 feet) and birds are usually placed at 20 to 21.5 birds per square metre. At 1.8 kilogram pick-up, this equates to around 36 to 39 kilograms per square metre which is within the code guidelines. In most cases the first pick-up is at around 1.65 kilograms live weight.

The size of sheds and broiler farms continue to increase because of economies of scale associated with building and land costs and logistics (getting infrastructure and services to the site). Most equipment is sourced from overseas and even major shed components are now made overseas as modules to be assembled on site. This means that changes in the Australian dollar exchange rate significantly impacts on shedding costs. The need to obtain large parcels of land to limit the proximity of sensitive use sites such as residential houses has also contributed to costs. This cost is further increased by the lack of ready access to services and infrastructure. This has precipitated the development of complexes with two to four farms on the property. This, however, then requires environmental consideration of the cumulative impacts of each of the farms in the form of an environmental risk assessment (ERA).

Broiler Management

Broiler sheds are not totally depopulated at the one pick-up but are subjected to a number of thin outs, usually three to six. This allows for better logistics planning and shed utilisation. More recently, shed placements have been further modified with the placement of sexed birds in either half of the shed, separated by a partition. Some integrators sex flocks prior to placements while others do not. The reasons for sexing include:

- Better flock uniformity at pick-up, causing less wastage at processing. Supermarkets changed to the practice of buying birds at set weight codes and while processors can provide birds above code size and “give away weight”, they cannot provide birds under code weight. Therefore, greater uniformity in bird size equates with greater profit since oversized birds are not sold at the same price as smaller birds.
- Female birds are less efficient feed converters as they get older. Hence, the aim is to depopulate females first.
- Female birds also lay down fat at an earlier age than male birds, making them less attractive to de-boners.
- Since male birds grow significantly faster, the final shed depopulation of large male birds can occur at an earlier stage thus reducing mortalities and also reducing batch length which improves shed utilisation.

Disadvantages include the cost of sexing at the hatchery, the tendency for males housed separately to have higher mortalities and, in the case of some smaller processors, meeting various customer requirements in terms of uniformity actually reduces bird weight profile. As growth rates increase and average live weights increase, broiler growers need to accommodate this by increasing ventilation levels at an earlier stage. The modern combi-tunnel shed has the advantage of automation which allows individual growers to grow larger

numbers of birds. Single operator farms of over 200 000 birds are now common. The ability to regulate winter temperatures are now achievable at relatively economical energy (gas) costs. Conversely, in times of high ambient temperature, not only are broiler losses minimised but optimal broiler growth rates and feed conversion ratios achieved. The need for back up power supply, spare pumps and other equipment is, however, critical in such facilities or significant losses can occur. Overall the welfare of broilers housed under such conditions has improved.

Readers can gain access to the most recent updated husbandry manuals at the broiler breeder company web sites (www.aviagen.com, www.cobb-vantress.com).

Grower farm activity involves: maintaining shed environmental conditions (stipulated by the processor) for the life of the bird to ensure optimum growing conditions; the recording of data; programmed delivery of the various staged rations; collection of mortalities; setting up of sheds; and assistance during pick-ups, usually in the early hours of the morning.

Currently, live V4 Newcastle disease virus vaccination is compulsory in most states. Compulsory NDV V4 vaccination in 2009 will not be mandated in Western Australia and Tasmania, and will be reviewed in South Australia and Queensland after two years. Vaccination for Marek's disease, while not universal across the industry, is implemented by most integrators.

Medication of broilers with classical antibiotics is becoming less common in the industry as a result of better health and management and tighter controls on scripted medication. Batch duration is usually around 50 days with a turn around time between batches of 10 to 14 days. This means that a shed can accommodate around six batches of chickens a year. Actual batch rates in the industry can vary within companies from four to six-plus batches a year, depending on the balance of growing space (shedding availability) and market requirements.

Growers are more aware of environmental issues and most participate in the national chicken meat grower-based Environmental Management Systems (EMS) plan (www.chicken.org.au).

Biosecurity is also becoming a more prominent feature of the chicken meat industry. National training and implementation programs are assisting growers with what constitutes sound sanitary practices. The poultry industry has also developed a national biosecurity manual for all poultry sectors.

Free Range Broilers

It is estimated that approximately 32 million broilers a year are produced and sold as free range in Australia. There are also some yellow birds defined as corn-fed birds produced by some of the larger producers.

Free range broiler production has continued to increase since 2005. Most major broiler integrators now produce free range birds although they do not all belong to accredited organisations such as the Free Range Egg and Poultry Association (FREPA). Specialist free range producers, such as organic, are covered in Chapter 12. Some companies have centralised their free range broiler production in one state while other are limited in their expansion of broiler numbers by shedding availability.

Essentially, all free range broilers produced by this sector are reared in existing smaller and older style broiler sheds. Some companies belong to a free range accreditation system and others do not. The definition of free range broilers generally implies that birds have access to areas outside sheds. The management of free range birds approximates that for normal

broilers with the addition of providing access to outside and the exclusion of antimicrobials (growth promotants) from feed.

The water supply for these birds is the same as that of normal broilers, a biosecure supply with access to surface water restricted. Control of indirect or direct contact with wild birds is limited aside from using methods to ensure there are no attractants to wild birds (like spilled feed).

Some companies have specific standard operating procedures (SOPs) for the operation of free range broiler farms, however, all farm procedures and external contacts are the same as those for conventional broiler operations. Retailers and consumers, however, have requested traceability systems be put in place during cartage and processing in order to ensure that there is confidence in the integrity of the supply of authentic free range birds. As not all free range birds are used for free range sales, the policy of having pigmented birds (produced through the feeding of high levels of corn) varies between companies. There are some limitations about mixing coloured product with normal product.

Free range broilers are usually processed before 2.5 kilograms of weight, and can be considered a low risk in terms of their potential for exposure to infectious disease such as avian influenza. This is even more so since most free range broilers do not have access to outside until 21 days.

Since 2005, more portioned or further-processed free range products are being marketed, increasing the average live weight requirements. For the alternative or traditional free range style of bird being managed for slower growth rate (compared to conventional broiler strains) the terminal grow out ages will be even longer.

Supermarkets prefer to sell their own generic brand of free-range product in order to avoid consumer preference for a particular brand that would then limit their competitive price negotiations with suppliers. While not a free range grower, one medium sized producer has been successful in expanding their market by labelling their birds as “processed chemically free” and able to “roam” within their facilities. The claim is based on the absence of chlorine containing spin chiller in the processing method.

The perceived role of free range broilers in avian diseases such as AI has lessened not only with decreased media coverage of AI, but also with improved industry understanding of the epidemiology of AI and how this relates to the operation of free range broiler farms under existing practices.

1.9 Horizontal Contacts

Dead Bird Disposal

Dead bird disposal methods are becoming more limited, particularly in regard to burial, with many responsible authorities restricting this practice and incineration because of the cost of fuel and permit restrictions. The practice of freezing birds on site and having these collected by a contractor, while becoming the preferred method by broiler growers and the responsible authorities, is itself beginning to experience a number of difficulties. These include direct collection costs which involve vehicular movements and labour, disposal costs at designated recycling depots (tips), increasingly restricted access times to tips, and biosecurity concerns with multiple contacts between poultry farms. While the biosecurity aspects can and are managed with carefully applied policies regarding movements and off site collection, the

access to low cost dumping sites is becoming limited.

The product is generally not considered suitable for rendered protein meal as a consequence of advanced putrefaction, and some export clients prohibit it. There are intentions, however, by one rendering plant in Victoria to install a designated batch cooker specifically designed for offal and animal waste (such as poultry mortalities). This will produce a specific high protein animal by-product and may possibly be supplemented by culled spent layers whose value for meat is limited.

The use of composting bins and contracted composting services for mortalities does not appear to have gained acceptance among producers.

Bioremediation sites for the disposal of poultry waste and other organic material are still being discussed. However, they do not appear to be a suitable solution because the initial capital cost and the ongoing cost of delivering material to a designated site are much greater than current alternatives. As in Europe, this method may only be employed when waste disposal becomes so difficult and expensive or heavily regulated, that these higher cost alternatives become attractive.

Dead bird disposal is performed using a variety of methods: burial, composting, incineration, disposal at the local tip by the grower, and contracted collection services. Collection services usually take dead birds to land fills under a permitted use agreement or to council tips. The use of dead bird contractors is becoming the most common method enforced by councils and often necessitates the use of freezers on farms. Where there are high mortalities (for example, from heat) and losses may be caused if birds cannot be disposed of by normal means, a temporary permit for on site burial may be obtained. In NSW a service is provided where specially constructed composting bins are used for disposing of dead birds mixed with small amounts of litter.

It should be noted that the use of dead bird collection services is a potential mechanism for disease spread.

For endemic diseases, the maintenance of dead frozen birds on site for short periods before removal has minimal consequences for existing birds on the farm. Most broiler growers who use contractors either have a large steel bin at their property entrance in which the frozen birds are placed just prior to collection, or smaller wheelie bins that are moved to the collection point. The collection point is either on the road or far from poultry sheds.

On breeder farms, similar procedures are adopted but generally there are fenced barriers or distant collection points ensuring that the transport vehicle does not enter the farm site. Commonly, integrators will undertake an induction with the dead bird cartage contractor on the biosecurity policies of the company. Invariably, for reasons of cost and logistics, these contractors may be picking up from other poultry sites on the same day and (in the case of some contractors) other species. The large bins they carry are infrequently swapped over for maintenance and cleaning, and local council laws ensure that the bins are secure from vermin and do not leak. This is particularly important for hatchery waste and dead birds being carted in hot weather.

The destination of dead birds is usually rubbish tips or permitted land fills. Land fill use is usually permitted under the condition that birds are buried (covered) within hours of dumping. This requirement can restrict access to tips over weekends when there are no employees on site. The other major destination point for dead birds is rendering plants, either company owned or independent. The rendering of dead birds can be problematic for a number of reasons which include the technical aspects of cooking birds with feathers still on, elevated levels of biogenic amines in finished poultry offal meal (as a consequence of

the putrefaction of the dead birds) and utilisation of the finished product. Additionally, a number of countries importing poultry offal meal do not allow the inclusion of dead birds.

Where dead birds are handled at independent rendering plants the final meat meal is most commonly a mixed species product. Interestingly, on occasions, rendering plants have been reluctant to take large poultry mortalities because of historical episodes of foreign bodies such as rocks causing costly damage to equipment.

Finally, the practice of same species feeding while not regulated in any way in Australia has declined, causing some producers selling poultry offal meal to look for alternative outlets for rendered birds. The product is too valuable not to get some return from it.

The risk of poultry offal meal or meat meal being a source of avian pathogen spread is unlikely within the broiler industry because even if there is cross contamination between meal and fresh material, all commercial meat chickens are fed heat-treated feed (heat treatment inactivates viruses). This is not the case in the egg laying industry where most layers are fed non-heat-treated mash diets.

The incineration of dead birds is limited due both to council restrictions and operating costs. Likewise, on farm composting can be problematic due to the offensive odour generated if it is not undertaken correctly. Ground composting using litter has also been found problematic due to the access of foxes and crows. Rat infestation can also be a problem with ongoing open composting of dead birds.

Live Bird Pick-Up

i Broilers

Broiler pick-up is usually undertaken by the integrator or by contract crews that work in close association with the company. Unlike other contractors who may work for a variety of poultry companies, pick-up crews invariably only work with the one poultry company in a particular region. The transport vehicles and drivers may, again, be integrator owned or contracted. While most cartage contractors only work for one processor, there are occasions when birds are picked up for another processor, and the vehicles and live bird crates of that second processor are used. Broiler crates are generally used for depopulating spent breeders when processed in-house.

Pick-up crews are usually five-person teams and visit a number of farms in a single night. The number of farms visited is influenced by the distance between farms, the age of the birds and the number of previous thin-outs of sheds. On some occasions the pick-up trailer may have partial fill from another farm's final pick-up. However, most processors ensure that their pick-up crews adhere to standard biosecurity practices of not associating with other avian livestock.

On the night of pick-up there are generally no prescribed restrictions of movements between farms, other than attempting to go from the youngest to the oldest farms. Exceptions to this may be made when there are either specifically recognised endemic disease problems or quarantine measures enforced by authorities. The increased incidence of double shifts, or shifts and a half, at some processing plants has resulted in more daytime pick-ups. Transporting birds humanely during hot weather can also be difficult.

Trailers and crates are washed down after bird removal in preparation for the next pick-up night. The quality of this wash-down and sanitation (if used) is to ensure that gross contamination is removed and a quantitative microbiological reduction occurs. The nature of

the infrastructures available and the unloading system used can make this process difficult.

Where companies have live sale customers on a regular basis, customers often provide their own cartage contractors (but use the integrator pick-up crews). On some occasions, live sales customers may (concurrently) be getting birds from another integrator and some customers may process other avian species.

Epidemiological studies have found that on farm populations of *Campylobacter spp*. are closely correlated with the movement activity of pick-up crews between farms.

Increasing difficulty in sourcing poultry industry labour also extends to the staffing of pick-up crews. There is a high turn over of employees and the nature of the work often means that it can be difficult to train employees in the required job competencies, including biosecurity measures. Most companies do, however, provide SOPs on biosecurity policies and animal welfare obligations to casual employees. The occurrence of Infectious Laryngotracheitis (ILT) in NSW and Victorian broiler grow outs in 2007 and 2008 resulted in a reassessment of vehicular and crew movements and also a reinforcement of sanitary procedures.

Some serious accidents involving personnel during broiler pick-ups have also resulted in WorkSafe authorities reviewing procedures.

The use of automated machinery for broiler pick ups has increased in Australia, and the decision to move in this direction has been influenced by the lack of suitably trained and reliable pick up crews and resulting pick-up damage to birds.

With regards to transport vehicles, the majority of broilers are transported in open-sided trucks that usually have some shelter that prevents birds getting wet during inclement weather. There is only one operator (in Queensland) using a fully enclosed force ventilated broiler transport vehicle. Its use is believed to have been necessitated at the direction of council after resident complaint about feather loss during transport.

There is also a small but significant movement of live sale broilers sold in the vicinity of the live handling bay at the destination processing plant. The sale numbers to each individual or small firm range up to a thousand birds, and the quality of transport conditions and crating varies. Enforcement of biosecurity measures can be difficult and these small client plants often process a number of avian species.

A second edition of the *Model Code of Practice for the Welfare of Animals: Land Transport of Poultry* was published in 2006.

ii Rearer Breeders

Companies that rear breeders on designated rearing farms must move valuable young breeding stock into production houses. By the time this livestock is ready for transfer it has been fully vaccinated and serologically tested by the company to ensure that flocks will be protected from most known endemic avian pathogens at the point of lay. This is particularly important where production farms (by their level of facilitation and location) may be less biosecure for diseases such as Infectious bronchitis and Mycoplasma.

When rearing occurs on a breeder complex and production farms are also present, then rearer transfers are usually done in-house using a tractor and trailer or the equivalent. Crates are designated for these transfers and may be permanently located on site.

Where it is necessary to transfer birds off site then this is usually undertaken using a contracted prime mover and trailer but rearer company crates are used. In some cases, the

trailers may be also company owned. The rearer breeder catching crew is normally the on-farm staff supplemented by staff from other breeder farms. Where contract catching crews are used, times are arranged to co-ordinate with non-broiler pick-up days (usually Sunday to Thursday night). Hygiene regarding clothing, footwear, prime movers is implemented. In general, industry compliance with hygiene and biosecurity practices when handling chicken meat breeders is high because company management are aware of the value of the stock and the impact that disease can have on flock performance. Crates and trailers are usually washed and sanitised on the breeder complex by company staff or the wash-down contractor.

iii Spent Breeder Hens

Spent breeder hens (end of lay) may be processed at the integrator's regional processing plant, at an interstate plant belonging to the processor or by an independent third party who specialises in the handling of this type of livestock. When processed at the integrator's processing plant, broiler pick-up crews' vehicles and crates are used since the flock is being depopulated for slaughter, resulting in less concern about maintaining hygiene and biosecurity against endemic diseases.

When birds are processed by a third party, a number of scenarios can occur regarding catching crews. Most commonly, the cartage contractor is an independent. Within the industry these contractors are probably associated with the highest risk as they are not strongly affiliated with any particular company and often transport a variety of avian types and species. It is up to the poultry company to provide documentation on biosecurity and welfare policies and to ensure that staff monitor policy compliance through observation, industry intelligence and questioning.

Plants specialising in spent hen processing also commonly process other avian types including broilers, spent layers and possibly turkeys or ducks.

Consequently, there is potential for transfer of avian pathogens from subclinical hosts to susceptible ones.

All types of live poultry are commonly transported for long distances over one or two state borders. DOCs move in their hundreds of thousands between states each week, in sealed controlled environment trucks. Reared birds may be moved between states in open sided trucks.

Broiler Litter, Breeder Manure and Other Poultry Effluent

Issues around disposing of broiler and broiler breeder litter and manure continue to be a concern for the industry. Various sites still (informally) stockpile litter and distribute to end users. Many of these end users have seasonal requirements and this fluctuating demand affects sites' ability to remove litter.

After depopulation, broiler farms can have a 5 to 28 (usually 10 to 14) day turnaround from last bird out to first bird in. The first requirement is to remove the used litter. While it is standard practice in Australia not to re-use litter, the developing shortage of litter materials such as wood shavings and rice hulls is forcing some processors to occasionally recycle used litter for one added batch. The situation is expected to deteriorate in Australia as litter becomes more difficult to obtain. As a consequence of increasing fresh litter prices, growers are lobbying for higher growing fees. The increased costs and tighter profit margins being imposed on both growers and processors will, as in the past, result in a re-evaluation of the

economic advantages of recycling used litter against the potential drawbacks. The concern about Marek's Disease from recycled litter has reduced with the introduction of day old or *in ovo* vaccination by many integrators.

Used litter may be used for a variety of purposes, including market gardens, vineyards, crop and pasture improvement, commercial production of home mix fertilisers and, finally, for domestic use. Some growers may remove litter themselves and utilise it in any one of these manners. This product may sell for between $2 to $9 per cubic metre and thus has significant commercial value to the grower, provided that he has the clients and locality to permit low cost movement. Some growers with adequate land and permits store used litter in piles for strategic sale to cropping farmers and other buyers. This stored material undergoes a type of composting process. Generally there has been reinforcement by chicken meat companies regarding the prohibition of storing of litter or manure close to shedding and even within the boundaries of the property. Difficulties arise when unrelated third parties spread poultry manure on the adjoining property to the broiler farm as there are no enforceable restrictions on this practice.

The most common method of litter removal is employment of specialised contractors with the crews and the equipment to undertake this work. These contractors also have permanent client arrangements. In the past, growers were paid for litter and had the contractor wash-down and clean the sheds as part of the package. Now, however, the grower may receive no payment for litter and may have to pay for its removal as well as the washing and sanitising of sheds. This provides another example of changes occurring in the cash flow structure of broiler farming.

In some slatted or colony caged breeder farms, manure rather than used litter material is produced. This product, like caged layer manure, has a higher commercial value.

Litter and manure removal contractors will invariably be involved with a number of different companies and avian types, including layers, breeders and broilers. The use of heavy equipment such as front end loaders and transport vehicles limits to some extent the practicability of a rigorous sanitation program between operations and farms. Again, despite providing biosecurity documentation, the poultry company is very dependent on the compliance of the contractor in not engaging in high-risk practices.

Another factor significantly influencing the use and movement of broiler litter and manure is fuel price and the cost of cartage. Regional market gardens, vineyards and cropping farmers seek this product keenly but the cost of transporting this bulky material is restrictive. To reduce these costs, back loading of bulk haulage trucks is practised, with the potential for cross contamination of materials.

Poultry processing plants and hatcheries are incurring increased costs in regard to effluent disposal. Processing plants and hatcheries, in particular, often have effluent systems that involve the use of settlement ponds and retention dams. Frequently, these water catchment areas are populated by migrating domestic waterfowl. While the water from these sources should not be, and generally is not, used for poultry drinking water, it is a potential source of avian pathogens (from a processing plant or hatchery) that wild water fowl may come into contact with. This offers the potential for a sylvatic cycle of infection (infection among wild birds).

Poultry processing plants create predominantly two types of effluent, the faecal material (wet manure) left at the end of the day in the live bay area and material left over from washing down of the plant. The wet manure may be removed by contractors, washed into and treated in effluent plants, or (in some cases) spread on pasture. Some dairy firms prohibit the use of poultry litter on their contracted dairy farms because of concerns about

the negative impacts on their export markets.

Farm Wash-Down and Sanitation

Farm wash-downs may be undertaken by the grower or the litter removal contractor. More commonly, the wash-down is now done by independent specialised crews. They follow specific programs designed by the integrator who also provides wash-down chemicals. These chemicals are usually the disinfectants aldehyde or iodophor, or quaternary-based sanitisers and insecticides. These wash-down procedures are observed by the farmers and service personal in order to monitor their effectiveness. On occasions, microbiological sampling is also undertaken. Wash-down methodologies have improved with the use of high pressure low volume systems which may include foaming detergents with an enzyme included in their formulation that assists in the breakdown of accumulated organic material. Short turnaround times can limit the quality of the wash-down and the effectiveness of the sanitation. Short turn-around times are particularly common during the one-batch cycle around Christmas.

Access to wash-down crews and contractors is an ongoing problem, with high turnovers of staff creating difficulties in the training and the maintaining of quality crews. Even when companies move away from in-house cleaning crews (because of labour difficulties or OH&S reasons) and move to contractors, staff may remain difficult to obtain.

Wash-down contractors often work for a number of different poultry operations, particularly the mix of broilers, meat chicken breeders and layers. In some cases, other species such as pigs may also be involved.

While these contractors are also provided with biosecurity policies, the poultry company is very much dependent on compliance by the contractor. And where there are tight schedules to be met, schedules controlled by depopulation dates and even restrictions placed by certain councils on working hours, there can be difficulties in conforming to basic biosecurity practices such as duration between farm visits. While protective clothing may be changed between farms, concerns about footwear and vehicle floors remain an issue. The capital value of equipment also means that this is hauled from farm to farm unless contractors with ongoing arrangements have designated equipment for specific farm complexes or sections of the company (e.g. breeder farms). The cleaning down of equipment between farms may be variable and is dependent on supervision by the processor's various farm mangers.

The quality of a wash-down and the compliance of the contractor very much depend on the level of supervision undertaken by the company farm manger, and the reporting of noncompliance through completion of non-compliance forms. Often, company concerns about farm contractors are more related to OH&S issues rather than biosecurity. In areas where there are problems with endemic diseases such as ILT, there has been a reinforcement of wash-down procedures.

Litter Material for Barn Type Shedding

The high consumption of scarce litter material such as wood shavings and rice hulls by the chicken meat industry has resulted in considerable cost increases for integrators and growers. A large downturn in rice crops due to drought has had a significant impact on quantity of material available and the demand for wood shavings exceeds production. Growers are now investigating other materials including sawdust and chopped straw.

High quality bagged shavings are still the preferred material for manual nest boxes, although

the broiler breeding systems are more commonly becoming automated systems using nest pads instead of a litter material.

Litter material is still extensively used in barn deep litter systems and all levels of the chicken meat industry use floor litter material. The only area where its reduction has occurred is with the increasing use of partial slatted floors in breeder sheds and the move towards using colony cages for parent breeders.

Fresh litter is placed in detergent washed and sanitised sheds once they have dried. Litter material has traditionally consisted of wood shavings from kiln- or naturally-dried building timber or of rice hulls. Sawdust is also used but is not the preferred material because it may be damp if made from green timber.

In essentially all cases, litter material is supplied by contractors in large high-sided trucks that often employ a moving floor. The litter is then pushed into the shed and spread. Rice hulls can contain low levels of whole rice attractive to vermin and wild birds. The nature of the conditions under which rice is grown also provides opportunity for contamination by water fowl. However, while theoretically a concern, the risk of contamination is extremely low due to specific conditions being required for contamination and the dilution effect in delivered material. However, hardy viruses such as adenoviruses could survive to infect poultry.

Chopped straw, while used by some (particularly in the layer industry), has faced an unusual impediment to its use. Some used litter contractors are concerned about their legal liability by acting as defacto seed spreaders of annual weeds such as Patterson's Curse (Salvation Jane).

The use of treated pine shavings has on occasions resulted in major broiler mortalities due to inorganic arsenic poisoning. Growers are now aware of this possibility and monitor materials being supplied. Damp shavings can also introduce *Aspergillus spp*. into poultry sheds, inducing respiratory disease in young poultry.

High quality bagged shavings that are derived from kiln dried timber are also used extensively by producers that still use manual nest box collection systems. Some of these breeder operations may also use paraformaldehyde prills in nest boxes to control microbiological contamination of hatching eggs.

Generally, designated trucks are used for the delivery of fresh material even where contractors are involved in both fresh and used litter businesses. As this is clean litter going into cleaned sheds, generally the overall hygiene situation is favourable.

Like litter removal vehicles, fresh litter material vehicles have access to the immediate vicinity of the shed. Thus, vehicular and driver hygiene and biosecurity practices are important.

Feed Manufacture and Delivery

As indicated earlier, the chicken meat industry uses (almost exclusively) processed pellet feed. Some companies are trialling using supplementary whole grain in their rations. Proposed advantages of this are reduced milling costs, improved bird health due to gizzard stimulation, and overall lower ingredient cost without reduced performance. Since 2005, a number of mills have upgraded from mash mills to heat treated pelletted feed to broaden their access to markets such as broiler feed.

Feed may be manufactured in integrator owned mills, purchased from a commercial mill or a combination of both. The high capital cost of building new feed mills and the low margins

on manufacturing costs negotiated by the broiler grow out companies with independent commercial mills, has meant that all new feed mills built by chicken meat companies were fully vertically integrated. Independent companies have preferred to invest capital in projects such as processing plant upgrades, breeder shedding and hatcheries, where greater returns are realised.

Raw materials include cereal grains, vegetable and animal based protein meals, legumes, animal by-product meals, fats and oils, additives and premixes.

Other than soya bean meal, fish meal and vitamins, all feed ingredients are sourced from Australia. The exception being during extreme drought and cereal grain shortages in Australia, when imports supervised by AQIS have been allowed. The importations were limited to city mills located on the coastline. Imported soyabean meal (SBM) prices have been high since 2005, despite the strong Australian dollar, compared to historical prices. The relief in the price of SBM in late 2008 due to falling US futures and declining basis costs were offset by a significant decline in the Australian dollar. The loss of the single desk monopoly of the Australian Wheat Board also occurred in September 2008, and now approximately 15 Australian companies have been approved to export bulk wheat. The impact of this on domestic markets is not clear yet, as drought and the ongoing world financial crisis have overshadowed this.

Company owned mills in the industry are mostly modern mills that belong to the Australian Stockfeed Manufacturers Association. All have well-structured in-house Quality Assurance (QA) programs.

Independent commercial mills are similar but generally have more rigorous QA programs that address feed related performance issues in order to prevent actions against the mill and to reduce public liability risks. Subsequently, manufacturing costs at commercial mills are higher due to the extra compliance costs involved.

All mills have a raw material testing program at the point of entry to ensue compliance with grain contract terms. Most raw feed material supply contracts are covered by the NACMA standard (www.nacma.com.au) in Australia.

While raw material mill inputs are screened for nutritional purposes, they are not screened for poultry diseases. The exception is mycotoxin. Raw feed material is tested at every load for potential toxic seed content and occasionally animal by-product meals are also tested for biogenic amines.

Minimal biosecurity is applied to raw material trucks due to the numbers of vehicles involved and the nature of the transport industry. Arguably, this biosecurity is not needed because of the low risk of input materials and the fact that all finished feed has been heat treated. Heat treatment is around 86 º C to 91ºC for 12 to 20 seconds.

While company owned feed mills only supply poultry feed, commercial mills may also supply other avian species as well as pig feed.

Commercial mills generally do not manufacture ruminant feeds at the same site as poultry feeds, due to the risk of cross contamination of meat meal containing poultry feeds. The litigation potential of this scenario is too high a risk for commercial mills.

As indicated earlier, while poultry offal meal (POM) is a valuable commodity and there are no technical reasons against its use in poultry feeds, concerns about public perceptions of same species feeding have resulted in its diminished use. This is expected to be backed up by regulatory changes in the future. Demand for Australian POM in domestic pet food and export to Asia both remain high, providing producers with alternative sale options with good

economical returns.

Finished feed delivery trucks are today mainly sealed blower tankers and the rest tipper blowers. Most trucks can carry around 20 to 25 MT. In the case of B-Doubles this is taken up to around 44 MT. In most cases they are owned and operated by contractors who are instructed in the company's biosecurity policies. If broiler feeds have additives harmful to breeders, e.g. Nicarbazin, company owned feed mills will mix in additives after additive-free feeds have been batched. Companies sometimes also designate trucks for breeder farms and those for broiler farms. Where this is not possible, deliveries are done in a way that minimises (first) the risk of cross feed contamination and (second) biosecurity risks. The logistics of this can be difficult for mills manufacturing for a variety of avian species and non-poultry species.

At most mills there are vermin control programs for rats and mice. The control of wild birds, especially pigeons, is much more difficult, particularly for mills in urban regions. Populations of pigeons at mills may be large and the inability to get permits for controlled destruction (or unwillingness to do so to protect corporate image) may result in a continuing problem.

At most large mills there are whole truck wash bays where trucks are washed on return to the mill. These are effective in getting rid of the bulk of contamination on the vehicle.

The procedure upon arrival of feed trucks at poultry farms varies depending on the stock involved and the level of farm facilitation. In all cases, drivers are requested not to wander around the farm but to stay within the locality of the truck and silos.

On modern breeder farms, feed chutes usually extend to outside the immediate fenced boundary of the farm. This is so that feed can be delivered to the site and silos without trucks needing to enter the farm proper.

On breeder farms without this level of physical security, it is common practice to have a wheel wash at the gate of the property. The value of this is questionable but it at least instills an awareness of biosecurity in operators. While not common, newer properties may own automated total vehicle washers.

On most broiler farms there are no farm hygiene practices for feed trucks.

Feed costs have been significantly impacted by raw material availability and ongoing drought conditions. Broiler ration costs for 2006 to 2008 have been at historically high levels and the least-cost availability of some raw materials limited. The importation of other raw material sources was reviewed but not found feasible or economic for broiler rations. Some relief in grain prices in the first quarter of 2008 was enabled by record sorghum harvests in northern NSW and southern Queensland.

Much of the increased demand in domestic grain is driven by the livestock industries. Together, these industries have increased feed grain demand to 9 million MT in 2007, an annual increase of 4.1% since 1993 (Grains Research and Development Corporation, Ground Cover, January – February 2009). Cereal grain for animal feeding is now the largest domestic market for Australian grain at 28%. The supply of cereal feed grain is not regionally balanced in Australia, with certain areas having a deficit while others have a surplus. This introduces logistical issues regarding the transport of grain. The lack of a dedicated feed grain industry in Australia, when compared to other countries like Brazil, can result in wide fluctuations in grain prices in Australia (on occasion prices are above export parity). In 2007, the poultry meat industry used just under 20% of the total feed used by the Australian livestock industry.

Beak Trimming and Vaccination

Beak trimming only occurs to a limited degree in the chicken meat industry. Broilers' beaks are not trimmed at all.

In 2005 a beak trimming unit of competency was developed and included in the Rural Production Training Package (RTE03). The training manual was written to support this workplace standard and can be delivered by any registered training organisation (RTO) in Australia with agriculture qualifications (e.g. Certificate II in Agriculture) on their scope of registration. The concept is for beak trimmers to be assessed as competent against the unit of competency (RTE2147A) and therefore gain formal recognition of their skills.

At all breeder levels, some companies may give a light beak trim (more correctly referred to as a 'beak tip') to females if there is concern about or a past history of picking behaviour in flocks. This can be of particular concern with rearer breeders who, because of their limited net nutrient intake and short feed times, can demonstrate picking behaviour on their flock mates. This could be picking to the head, toes, tail butt or cloaca (vent). This behaviour may be seen after some feed disruption, management intervention such as vaccination, or where the light intensity has been increased for a management or maintenance procedure. Often the first indications of this are tail feather sucking and feather pulling which then leads to picking the tail butt or vent. More commonly the behaviour does not progress beyond feather sucking.

Control of the behaviour is by correcting any identified nutritional factors, ensuring adequate feeder and drinker space, correct placement densities and light control. Generally, with the improvement of rearing blackout/brownout facilities, the incidence of picking during rearing is uncommon.

In production, particularly early production, picking can be a problem in females where there is competition for light space and increased light intensity and duration. Some breeder strains have a tendency to be precocious in sexual development which can result in cloacal prolapse and subsequent trauma from pecking. Again, similar corrective actions (as for rearers) can assist in the prevention and control of the problem. The movement of breeders into controlled environment sheds is beneficial. The overall incidence of picking in breeders is quite low and consequently over 50% of female breeders would be not beak trimmed, as it is considered an unnecessary expense. This percentage may vary depending on company experiences over time. Some companies do beak trim males to avoid the damage done to females through scruffing by the male. For similar reasons, males may have one or two of the inside toes removed as day olds at the hatchery, to avoid back and flank damage to the female during mating.

Generally, beak tipping in males is done in-house by farm staff. Females will be beak tipped by the vaccination crew. Obtaining staff for vaccination crew work remains difficult with high staff turnovers.

Broilers in Australia are currently vaccinated for only three diseases:

- Marek's Disease (MDV) either in-ovo at 18 days or as DOCs at the hatchery using cell associated HVT. No Rispen's vaccination is undertaken in Australian broilers.
- Manual vaccination of DOCs for MDV is done at the hatchery usually by casual hatchery staff who may also rotate around to other duties at the hatchery such as sexing.
- Infectious Bronchitis virus (IBV) by coarse aerosol spray at the hatchery and occasionally by aerosol or drinking water at the broiler farm. There are currently four

commercial IBV vaccines on the Australian market, with three of these belonging to the one grouping. There have been some recent concerns about the emergence of variant IBVs in Australia causing performance problems in both broilers and breeders. Studies suggest these emerging strains are not as well protected against when using existing vaccines.

- Live Newcastle Disease (NDV) V4 either at the hatchery or between 7 to 14 days at the broiler farm via the drinking water. Revised NDV SOPs to be implemented in 2009 will not mandate that broilers have to be vaccinated in Western Australia or Tasmania.

Vaccination for NDV (and IBV if undertaken) are usually performed by broiler farm managers under instruction by their company service person.

Vaccination programs in broiler breeders are quite extensive compared to those for commercial layers. This is because breeder vaccination is undertaken not only to protect the breeder against disease but to prevent or control disease in progeny. Vaccinations include MDV (usually Rispen's and occasionally bivalent Rispen's and HVT), IBV, ILT, Avian Encephalomyelitis (AEV), Fowl Pox (FP), Fowl Adenovirus (FAV), Egg Drop Syndrome (EDS), Chicken Anaemia Virus (CAV), Infectious Bursal disease (IBDV) and coccidiosis. Approximately 25% of broiler breeders are also vaccinated with autogenous killed Fowl Cholera vaccines. Salmonella vaccination is not undertaken universally across Australian chicken meat broiler breeders. There is some use of autogenous killed vaccines containing a number of serovars and more recently locally produced and registered live salmonella vaccine has been trialled (www.bioproperties.com.au).

Water vaccinations are normally performed by farm staff whereas vaccination crews administer vaccines that require the handling of individual birds. Other husbandry procedures such as grading and beak trimming may be undertaken concurrently with vaccination.

Vaccination can be done by:

1. In-house company staff who undertake other husbandry duties within the company.

   Control over quarantine and biosecurity practices is determined by company policy. Generally, the only concern might be endemic disease spread between farms if procedures (including equipment handling) are not implemented correctly. Essentially, all breeder farms in Australia have entry shower facilities with clean protective clothing and foot wear available. Even leaving the farm site for lunch will necessitate the employee showering to re-enter the farm.

2. Outside casual staff employed through employment agencies but company supervised.

   Obtaining staff for intermittent casual work is difficult within the poultry industry and the use of staff from employment agencies can be a solution. Generally the level of competence and discipline of the employee is poor and staff turn-over is high. Although there is a level of uncertainty about possible interaction by such workers with other avian species despite usually signing a company biosecurity agreement, the need to shower before entry and to wear protective clothing and footwear reduces the biosecurity risk. It is up to company breeder managers to ensure vaccination equipment is correctly handled and sanitised between farms. Most farms have an ultraviolet transfer box in the shower amenity.

3. External vaccination contractors.

External vaccination contractors are often themselves dependent on getting some staff through an employment agency. Because vaccination contractors provide better continuity of work, they usually have several permanent members of the vaccination crew who are competent and aware of the company biosecurity requirements. Since no vehicles enter the site proper and all entering crew shower and change their clothing and footwear, it is primarily vaccination and beak trimming equipment that can lead to a breach of biosecurity. Where there has not been adequate time between farm visits (say 48 hours) this could pose a slight risk.

Non-company and Maintenance Personnel

Growers in general are becoming more aware of biosecurity and are generally more attentive to visitors to their farms.

i Service Providers

Horizontal contact with non-company personnel is frequent and control over biosecurity is sometimes limited.

Service providers of gas, electricity and water are required to read meters for invoicing purposes. Where meters are located on farms, many of these operators refuse to shower onto the premises and allowances have to be made for these deviations in company biosecurity. In situations where there are a number of poultry farms in close proximity, there may be potential for endemic disease spread. Companies should consider this when building new farms to ensure that access to meters can be achieved without breaching farm biosecurity.

ii Maintenance Personnel and Tradesmen

Generally, both company and external tradesman work in poultry sheds after depopulation and during turnaround times when there is minimal risk of biosecurity breaches. Farms are also sanitised prior to the next placement. Where there is a requirement for immediate maintenance, tradesmen will enter the farm during its period of population. While most maintenance people will shower on, the handling of tools and equipment may be problematic. Sanitation of this equipment is difficult, time consuming and potentially damaging. Fumigation is usually only contemplated for particularly secure facilities like import facilities or those for elite stock. Generally, there is a need to evaluate personnel movements, ensuring that equipment is free from gross contamination and to only allow controlled entry.

iii Domestic Visitors

The importance of domestic visitors in biosecurity is often underestimated. Commonly it is family and friends of farm poultry workers who visit poultry farms. Often, these family relatives work with poultry or have had association with poultry. The same applies for international visitors if they have a poor appreciation of animal husbandry and biosecurity.

iv Shed Builders and Equipment Suppliers

There has been a general shortage of quality maintenance and tradesman which has

prevented companies and growers from addressing maintenance issues in the desired response times and level of quality. This particularly relates to the equipment that is imported from overseas. The declining number of experienced poultry shed builders and the high cost of shedding means that less experienced builders are being utilised and modular construction using overseas prefabricated components is becoming more common. The use of short-term visa immigrant labour is also becoming more common.

Limited shed builders and equipment suppliers result in the potential for biosecurity breaches to occur due to their movement between poultry farm sites. Often, building contractors move back and forth between building sites without consideration for biosecurity. Even poultry farm management may compromise on biosecurity faced by the need for new capital works. There may not only be only the movement of tools but of building material and equipment between sites or poultry farms.

It is also common for people involved in poultry shed building and facilitation to also own their own poultry farm, returning every evening to their farm. Within the industry, incidents of Infectious Laryngotracheitis in broilers have had their origin in this manner.

With the shortage of labour for this type of work in Australia, procurement of short-term visa holders from Asia to work on poultry farm building sites has begun.

v Government and Other Regulatory Authorities

These include DPI, RSPCA, EPA, council officers and health departments. Most of these groups have the right of entry onto farming properties but despite this may be unfamiliar with biosecurity requirements. Incidents have been reported where visiting officers went to farm sites and when questioned revealed that they had handled or had contact with farmed waterfowl within the past six hours. While most meat chicken companies have biosecurity policies, there is a need for regulatory authorities to be aware of and follow biosecurity measures during farm visits.

The *Model Code of Practice for the Welfare of Animals:Domestic poultry*[1] details the maximum stocking rates that should apply to the farming of domestic poultry. The code emphasises that, whatever the form of husbandry, all managers, employees and other staff responsible for the day-to-day needs of domestic poultry have a responsibility to care for poultry under their control. Where the provisions of the code have not been followed as defined by animal welfare legislation, this might be used as an indication that the owner/person-in-charge of the poultry did not take all reasonable steps to protect the animals. The code is largely followed by the poultry industry.

The role of government departments in the chicken meat industry is undergoing a shift. Generally, the role of departments of primary industries is decreasing, with reduced infrastructure, staffing and service provision in most states. Conversely, in the area of food safety there has been a significant increase in regulatory activity and personnel. Occupational health and safety (WorkSafe) activity has also increased, with officers now visiting broiler farms.

Within the *Food Standards Code* under Standard 3.2.2 (Food Safety Practices and General Requirements) there is a requirement for food manufacturers, including chicken meat processors, to have a recall system that will ensure the recall of unsafe food. The industry needs to have systems in place fore both up-steam and down-steam tracing. The close vertical integration and limited suppliers in the chicken meat industry aids this process.

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[1] http://www.publish.csiro.au/nid/22/sid/11.htm

Since 2005, some additional media coverage of animal welfare in the chicken meat industry has occurred due to associated activist criticism of fast food chains.

vi Veterinarians

The limited number of veterinarians in the poultry industry are:
- company-employed veterinarians
- consultant veterinarians
- government veterinarians
- veterinarians associated with the pharmaceutical and biological industries.

All chicken meat integrators have either veterinarians on staff or use consultant veterinarians aligned with their company.

Generally, all industry veterinarians are compliant with (if not responsible for) industry biosecurity policies. At times, compliance with the general 'rule' of allowing 48 hours between visiting different types of poultry enterprises (e.g. broilers to breeders, hatchery to breeders) can be difficult. The practices of total change of clothing, double showering and vehicle hygiene, however, make such activity very low risk.

Poultry veterinarians continues to be an aging population, with only a few new faces joining the industry. The national recognition of veterinary registration should facilitate veterinarians working across different states.

Water

The availability of potable water is still a major problem in the southern states. The flow reductions from bores, the absence of rain to fill dams, and the reduction of allocations from irrigation systems by water authorities has impacted seriously on the operation and running costs of many broiler farms. A number of farms or farm complexes have been required during the dry periods to buy water, at a cost in excess of $10 000 a week.

With this has come the realisation that securing a reliable supply of quality water is essential for a broiler operation. New sites for broiler farms are now only chosen if there is a guarantee in regard to secure water supply. This may necessitate significant capital cost in mains water augmentation, or bore construction and deioniser plants.

New technology has meant that de-ionisation of high salinity bore water is now economically feasible. For capital costs of $150 000 and operating costs of around $15 000 per annum, it is feasible to produce around two megalitres of quality drinking water from previously unusable bore or underground water. This water generally poses no biosecurity risk. Not all bore waters are safe, however, as shallow bores after heavy rains often test high for levels of coliforms, including *E. coli*, which suggests that manure run-off from pastures is entering the water.

Surface water from dams, irrigation channels, rivers and streams is used for a limited number of chicken meat breeder and broiler farms. Some producers previously on sanitised dam water have had to spend large capital amounts to get mains water because of the lack of rain water.

Sanitation of surface water with chlorine can be non-biosecure for a number of reasons:
- failure to monitor residual chlorine levels
- equipment failure
- organic load neutralisation of chlorine as surface water quality changes.

In 2009, a national water biosecurity manual[2] was published to assist poultry producers with implementing water biosecurity measures.

There has been a recent movement to chlorine dioxide which works by oxidation. Chlorine dioxide has many advantages and these are discussed in Appendix 2. Cost is one disadvantage.

1.10 Industry Organisational Structure and Codes

The Australian chicken meat industry is structured through the Australian Chicken Meat Federation, which operates through the various chicken meat bodies in each state.

The overall co-operative interaction of the chicken meat industry with the Commonwealth government is good. Australia's capacity to manage an exotic incursion is very much dependent on state resources and competency.

In 2009 a new *National Poultry Farm Biosecurity Manual*[3] was published, that is applicable across all poultry sectors.

The structure of the chicken meat industry involves only a limited number of integrators which allows it to control and implement farm policies more effectively than the commercial layer industry. A *National Biosecurity Manual for Contract Meat Chicken Farming* has been presented to all broiler producers in Australia through workshops.

States such as Victoria have also introduced environmental management practices for broiler farms which include animal welfare and biosecurity elements. In Victoria the program is called *Chicken Care*. A national program titled 'The National Environmental Management System for the Meat Chicken Industry' is now being implemented and introduced through workshops throughout Australia.

In a number of states there is ongoing revision of codes or guidelines associated with broiler farm developments. It is the area of food safety where extensive activity has occurred at the level of FSANZ in developing the new Primary Industry and Production Standards for Poultry Meat. Independent of this, the various states and territories have been proceeding with the development of guidelines and regulations.

1.11 Chicken Meat Production Locality Areas

The maps on the next two pages complement the text of this chapter and help the reader appreciate the distribution of the chicken meat industry throughout Australia. The clustering of chicken meat "production localities" is represented as coloured areas on the maps. For clarity, Victoria is covered separately from the rest of Australia, in Figure 1.2.

The number of farms is declining in peri-urban areas such as the Mornington Peninsular in Melbourne, and broiler farm contracts have decreased in the Mangrove Mountain area in NSW. Increases in rural residential living have encroached on new broiler farms and complexes, resulting in new farms being built on remote, larger holdings more distant from processing plants. Consequently, a 200 km round trip for broiler pickups is now becoming

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[2] http://www.daff.gov.au/animal-plant-health/pests-diseases-weeds/biosecurity/animal_biosecurity/bird-owners/poultry_biosecurity_manual

[3] http://www.daff.gov.au/animal-plant-health/pests-diseases-weeds/biosecurity/animal_biosecurity/bird-owners/poultry_biosecurity_manual

more common. With the development of ring roads and highway bypasses, longer trips often take less time than routes through urban fringe areas and city roads.

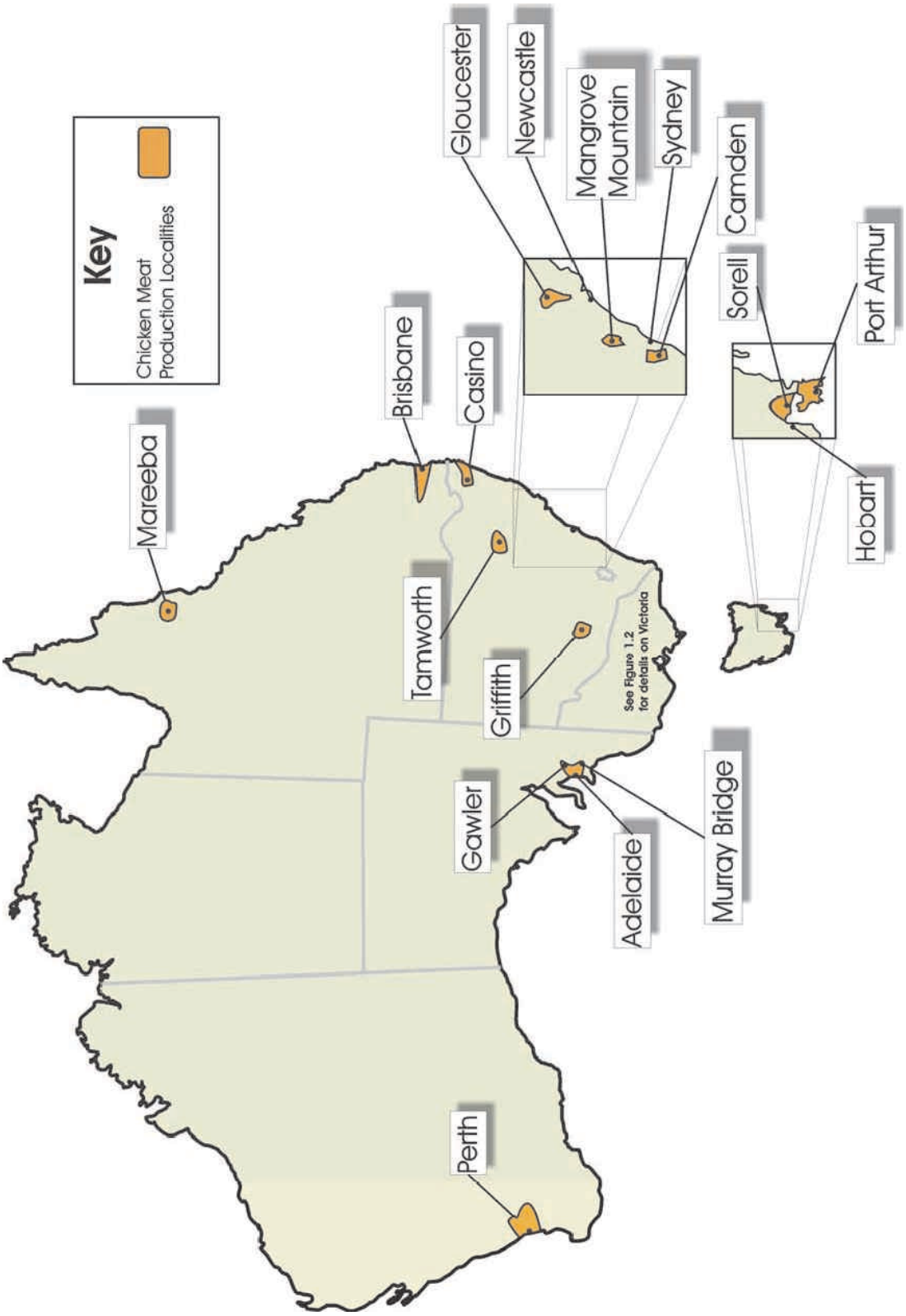
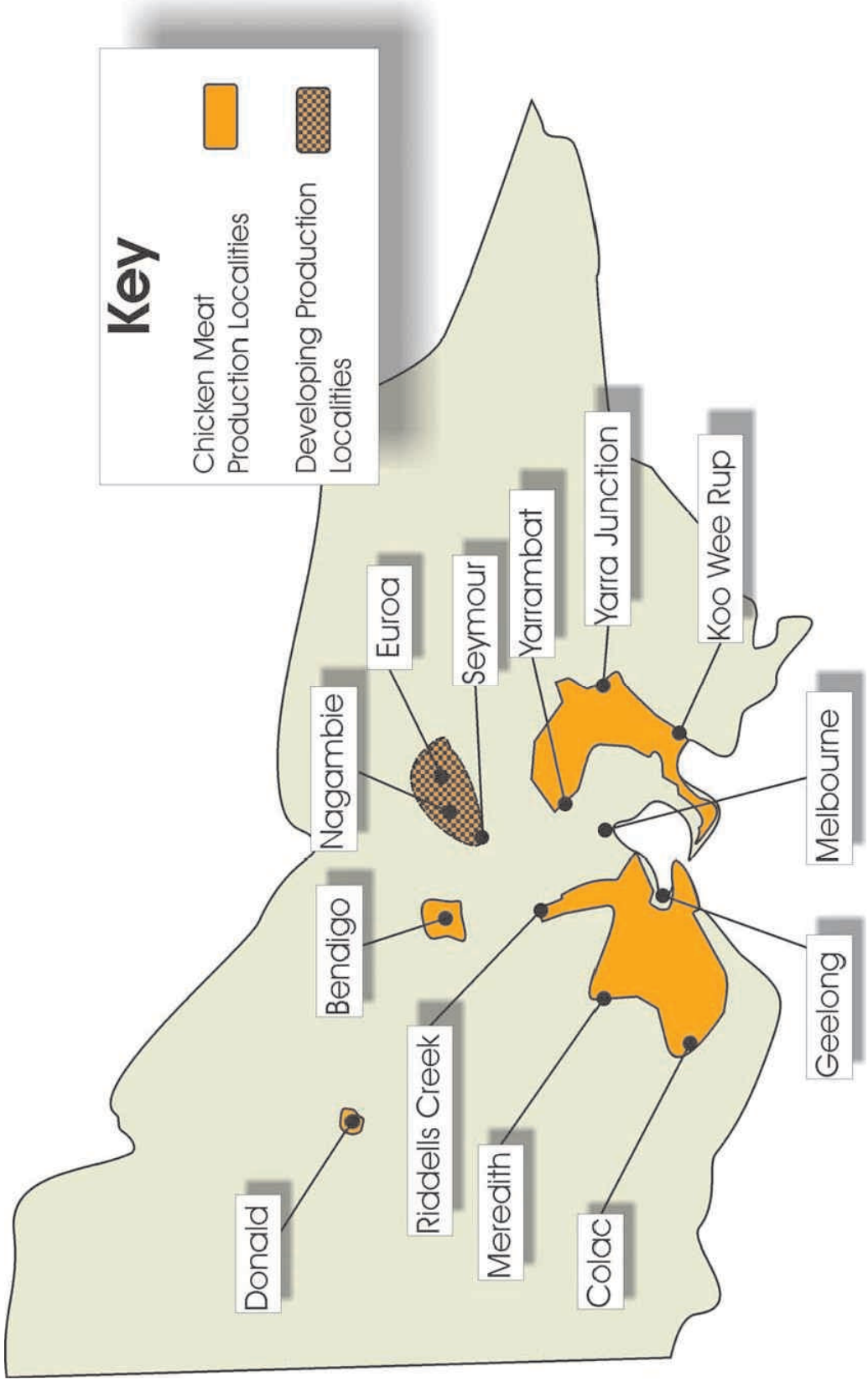


Figure 1.1: Distribution of chicken meat production localities around Australia

Figure 1.2: Distribution of chicken meat production localities around Victoria



Chapter 2: The Egg Layer Industry

2.1 Background

Egg consumption has continued to increase in Australia and detailed production figures are provided in Appendix 1. The increased consumption applies across all sectors, including whole shelled eggs, further processed eggs, and takeaway food.

The Australian Egg Corporation Ltd (AECL) reported[4] in its 2009 Annual Report that there were approximately 20 million commercial layers in Australia (as at 30 June 2009), including 14.7 million laying hens and about five million pullets reared to laying age. Egg production is estimated at 334 million dozen eggs for the 2008-9 financial year. This is an increase from 2005, when hen numbers were estimated at 15 million and total production (including backyard) was around 214 to 240 million dozen eggs per annum.

Approximately 85% of Australian-produced eggs are sold domestically through grocery and retail chains, and wholesale to the food service sector. The remaining are processed into liquid, frozen and dried egg products for use in the food service and processed food sectors. The reader is referred to Appendix 1 for tabulated details of AECL data.

Victoria, NSW each comprise around 30% of the national flock, while Queensland accounts for 20% of the national flock (ibid).

Of all eggs produced, around 4% are vegetarian, organic or speciality eggs. Of the 96% remaining regular eggs, the retail/grocery production system market share volume in 2008 was around 67% cage eggs and 26% free range (ibid). The barn laid egg market accounted for 5% of production volume.

While there are industry arguments that the estimated 15% increase in table egg numbers in the spring and summer seasons is due to increased backyard production, a closer examination of the layer figures and the estimated backyard production numbers does not arithmetically support this. A more probable reason is that, in conjunction with an increase in backyard production, there is a significant increase in production by point of lay commercial flocks housed in open sided sheds (which experience natural light conditions). Out of season flocks reared under natural conditions typically experience lower peak production and overall levels of sustainable production, as well as final housed hen numbers. The converse is true for in-season flocks that are reared under increasing natural light conditions. This overall seasonal impact on egg production numbers would be made more discernable by the increasing number of birds housed under alternative systems where the influence of out of season and in-season flocks is more important.

The consumption of eggs declined in the 1980s when concerns were raised about egg cholesterol and heart disease in humans. In 1940, Australia produced around 140 million dozen eggs (compared with the 2002/2003 estimate of 190 million dozen) and per capita consumption was around 250 eggs. Between 1981 and 1983, consumption dramatically dropped from 220 to 145 eggs per capita. Although the level of concern about cholesterol was not scientifically justified, the decline in egg consumption continued until recent efforts by the AECL to improve the nutritional image of eggs and by industry to produce a variety of eggs meeting varying consumer demands. In the 2008-9 financial year, grocery/retail sales of eggs in

[4] http://www.aecl.org/resources

Australia was estimated at 109.8 million dozen (ibid).

Imports are of egg powder only, this being equivalent to approximately five million dozen eggs. Such imports are by both independent and egg marketing bodies. Imports of dried egg white started in 1987, but the importation of whole and yolk powder was not permitted until 1995. Egg product imports in 2007 to 2008 were 1039 MT of egg powder, 318 MT egg pulp and 306 MT of preserved / cooked eggs.

Exports increased substantially from late 2004 with additional exports to Singapore due to an outbreak of AI in Malaysia. From the 1960s to the 1980s, per annum export of eggs ranged from 20 to 40 million dozen. Egg product exports in 2007 to 2008 were 200 MT of egg pulp and 168 MT shell eggs, the latter being mainly to Singapore.

2.2 Introduction

Historical Aspects

The egg industry developed initially when numerous small populations of free-range birds produced eggs excess to family requirements and these were sold or bartered. With urbanisation, larger flocks were developed to supply consumers and as demand and bird numbers increased, the farming of these birds became more intensified (and systems progressed from free-range to barn to cage layer systems). By the mid 20th century, a significant egg industry had developed in Australia. While much of the industry clustered around the fringes of major cities, a substantial number of farms developed in regional centres where cereal cropping occurred. Bendigo in central Victoria was an example of this, with eggs being one dollar a dozen in the 1970s which is comparable to today's farm gate price. Producers with moderately large farms for the time (5000 to 10 000 birds) were able to have a good standard of living. During this period there was also significant expansion creating larger farms of 50 000 to 100 000 plus birds. This was paralleled by the introduction of high-rise multi-tiered cage sheds.

The improved husbandry and improvement in health conditions with a corresponding reduced labour input have enabled higher production levels of eggs.

During this time, regulation of the egg industry occurred, with the result that eggs were predominantly marketed through specific state bodies. Thus, farmers focused on bird production and left the marketing of eggs to the egg board, which was successful in maintaining relatively high and stable prices.

There were a number of Australian layer strains and research and government agricultural and veterinary bodies supported research and development into all aspects of poultry (especially genetic improvement). Departments of agriculture in all states had well staffed poultry specialists and extension officers.

The strains of birds during this period included: CSIRO CB, Hy-Line, Leaches Tint, Tegel New Queen, Tegel Dutchess, Hazlett Black and Aztec. These strains were based on either Leghorn or Australorp crosses. There were very few pure white egg layers and no commercial brown egg layers, with all birds predominantly laying tint eggs. These birds produced around 240 eggs per hen housed.

Since deregulation, the industry has undergone significant structural changes with individual enterprises becoming fewer in number, larger in size and more vertically integrated. The industry became more sophisticated in order to meet both consumer demands in regard to quality of the product and to reduce concerns about animal welfare and antibiotic residues.

There was a review of layer hen housing in 2001 and the industry has now developed a generic quality assurance program that addresses food safety, bird welfare, biosecurity and labelling.

Importation of New Genetic Material

Like the chicken meat industry, the layer industry imported four new strains of layers in the late 1980s and early 90s to ensure the international competitiveness of the Australian industry. These entered the country as hatching eggs through the Torrens Island quarantine station. Imported were the Lohmann, Isa Brown, Hisex (all European based birds) and the Hy-Line Brown from the USA. All these strains are brown egg layers and the industry decision to import brown egg layers was based on surveys indicating Australian consumer preference for brown eggs. The newly imported strains of layers are prolific layers, achieving 340 saleable eggs to 74 weeks.

In 2009, there are still only three major genetic lines of commercial egg layers in Australia; HyLine Brown, ISA Brown and the HISEX Brown, all brown egg layers. The importation of other genetic lines is limited by access to a PAQ facility, and the relatively small Australian market.

Production peaks of 95% are achieved at around 26 weeks of age with some flocks achieving 90% production up until 60 weeks of age. Whole of life mortalities from day old to death of cage layers is commonly around 4% or less. Selection of the birds is now aimed not only at hen day production which is approaching physiological limits of an egg a day but focusing on sustainability of the production of saleable eggs.

In contrast to the predominantly brown egg production in Australia, the US market produces almost entirely white eggs which are laid by smaller birds with lower feed intakes, lowering production costs. In Australia, what demand there is for white eggs comes from the Asian and Greek communities, particularly during Easter. There are remnants of white or tint egg layer strains that some producers use to supply this demand.

Impact of Marek's Disease and Newcastle Disease on the Layer Industry

There have been no recorded outbreaks of virulent Newcastle disease virus (vNDV) in the layer industry since 2002, due in part to the adoption of the ND Management Plan and. increased awareness and compliance with biosecurity.

Revised industry NDV SOPs introduced in 2009 remove the requirement for killed ND vaccination in layers and broiler breeders in four states: Tasmania, NSW, Queensland and Western Australia. The requirement for live NDV vaccination with V4 remains. Producers are required in these four states to undertake strategic serological monitoring throughout lay to ensure that titres meet minimum requirements.

Surveillance will include some active surveillance by serology, including sentinel birds, and also ongoing passive surveillance in flocks experiencing production problems. Interstate poultry movements will also be subjected to some testing procedures. The 2008-12 program will be reviewed two years after its implementation.

With the introduction of the Rispen's vaccine, Marek's Disease (MDV) in commercial layers is now uncommon. This eradication has been aided by most larger operators and contract pullet growers choosing to manage single-age rearing farms. There are also less pullets being grown on production farm sites.

MDV proved to be most serious for imported layer strains, with mortalities in excess of 50% in many cases. Numerous producers were disgruntled with suppliers over the high losses associated with MDV and believed that virulent MDV had been imported with these new strains. While there was no scientific evidence for this, and there had been some limited emergence of MDV as a problem in local strains prior to imports, the observation of recently imported birds dying of MDV created a lot of questions. The Australian layer industry at this time generally had a low standard of biosecurity and husbandry practices were average. Rearing on multi-age farms and even multi-age sheds was accepted as normal practice.

While scientists and veterinarians argued this was a major causal association of MDV, producers who reverted back to the original Australian strains could demonstrate performance under these conditions with fewer problems with MDV.

Despite this major problem in the industry, the need to control MDV did spur a significantly improved approach to husbandry and biosecurity in the layer industry. The producers that developed isolated single age rearing farms and sound sanitation practices started to achieve the high performance achievable by these imported birds. While there was a period of uncertainty about the role of local Australian strains, it soon became clear that imported strains under good husbandry conditions were significantly economically advantageous. With the introduction of the Strain 1 Rispens Marek's vaccine greatly enhancing the liveability of layer stock, local strains were discontinued by mainstream suppliers.

During this period in the industry, there were significant changes as producers commenced rearing their own pullets (rather than buying them from suppliers) in specifically built rearing farms. Many of these were colony cage rearing farms rather than deep litter barn sheds.

The introduction of the cost sharing agreement between industry and government for emergency disease outbreaks further strengthened the resolve of both the chicken meat and layer industries to lift the standards of the poultry industry, particularly in the area of biosecurity.

Strong and successful lobbying of the government by welfare groups also resulted in a major review of the animal welfare code, with outcomes requiring a revision of cage densities and the decommissioning of up to thirty per cent of cages by 2008. The layer industry also needed to develop industry biosecurity, beak trimming codes and quality assurance guidelines.

These recent policy changes to the layer industry are creating the most dynamic structural changes since deregulation. Some layer producers consider these changes too difficult and are seeking to exit the industry. Other more progressive industry groups or members are using this as an opportunity to modernise and progress their business.

A number of other factors impacting on certainty in the egg industry are discussed below.

Year 2008 Compliance

Under the Commonwealth Primary Industries Standing Committee *Model Code of Practice For the Welfare of Animals, Domestic Poultry 4th Edition* all cages not meeting particular standards as outlined were to be decommissioned by 1 January 2008. The enforcement of this depends on each state and territory enacting supporting legislation. This is further dependent on how existing jurisdictional Animal Cruelty legislation is written. Animal welfare legislation varies across each Australian state and territory. The various states have regulated different sections and aspects of the code despite the Australian egg industry being a national industry. Some jurisdictions have delayed implementing the underwriting of the legislation beyond January 2008, creating some uncertainty for layer producers (Geof Runge, personal communications). Conversely, egg producers knew in 2001 what the regulatory requirements were and thus had seven years in which to work towards compliance. The absence of regulation does, however, limit the legality of enforcement of the code. Based on current information, enforcement of the requirement for cage densities of 550 cm^2 will begin in 2008 in the ACT and Tasmania, 2015 in Victoria and South Australia, and 2021 in Queensland, NSW, WA and the Northern Territory.

The monitoring of these regulations will also vary between states and will include the local responsible authority, agriculture department and RSPCA. It is expected that most states will achieve cage compliancy by mid 2009.

Alternative Layer Systems

The number of layers housed under cage or barn systems is difficult to estimate as current figures are not available from the ABS or AECL. Pure barn production, however, is diminishing because the market differentiation between it and cage production, as compared to free range production, provided no marketing and pricing advantage.

In 2009, based on supermarket sales, the consumer demand for barn and free range produced eggs was around 31% of total eggs produced. Based on European trends and the likelihood that companies such as McDonalds will only purchase non-cage eggs in the future, these numbers are expected to grow.

There has been considerable debate about what constitutes an 'authentic' free range production system. This has arisen because of the concern about the operational aspects of some larger facilities in the production of free range eggs and concern about the use of European aviary-based layer systems. Debate exists over appropriate shed densities, size of the outside free ranging area, use of artificial lights and lighting programs, and confinement within sheds during rearing and "inclement" weather. Many of these arguments are industry debates and it is believed that many of these husbandry details are of limited concern to the consumer who simply considers free range egg production that where birds in lay have free access to range outside. The AECL, by surveying consumers, hopes to establish minimum requirements for free range egg production which will become AECL policy. Producers can then implement or use these requirements for marketing advantage.

Despite the call by welfare groups to ban cages and place all laying poultry under free range conditions, barriers exist in the form of access to sufficient suitable land and obtaining relevant permits. It is, in fact, becoming harder to gain permits for free range farms because of concerns about nutrient run off and environmental degradation. Thus, there is a need to reinforce with regulators, RSPCA and animal welfare groups that moving birds from cages to free range is restrained by the availability of land and services.

It should be noted that from 1976, when avian influenza (AIV) first occurred in Victoria, until the last Newcastle Disease (NDV) episode in NSW, farms involved were semi-intensive and not free range farms.

The establishment of basic biosecurity policies for free range birds (including no access to surface or free standing water) helps ensure that the disease risks of free range flocks are minimised.

The operation and profitability of barn and free range systems is dependent on the price differential paid for cage and alternate system eggs. Any closing of this gap will impact on the proportion of eggs produced under existing barn and free range systems. The alternative is the development of special purpose built barn or free range farms where productivity losses due to mortality, lower production and poorer recovery will be eliminated. Such systems which allow higher stocking densities are currently gaining support in Europe. The semi-controlled environment of the shedding further reduces the risk of emergency disease incursions, as does the inclusion of winter gardens (a covered free range area).

Backyard Production and Cockerel Rearing

The last census of backyard poultry ownership in Australia occurred in 1992. The Australian Bureau of Statistics household survey established that 7% of households keep backyard poultry. It is estimated that the average flock size is between two and ten birds per flock. Not included in these figures are the 2000 pure breed 'fancy' flocks which average 50 multi-age breeder birds per flock for exhibition.

Based on the best information available, the size of the Australian backyard poultry flock is estimated at:

- between 100 000 and 200 000 owners of backyard poultry with a flock size of between two and ten laying hens, with an estimated population of around 1 million birds
- between 3000 and 5000 owners of small flocks (up to 500 birds) for meat and egg production.

There is little breeding in the backyard sector where most poultry are kept only to produce eggs for the owner's personal consumption and breeding is unnecessary. Breeding is also limited in urban areas where the keeping of roosters is restricted by local government (council) regulations. The majority of birds in backyard flocks come from specific pullet producers and through the sale of spent hens from commercial flocks. The number of chickens and other poultry species kept for the production of poultry meat for home consumption is very small and not significant as a proportion of total poultry meat production in Australia. Such activity is usually restricted to rural holdings where the keeping of roosters and larger species like turkeys and geese is not restricted.

In Australia, approximately 2000 poultry flocks are estimated to be owned by poultry enthusiasts who show and sell poultry of various special breeds (J. Finger, Bellsouth Ltd. Pty., pers. comm. 2009). Breeds in this category include traditional chickens, bantams, ducks, geese, quail, pigeons and turkeys. Flock sizes average around 50 birds with the total population estimated at 0.1 million birds.

There is little contact between the commercial poultry operations and backyard, enthusiast, small commercial and niche market poultry operations. The main opportunity for potential contact between sectors is through feed store operators and suppliers of other products.

The rearing of layer cockerels for the Asian market has not increased since 2005. The reasons for this have not been ascertained but could be due to high production costs and low profit margins. Flocks of less than 1000 birds are not subject to regulatory requirements (such as NDV vaccination) under current state legislation.

Broiler Breeder Eggs Movement into the Egg Industry

In 2005, there were approximately six million broiler breeders in Australia, each bird producing approximately 150 hatching eggs during their one-year production life. Of these, a percentage are non-settable eggs sold as consumer eggs or sold on to commercial egg laying grading floors for pulping. Total egg numbers are estimated to be between 0.5 and 1.5 million dozen per annum.

2.3 Structure of the Australian Egg Industry

Commercial Layer Strains

Currently in Australia there are only three major distributors of layer genetic material. Approximately 5% of the commercial layer population is supplied by smaller independent distributors.

Unlike the chicken meat industry, parent layers produced from the GPs are maintained by suppliers for the production of commercial day old layers. These day olds are either sold to egg producers to rear or are reared by the companies themselves to sell as point of lay pullets. Over time, as the number of smaller producers has declined, so has the rearing of point of lay birds by suppliers. The difficulty of establishing suitable farms and finding quality farm managers, as well as the desire to avoid carrying a capital cost for 15 weeks plus, have also resulted in suppliers preferring to sell day old stock. This was particularly so when losses were high due to MDV.

Livestock Movements

Fertile eggs are transported for hatching and day old commercial layers are then transported by air or truck to layer farms all over Australia.

Some day old commercial layers are also exported by airfreight to Oceania island countries such as Kiribati, Samoa and Micronesia.

The movement of pullets is limited compared to that of day olds but is still extensive. Reared pullets move up and down the east coast of Australia and to South Australia.

Unlike the broiler industry, there is essentially no movement of fertile hatching eggs between suppliers.

Since 2005, the shortage of shedding for pullet rearing in Victoria has resulted in around 400 000 pullets reared in SA being transferred to production facilities in Victoria.

2.4 Typical Farm Structure

While the traditional multi-age poultry farm is still common in the layer industry, the rearing of pullets on designated and isolated rearing sites is becoming more frequent. These pullets may be reared by the layer production company or by designated and specialist pullet rearing farms. This has a number of advantages including:

- improved biosecurity allowing vaccination immunity to develop in isolation
- focused management on the rearing pullets in regard to lighting and feeding programs.
- body weight management
- savings on capital infrastructure
- less labour / staff recruitment requirements.

High costs and, on occasion, regional difficulties in sourcing some raw feed materials has meant more producers are moving to commercially manufactured layer rations. This has also been encouraged by operational and personnel restraints associated with manufacturing feed on site. Contributing to this trend is also the realisation that the modern layer has more exacting nutritional requirements which producers must meet for layers to achieve optimal performance.

Traditionally, farms are multi age and have several rearing sheds which produce two or three batches of birds a year. Birds are reared to 15 to 17 weeks of age and then transferred to production sheds. Most farms are multi age as this allows producers to maintain continuity in the supply of eggs and in a size range that meets varied market requirements. In some cases, smaller operators may even have multi age sheds.

This farm structure is significantly different to that of the chicken meat industry where predominately all farms, both company owned and contracted, are maintained as single age sheds on single age sites. The only deviation from this practice is at elite livestock levels where different breeding lines are kept in small numbers on the one site.

It is more difficult to control endemic avian disease in multi age layer sites once they have become established.

As discussed elsewhere in this chapter, more modern layer farms are commonly structured with single age farms and off site rearing. Financing institutions are now also more aware of the risks associated with disease and are seeking technical advice on matters of biosecurity.

Many farms, possibly approaching 50%, also have small mash (non heat-treated) feed mills on site. The remainder buy their feed either from commercial feed mills or a significant percentage buy mash feed from other poultry producers with small mills.

Each farm usually has at least a packing floor (where eggs are placed on egg flats). These eggs are then transported to a grading floor operated by one of the marketing groups. Some eggs packed on the grading

floor go straight into what is called the box market. Distances travelled from farms to grading floors can be a few kilometres or up to 500 kilometres.

Manure or litter is usually stored on site for a limited time before being removed by a contractor.

After the negative impact of MDV many producers started to rear pullets off site in an attempt to improve biosecurity and reduce MDV. While there are still sound technical reasons why this is preferable, many producers still rear on their multi-age sites relying on the control of endemic disease by vaccination. The majority of new farms being built separate rearing and laying facilities, usually by at least 500 metres but more commonly by several kilometres.

Noting the improvements achieved in bird health and productivity, many of the larger cage layer producers now implement single age rearing farms and single age production farms. In some cases, there may be layer farm complexes with single age farm units separated by 100 to 500 metres. This, as with the chicken meat industry, has been necessitated as the most economical way to obtain services. Single age shed groups of 100 000 to 300 000 production birds are becoming more common.

Large farm complexes have their own grading floor and from there eggs go directly to the retail market.

Most barn lay sheds are former contracted lapsed broiler sheds and are generally not of a modern best practice broiler shed design. They may be single or multi age farms. Some producers are building new barn sheds to obtain production efficiency close to that of cage layer sheds. Typical barn sheds contain 5000 to 10 000 birds.

Free range farms are of two essential types:

- typical broiler style barn sheds where the birds are allowed outside access either through flaps or opening of the end doors
- small hutch-type houses (which may be portable) placed strategically around the property.

In the former, good performance can be obtained if facilitation is adequate. The number of birds per shed generally ranges from 5000 to 7000 birds with the larger farms currently having 30 000 birds.

In the hutch-type systems, production can be varied and seasonal, particularly where no artificial light is used. Usually there are around about 2500 birds in each group on such farms, with farm populations around 10 000 birds.

A number of the older farm complexes run a combination of production systems on site.

Most farms also have a resident farm manager and a leading hand who may or may not live off site. Larger farms will also have maintenance personnel, a feed mill operator and the staff necessary to run and staff the packing/grading floor.

2.5 Shedding Design and Facilitation

Cage Layer Facilities

Since 2005 there has been a continuation of the building of new controlled environment (CE) cage facilities to meet increased market demand and/or to replace older cage systems that are not compliant with the 2001 code. Essentially all new CE cage sheds are based on overseas technology, particularly that from Europe. The layer industry differs from the broiler industry in that most of the larger integrators deal directly with the international companies when building sheds rather than through local Australian agents.

The automation of these modern sheds improves significantly the ability to maintain a homeostatic environment for the birds and thus achieve optimal performance particularly in regard to feed conversion

efficiency. More birds can also be managed by less people. The style of the cages, size and design has generally resulted in improved welfare in regard to feather score and foot conditions.

The initial concerns about the welfare pressures to phase out caged facilities has somewhat diminished with there being no clause relating to this in any proposed legislation (other than the ACT) and awareness of some changes in the sentiment in the European Union (EU) about cage layer production. This in the EU has not only come about because of commercial pressures related to costs and competitive imports but also because of the recognition of the increased concerns in regard to mortalities associated with behavioural changes and some diseases. Food safety issues, particularly in regard to Salmonella control are also influencing the European industry.

Conventional sheds are single level with several rows of single tiered cages. The side walls are either slatted or consist of a single curtain and usually have ridge flap ventilation. Environmental control is minimal in these sheds, with cooling performed by foggers (misters) and possibly some circulating fans. Water supply consists of nipple drinkers attached to the top of the cage which are supplied by a front positioned trough which may be manually or automatically filled. Egg collection is manual from the front of the roll-a-way cage.

Control of wild bird and vermin access can be more difficult in these sheds. Manure collects immediately below the cages and is removed manually by a front end loader.

A modification of this shed design was the Hi-Rise design with the manure falling to the lower level where it could collected by vehicular entry.

This design was further developed by the incorporation of multi-tiered cages with automatic egg collection belts.

Since the 1980s, controlled environment Hi-Rise sheds were built with extraction fans, cooling pads and automated controllers. More recently added are manure belts that allow the weekly removal of dry manure from the shed.

Control of the shed environment, including light intensity and vermin and wild bird access, has resulted in sheds that require less labour and perform optimally under conditions of enhanced biosecurity. These improvements have seen an increase in the numbers of birds held on smaller areas of land.

Shed controllers maintain temperature and ventilation levels, record feed and water consumption, and (in some cases) automatically weigh birds and record egg production numbers. All these parameters can be integrated into an alarm system including power phase failure alarm.

Cage stocking densities currently range from 400 to 650 square centimetres per bird.

Barn Layer Sheds

Barn layer sheds are mostly converted broiler farms rather than purpose built structures. As a consequence of this, a number of these facilities may be regionally associated with broiler sheds. These sheds may be naturally ventilated, fan assisted or controlled environment.

Floors may be deep litter with manual collect nest boxes or two thirds slats and one third deep litter with automatic collect nest boxes. The configuration of these sheds and stocking densities may be determined by RSPCA accreditation (obtained for marketing purposes) requirements.

Stocking densities are usually around eight to ten birds per square metre, with eight centimetres of feeder space (20 birds per pan) and eight birds per nipple drinker.

Light control has become a significant issue in barn sheds because of the potential for high mortalities from pecking and cannibalism.

Some barn sheds are being built (or existing sheds modified) with full automation, including manure belt removal systems. This is in an attempt to achieve productivity comparable to that of cage layer facilities and ensure sustainable economical returns if barn egg prices decline.

2.6 Free Range Housing

There are very few specifically built free range facilities, most facilities are converted broiler sheds or conventional cage layer sheds. Some of the smaller producers are building a simpler style shed with minimal or no insulation, open side walls, and with pan feeders and nipple drinkers. More growers, however, are incorporating slats and automated nesting systems because of the cost and difficulty of sourcing labour.

One large free range aviary system has been built in Victoria. The aviary system is of European design and the aviaries are internally like a barn lay facility, except with elevated rows of perching and nest box systems. This allows the accommodation of more birds per square metre as the birds live in a three dimensional configuration. One argument against these style of sheds is that the larger bird numbers reduce individual free ranging space outside. Conversely, these styles of sheds allow birds greater freedom of movement than single level sheds.

It is expected that, over the next few years, more purpose-built farms for free range layers will be constructed. These will take into consideration the planning aspects of landscaping and vegetation, drainage and general aesthetic elements. They will also allow pasture rotation to assist in vegetation management and disease control.

The largest number of free range eggs are produced by barn-type facilities where birds are allowed to range outside. The type and quality of this shedding is extremely varied. Husbandry practices also typically vary and performance variation is large.

Those that are governed under organisations like FREPA and subject to audit are generally compliant with good industry practice. Some smaller producers sell eggs at the farm gate, farmers markets or to regional stores.

2.7 Horizontal Contacts

As the chicken meat industry and egg layer industry have similar horizontal contacts, only those details specific to layers will be discussed.

Dead Bird Disposal

Bird numbers and mortalities are considerably smaller for the layer industry compared to those of the chicken meat industry. Some calculations based on industry performance parameters would estimate approximately 600 MT of weekly mortalities in the chicken meat industry compared to 30 to 40 MT in the layer industry.

Means of disposal are similar to the layer industry except that there is less access to poultry-based rendering plants. While burial has been common in the past, newer farms are required to dispose of mortalities using commercial contractors.

Day Old Commercial Layer and Pullet Movements

The majority of day old commercial layers come from one of the three major layer companies all who have strict biosecurity practices in place and use their own vehicles. All these organisations have restricted and biosecure access to their properties as well as rigorous vehicle sanitation. An average of

around 200 000 day olds are delivered each week from the three hatcheries, resulting in around 10 to 20 deliveries per week depending on the size of the recipient farms.
There are times when some layer suppliers may hatch both broilers and layers. A common day old chick truck may be used for either broilers or layers on occasions.

Pullets, on the other hand, are delivered by cartage contractors who regularly transport different types of chicken species. Typically they can cart pullets, spent layers, spent broiler breeder hens, broilers and possibly turkeys. The large integrators usually operate under tighter biosecurity conditions, taking depopulated birds to the their fence line and not allowing any external equipment, vehicles or crates onto the property.

To avoid high transport costs, pullets are usually only moved within a state or to adjoining states.

Spent Layers

These generally are of low commercial value and, in some cases, the purchase of day olds from suppliers has been on the condition that the supplier will take and dispose of the spent hens. There have been periods where spent layer hens have been disposed of in the same manner as dead birds. Currently most spent layers are processed at chicken meat processing plants, small processing plants designated specifically for spent layers and broiler breeders or, in one case, at a plant owned and operated by a turkey producer.

Layer producers have to be careful to get their birds booked in and may have to alter their depopulation dates to fit in with the processor.

These birds are often carted by operators who also transport pullets. While most cartage is within each state, there is a significant movement of spent layers out of Victoria into Sydney NSW.

On occasions, layers are depopulated and culled by using carbon dioxide under strict protocols and welfare conditions. There are considerable costs in culling, transport and disposal using this method and this means that the disposal of spent layers by processing is still the preferred option. In Tasmania, the disposal of spent layer hens is limited to pit burial.

A developing option is farm gate sales for home consumption to Asian consumers.

Layer Litter and Manure

Layer industry manure has a commercially higher value than that of broiler litter. The movement of this litter is as for the chicken meat industry. Storage of litter and manure in piles where grazing ruminants may have access is not permitted.

All states now have strict regulations in regard to poultry manure and rendered animal material (RAM) content and ruminant access restrictions.[5]

Farm Wash-down and Sanitation

While suppliers of commercial layers have the same rigorous farm wash-down procedures as chicken meat companies, farm cleaning practices by the independent layer producers vary.

Many layer producers only dry clean and do not have any wet wash-down procedure. This may be for a number of reasons, including: having multi-age sheds, concern about damage to equipment, the cost of

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www.dpi.vic.gov.au/DPI/nreninf.nsf/v/6A07A92E2996872ECA25740F007B2626/$file/Poultry_Litter_Poultry_Manure_and_Poultry_Feed_in_Livestock_Production_Systems.pdf

wash-down, inadequate drainage of some sheds, and lack of water supply. The concern about damage and cost are usually without foundation and some of the largest layer companies have a full wash-down procedure which assists them to achieve above standard industry performance.

While rearer farms are generally washed and sanitised, the increasing cost of new litter and the relative rarity of Marek's Disease has seen some reduction of sound cleanout practices on rearer farms. Where cage rearing is undertaken, cleanouts with effective sanitation are more common.

Wash-down crews are generally involved with other types of chicken enterprises and a number of different operations.

New Litter Material for Barn Sheds

The amount of new litter material used in the layer industry is limited and new litter is only used in some barn-type facilities. The suppliers and horizontal contacts are as for the chicken meat industry.

Feed Manufacture and Delivery

The use of heat-treated pelleted feed in the layer industry is limited with the industry using only around 5% of all feed grain used in the Australian livestock industry. The only area where it is commonly used is as a starter ration for young pullets.

Pelleted starter rations are used for their improved consistency and texture, and freedom from Salmonella.

The precise nutrient requirements of the modern pullet has necessitated the use of staged feeding, essential if producers are to achieve near genetic optimal performance. Such rations may include: Pullet Starter, Pullet Grower, Pullet Developer, Layer Pre Lay, Production 95, Production 105 and Production Late Lay. The rearer rations ensure that the growth characteristics of the young bird are optimised and that it is prepared for its production life. Production rations allow for variations in intake at different ages, and different net nutrient and macro mineral requirements throughout the life stages of birds.

As a consequence of the increasing complexity of feeding and nutrient requirements, layer producers are moving away from in-house mills (or, conversely, increasing the sophistication of their mills) to using commercially prepared feeds where a nutritionist is provided as a service. Producers can still influence their costs by purchasing all their own raw materials, premixes and other additives with no margin applied, and only effectively paying for manufacturing costs and transport.

Most of the industry uses mash-based feeds produced on farm or from other farm-based or commercial mills. Some large commercial mills have commenced producing heat-treated mash feed to gain some market share while still maintaining compliance with their quality assurance requirements. Small farm-based mills may not have quality assurance programs.

Because manufacturing mashes costs less, mills producing mash can compete successfully with larger commercial mills. That is, mills producing mash can offset transport costs with lower manufacturing costs. Transport costs can be high because it is not uncommon for layer feed to move between states at distances of up to 800 kilometres.

The movement of this feed interstate can theoretically pose a higher risk, however, few farms are usually involved.

With the increase in food safety concerns throughout most jurisdictions, some attention is being focused on feed as a source of Salmonella contamination for layers and (potentially) eggs. This area of interest may have been influenced by policy development in the EU in regard to feed manufacture, and monitoring the input raw materials and finished feeds for salmonella. In some scenarios the use of organics acids in feed milling practices is routine.

Beak Trimming and Vaccination

The introduction of the day old chick infra-red machine by Hy-Line Australian has reduced beak trimming on farm by close to 50%. This reduces the need for beak-trimming crews.

The use of infra red beak trimming is being now used by a number of layer hatcheries in Australia. While there are recognised welfare advantages, industry producers appear to still have mixed opinions of the quality outcomes of infra-red beak trimming compared to conventional hot blade techniques. The quality issue with infra-red beak trimming at day of age appears to be associated with the set up of the machine at the commencement of the process. Producers in alternate systems, if not restricted by any of their voluntary production codes, usually undertake a second beak trim at around 10 weeks of age.

Beak trimming is usually undertaken by vaccination crews. While these crews are similar in structure to those that operate in the chicken meat industry, they are usually independent and work at many independent farms.

The vaccination program for layers is similar to that of broiler breeders except for the exclusion of chicken anaemia virus (CAV), Fowl Adenovirus (FAV) and infectious bursal disease (IBD).

Over the last few years there have been ongoing difficulties with the supply of a number of live vaccines in Australia including IBV, IBDV, AEV, Fowl Pox (FP) and ILT. This has resulted in a number of flocks being brought into production without the assurance of protection from vaccination. Reasons for this are explained in Chapter 10.

Egg Movements and Egg Fillers

This is one of the areas of greatest concern with regard to horizontal contacts in the layer industry. Within companies it is not uncommon practice to move second-hand cardboard fillers between farms. While producers appreciate the biosecurity risk, economic considerations dominate. Of concern is the possible spread of ectoparasites and endemic avian pathogens and of course more serious pathogens. Often (illogically) companies have truck wash facilities and shower-on facilities at farms but allow the free movement of second hand cardboard fillers onto farms.

However, since 2005, an increase in the incidence of EDS has increased the industry's awareness of the movement and reuse of egg flats (fillers). Some large organisations have introduced sanitised plastic fillers and / or the streaming of fillers to reduce the risk of disease transmission.

Eggs can also come from smaller farms onto the packing floor and cool room of larger farms before distribution to a grading floor. In some situations the grading floor is on a large laying farm and all associated vehicles, pallets and trolleys pose additional biosecurity risks.

Movements of eggs from farms to centralised packing floors can be up to 400 kilometres.

Non-company and Maintenance Personnel

Generally what is applicable to the chicken meat industry applies also to the layer industry.

Water

While water supply is similar to the situation with chicken meat farms, there is more variable compliance regarding surface water sanitation on layers farms. This is because the independent operators are not audited by company personnel, as is the case with chicken meat producers.

The introduction of Egg Corp assured, with its trained and qualified auditors, in combination with auditing bodies like Queensland Food Safe, should help to identify noncompliant farms.

2.8 Industry Organisational Structure and Codes

The Australian Egg Corporation (AECL) is the main body representing the egg industry. It is funded through research and development and marketing levies (www.aecl.com.au). It is also a core participant in the Poultry CRC.

There is recognition by organisations such as FSANZ, AECL and various DAFF/AHA subcommittees for ND and AI, that the egg industry, unlike the chicken meat industry, has a number of producers ranging from small to medium in size that are non-aligned with the formalities of the egg industry. The egg industry's national quality assurance program, Egg Corp Assured, while progressive, does not cover all producers. It is hoped that new food safety legislation based on the FSANZ Egg Standards, when introduced into each of the jurisdictions, will ensure that all farms comply with best industry practice. While some states are formally identifying all commercial poultry farms by the use of property identification codes, this does not mean they will have the legislative power to act on non-compliance issues related to biosecurity.

The existing codes for the welfare of animals are included in the various state legislations and are enforceable.

FREPA is the most recognised organisation representing the free range industry, although not all free range producers belong to the association.

While the egg industry is well structured at the executive level (as is the chicken meat industry) the fragmented nature of the layer industry means that implementation of policies is more difficult. Industry response to surveys (for example) is generally very poor.

2.9 Chicken Egg Production Locality Areas

The map on the next page complements the text of this chapter and indicates the distribution of egg layer producers in Australia. Like the chicken meat industry, several regions containing a high number of egg layer properties can be identified. However, unlike the chicken meat industry, a reasonable proportion of egg layer properties are also located in areas away from dense production localities. Figure 2.1 represents this distribution by graphically illustrating the regional density of egg layer farms. Since 2005, new farms are being established in regional areas, generally where other poultry production is not present.

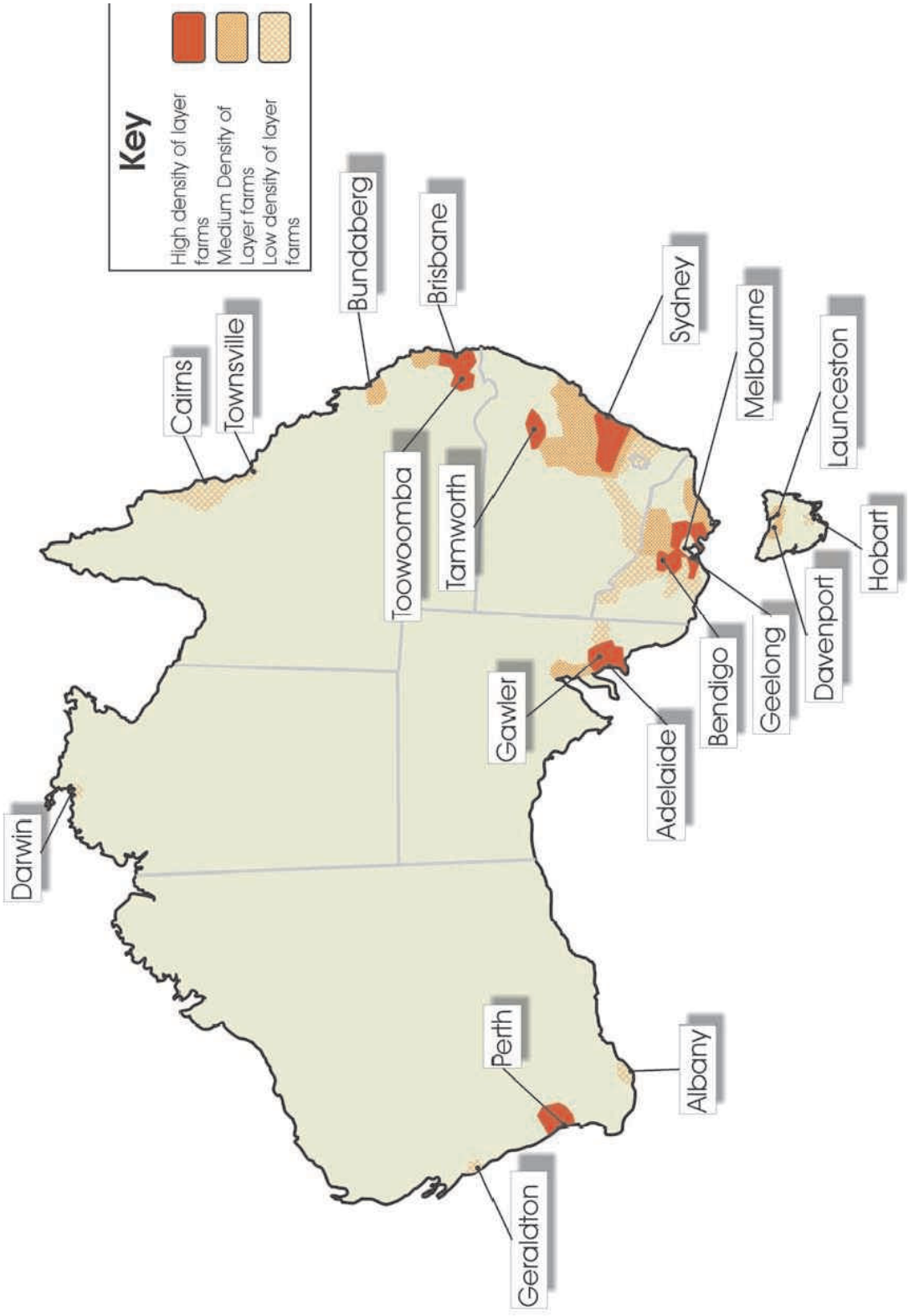

Figure 2.1: Regional Density of egg layer properties throughout Australia

Chapter 3: The Turkey Industry

3.1 Description of the Australian Turkey Sector

Turkeys arrived in Australia on the First Fleet and have been an integral part of the traditional Christmas feast since that time. Compared with the chicken meat industry, the turkey meat sector is quite small, with approximately 4.7 million birds slaughtered in 2001-2002, resulting in sales product valued at around $200 million. (Source: QDPI National Capability Survey 2002). Since 2001-2002 it is estimated that the industry has grown by between five and nine percent. There is no commercial turkey egg industry in Australia.

Turkey stocks are estimated to be 1200 Grand Parents, 4500 Parents, and around 3.9 million commercial birds in late 2008 and moving up to around 4.2 million in 2009 (pers. comm. Australasian Turkey Federation). This figure is less than that estimated in 2005 but that year there was overproduction. These figures assuming an average live weight of around 9 kilogram equate to a turkey meat per capita consumption of around 1.25 kg. Small increases in the number of free range and organic birds have occurred since 2005, in line with the estimated 4 to 6% increase in total turkey numbers slaughtered yearly.

Turkey production has been increasing and intensifying in Australia, with a larger number of commercial contract growers running larger farms, and an increasingly strong market for niche birds, such as traditional coloured breeds and free range. A marketing campaign by one of the larger integrators has resulted in increasing consumption of turkey meat throughout the year, as well as at Christmas. Small flocks produced with low overheads (using low cost shedding, home milled feed, home processing and selling direct to consumers at farmers markets or from farm shops) can prove very profitable.

The two breeds commercially available for meat production in Australia are the Hybrid and the Nicholas.

3.2 Sector Structure, and Establishing and Maintaining a Flock

There are two common types of commercial turkey farm in Australia. The first is the large, commercial contract grower, similar to the commercial chicken contract broiler grower. This type of grower is responsible for more than 85% of turkey grown in Australia. The second is the small, low input, integrated farm, accounting for the remainder of production.

Commercial contract growers grow broiler birds for four vertically integrated turkey companies –based around Bargo in NSW, Beresfield in NSW, McLaren Vale in South Australia and St. Arnaud in Victoria (see Figure 3.1). In 2009, an expansion of facilities in the St. Arnaud area in Victoria, and a reduction in breeding stock in NSW were observed.

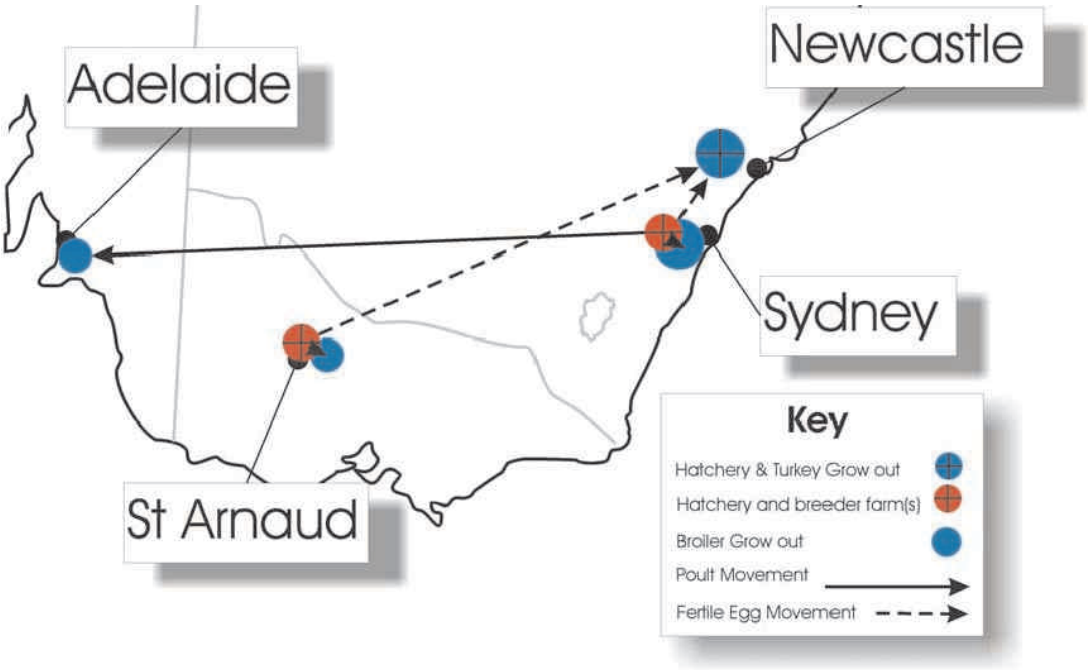

Figure 3.1: Distribution and bird and egg movements in the Australian Turkey Industry

These growers are essentially identical to commercial chicken broiler contract growers. They supply the farm infrastructure, litter materials, labour, electricity, water and gas, and in return are supplied with feed, birds and technical advice by the integrator. Some contract growers for thelarger integrators are now paid on a “per square metre” shed area basis, rather than a per bird grown basis.

Small growers purchase day-old poults from a hatchery for between $4.75 and $5.50 each, grow them out, market and then sell the product themselves. Typically these are multi-age farms with multiple age groups of birds at different stages of grow out at any time. Some have licensed processing plants on site, others transport live birds to small licensed processing plants and pick up the dressed carcasses for a fee. These producers may also further process product by boning, portioning or smoking. Usually these growers have their own brand and a small number of dedicated retail outlets in the same state, often combined with small farm shops or sales at local farmers markets.

Only two companies maintain commercial quantities of primary breeding stock in Australia. Hatching eggs from these farms are transported by road to four hatcheries. These hatcheries then supply commercial quantities of day old poults to the industry.

The Nicholas breed is now the dominant imported line, with both breeding companies using this bird. There are few Hybrid birds being grown in Australia.

Both eggs and poults may travel long distances. For example, eggs move from Victoria to NSW hatcheries and poults are air-freighted to Western Australia, Queensland and Tasmania from Victoria, or to SA from NSW. There is potential for interaction between poults and cage or aviary birds transported across Australia in a similar manner, although the number of poults transported, and the frequency of these movements is low when compared to the number of chickens and turkeys transported by road.

Movement of broiler turkeys from farm to farm is very uncommon, although movement from shed to shed within a farm may occur. This commonly happens when producers brood birds in one shed equipped with heating infrastructure and then move them to other sheds on the same farm later in the grow-out. Female broiler turkeys are processed at around 10 weeks of age at a weight of around 5kg. These birds are predominantly used for the whole bird market. Males are processed later, at around 17 weeks of age. The

weight of males is usually between 16kg and 18kg. The males are typically used for breast yield and thigh/red meat portions, rather than as whole birds. However, some larger sized birds are required for seasonal celebrations. Due to the size of the birds and the cost of freight, turkeys typically do not travel long distances from broiler grow out farms to slaughter.

3.3 Production Unit Size, Husbandry and Shedding

Production unit size is highly variable. Commercial turkey broiler producers with multiple sheds ranging from 10 000 to 20 000 square feet in size may have up to 32 000 birds on one site. Other smaller farms may have multiple, smaller sheds to allow for different age groups on the farm. Farm sizes are increasing, particularly as many of the small producers find increasing markets outside of the traditional Christmas demand. Shedding requirements for turkey are similar to that required for chickens, although most turkey sheds are older and naturally ventilated rather than controlled environments.

3.4 Factors affecting flock size and density

The turkey industry, while undergoing some expansion as a result of Australian population growth, has not achieved the same consumer demand as in the USA. Reasons for this appear to be related to retail pricing, consumer perceptions about the preparation/taste/texture of turkey breast meat, and the perception that turkey is a special occasion meat. There are concerns that the acceptance of the turkey as a traditional part of the Christmas dinner is also declining. In response, companies have released a new range of portioned, value added, frozen meals (including filet mignon, cranberry Wellington and mini roast) and fresh products (including sausages, schnitzels and mini roasts) to attempt to increase consumption of turkey products by consumers throughout the year.

Compared to chicken, turkey meat is expensive to produce and this cost is passed on to the consumer, resulting in a more expensive meal. These factors continue to limit the local market for turkey products outside of the festive season. The expense of turkey production in Australia compared to overseas also limits export opportunities, except in very small niche markets such as religious slaughtering. A significant increase in poult hatching must occur every September to supply well grown, whole, fresh birds for Christmas sales. A large volume of product has to be stored in freezers during the year to allow for increased Christmas sales, and this can be costly for producers.

Marketing campaigns have resulted in an increasing proportion of product being consumed outside the festive season. New products such as cold cooked meats, small portion size product such as thigh chops and other further processed product are proving more popular with consumers. These products can also be marketed to the consumer at a cost similar to that of red meat and command a small but increasing share of the poultry meat market.

Residential encroachment on small producers wishing to expand is a significant problem, as it is for the chicken industry. Many small farms are in areas of increasing residential demand but the cost of establishing a larger farm in more remote areas is prohibitive. Specifically, additional costs in remote areas include payments for the connection of electricity and gas, establishing a permanent potable water supply and increased transport costs. Environment and welfare issues associated with the turkey industry do not get the same attention as those associated with the chicken meat industry.

3.5 Commercial mixed species farming

Commercial populations of other bird species on the same property as commercially farmed turkeys is

uncommon. Commercial populations of other poultry species are not permitted by the biosecurity codes implemented by the vertically integrated companies. Additionally, most farmers appear to have an understanding of basic biosecurity principles.

Occasionally, a small turkey producer will have a population of commercial free range chickens on the same property. Typically, these will be kept on separate areas of the farm to increase ease of management, but also to assist the control of Blackhead (Histomoniasis). The causative agent, *Histomonas meleagridis*, is a protozoan parasite that can cause severe mortality in turkey flocks. It has a direct transmission cycle in turkeys but may also be spread by a common chicken intestinal worm.

On small organic and free range production farms there may be some horizontal contact with other species of poultry.

3.6 Dynamics Within the Industry Sector

Establishing Flocks of Genetic Stock

There are two commercial strains of meat turkey in Australia. The Nicholas breed is sourced from the USA, and enters Australia via Torrens Island as Great Grandparent (GGP) eggs. The Hybrid breed is sourced from Canada and enters Australia as GGP eggs via an importation facility. Small producers with a hatchery on site may maintain lines of rare breed birds, such as the King Island Turkey, coloured birds, or traditional Australian genetic stock (commercial white, bronze wing) in an organised breeding program. Both the large commercial hatcheries and these small producers have significant numbers of small-holder clients who will purchase small numbers of turkeys for grow out before a traditional Christmas or Thanksgiving kill.

Development of Genetic Stock

i Management of Genetic Stock

GGP, GP and parent breeder stock are typically kept at a higher level of biosecurity than meat birds. These farms will include shower facilities for staff, and strict rules regarding movement of personnel and equipment between farms. As natural mating of all commercial breeds is impossible, semen is collected from mature toms and artificial insemination of hens is completed weekly by on-farm insemination staff.

There is no movement of staff or equipment between the two commercial breeder companies, although sanitised equipment may move from breeder farm to breeder farm within the same company.

Fertile eggs are sent by truck to the four commercial hatcheries for hatch of poults. Eggs travel weekly from Victoria to NSW, as well as between NSW based breeder farms and hatcheries.

ii Feed and Water Supplies

Breeder flocks are always supplied with commercially milled, heat-treated, nutritionally balanced feed. The weight of these birds in rear and lay is usually controlled by manipulation of feed formulation, rather than restriction of intake, as is usual in broiler breeder birds. Water supplies are always sanitised.

iii Live Bird Disposal

There are a small number of farms where turkeys are reared until sexual maturity before transfer via trucks to a production farm for fertile egg production. Some rearing and production facilities are on the

same site. All birds from breeder farms are sent for processing at the end of their production cycle. Disposal of large (>30kg) breeding toms at the end of their productive life has been proving difficult for some breeders. The birds are too large to be crated, transported and processed as for smaller birds, and may be killed and disposed of into landfill rather than processed for human consumption.

iv Farm Waste Disposal – Reject Eggs and Dead Birds

Disposal of dead birds and cracked and dirty eggs usually takes place on-farm by burial or through an in-vessel composting system. Hatchery waste may be sent to landfill.

v Factors Influencing Genetic Stock Performance

The production performance of turkey breeders in Australia is similar to the production performance of turkey companies overseas. Typical egg production per turkey breeder housed will be between 95 and 105 eggs in a 28 week laying period, with fertility ranging from 95 to 88 per cent. Overhead costs per hen housed are increased by the small size of facilities and flocks and an inability to utilise facilities such as GGP housing to their full potential. These factors contribute to increased costs per poult produced which are higher compared to overseas costs.

Management of breeder stock is influenced by staff experience and competence.

Vaccine companies are reluctant to conduct the expensive testing required to allow their chicken vaccines to be registered for turkeys, or to allow the development of vaccines for diseases specific to turkey. This is primarily due to the small Australian market for these products. The unavailability of vaccines to protect against common, endemic diseases of turkey in Australia such as *Mycoplasma meleagridis* has resulted in the need for strict biosecurity measures to prevent the spread of production limiting disease into "clean" imported breeding flocks.

Cheap serological diagnostic tests for many of the common diseases of turkey, particularly *Mycoplasma meleagridis*, are unavailable in Australia, making rapid disease diagnosis and monitoring difficult.

3.7 Husbandry and Dynamics of Production Stock

i Management of Production Stock

Broiler turkeys are grown in naturally ventilated or assisted ventilated sheds similar to those used for commercial chicken production.

Turkey poults can be very difficult to brood because they are easily frightened and tend to crowd into corners, resulting in smothering mortality. Most poults are brooded within brooding circles, with an elevated hover brooder that has easily identified feed and water supplies. The eyesight of poults is poor when compared to chicks, and increased light intensity assists them to find feed and water, as does the addition of marbles or other shiny objects to feed and water troughs.

Broiler turkeys may be housed with males and females in the same shed and separated by a fence. Females are removed first at around 10 weeks of age and the males released into the remaining half of the shed for continued grow out until 18 weeks of age. Alternatively, males and females may be housed in separate sheds.

Growing broiler turkeys is considered more difficult and demanding than growing broiler chickens. This is primarily because shed design is less automated and more knowledge and experience is required to maintain constant and optimum shed conditions for growing birds than when fully automated, controlled environment sheds are used. Also, brooding of turkey poults is difficult, and requires almost constant

supervision of the birds for the first two to three weeks.

Chicken farmers who are under pressure from integrators to complete costly upgrades to convert their sheds to controlled environment style may turn to turkey integrators to avoid this cost, and to prolong the productive life span of their older style shed without modification. This can only occur in areas of turkey production such as McLaren Vale and Beresfield, and where farmers are looking to gain new skills in poultry farming by growing turkeys.

ii Feed and Water Supplies

Heat-treated, pellet feed is supplied by commercial mills to most broiler producers, although some small farms (particularly those with niche markets) will use home milling.

Water supplies may be from mains, surface or underground water. Some free-range flocks may be offered water in open troughs but a majority of producers use closed drinking systems within sheds.

Surface water, where used, is always sanitised. Bore water is commonly used where available and is rarely sanitised.

iii Live Bird Disposal

All turkeys are sent to processing plants specially equipped to handle larger size birds. The process used to slaughter and dress turkey carcasses is identical to that used for commercial broiler chickens.

iv Farm Waste Disposal – Reject Eggs and Dead Birds

Disposal of dead birds is usually by burial on farm as mortality rates are low. Some farmers utilise an in-vessel composting system, or compost their dead birds in used litter.

v Factors Influencing Production Stock Performance

The performance of turkey broiler stock in Australia is comparable to overseas. Feed conversions of 2.2 to 2.3 kg of feed to 1kg of live bird are industry standard for female broiler birds processed at around 5kg live weight.

Commercial turkey broiler growers are pressured by integrators to maintain and improve production parameters such as mortality and feed conversion. They may also be paid a bonus based on these production performance parameters.

Small, niche producers selling product at higher prices per kilogram with lower input costs can be more inefficient than commercial contracted growers yet still make significant margins per bird processed.

Fowl Cholera continues to be a health problem for the turkey industry with the majority of breeders vaccinated with autogenous killed vaccines. It is hoped that the introduction of a locally developed live attenuated FC vaccine will assist in improved control of this disease.

The removal of dimetridazole from the commercial market leaves the turkey industry without an effective treatment against Blackhead.

Newcastle disease (ND) vaccination is not compulsory for turkey flocks in Australia.

3.8 Horizontal Contacts Between Industry Sectors

Facility Builders/Suppliers of Basic Materials

Shed design is essentially the same for both commercial turkey broiler and chicken meat sheds. Older style sheds built originally for commercial chicken production are easily and cheaply renovated for commercial turkey production, compared to the cost of building a new shed. Occasionally brand new turkey farms will be established. Most turkey feeder and drink equipment is imported.

Husbandry Equipment Suppliers

Due to the small amount of product required, artificial insemination equipment may be sourced through the commercial pig industry. Generally, equipment will be available for purchase through the same suppliers of chicken husbandry equipment.

Flock Placement

Following hatching from one of the four commercial turkey hatcheries, poults may be transported large distances compared to the chicken meat industry. Poults routinely travel from Victoria to Western Australia, Queensland and Tasmania by air, and from Central Victoria to Gippsland by road and rail.

Typically, fresh litter is used to brood poults and this may consist of wood shavings, chopped straw or rice hulls, depending on the area and availability. This is discussed in detail in the chicken meat chapter of this document. Males and females may be placed in separate ends of the same shed or in separate sheds depending on farm design.

Feed Manufacture

The majority of turkey feed is manufactured in the same mills that manufacture commercial chicken feed. Some small producers mill their own feed. The movement of feed trucks between farms of different species carries a potential risk for transfer of disease between species.

Vaccination and Beak Trimming Crews

All vaccinations and beak/toe trimming is completed by farm staff. No transfer of staff occurs from one breeder farm to another, although equipment may move from breeder farm to breeder farm within a company.

Veterinarians and Service Personnel

There is little organised veterinary technical input into turkey farming in Australia. Some large companies employ veterinarians for their chicken business who also service the turkey technical requirements. Other producers will employ poultry veterinary consultants as required.

The larger turkey integrators employ service personnel to assist with the management of turkey flocks. These personnel are very aware of biosecurity protocols and their contact with birds is usually limited to the turkey flocks of their employer.

Processing Plants/Pick Up Crews

There are three distinct types of turkey processing plant operating in Australia. The larger integrators have processing plants dedicated to their turkey farming operations. These plants may be set up in association with chicken processing plants but the live bird holding areas are completely separate.

The smaller integrators have plants that process turkey in association with spent laying chickens. The small independent growers that process their own turkeys on site may also process small numbers of other poultry, usually chickens, for local growers. There may be close association between the species in these abattoirs, with birds of different types held in the same live bird holding area. In general, plant management attempts to process different species on different days, to minimise equipment adjustment during staff working hours. This also limits potential contact between the different species.

Egg Collection and Distribution to Sale Points

All turkey eggs commercially produced in Australia are destined for fertile egg hatcheries. There is no fresh turkey egg market in Australia. Reject turkey eggs are disposed of as for dead birds.

Transportation

Turkey are easy to herd and to prevent entry of staff and vehicles into and around sheds, pick-up of birds for slaughter is conducted by walking the birds to the edge of the farm and then herding them up a loader, where catchers crate birds at the top. This is done in daylight, the afternoon before the day of slaughter. Birds on small farms with small processing plants on site will usually walk the birds to a catching pen and hang them directly on shackles within the plant at the time of slaughter.

Pet Food Manufacture/Rendering of Waste Materials

Materials not suitable for human consumption from small turkey processing plants will either be buried or sent to rendering plants for the recovery of fats, oils and proteins (as feed for poultry, pigs or fish). Larger plants may also send waste for pet food manufacture.

Fresh Litter Suppliers

Suppliers of fresh litter to the turkey industry are similar to those that supply litter to the commercial chicken industry. The recent shortage of rice hulls has required some growers to change litter materials from rice hulls to wood shavings or chopped straw. These products are usually sourced locally to reduce transportation costs.

Litter and Manure Disposal

Commercial contract growers will utilise the same litter disposal companies as the commercial chicken industry. Smaller growers often have local people that pick-up used litter from the farm for home use.

3.9 Summary of Between Industry Contacts

The turkey industry has very little contact with other commercial poultry industries apart from a very small number of producers with small numbers of both commercial free range chickens and commercial free range turkeys.

Farming of turkeys is significantly different to farming of other poultry, and for this reason most commercial contract farmers have little contact with growers of other species. However, three of the four main turkey growing areas in Australia (Beresfield and Bargo in NSW, and McLaren Vale in South Australia) are in regions of significant chicken production. Indeed, one complex at Beresfield contains processing plants and hatcheries for both the commercial chicken and turkey sections of the company. St Arnaud in Victoria is also close to one of the main duck processors in Nhill. The main potential source of

contact between chickens, ducks and turkeys in these regions is feed mill trucks that may supply feed to farms of multiple species.

The larger integrators have specialised service personnel for their turkey and thus have little daily contact with the chicken side of the business.

Some smaller processing plants will process a small number of chickens in the same plant as they process turkeys. This is provides potential for mingling of birds before slaughter.

Another small potential risk of interspecies contact is at airports, as poults may be held before transport in areas with other species of bird, particularly cage and aviary species.

By-products, such as waste from slaughter, may also go to the same rendering plants as waste from chicken slaughter.

Additionally, turkey shed litter may be transported and disposed of by the same companies that dispose of commercial chicken manure and litter.

Chapter 4: The Duck Industry

4.1 Description of the Industry Sector

Australia ranked 24th among duck-producing countries with 9600 metric tons produced in 2006.[6] It is estimated that 5.4 million ducks were slaughtered in Australia for human consumption during 2006 to 2007.

The Australian Poultry Cooperative Research Centre reported in 2010 that the Australian duck industry produces over 8 million ducks (18 000 tonnes of duck meat) annually and is worth about $100 million.[7] In contrast, the duck egg industry is a very small industry with mostly small operators producing opportunistically for small and specialist outlets.

The Australian Poultry Cooperative Research Centre (ibid) reports that duck meat production has been increasing at the rate of over five percent per year. This reflects the marketing of specialist cuts and ready to cook and cooked products that have made consumption of duck meat more convenient. In turn, the value adding of further processed product also reflects the increased economic returns of the industry. One integrator's product consists of about 25% of further finished product and this is the area of production increasing most rapidly as most people, particularly people of Anglo-Saxon background, are not prepared to purchase a whole carcass. Another factor encouraging people to try duck meat in convenience form is the current high price of lamb and beef as a result of high domestic prices from countries free of bovine spongiform encephalopathy. Duck meat, even in further finished form, is competitively priced.

The duck egg industry has the potential for selling salted fresh, pickled eggs; pickled, salted as well as fresh eggs; and balut eggs, all favoured by Chinese and other Asian restaurants. Balut are fertile eggs that have been incubated for about 18 days and are sold for eating after boiling. Century or thousand year eggs are prepared traditionally by covering duck eggs with a coating of lime, ashes, salt and rice straw and burying in shallow ground for up to 100 days. Nowadays the eggs can be pickled in a solution of sodium chloride and sodium hydroxide for about 10 days at 15C° to 20C°, dried and the shells then sealed with polyvinyl acetate (PVA) or another sealing agent. These eggs last about 30 days. Duck eggs are not big lines in Australia and are largely consumed by the South-east Asian community but they are an alternative for persons allergic to chicken protein. The ability to import retorted salted pickled ducks eggs from China and other South-east Asian countries is putting pressure on Australian producers because the costs of Chinese 'century eggs' is a fraction of Australian costs.

The feed requirements for ducks, with good genetics, are similar for meat breeds of chickens although rations are quite different nutritionally. The major breeds available for meat production in Australia before importation of overseas poultry genetic material in 1990s were Muscovy, Aylesbury, Pekin, and Rouen and crosses of these breeds. The major breed type in duck production in Australia used to be the Pekin/Aylesbury cross. In recent times the Pekin breed has become the predominant breed for meat

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[6] http://www.agr.gc.ca/volaille/prindd3_eng.htm

[7] http://www.poultryhub.org/index.php/Duck

production and Cherry Valley strain ducks are the main genetic stock for duck meat in the western world. The Grimaud strain of duck from France was also recently imported to increase genetic production capacity. A feature of the imported duck strains is a low fat to meat ratio of around 15% compared with traditional meat ducks' fat ratio of 50%. The cost of importation of elite genetic stock including the testing of the overseas source flock, hatching and rearing in the Torrens Island importation facility in Adelaide and retesting hatched birds amounts to around $1 million per consignment.

Khaki Campbell and Indian Runner were the major breeds used for egg production but these breeds are difficult to maintain in large numbers because they become nervous and are not economical egg producers. Modern day Pekin ducks lay very well and are used for egg production because Pekin ducks are naturally gregarious and this greatly assists intensive housing. Even in free range, Pekin ducks do not stray far from flock security. Egg production of ducks can be comparable to that of hens in the best maintained lines.

One commercial producer of Muscovy ducks was identified in the survey situated in south-east Queensland with a breeder flock of 8000 birds. The farm produces fertile eggs and hatchling ducks are despatched to three farms in NSW, one farm in Victoria, one farm in SA and one farm in Darwin. Only one farm in NSW is of commercial size, receiving 1000 ducklings a week. The Queensland breeder farm comprises GP and P stock that are kept in naturally ventilated sheds that have a heated floor to stimulate and prolong egg laying. GP stock are also maintained on another farm (for security purposes) some distance from the main breeder farm.

4.2 Structure of Industry

The duck industry established a peak industry body, the Duck Meat Industry Association, in 2008 to enable industry representation. This body has obtained membership of Animal Health Australia alongside the chicken meat and egg layer industries.

Some 15 years ago the duck industry was a diverse enterprise with some medium sized and many small producers. Around 9 years ago, elite Cherry Valley stock was imported into Australia from the United Kingdom through Torrens Island and the number of industry participants has been contracting since.

A number of independent producers operate in niche markets such as free range and supplying speciality restaurants. Stock for these enterprises is supplied by independent breeders and producers frequently have a small processing plant on the farm site. Small duck farms that operated in Western Australia and South Australia no longer operate because their economy of production could not compete with the larger integrated operations supplying duck meat into those states.

Companies are very protective of their genetic stock and do not supply hatched ducklings to anyone who is not a contracted grower. On the rare occasions that stock are slaughtered in processing plants outside their control, it will likely be for religious slaughter but even this is being required to be performed on the integrator's processing plant. This is a different situation to the chicken meat industry where birds ready for processing are shared around to meet customer requirements.

4.3 Establishing and Maintaining a Flock

Broiler ducks are now raised and reared like meat chickens thus requiring similar structures and operations. Housing apart from elite stock is all in naturally ventilated sheds. Establishing a farm comes under the same scrutiny and conflict with the conditions of environmental and planning authorities that meat chicken enterprises encounter. State departments of primary industries provide advice to prospective industry entrants on how duck production might be undertaken and what is involved in establishing a breeding enterprise. There are a number of small independent breeders of meat ducks and these

enterprises fulfil a function in supplying small producers with growing stock. Apart from smaller free range producers, production farms do not have outside runs. Water exposure, commonly seen in Southeast Asia, does not occur at any of the duck properties partaking in this survey. Young ducklings do, however, need to have access to enough water to immerse their head.

4.4 Production Unit Size, Husbandry and Shedding

The great majority of production units are of small size (50 000 birds or less) although one property in Victoria is of medium size (50 000 to 100 000 birds) and one property under development in Western Australia will be of medium size.

Shedding requirements for duck production are similar to that required for meat chickens with broiler ducks being processed at around six to nine weeks of age. Production units 15 years ago would have allowed ducks daily access to surface water. Such husbandry is more difficult nowadays given environmental and planning restrictions and that such access could attract wild water fowl and the exchange of avian influenza and Newcastle disease viruses between populations. The duck meat industry is very much smaller than the meat chicken industry (8200 vs. 700 000 tonnes annual production) so units are comparably smaller reflecting the economics of production. The need to have numbers in rearing units reflects processing requirements over a time period. Ducks can be reared at similar rates of density as chickens size for size. Ducks in sheds are kept on litter that is replaced after each batch of ducks. The litter is obtained from the same sources used by the chicken meat and breeder industry, although sawdust and other wood products are generally used because of lack of proximity to the rice industry.

4.5 Factors Influencing Flock Size and Density

The factors affecting the size of broiler duck flocks are similar to those influencing meat chicken production flocks. However the size of broiler duck sheds will not be as large as meat chicken sheds because the capacity of duck meat production is only 1.2% of that of chicken meat production (reducing the need for high turnover in a growing cycle). The smaller size of duck grower farms was reflected in all farms surveyed being multi-age units which is uncommon in the meat chicken industry.

The size of Indian Runner and Khaki Campbell flocks kept for egg production is limited by the nature of the birds. Although they can match chickens for egg laying capacity, laying an egg nearly every day for a year, the birds become nervous in large numbers and egg production is also significantly more expensive than for chicken layers. Pekin ducks, on the other hand, can be as productive as chickens and do not have the disadvantages of the other two breeds. Due to the higher cost of production and small consumption by the non-South-east Asian population, laying birds are kept in small numbers and producers supply niche markets, mainly the South-east Asian community. Larger Asian communities in Australia have increased the demand for cultural products and varieties of egg and duck preparation have increased duck egg and meat consumption.

4.6 Mixed species farming

A survey of duck producers has demonstrated that the main integrated production companies do not keep other poultry on their properties. Small producers, particularly free range producers, do tend to have a variety of poultry on their premises and allow the various species to have outside access due to being free range poultry enterprises. Such outside access is free from surface water contact.

4.7 Dynamics Within the Industry Sector

Establishing Flocks of Basic Genetic Stock

The two main integrated companies have elite breeding and parent breeder flocks. One integrator has overseas derived stock and the other large producer has Australian selected and (recently) overseas derived stock. All other producers have Australian derived breeding stock.

In 2009, Biosecurity Australia revised quarantine requirements for the importation of hatching (fertile) duck eggs from approved countries, with the result that the PAQ period was reduced from 12 to 9 weeks.

Management of Genetic Stock

All duck breeders have a system of grandparent, parent and production stock and the large integrated companies with overseas imported stock maintain great grandparent flocks. The purpose of further importations is to gain additional great grandparent strains that will provide for a wider diversity of production traits. This elite genetic duck stock has housing of a higher biosecurity standard than parent breeder and broiler production stock. Great grandparent birds undergo selection for production traits. All generations of breeders and broilers are processed out at the end of their productive life. The elite stock of one large integrator and one small independent duck breeding operation have established controlled environment sheds for their elite stock. Elite breeding stock is usually held under a higher level of biosecurity than production stock. Parent breeder and production stock are maintained in more conventional natural ventilation shedding. Birds are maintained on litter largely comprised of waste wood products and this is changed with each batch, contractors supplying fresh litter. Contractors take away waste litter from the larger organisations but small independent operators in more remote areas dispose of their waste litter and manure locally for cropping purposes. As noted above, the sources of fresh litter are the same as for the chicken meat and chicken breeder flocks, providing one point of contact between the two industries. Elite stock are usually hatched in a place separate from production stock to reduce the risk of disease from stock kept at a lower level of biosecurity.

The large integrated companies and a few smaller independent breeders of ducks have established written biosecurity plans. The location of the major breeders of Pekin and Muscovy ducks are presented in Figure 4.1.

Feed and Water Supplies

Feed and water supplies for broiler duck farms are obtained depending on the locality of the operation. Ducks tend to be kept in areas further away from encroaching housing population than are chicken properties. This limits access to town water but this is used as a water source where available; bore or underground water is an alternative in some districts. Surface water, where used, is sanitised. Feed for the large and small production units is all obtained from commercial manufacturers and is heat-treated on supply to all levels of breeder and broiler duck flocks. The duck feed ration is quite different nutritionally to that supplied to the chicken industry so feed is produced in different batches, but the same vehicles delivering feed can carry feed for both operations. One small operator mixed and made his own feed from basic grains and prepared premixes.

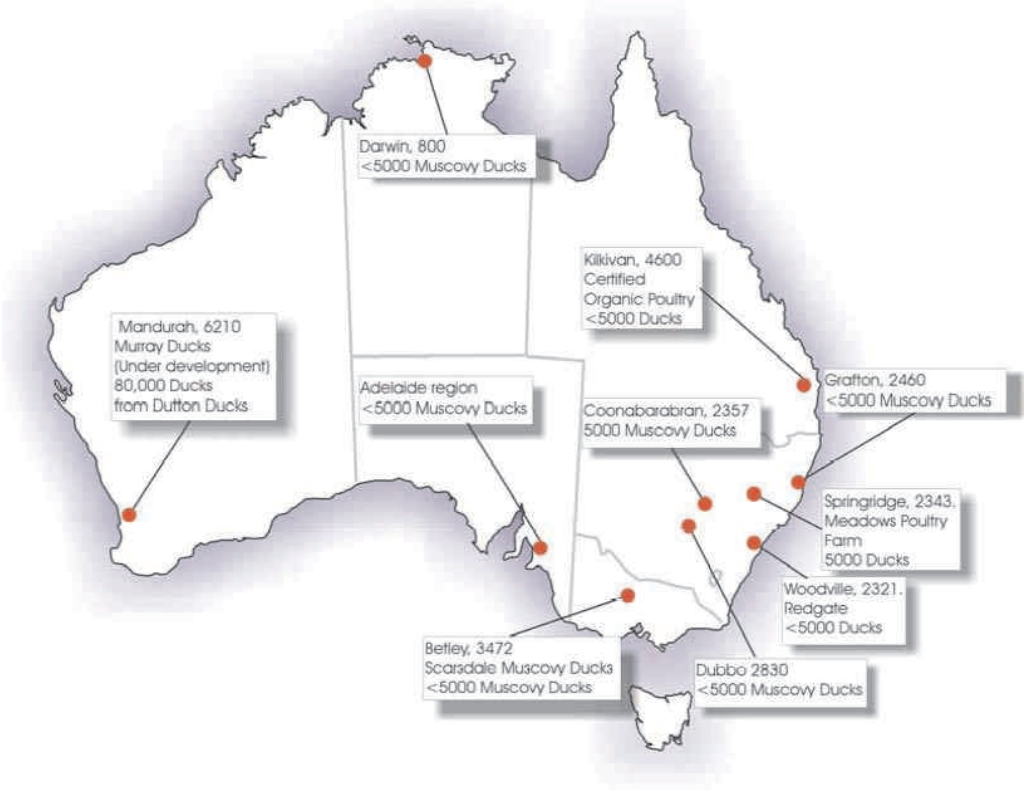


Figure 4.1: Distribution of Pekin and Muscovy ducks in Australia, May 2005

Feed is delivered by the feed manufacturing companies and this provides a point of contact between duck, chicken and other poultry units.

Farm Waste Disposal – Reject Eggs and Dead Birds

Elite and larger production units freeze dead birds and dispose of them with hatchery and egg waste to rendering or landfill, however, renderers are reluctant to accept hatchery waste so most hatchery waste ends up in landfill tips. Major production units have collection of dead birds and disposal through contractors of which there are a significant number; the great majority of dead birds go to rendering. The smaller production units tend to bury, compost or incinerate dead stock on site, particularly in the more remote areas. Those contractors and renderers supplying services to the duck industry also supply services to the other poultry industries and this provides a point of contact between the industries and possible opportunity for transfer of disease agents.

Factors Influencing Genetic Stock Performance

It is necessary for imported stock to be upgraded from time to time to ensure genetic production traits are maintained and enhanced by overseas breeding schemes.

Ducks are fairly resistant to disease and duck virus enteritis and duck virus hepatitis, the major pathogens of ducks, do not occur in Australia. In the last two years, highly pathogenic avian influenza has emerged as a major pathogen of ducks in South-east Asia, however, this disease has not occurred in Australia. *Reimerella anatipestifer* is a particularly problematic bacterium in duck production, especially when it

occurs in conjunction with other viral and bacterial infections and impacts on production capacity. Infection of ducks with chlamydophilosis, caused by *Chlamydophila psittacii,* can be a problem for occupational health and safety in the processing of affected birds. Ducks show few signs of infection with chlamydophilosis infection but these ducks are probably more susceptible to other infections and their impacts. Infection with *Reimerella anatipestifer* is controlled, once bacterial infections are eliminated from the breeding flock, with cleaning and disinfection from subsequent generations of ducks. Security for great grandparent flocks has been increased by housing in controlled environment sheds which also enable a higher standard of biosecurity to be maintained.

4.8 Husbandry and Dynamics of Production Stock

Management of Production Stock

Broiler production stock are handled like breeder stock and are kept in naturally ventilated sheds. Fresh litter is supplied by contractors for each production batch by larger companies and most small operations. Waste litter is also removed by contractors who sometimes also supply fresh litter. These companies also supply to chicken broiler producers and this may be a potential point of contact between the industries. Where on site burial, incineration or composting is not practised, contractors collect and dispose of dead birds. Ducks kept in small numbers are usually maintained free range and there are small producers marketing products as 'organic' or 'natural' who need to run their ducks free range for speciality markets. One small free range grower sells stock grown and processed on the property to export markets as well as locally. The location of farms producing ducks is presented in Figure 4.2.

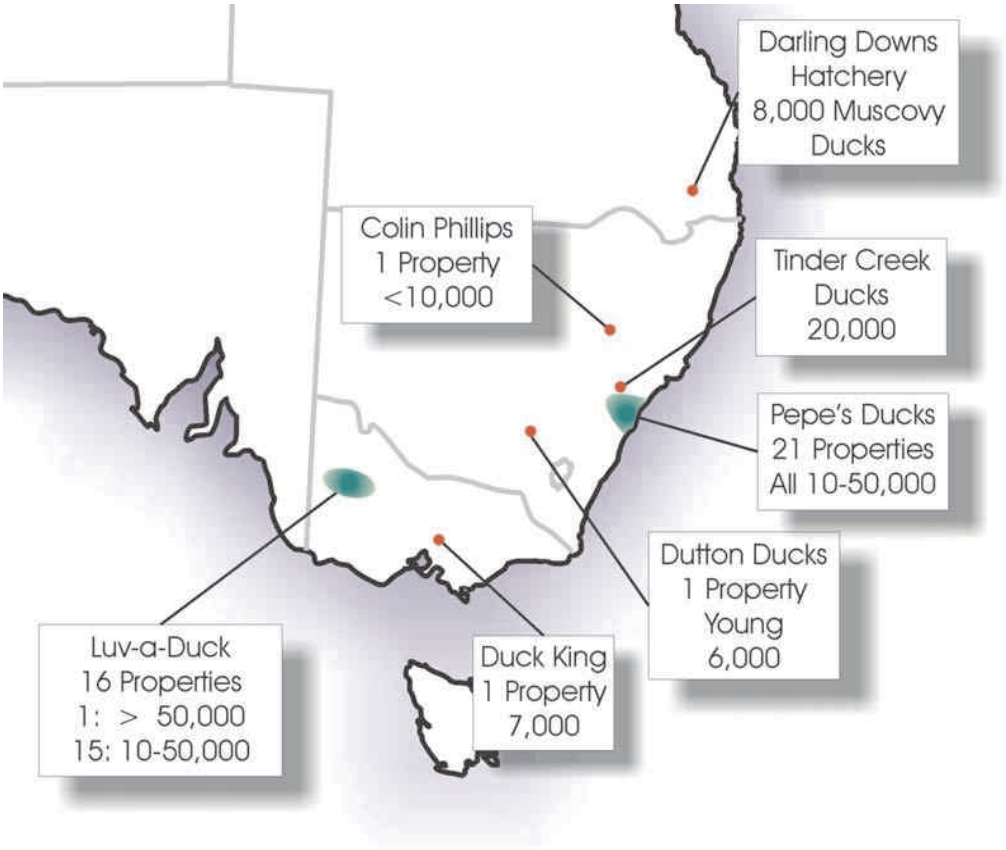


Figure 4.2: Distribution of commercial ducks in Australia in 2005

Feed and Water Supplies

Feed is carefully balanced nutritionally for optimal production and commercially manufactured and heat-treated as for breeder stock. The feed mills producing for ducks tend to specialise, so one mill will produce feed for a large number of producers. Most production units use mains or underground water and where surface water is used it is sanitised.

Live Bird Disposal

All broiler ducks are sent to processing plants that provide the different processing procedures needed for ducks (ducks need to be waxed after de-feathering to remove the down close to the skin). Ducklings are transported from their housing to the abattoir in crates when they have to be transported distances. For short distances, ducks can be herded onto tray trucks or trailers and transported to the processing plant. Small numbers of ducks can be purchased from small breeders and live bird sales. There is no such trade from the larger operations. A number of smaller processing plants process other species of poultry.

Farm Waste Disposal – Reject Eggs and Dead Birds

In the more remote areas, dead birds on broiler duck farms are disposed of in burial pits. In closer settled areas, dead birds are disposed of by incineration, composting and (through contractors) to rendering or to landfill. Reject eggs and hatchery waste are not welcomed by commercial rendering plants and such waste is sent to landfill through contractors.

Factors Influencing Production Stock Performance

The same infections that impact on breeding stock also affect broiler production. Infections caused by *Reimerella anatipestifer* can limit production and Chlamydophilosis (*Chlamydophilus psittaci*) infection can produce infections in the workers processing birds.

4.9 Other Bird Species on Properties

A limited number of smaller duck farms own and maintain aviary birds on site, although this is the exception rather than the rule. Small free range producers are likely to maintain poultry of other species but species are run separately.

4.10 Horizontal Contacts

Facility Builders/Suppliers of Basic Materials

The same builders and suppliers service the building and maintenance of housing for both the duck and chicken industries. The smaller scale of buildings in the duck industry encourages local contractors and owners to conduct construction of buildings.

Husbandry Equipment Suppliers

Husbandry equipment is specialised for ducks but is largely imported and available through the same

suppliers as chicken husbandry equipment. Water equipment to fit out sheds for ducks is different from that for chickens but feed systems are similar although on a smaller scale on grower farms.

Flock Placement

Following hatching, ducklings are transported in containers and vehicles (similar to those used for chickens) and transported to broiler farms prepared for their receipt and grow out. A limited number of ducklings are kept for egg production. Sheds on a property are used on an all-in-all-out basis and fresh litter is used for the placement of ducklings. In contrast to chickens, all the ducks on a property are not of similar ages. This practice reflects the smaller nature of the duck industry and the need for a continual supply of ducklings for processing.

Feed Manufacture

Ducks in the large integrated companies in Australia are fed specially compounded rations supplied by a limited number of feed mills. All rations are heat-treated and supplied in pellet form. The supply of feed uses the same vehicles as for distributing chicken feed. While formulation and additives are different for species and the same feed is not distributed to duck and chicken farms, feed supply vehicles can carry different rations in the same vehicle. The risk of transfer of diseases between species is not as great as for spread within species, but a disease common to both ducks and chickens could possibly be spread by feed delivery services.

Vaccinators and Beak Trimmers

Ducks in Australia do not require vaccination against disease as neither duck viral enteritis nor highly pathogenic avian influenza occur in Australia. Beak trimming is not carried out in ducks.

Veterinarians and Service Personnel

Ducks are relatively healthy birds compared with chickens and with no requirement for vaccination and monitoring flock immunity, the activity of veterinarians less than that provided to the chicken industry. Service personnel assist contract growers to produce suitable ducks for processing and monitor the processing of flocks.

Processing Plants/Pick Up Crews (Broilers and Layers)

Processing plants for ducks and the other poultry species are separate premises except for small specialist operators. The large integrated companies producing duck and chickens do not operate in both industries so there is no sharing of equipment, transports or pick-up crews that handle ducks and chickens. The small processing plant operators perform catching, transporting and processing in-house, without the need for other personnel and transport.

Egg Collection and Distribution to Sale Points

Duck producers that sell eggs are producing for speciality markets with direct sales and even carrying out secondary processing to produce salted fresh, balut and ‘century’ eggs with and without salt treatment. Most producers send the eggs to specialist processors close to the large markets in Sydney and Melbourne.

Transportation

Ducks are relatively easy to drive and to move into transport vehicles compared to chickens. Chickens must be caught and crated at night; this can be done in daylight with ducks. Over short distances ducks can be transported in open vehicles and without crating; over longer distances ducks are transported in crates as are chickens. Newly hatched ducklings are transported in boxes just as for chickens; in Australia ducklings are not vaccinated in the hatchery.

Fresh litter is supplied to breeder and grower farms by a whole range of contractors and comprises sawdust, wood shavings and other wood products. The use of rice hulls is limited to a few small duck producers.

Used litter has been traditionally handled by spread onto agricultural land but with stricter environmental controls there has seen the development of large scale composting ventures and a commercial bulk landscaping supply company in the Sydney Basin provides such a service and the litter from the local growers and breeders is composted with other material and the product used for market gardens and home use. The small independent producers either compost waste materials such as dead birds or bury them and supply waste litter for cropping or composting before use in agriculture.

Pet Food Manufacture of Waste Materials

Materials not suitable for human consumption from duck processing plants and further processing works are frozen and this is used either for manufacture into pet food or sent to rendering down plants to recover fats, oils and protein meals for feeding to poultry or pigs. Pet food production from duck processing is uncommon because of the small nature of the industry. Most material is sent to rendering from the large processors or to burial landfill or composting from small processing plants.

Rendering of Industry Waste Material

Waste materials from hatcheries, processing plants and dead birds from some farms are sent to rendering plants for processing into fats, oils and protein meals. Specialist rendering plants handle feathers and down that cannot be used for other purposes or turning them into feather meal. Hatchery waste is not a desirable product for renderers so this waste is disposed of through landfill for the large operators; small hatcheries have the opportunity to dispose of their waste through composting or landfill.

Fresh Litter Suppliers

Fresh litter suppliers supply both the chicken and duck industries and the sharing of vehicles and personnel provides opportunity for disease agents to be transferred from one industry to the other. Some fresh litter suppliers also contract to remove the waste litter and arrange for appropriate disposal (largely for agricultural use). However, the majority of the duck industry has separate supply and removal contractors and the great majority of used litter is recycled for agricultural purposes either before or after composting.

Litter and Manure Disposal

Waste litter disposal in the duck industry is nearly identical to that in the chicken meat industry, with contractors removing waste for compost, use in agriculture, or for local and domestic sales. The same contractors cart both duck and chicken waste and this could be a point where disease agents could be transferred between industries. The bulk of waste litter from duck farms in and around Sydney is used for composting on market gardens and in Victoria litter waste is being spread on farms that are cropping

grains.

Live Bird Sales and Auctions

Australia has no continuously populated live bird markets such as those seen in Asia and the USA, and slaughter of poultry is not permitted at sales venues. There are weekly markets at Gawler in South Australia and Scoresby in Victoria where poultry are sold. Ducks were not a significant part of these markets 20 years ago, but the growth of Asian culture and keeping of ducks on hobby and other farms has seen an increase in duck numbers sold. Ducks at markets are usually sold to purchasers for slaughter. Live bird sales also serve as an easy method of dispersal of excess birds removing the need for owners to kill excess stock.

4.11 Summary of Contact Between Sectors

The duck and other poultry industries are relatively separate in terms of ownership with the large chicken integrators no longer owning duck flocks and this has led to specialisation in the industry. Duck production is so different from chicken or turkey production that the large integrators in the chicken industry have left duck growing and processing to specialist companies. This has removed significant contact between service personnel and equipment sharing between industries. Even the small independent companies that raise and commonly produce other poultry species have few contacts with other segments of the industry except through feed supplies. If not bred on site, the various species are sent as day olds from hatchery to producer frequently using owner transport or pick up from a central point.

Water supply for both large and small operators is overwhelmingly mains or underground water and the few using surface water supply sanitise their water.

Feed supply companies for ducks are similar to those supplying chicken and turkey producers. Given the special nutritional requirements for ducks, their feed is largely produced at specialist feed mills that will supply as far away as 150 km from a duck farm. Feed delivery vehicles are shared between the larger and smaller producers and these could provide the opportunity for transfer of disease agents between sectors.

Another point of contact between the other poultry industries and ducks is fresh litter suppliers. The movement of used litter is now more specialised with properties close to urban areas disposing through contractors while those in rural areas dispose to land owners using in-house labour and cartage.

Chapter 5: The Ratite Industry

Ratites are a family of large flightless birds. Two species are farmed commercially in Australia, the emu (*Dromaius novaehollandiae*) and the ostrich (*Struthio camelus*). Both species will be considered in turn as each industry has its own unique features and practices.

The Australian Ratite On-Farm Surveillance Plan (ARIOFSP) was developed in consultation with industry and provides a mechanism that facilitates the export of Australian ratite meat to the EU in accordance with the requirements detailed in Commission Decision 2003/810/EC and associated documents. Under the ARIOFSP there has been active NDV surveillance on an ongoing basis (Black, pers. com.). This testing commenced in 2002 and all sera are still held in store at the Victoria Institute of Science, (Victorian DPI), Attwood. This serum is available for AIV testing. Testing for AIV is only taken when there are specific export requirements or as part of a mortality investigation. There is recognition by the ratite industry in Australia that the ARIOFSP has placed them in a favourable trade position with the EU, which has increased compliance requirements for ratite imports.

In 2009, two out of Australia's eight commercial emu farms (equivalent to 25% of the commercial emu population) were part of the ARIOFSP. In 2009 the emu population for processing was estimated to be around 5000 birds.

For the ostrich industry, over 90% of flocks and birds are part of the ARIOFSP. In 2009 it was estimated that there was a total of just over 6000 ostriches of which under 3000 were breeders. High feed prices and the higher value of the Australian dollar in 2008 significantly depressed activity in this sector of the ratite industry.

There has been a major decline in ratite numbers and producers since 2005.

Part 1: The Emu Industry

5.1 Description of the Emu Industry

History of the Emu Industry

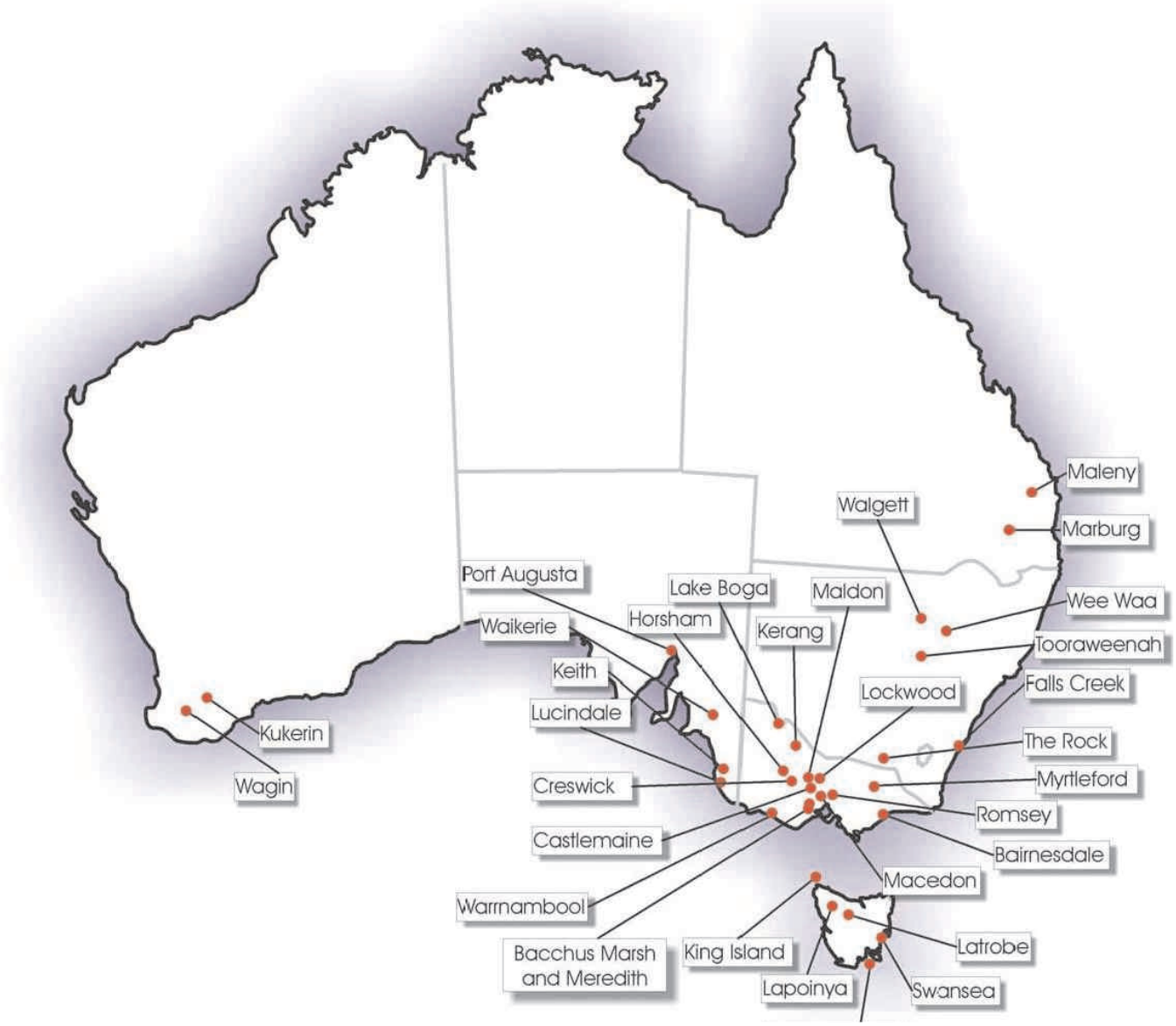
During most of the twentieth century, the Commonwealth Nature Conservation Act prohibited the capturing or killing of native emus in the wild. In 1987, the state of Western Australia legalised the farming of emus and the commercial Australian emu industry began.

By 1994, all Australian states permitted the farming of emus and that year approximately 75 000 emus were being farmed. By 1995 the number rose to in excess of 200 000 with approximately 1300 properties registered as emu farms. In 1996 there was an oversupply of emu products on the market and emu farming rapidly became unprofitable. From 1996, the estimated number of emus being farmed in Australia fell from over 200 000 down to 18 600 as of March 2005. The number of properties identified as emu farms is currently 144 with most of these not involved in commercial production and many having less than 10 birds.

The decline in bird numbers stabilised in 2005. Emu farms are currently registered in Western Australia, South Australia, Tasmania, Victoria, New South Wales and Queensland (see Figure 5.1 over page). Each of these states has a small number of commercial farms. In Western Australia, South Australia and Queensland, commercial farms number no more than two or three properties. In Victoria, Tasmania and New South Wales, commercial farms may number up to five or six properties.

Between 2005 and 2009, the emu industry has seen no new commercial farms starting up, and some existing commercial farms either leaving the industry or scaling back their flock size to non-commercial numbers. In some states, commercial farming has ceased due to the difficulty in getting birds to appropriate processing facilities. There are a few farms which still farm emus commercially but this is rarely the sole economic activity on the property. Many emu farmers who were once operating at a commercial scale still maintain small flocks of birds on their properties which they may breed from again when emu farming becomes more profitable. These flocks may breed naturally. Fewer farms are actively breeding emus than in 2005.

Figure 5.1: Distribution of Commercially Operating Australian Emu Farms, May 2005.



Output and Economic Value of the Emu Industry and Products

The emu is farmed for three different products: meat, leather and emu oil. The latter is the most valuable of the commodities (see Table 5.1). Emu oil is registered with the Therapeutic Goods Administration and can be listed as an active ingredient in cosmetic products and over the counter remedies in Australia. Oil is also exported to the European Union and into Asia. Some producers market their oil from the farm gate or on the internet.

In recent years, formal research on the therapeutic properties of emu oil in the treatment of skin burns in people has occurred in the United States. In Australia, the use of emu oil as a gastrointestinal protector in patients undergoing chemotherapy has been trialled in rats with promising results. The industry is looking at taking this research further, eventually leading to human trials, www.emutracks.com.au.

Meat is largely sold for consumption in the domestic market but is a seasonal product, while a small percentage is exported to Europe.

Leather is also a seasonal commodity. Producers involved in the industry report that there are international markets for emu leather, but the industry size would need to expand to be able to satisfy these markets with a consistent supply of product.

Emu properties that are near population centres can also attract tourists to see their operations.

Commodity	Price	Unit
Emu meat	$16	Per kilo
Leather	$15	Per skin
Emu oil	$40	Per litre

Table 5.1: Prices of emu products at May 2005.

A single bird can be expected to produce on average 10 to 12kg of meat and 10L of oil. With current commodity prices, the value of a single emu at slaughter is approximately $575 to $600 Australian dollars.

Data from the Ratite Slaughter Levy indicates that 5344 emus were slaughtered in processing plants in Australia in 2007-2008 (DAFF, 2009).

However not all products from all birds are utilised. Often the skin and meat are discarded and only the oil retained when birds are slaughtered outside of a licensed processing facility. This limited utilisation would reduce the net annual value of the industry but it is not known exactly what percentage of birds may be slaughtered in this way. From EIFA estimates and speaking to emu producers, at least all the birds in Queensland may be slaughtered in this fashion (possibly up to 800 birds or 18% of the national estimate).

The Department Of Agriculture, Forestry and Fisheries keep an annual record of the number of ratites processed for human consumption through the National Ratite Slaughter Levy. From July 2004 until April 2005, 3188 emus were slaughtered in Australia and their meat sold for human consumption (DAFF, May 2005).

5.2 Structure of the Emu industry

Industry Organisation and Legislation

There is no integration or large companies owning multiple emu production facilities in the Australian emu industry. All commercial properties and many of the smaller operators have their own incubating, brooding and rearing facilities and therefore all stages of production are carried out on the one site. Each state has its own Emu Farmers Association (EFA), although not all emu farmers are members of these organisations. Nor are all members active commercial farmers. The Emu Industry Federation of Australia (EIFA) is the national producers' organisation representing the industry, however, legislation for gaining membership is under review. In 2005, producers could become members of their state Emu Farmer's Association (EFA). Two representatives from each state would then be nominated to sit on the EIFA council. As state EFA memberships and financial resources decreased, a proposed change to allow individual producers to become members of the national body is currently being discussed. If passed, this change will allow producers and other people involved in the emu industry (e.g. marketers, processors) to become members of EIFA without having to be members of their state group.

To farm emus in each state it is necessary to get an emu farming license from the local Department of Primary Industries (DPI). This provides some idea of producer numbers but many properties with only a few birds may not register themselves with the department. Additionally, because some state licenses only need renewal every five years, some listed farms no longer commercially farm emus. Most, if not all, farmers commercially producing emus are registered with their state DPI.

Distribution of Emu Farms

The number of farms actively farming emus has decreased since 2005. The distribution of commercially active emu farms is largely dependent on access to processing facilities. In 2009, only two processing facilities were identified as processing emus in Australia. One in Wycheproof, Victoria and one in Eurobin, Victoria. The majority of commercial farms are therefore in Victoria, South Australia and New South Wales.

Properties farming emus are usually located in areas with access to grain and feed, commonly country where sheep or cattle can be grazed and where cropping occurs (i.e. the wheat belt, refer to Figure 5.1). Emu farms do not need to cluster as currently there is very little need for them to move stock between farms.

Two farms identified in 2005 as being commercially active in Western Australia (located in Tooyay and Kukerin) are still active and have small processing facilities on their own farms. The producer in Kukerin plans to expand their processing facilitie which the other producer may eventually use.

In 2009, Tasmania still lacks a ratite processing facility. The practice of Tasmanian producers transporting birds to Victoria for processing no longer occurs, and therefore the commercial industry has largely ceased in this state. Previously identified farms may still have small flocks of birds.

5.3 Establishing and maintaining flocks

When the industry was in its infancy, stocks of emu were initially captured from wild populations. Today, birds taken from the wild cannot be sold commercially, therefore all stock on farms have been bred in captivity.

Most farms still operating have their own incubating, brooding, rearing and grow-out facilities, but only those commercially producing birds will use them. The rest have either permanently shut down their facilities or are waiting for signs of industry revival before recommencing breeding.

Even without active breeding, flock numbers can be maintained for years because emus are live for 20 to 30 years (or longer). They have a useful commercial reproductive life of approximately 10 years.

As a result there is very little movement of day old chicks in Australia and most farms maintain their own

genetics. Up to 2005, the turn over in breeding stock on a farm was very low with it only being necessary to replace one or two breeding birds every few years. However, with recent improvements in emu oil markets, several growers are retaining more stock to increase their breeding numbers.

On the properties where emus are no longer farmed commercially, eggs are no longer collected and incubated. The remaining small flocks may breed naturally and raise chicks in the paddocks. However, due to foxes, a large number of these naturally raised chicks do not reach adulthood.

5.4 Production Unit Size, Husbandry and Shedding

In 2005, commercial emu farms ran anywhere between 90 to 1200 birds. Chicks are grown in semi-intensive conditions and breeding stock housed in open paddocks or as pairs in breeder pens (during the pairing up and breeding seasons). Feed and water are provided via troughs. Dams are occasionally used as water sources on emu properties but because emus enjoy swimming and thus muddying up dams, some producers do not allow the birds access to them as water sources.

Eggs are incubated in custom-built incubators and chicks are brooded in a heated brooding shed. Adjacent to the brooding shed are runs which chicks are allowed out into during the day from the age of 3 days to 12 weeks. Fenced-in runs are necessary for the chicks as they are very susceptible to predation from foxes, crows and birds of prey in their early days. From 12 weeks of age the chicks weigh around 8kg, are allowed into the grow-out paddocks and no longer return to the brooding shed.

Grow out stock are housed in paddocks like adult breeders and normally processed at 15 to 18 months of age, although sometimes growers may process their birds at 24-30 months of age. Emus, unlike other stock, cannot be herded so must be coaxed to the required destination with feed or by appealing to the birds' natural curiosity about unfamiliar objects or human activity.

5.5 Size and Density of Emu Farms

Industry Populations

Bird numbers over the last decade decreased because of the lack of market opportunities, the loss of processing facilities in many areas and the unpractical cost of transporting birds to slaughter. Industry flock numbers seem to have stabilised, however.

Regionally, some states have lost processing facilities willing or able to process emus. In these states, producers either pay for transportation of their birds to another state for processing, retain their birds over until the next season, process their birds at a local butcher, or process birds on farm (and are thus unable to sell the meat for human consumption). The latter option is known to occur in Queensland and Western Australia.

Individual Farm Populations

For non-commercial emu farms, the increase in grain prices with drought has had a direct influence on the number of birds they are willing to carry while they decide whether to re-enter the industry. It is not feasible to maintain hundreds of birds on a property if no economic benefit is gained (one producer stated that it cost about A$1 per day to feed an adult emu with the current grain prices). Thus, non-commercial flocks tend to be very small. Restocking to commercial numbers from a small flock could be achieved over just a couple of years, as a breeding pair may produce anywhere between 20 to 30 chicks in a year.

Due to the seasonal breeding and processing of emus, stock populations on farms fluctuate over the course of a year (see Figure 5.2). Emus breed around April to June and eggs take eight weeks to incubate

and are set in batches based on the availability of incubator space. Eggs may be stored for two weeks or longer before being set. Chicks are hatched from June to August and farm population therefore increases during this time

Production stock is usually kept 15 to 18 months before processing. The best time to process is January to March as the birds have the highest amount of body fat. The farm population decreases as the grow-out stock is processed. This seasonal production results in the farm population being higher from July to January than in the first half of the year (see Figure 5.2).

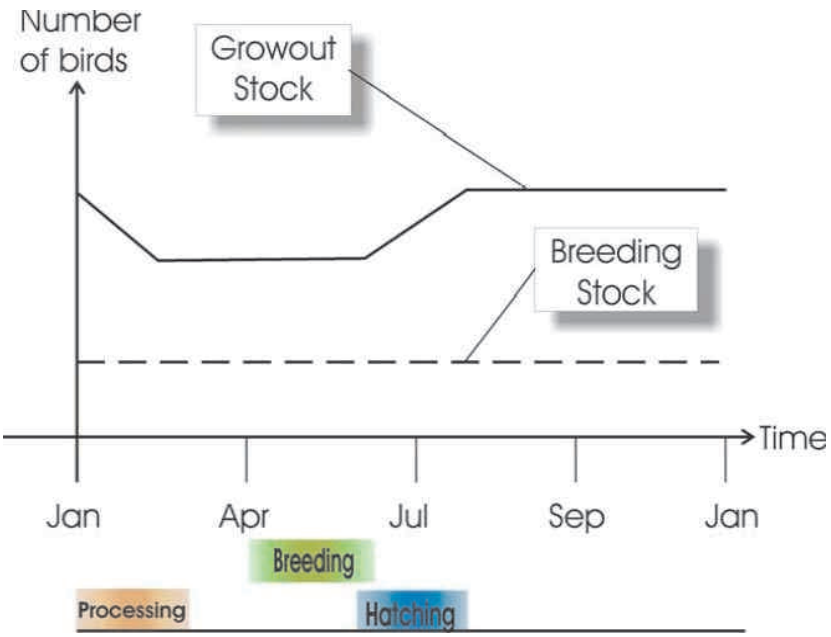


Figure 5.2: Stock fluctuation over one year on a typical emu farm.

5.6 Mixed Species Farming

Emu farming is very rarely the sole farming enterprise on a property, a lot of emu farms are also cropping or sheep properties. In 2009, only one emu farm maintained a population of ostriches on the property with emus. No members of the industry surveyed in 2009 knew of any producers who had other poultry species on an emu property.

5.7 Dynamics within the Emu Industry

Establishing Flocks of Basic Genetic Stock

Unlike the chicken industry, genetics management, breeding, incubating and rearing all occurs all on the one property, except for one farm in Victoria. Very occasionally growers will bring in genetic material from other properties as day old chicks. When this has happened in recent years, the chicks are more often intended to be grow-out stock, from which breeders may later be chosen. This usually occurs in situations where the farm has chosen not to breed its own birds that year.

Management of Genetic Stock

In Australia, the gene pool of emus is the largest in the world and therefore there is very little chance of inbreeding occurring in most commercial flocks. Four subspecies of emu have been recognised based on plumage colouring: Black, White, Silver and Gold. Each of these subspecies is thought to have originated in different geographical regions of the country. Most emu farms will have a mixture of genetics from the four subspecies in their flock, however, a couple of farmers are looking at starting to specifically breed a particular subspecies on their farm. Some preliminary genetics work has shown that some subspecies may produce more biologically active emu oil than others and two farmers are hoping to start breeding those strains specifically.

There is very low turn over of breeding stock on most emu farms as breeders often have a useful breeding life of ten years before reproductive parameters start dropping. Breeders are housed in paddocks or in breeder pens if the reproductive performance of a pair of emus needs to be evaluated (e.g. before their introduction to the breeding flock).

Factors Influencing Genetic Stock Performance

A breeding pair of emus will mate every day and the female will produce an egg every two to three days. A good breeding hen may lay around 25 eggs per season. Younger pairs will produce a lower number of eggs. In the wild, the hen usually lays a clutch of 8 to 10 eggs at which point the male becomes broody and stops mating with the female and starts sitting on the eggs. With frequent egg collection, a clutch of eggs never develops and therefore the male does not get the opportunity to become broody.

In some regions of the country, the start of the emu breeding season is naturally coordinated with the onset of the autumn rains. Therefore if the autumn rains are late then the emu breeding season may start later.

Emu eggs are stored in an egg room (any place that maintains a relatively constant temperature) often for two weeks or more before they are set in an incubator. Any negative impact from storing eggs for this length of time on hatchability is offset by the management benefits of customising the egg setting program and chick hatching plan to effectively allocate incubator, brooding and rearing facilities.

With many emu farms choosing not to breed birds, genetic stock performance is not a concern to these farmers. Instead they look to keep their stock healthy until the day that they may decide to re-enter the industry.

Husbandry and Dynamics of Production Stock

Production or grow-out stock is raised on the same farm as their parent breeding flock. At 12 weeks of age, stock is moved from the rearing pens on the farm to the grow-out paddocks. Stock is raised until 15 to 18 months old and then sent for slaughter. Very little movement of stock occurs between farms. The exception is Tasmania where day old chicks were sent to other farms to grow out.

During rearing, predation can be a major problem. Therefore chicks are only allowed out of the brooding shed during the day and pen fences are made fox- and feral cat-proof. Crows can also prove to be problematic for chicks up to three weeks of age.

Feed and Water Supplies

Breeder and grow-out stock are fed and watered with troughs in their paddocks. Most farmers feed a mixture of grain, roughage and supplements that are mixed on farm. Because many emu farms also grow

crops, they use a component of what they grow to feed their stock. It is also not unusual for them to source feed from neighbouring cropping farms. Vitamin and mineral supplements are also purchased and added to the diet.

Drought-affected grain prices made feeding emus very expensive and cut heavily into the profit margins of growers, particularly if they were unable to sell their stock for slaughter and carried them for longer than 18 months due to the lack of processing facilities. The use of pellet feed supplements in adult stock has decreased since 2005, due to the cost of feed. Pellets are still used to feed chicks on farms that are actively breeding emus. Adult birds are fed with a variety of products that are sourced from nearby farms.

Farm Waste Disposal

The types of waste generated by emu farms are similar to other species (brooding litter, reject eggs, dead birds) except that litter waste quantities are much smaller due to the small operation size and as such can be dumped into a pit on the farm or burnt. Brooding litter is often used as fertiliser on the farm cropping fields or neighbouring properties.

5.8 Horizontal Contacts Within the Emu Industry

Due to some similarities between husbandry practices in emu and ostrich farming, the similar section discussing the specific contacts between ostrich properties will make reference to this section.

Facility Builders/Suppliers of Basic Materials and Husbandry Equipment

All emu farms currently operating in Australia have been set up for a number of years and purchasing of basic equipment such as fences, incubators and troughs is infrequent (as the infrastructure is pre-existing). Discussions with a ratite incubator supplier in Melbourne indicate that no Australian property has purchased a new or reconditioned incubator for over four years and that all their sales are international.

Feed Manufacture

Each farm sources its own grain and mixes its own feed on farm. In earlier days of the industry, commercial pellets were commonly fed to birds however, this has become uneconomical in the last few years and producers have switched to mixing their own feed from grain, roughage (i.e. Lucerne) and mineral supplements.

Grain is often sourced from the farm itself if there is cropping occurring in paddocks or from nearby farms/grain mills. Emu farms tend to be reasonably spread out so that it is unusual for two producers to be acquiring feed from the same source.

One Victorian distributor of emu feed supplements almost exclusively supplies properties in Western Australia and a large part of South Australia.

Animal Health: Vaccination, Declawing and Veterinarians

Vaccination is currently performed on only a few emu farms in Australia against *Erysipelothrix rhusiopathiae*. Farmers themselves performed the vaccination procedure without the involvement of a veterinarian.

Declawing is a process done on day old chicks where the nail and nail bed of each toe is removed with a

hot blade. The rationale behind this procedure is to prevent the birds from injuring each other and people, particularly during transportation. Unlike the chicken meat and egg layer industries, this procedure is always done on farm and no horizontal contact occurs between emu properties through contractors performing this procedure.

Veterinarians are rarely called to visit emu farms. One veterinarian who has taken an interest in ratites is not called regularly to emu properties save for export accreditation work (refer to section 5.10 for more information on the Ratite Industry on-Farm Surveillance Plan).

Processing Plants

There are very few facilities able to process emus in Australia. Between 2003 and 2005, three facilities (one each in Western Australia, Queensland and Victoria) closed down or no longer process birds. This is a major problem for some producers who must pay high transport costs and it is a major factor dictating whether producers will increase their flock size or not.

In 2005, two processing facilities in Victoria processed birds from the largest geographical area. Birds come from Tasmania, New South Wales, South Australia and Victoria.

Some producers in Queensland, Western Australia and South Australia have arrangements with local abattoirs to process their birds. Others are either not processing birds this year or processing the birds on farm. In this situation, the farm is not recognised as an accredited slaughter facility and the meat from these birds cannot enter the domestic market for human consumption. Fat, however, can still be harvested for oil.

Egg Collection and Distribution to Sale Points

All emu eggs laid are usually set for hatching. No eggs are sold for domestic consumption. A very small number are sold for art and craft or tourism purposes.

Transportation

Transportation of day old chicks requires no specialist trucks or handling skills and transportation of young stock, if done, is performed by farmers themselves in cars, utes or light trucks.

In 2009, two transporters of emus were identified, that were also active in 2005. They have custom designed vehicles for moving ratites and both transporters are involved with both the ostrich and emu industry.

Some vehicles have the capacity to move up to 180 emus, however, consignments of this size are very rare. Emus can injure themselves and each other during transportation, so bird density is reduced proportional to the travel distance.

Individual growers in Western Australia, Queensland and South Australia have their own transport truck and move their own birds.

Industry Wastes

The small amount of waste material generated by each farm is normally handled on farm. Waste product at abattoirs, or meat unable to be sold for human consumption, is treated the same as waste from other species processed. The abattoir at Wycheproof composts offal and sells it for fertiliser.

Fresh Litter Suppliers

Litter is only used as a substrate for the floor in brooding facilities on emu farms. Most farmers will source this from a nearby sawmill.

Contact With Other Poultry Sectors

Emu farms are unlikely to have contact with other poultry sectors, even if farms are geographically close to other poultry farms. Transportation vehicles for ratites are custom designed, thus excluding use for non-ratites. Potentially, feed manufacture of pellets for emu chicks may come from feed processors that also produce pellet feed for other poultry species. Slaughter facilities may also process other poultry (but not on the same day when emus are being processed).

The housing of emus and ostriches together does not seem to be a common practice and most ratite farms will have one species or the other on farm.

Part 2: The Ostrich Industry

5.9 Description of the Ostrich Industry

History of the Ostrich Industry

Ostrich farming is known to have started in South Africa in the 1860s in response to wild ostriches being hunted almost to the point of extinction in that country. After almost disappearing as an agricultural practice, modern ostrich farming began in the 1960s when the number of properties farming ostriches began to grow steadily. Ostrich farming in Australia began in the late 1980s following the importation of stock from South Africa. Importations continued through the early 1990s while prices for breeding stock were extremely high.

In 1993 the first processing facility to handle and slaughter ostriches was set up and the industry grew rapidly, driven by a large number of investors buying breeding stock and ostrich farms. By 1996 it was realised that the market for Australian Ostrich Products had been overestimated and that there was an oversupply. As the price of ostrich products dropped and the value of individual birds fell, the number of producers involved in the industry also decreased. Birds that once would have fetched $40 000 (the maximum price ever paid for a single bird was $100 000) were now only worth a couple of thousand dollars or less. This market crash resulted in many people losing a lot of money but also meant that from then on, ostrich production would be approached as an exercise of farming livestock and marketing a product as opposed to the speculative activity of breeding, buying, and selling birds which had been the driver of the early boom of the industry.

The industry grew at a more sustainable rate from 1997 onwards. In 1997, 5000 birds were processed Australia-wide while 8330 birds were processed in 2004/05. However growth has not been constant as the industry faced another serious setback in 1999.

In April 1999, the Newcastle disease outbreak in New South Wales resulted in a temporary stop on all poultry products being exported from all parts of Australia. This almost crippled the ostrich industry as 95% of all ostrich products produced in Australia were, and still are, exported to other countries. The Newcastle disease outbreak also occurred during the latter part of the ostrich processing season so that a large proportion of the national produce did not reach its intended market that year. This saw a number of producers leave the industry in a second exodus, leaving an even smaller pool of producers remaining.

More recently, the difficulty of gaining access to processing facilities able to slaughter ostriches has seen the commercial industry disappear in Tasmania and Queensland.

Today there is good demand for ostrich products internationally and the Australian industry cannot keep up with the current demand. As a result, the price of ostrich meat and leather has risen. Much international demand has risen because many countries banned imports from South Africa where there was an outbreak of Avian Influenza among ostriches in August 2004.

Between 2005 and 2009, the number of producers actively involved in the ostrich industry in Australia has decreased further. Current estimates indicate that there could be as few as six properties in Australia with commercial flocks of ostrich. Only two or three of these are actively breeding birds.

Outputs and Economic Value of the Ostrich and its Products

Ostriches are farmed for two products, the meat and the skin (leather and feathers). Currently, the meat is the most valuable commodity but leather prices are continuously rising and may one day soon reach a point where the leather is as valuable as the meat (see Table 5.3). Overseas, feathers are a separate commodity and can add value to a carcass, however, they are discarded in Australia as it is not economical to harvest and transport feathers to international markets and no demand exists locally.

Commodity	Gross value/Carcass
Meat	$250
	($10-16/kg depending on cut of meat)
Leather	$160
Total	$410

Table 5.3: Market price for the typical products from an ostrich carcass in 2005

For the period between 2007 and 2008, the Ratite Slaughter Levy reported that 4165 ostriches were processed in Australia (DAFF, 2009). This is a decrease in the number of birds processed in 2005, with 8330 ostriches processed in the first 9 months of the recording period (July 2004 to April 2005). In 2009, ostrich leather is selling for about $160 per skin. The meat on each carcass sells for $300 to $325. Most ostrich products are going to the United States, however, the size of the Japanese export market is increasing for Australian producers.

One producer in Victoria has been exporting live chicks and fertile eggs internationally between 2005 and 2009. Other producers may enter this market in the near future as Australia is recognised internationally as having good genetic stock. A large market exists for live chicks in the European Union, but Australian producers currently cannot export to these countries.

The small size of the ostrich industry makes its exports vulnerable to the effect of exchange rates. If the industry were to expand in size, exchange rate effects could be offset by the benefits of economies of scale. In 2009, producers can see potential in the industry for more contract growers to become involved and increase exported product to meet market demand.

5.10 Structure of the Industry

Industry Organisation and Legislation

There are four stages of production involved in growing ostriches for slaughter. These are:
1. breeding and production of fertile eggs
2. incubating and hatching of chicks
3. rearing of chicks to 90 days of age

4. grow-out of production stock to 9 to 12 months for slaughter.

Ostrich farms can either specialise in one or two steps of this process, or have all four stages occurring on the one property. About 50% of the properties identified involved in the production of ostriches carry out all stages on the one site.

Individual ostrich farms are owned by independent farmers or small syndicates of producers. Because the industry is small, there is a lot of cooperation between farms particularly in the multi-site production arrangements. One group of farmers in Western Australia own all the properties involved in the different stages of production and the processing plant, simulating the vertical integration that occurs in the chicken, turkey and duck industries.

A national farmers body, The Australian Ostrich Association (AOA), exists to promote the industry and to lobby the government for changes that will benefit the industry. The AOA has recently been reshuffled and is implementing a new management structure. Once this in place, it plans to centralise ostrich production records which will include numbers of birds, stock movements and production figures.

Ostrich producers in Western Australia also meet to discuss their industry which runs independently from the industry in the east of the country. This gathering of producers is informal and is not done under any producer association banner.

Because of the Newcastle disease outbreak in 1999 and stringent requirements for exporting product to the European Union, the Australian Ratite Industry On-Farm Surveillance Plan was developed. All major producers on the eastern seaboard are now part of this program, which requires them identify all stock, keep detailed on-farm records, undertake yearly blood testing for Newcastle virus antibodies and means they can be audited by the Australian Quarantine Inspection Service (AQIS) anytime. Farm records must include from which farm a bird was transported, by whom, where and when it was transported, and where and when it was slaughtered/died.

The European Union has recognised this plan since 2003 and now accepts Australian imports of ostrich products from accredited properties. Western Australian producers do not participate in this program but still export the majority of their product to Asia and the United States.

Distribution of Ostrich farms

The availability of export-accredited processing facilities able to handle ostriches is the major determinant influencing where ostrich farms are distributed in Australia.

The only processor currently processing ostrich in Australia is The Game Meat Company of Australia, Eurobin, Victoria. Therefore, farms with commercial flocks of birds are located in Victoria, with one farm possibly still operating in northern New South Wales (see Figure 5.4). One property in Western Australia is maintaining a flock of ostriches, but does not currently have access to processing facilities.

Ostrich transporters estimate that the cost to transport one bird should not exceed $20 or else the profit margin becomes too small. Twenty dollars equates to transportation over a distance of about 300-350km.

The industry has finished up in Queensland due to the closure of the processing facility in Caboolture, Queensland.

5.11 Establishing and Maintaining Farms

Ostrich farms have their own on-farm breeding programs to maintain stock, are supplied eggs to hatch, or supplied 12-week young birds to grow out. No stock travel across the country between the two ostrich producing regions.

Parent stock begin their breeding lives at three years of age. Breeders can be kept as pairs or trios in small

pens in intensive selective breeding programs but are more likely to be run in paddocks as a small flock called a breeding colony.

Breeding programs producing chicks for meat birds usually involve crossing two pure breeds of ostrich to produce a first-cross generation of offspring whose meat production characteristics are enhanced by hybrid vigour. To maintain this type of breeding program, pure lines need to be maintained through their own breeding program. Breeding stock is more likely to be kept in pairs or trios in the breeding programs maintaining the pure parent stock. This practice is more expensive to maintain than the colony breeding system but allows performance traits of specific birds to be measured quantitatively.

Figure 5.4: Distribution of ostrich farms in eastern Australia in 2005

5.12 Size of Production Units and Types of Shedding

The stages of production occurring on an ostrich farm will determine the types of facilities present and the variation in stock numbers throughout a typical year.

In 2005, breeding flocks were known to range in size from 40 birds to 2500 birds. Breeding stock is kept at relatively constant numbers unless the farmer is trying to increase production numbers for the following year. Breeders are usually not introduced into a breeding flock until three years of age and younger birds are usually run separately from the breeding colonies.

Breeders are kept in paddocks where they can graze pasture as well as being fed a commercial pellet and grain diet with or without supplementary roughage such as lucerne (depending on the feed availability in

the paddock). Smaller pens are also used to keep smaller numbers of breeders. Fencing around ostrich pens needs to be such that the adjacent breeding paddocks are separated by at least six feet to prevent males from fighting through fences. Screening with vegetation can also minimise fighting.

Breeding season in Australia runs from August to March and eggs are collected daily. Regular egg collection stops birds from developing a clutch of eggs, becoming broody and then nesting at which point egg laying ceases. A typical hen will produce 40 to 50 eggs per season. From these 20 to 30 chicks should hatch.

Incubating, hatching and rearing of chicks usually occurs on the one property. Eggs require incubation for 42 days before they hatch. Housing facilities are different from those used by breeding stock with young chicks requiring facilities much like emu chicks. Chicks are kept in a warmed brooder shed but are allowed outside during the day from as early as two days of age. They must be protected from predators and the environment must be kept clean as they can be very susceptible to bacterial infections in the first few weeks of life. Up to 30% may be lost in the first 90 days of life.

Chicks are progressively given more area in outside runs as they get older. They are housed in the brooding shed and runs until they are 90 days of age. At this point they weigh close to 30kg and are ready to be moved to a grow-out paddock.

Grow-out facilities house growing ostriches in paddocks until processing age which is typically 9 to 12 months of age in Australia. Processing usually occurs from July to May each year.

5.13 Size and Density of Ostrich Populations

Industry Populations

The national ostrich population has decreased over the last decade from the level it was at the end of the ostrich boom. Newcastle disease outbreaks and the loss of processing facilities have also seen the number of birds in the country drop as some farms discontinued production.

The majority of ostrich products are exported. Factors which affect export markets therefore affect the size of the industry in Australia. In 2007 and 2008 when the Australian dollar was high, export markets diminished as Australian products became less competitive internationally. This, coupled with the high cost of feed, has made ostrich farming uneconomical for several producers, hence the drop in the size of the industry in Australia.

In Western Australia, the only export accredited processor processing ostriches in Cowaramup stopped processing birds in 2007. Only one farm in Cowaramup is known to be holding a commercial sized flock of ostriches in this state. With an emu processor looking to expand their ratite processing facilities, it may be possible for this farm to process their birds here and recommence commercial operation.

Individual Farm Populations

Populations of ostriches in the country fluctuate because of the seasonality of ostrich breeding. Breeder flocks will remain constant with minor changes unless there is an overhaul of the breeding program. Production stock numbers are increasing from mid- September onwards until May (coinciding with hatchings). In July, processing begins and the first birds of last year's hatch are slaughtered. The population continues to drop until May the following year when processing concludes. However the next crop of birds is raised from mid-September onwards to replace the yearlings being processed (see Figure 5.5).

Properties specialising in incubating and chick rearing will therefore be clear of stock from roughly July

to September. Grow-out facilities will never be clear of stock but the lowest number of birds on farm will be between late Spring and early Autumn and the peak will be in early Winter.

Most commercial ostrich farms which have ceased breeding new stock will be holding the number of stock on their farm at a constant level until they are able to sell them for a reasonable price.

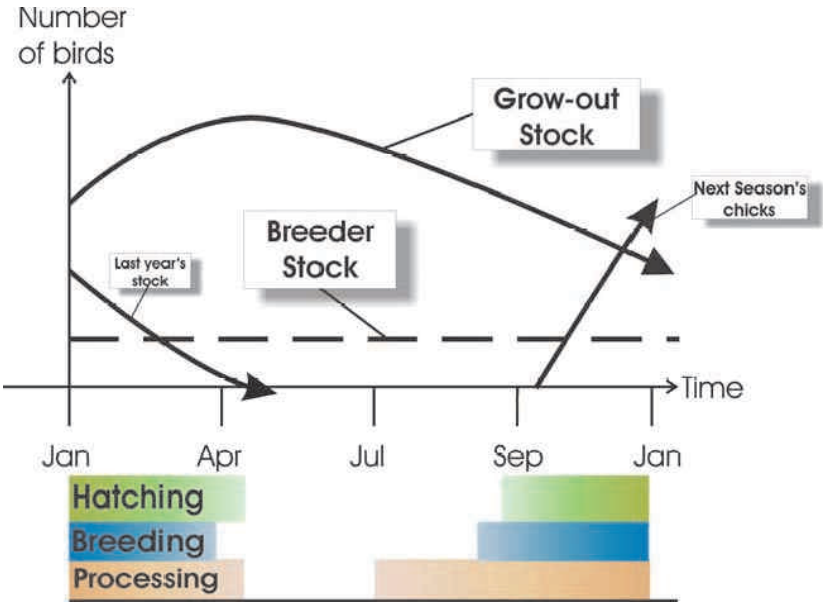


Figure 5.5: population changes in production and breeder birds in one year

5.14 Mixed species farming

The only other species of poultry found on ostrich farms were emus. Other poultry species could not be kept with ostriches in accordance with the Australian Ratite Industry On-Farm Surveillance Plan. The one farm with both species was accredited to export both emus and ostriches.

5.15 Dynamics within the Ostrich Industry

Establishing Flocks of Basic Genetic Stock

Most breeder farms establish their own breeding program using farm stock. Birds from other properties can be brought in to add genetics to the pool, however, if a property is AQIS accredited only birds from other AQIS accredited farms may come on to the farm.

With the recent departure from the industry of ostrich producers in Queensland and some in Western Australia, remaining ostrich breeders have acquired some of the breeding stocks from those farms. This appears to be a common practice when an ostrich farm closes down. Again AQIS accredited farms can only bring birds into their flock if they are from another AQIS approved property or else risk losing their accreditation (which would take 6 to 12 months to regain.

Other than in the above situation, breeding stock is generally not moved around as moving breeders can upset their reproductive performance.

Management of Genetic Stock

Australia is lucky to have had a large number of ostriches imported in the early days of the industry so that the genetic pool of the industry is quite large. The chance of inbreeding is therefore low in a well-managed breeding program. Only two producers are currently breeding and quantitatively measuring production traits.

Factors Influencing Genetic Stock Performance

Like other species of poultry, diet and husbandry practices will influence genetic stock performance. Feed with too low an energy density will result in the female bird losing weight over the breeding season and decrease the number (and hatchability) of eggs she produces.

Climate also has an affect on ostrich breeding, with the birds being more productive in a warm dry climate (like that of their native South Africa). The areas where ostrich are produced in Australia satisfy these climatic requirements.

Husbandry and Dynamics of Production Stock

Fifty per cent of breeder properties in Australia have their production birds reared on another site. Birds may spend time on up to three properties before reaching slaughter weight and these properties may be up to 500km apart.

Feed and Water Supplies

Breeding and grow-out stock are fed a mixture of pellets, grain and roughage. Chicks are fed a high protein commercially manufactured mash. Troughs are placed in paddocks and most properties will mix pellets with grain themselves. If pasture is scarce, lucerne hay and other roughage are provided to the birds. Current drought conditions make feeding ostriches expensive and sourcing hay or pasture has been particularly difficult for some in the industry.

Farm Waste Disposal

The most common form of waste produced on ostrich farms is brooding litter, dead birds and reject eggs, all of which are usually discarded in a farm pit or burnt.

5.16 Horizontal Contacts

Facility Builders/Suppliers of Basic Materials and Husbandry Equipment

Equipment used on ostrich farms is similar to that used on emu properties. Most farms have been established for a number of years and therefore do not need to source any materials such as incubators or brooding facilities.

Feed Manufacture

Commercial pellets for ostrich farms are sourced mainly from feed mills in Daveyston, South Australia or in Gunbower, Victoria. Grains are sourced locally from many different suppliers.

As ostrich producers source feed from common feed mills, the movement of feed is a potential horizontal

contact between farms. These mills and vehicles also supply other poultry industries such as game bird farms.

Animal Health: Vaccination and Veterinarians

Clostridial vaccination of chicks is beginning to occur on several ostrich farms in Australia. The vaccine used is the cattle six-in-one clostridial vaccine. Producers themselves tend to administer the vaccine.

To maintain AQIS accreditation for export to the European Union, accredited farms must undertake once yearly serology of the birds on their property. This is performed by an AQIS approved veterinarian. The cost of testing sera for NDV antibodies is prohibitive for most producers.

Processing Plants

Producers only have access to one processing plant and therefore all producers in a region send their birds to the same location. Transportation to these facilities is done by specialist transporters.

Transportation

Transportation of ratites is a specialty area, requiring custom made loaders on vehicles. Two transporters are currently involved in transporting ostriches in Australia. Both are also involved in moving emus from farm to processing facilities. Transport vehicles are a horizontal contact common to almost all emu and ostrich properties. All transporters report having no contact with other poultry species other than ratites.

Industry Wastes and Fresh Litter Suppliers

The industry practices for handling wastes and sourcing litter for brooding farms are identical to those in the emu industry.

5.17 Summary

- Ratite farms are usually independently owned. Emu farms move birds between farms very little, whereas ostrich farms move birds frequently.
- Transport vehicles are probably the most frequent horizontal contact between properties. These vehicles are usually customised to move ratites and therefore have no contact with other poultry industries.
- Feed for ostriches is source from mills which supply other poultry industries.
- Ostrich farmers are required to keep detailed records of birds for export accreditation. The emu industry has been slower to adopt this practice.

Chapter 6: The Squab Industry

6.1 Description of the Australian Squab Sector

Approximately 680 000 squab were processed in Australia in 2001-2002 and this accounted for approximately $6.8 million of product in that year.

There has always been a small squab pigeon market in Australia of gourmet markets and the Asian community. Product is usually processed with the head on and presented for sale as a whole bird.

Since the 1970s there has been a growing market in both the restaurant sector and local and export Asian markets for the product. This demand declined in 2002 which resulted the loss of some smaller or less committed farmers from the industry. Demand has recently increased again and sales remain stable.

6.2 Structure of Squab Sector

The squab industry is typically made up of multiple growers of varying size that produce birds for a central processor who markets and sells the product. All farms maintain their own nucleus breeding stock and import genetic stock from other producers.

An increase in grain prices since 2005 had resulted in some smaller or less efficient producers becoming non-viable and decreasing or ceasing squab production. Demand, however, remains steady, and product prices are sufficient for larger, more efficient growers to cover the cost of efficient squab production.

6.3 Establishing and Maintaining Flocks

Generally, squab farms are small and family run with producers maintaining between 300 and 1200 breeding pair of pigeon. The farm is usually made up of multiple lofts containing 20 to 40 breeding pairs arranged with nest boxes, ad-lib feed and water access and a covered or open flight area. Other pens on the farm will contain young birds (weanlings from 30 to 45 days of age, adolescents from 45 to 75 days of age and older birds 75 to 150 days of age, prior to mating), virgin breeding pairs and genetic breeding stock.

Once a pen of breeding pairs is established, this group will remain together for their productive life of four to five years, however, a small, continuous culling program is typical with occasional weaker birds or non-producing pairs removed and replaced as required.

Typically, a hen will lay one clutch of two eggs per month. The eggs are incubated for 17 days and both parents sit on the eggs, with the squab being raised by both her and the cock bird. Squab eat nothing but crop milk (a secretion from the parent bird's crop) and never leave the nest. The hen starts to lay again, in a separate nest, when squab are two weeks old, so most of the feeding of the squab then falls to the male. The squab are then processed between 25 and 30 days of age. At times of peak output, or for particularly good breeding pairs, it is likely that a hen will incubate a clutch of eggs while still feeding older squab. The annual moult starts in February and breeding slows during this period. In winter, when days are short, breeding is also interrupted, although better breeding pairs may continue to breed throughout both these periods.

6.4 Production Unit Size, Husbandry and Shedding

Production unit size varies but all flocks are expected by processors to provide a certain number of squab on a particular day each week for processing.

Husbandry varies, with some experienced producers returning excellent production while others do comparatively poorly. When a producer enters the industry, shedding is typically made up of converted older style buildings. Common conversions include garages, old shearing sheds and ex-laying hen sheds. As a producer becomes more involved and expands their production, purpose built lofts are generally established. Only rarely will pigeons be housed on wire or elevated from the floor. Most commonly, dirt flooring is used.

Serological evidence of *Chlamydophila psittacii* infection can be found in a proportion of squab and breeder birds sent to abattoirs for processing. Occasional outbreaks of clinical disease in humans in these processing plants may also occur.

6.5 Size and Density of Flocks

Squab farms have generally been established as part of farm diversification programs, hobby-farming ventures, or by full or part-time town workers with a few acres looking for an extra income stream. They are typically used to supplement income from other farming enterprises (such as cropping) or to supplement other income sources such as a part-time job. There are few “stand alone” squab farms in Australia that are run by full-time staff. Typically, people enter the industry as a “hobby farmer” with little background in farming other species of birds.

Pigeon prefer to be housed in groups of 20 to 40 breeding pairs as larger groups can suffer from aggression towards squabs by cock birds. This requirement results in increased housing and equipment costs compared to other species where thousands of birds can be run in one unit.

The ability of good breeding pairs to rear young throughout the winter results in a consistent supply of product, and this trait is continually being selected for in breeding programs.

6.6 Mixed Species Farming

Commercial populations of other species on the same property are uncommon but small populations of ornamental ducks, geese or laying hens raised for home egg consumption may exist.

6.7 Dynamics Within the Industry Sector

Establishing Flocks of Basic Genetic Stock

A squab farmer will typically enter the industry by purchasing a group of mixed sex adolescent birds or a few breeding pairs from an established producer. From these original birds, a nucleus breeding flock is established. The flock is later supplemented by further breeding pairs or adolescent birds which may come from a variety of sources, including interstate producers. This results in a significant risk of disease transfer between different squab producers. Usually, squab from better producing breeding pairs are grown out and kept by the producer, or sold privately as breeding stock. Some farms will have well documented and highly organised breeding programs to ensure maintenance of hybrid vigour and production characteristics within flocks. There are no commercial suppliers of breeding pairs.

6.8 Development of Genetic Stock

Management of Genetic Stock

A closed breeding program is common amongst producers, with a separate loft for offspring from better producing birds kept as breeding stock. Higher level breeding stock are treated identically to breeder pairs that produce squab for processing except that the breeding offspring are kept and raised after fledging rather than sent for slaughter. Genetic stock and parent birds are slaughtered as “soup birds” at commercial processing plants.

Feed and Water Supplies

Feed is usually mixed on site using grain purchased from local suppliers. Pigeon must be offered clean, whole grains so there is no commercial milling facility required for feed supply. A “cafeteria” feeder is hung in each loft. This feeder will have between four and eight separate compartments with different grains in each. A typical feeder will contain wheat, corn, sorghum or a similar oilseed and peas, along with a commercial mineral mix and shell grit.

Farm Waste Disposal: Reject Eggs and Dead Birds

Due to the small number of dead birds, most are buried or composted on site. Some are also fed to farm dogs and cats.

6.9 Husbandry and Dynamics of Production Stock

Management of Production Stock

Squab are altricious – that is, they rely on parent birds entirely for their care and survival. Adequate nutrition and husbandry of the breeder pigeons result in high quality squab for processing.

Feed and Water Supplies

As for genetic stock

Live Bird Disposal

As for genetic stock

Farm Waste Disposal: Reject Eggs and Dead Birds

As for genetic stock

Factors Influencing Production Stock Performance

As squab are altricious, the husbandry, disease and nutrition factors that affect the parents’ ability to care for the squab will be the major influence on the production of squab.

Diseases such as trichomoniasis (canker), a common protozoan parasite that causes a build-up of cheesy material in the throat and oesophagus of the squab, can result in failure to thrive and mortality can be

significant in heavily infected flocks.

6.10 Horizontal Contacts

Facility Builders

Most lofts are simple, home-built sheds built at low cost by the farmer. Others are converted sheds and, again, this conversion is usually done by farm staff.

Suppliers of Basic Materials

Pigeon “cafeteria” feeders are sourced through commercial suppliers of chicken husbandry equipment.

Feed

Breeding pigeon will not eat commercially milled feed but rely on an offering of mixed grains for their dietary intake. Wholesale feed deliveries of whole grains are made by truck to many of the larger producers but most small farmers will buy grain by the bag from local suppliers. There is little movement of grain trucks between different squab farms or between squab farms and other poultry properties.

Vaccination and Beak Trimming Crews

There are no commercial vaccines registered for use in squab pigeons in Australia.

Squab farmers may be members of an egg co-op and other local rural supply stores and have goods such as anthelmintics, water acidifiers and mineral supplements delivered by vehicles owned by these stores. This is a potential risk of movement of disease causing organisms from one farm to another.

Veterinarians

Veterinary input into squab production is minor. Many squab growers rely on advice from other growers in their area, or from processors, when having production or disease problems rather than consulting a local veterinarian. Occasionally, veterinary investigation will occurr in response to cases of severe mortality or complaints from a processor about skin lesions. There are few veterinarians skilled in pigeon/squab husbandry and diseases in Australia.

Processing Plants/Pick Up Crews

Squab are delivered in crates owned by the farmer to the processing plant by individual farmers. There is potential for mixing of farmers, birds and crates at the time of delivery. This creates a serious potential risk for disease transfer within the industry. Crates are washed at plants and returned to the farmer.

Outbreaks of human disease caused by *Chlamydophila psittacii* in processing plant workers have been recorded.

Egg Collection and Distribution to Sale Points

There is no commercial pigeon/squab egg market in Australia.

Transportation

Adult pigeon are typically crated and moved by road in small trailers or tray trucks. Squab are transported in a similar manner to processing plants.

Rendering of Industry Waste Materials

Materials from small processing plants not suitable for human consumption will either be buried or sent to rendering plants for the recovery of fats, oils and proteins as pigs, poultry or fish feed. Larger plants will also send appropriate waste for pet food manufacture.

Fresh Litter Suppliers

Fresh litter is used to line nest boxes in lofts. The preferred material is pea straw but other substrates such as straw from other grain production or wood shavings may be used. Typically, the cheapest and closest local source of any suitable material will be used.

Litter and Manure Disposal

Farmers will rake manure from the floor of the loft every week or month. This, along with used or dirty nesting material is usually stockpiled on the farm in a type of compost heap. Due to the small amount of litter, is it usually sold domestically to local gardeners for home use. Some larger farms with cropping or fruit trees will integrate it into the farm management system.

Chapter 7: The Quail Industry

7.1 Description of the Quail Industry in Australia

Quail are the smallest species of game bird farmed in Australia. Found in the wild in Europe, Asia, America and Australia, commercial strains are farmed for meat and eggs worldwide. Quails are considered separately from the other game birds in this chapter because they are often farmed independently of these species due to different management requirements.

Species of Quail Farmed in Australia

The most common species of quail used in commercial enterprises is the Japanese Quail (*Corturnix Corturnix japonica*). Australian quail are among some of the best meat producing quail in the world, able to achieve an average live weight of about 240 grams at five weeks of age. The natural reported weight of this species outside of production units is 100 to 160grams.

History of the Quail Industry in Australia

The quail farming industry began in Australia around the early 1970s. Game Farm, the largest producer of quail in the country today, began operation in 1975. The number of independent producers has declined over the last two decades. In Victoria alone, there were ten producers operating in 1990. Today only three properties produce quail commercially. Other states have experienced a similar drop in the number of producers. The Northern Territory lost its last producer in around 2000 and Queensland was left with two producers when its third last property closed down around the same time. In New South Wales, some smaller properties have been bought out by larger ones.

In May 2005, only thirteen producers could be identified Australia-wide. Seven of these are in New South Wales and Victoria. The Australian quail industry has remained relatively constant in size between 2005 and 2009.

Output and Economic Value of the Quail Industry and its Products

Quail are farmed for meat and eggs. Meat birds are usually harvested at five weeks of age, but sometimes at four weeks of age. Eggs can be sold as infertile eggs or as embryonated eggs. Embryonated eggs are incubated for twelve days before being harvested for market. Almost all quail products are sold on the domestic market. In January 2009, a fresh 200g quail carcass could retail anywhere between A$2.70 and A$4.20. A packet of 18 quail eggs sells in Melbourne for around A$3.50.

Based on an average production of 280 eggs per hen per year, 70% hatchability and a breeding ratio of three hens to one male, the responding farms surveyed produce approximately 3.55 million birds annually. In 2003, RIRDC estimated the number of quail produced annually to be 6.5 million.

Most producers have steady clients to whom they supply products and have not increased their flock size significantly in the three years prior to 2009. Competition between producers has reduced and the price of quail meat has stabilised. One producer attributes a drop in demand for their product to the current economic climate, and as a result has scaled back production.

Most producers produce meat and eggs for their customers. Some producers specialise in distributing to local clients but others, send their products interstate as well as supplying local customers. Queensland producers only produce quail meat for their markets. Commercial quail egg production is disadvantaged by the requirement to candle eggs for cracks before retail. This requirement is part of an accreditation program for egg producers set by Safe Food Queensland. Pigmentation in quail egg shells makes this more difficult than for other poultry species and the size of the local market opportunities has not warranted further investment in this area by Queensland producers.

7.2 Structure of the Quail Industry

The quail industry is made up of a number of independent producers and one large integrated company in New South Wales. Queensland, Victoria, South Australia and Tasmania have smaller independent producers. All independent farms breed, hatch, grow and process stock all on the one site. The large integrated company breeds and hatches birds at one site, has three grow-out facilities, and processes at another separate property.

New South Wales has eight quail farms that could be identified in 2009. Five of these are owned by the one company. Each of the operators in this state has their own processing facilities.

Three operating quail farms have been identified in Victoria in 2009, including a new farm opening in Sebastian. This new farm will have approximately 10 000 quail and will also house other game bird species.

Two quail farms in Victoria are known to have stopped operating since 2005, one in Devon Meadows, and a farm near Ballarat not previously identified. The existing quail farms have their own processing facilities. The new farm in Sebastian will send their birds to Bendigo to be processed.

Tasmania is believed to have one operating quail farm. One farm in Tasmania in Scottsdale may have ceased commercial operations between 2005 and 2009, as it could not be contacted or identified in telephone and business directories.

South Australia has two quail farms, one at Two Wells and the other in Kapunda. The Kapunda farm also farms partridges, guinea fowl and pigeons and will be relocating to a nearby property in 2009. The Kapunda farm processes birds at a nearby processor in Kapunda.

Queensland has one known quail farm in Pittsworth, and processes its own birds on site.

In 2009, ten producers were identified in this survey across five states of Australia, a decrease from the 13 producers identified in 2005. No quail farms were identified in Western Australia and the Northern Territory (see Table 7.1).

Producers have no independent industry body through which to lobby government or discuss the future of the industry. However, representatives from the two largest producers are members of government-poultry industry working groups.

State	Number of Producers	Number of Commercial Quail Properties
New South Wales	4	8
Victoria	2	3
Tasmania	1	1

South Australia	2	2
Western Australia	0	0
Northern Territory	0	0
Queensland	1	1
Total:	10	15

Table 7.1: Quail Producers and properties by state in 2009.

Distribution of Quail Farms

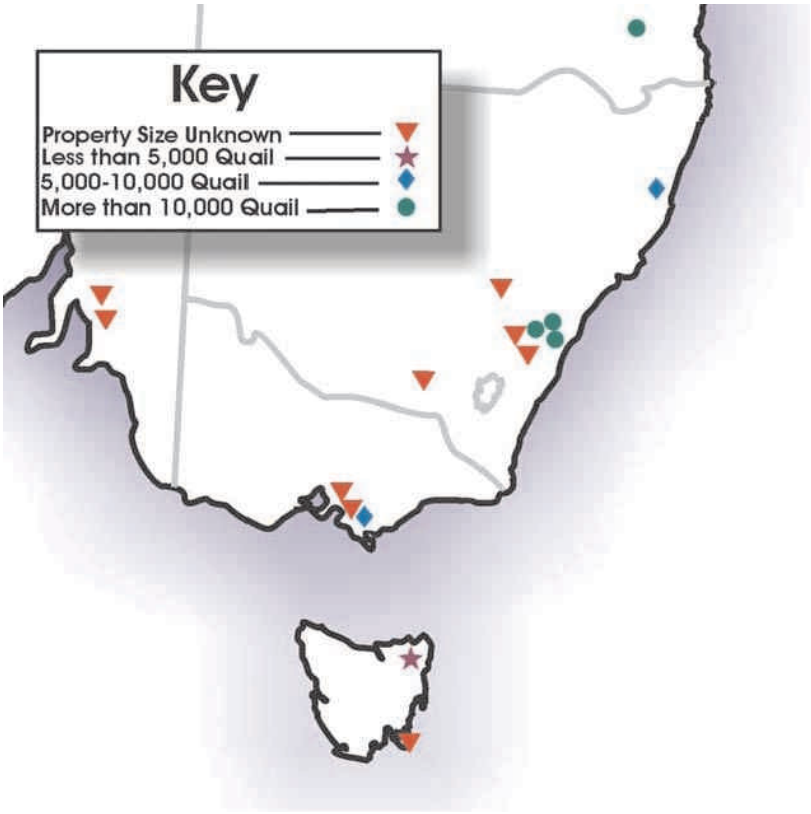


Figure 7.1: Distribution of quail farms in Australia in 2005

The majority of quail farms exist near larger consumer markets. Farms close to Melbourne, Sydney and Adelaide lie in areas where substantial numbers of chicken broilers, layers and breeders are also housed (see Figure 7.1).

7.3 Establishing and Maintaining a Flock

Most quail farms have been established for a number of years and thus have their own independent breeding program in place on their farm. Only one new quail farm has started in recent years and two others have changed owners. No producer surveyed had accepted new birds into their flock this year. New birds are rarely introduced into an established quail flock unless new genetic stock is required. If stock is required, birds were reported to come from other producers.

Quail can breed throughout the year if given 14 to 18 hours of light a day. Breeding stock can live for 2 to 2½ years but are often turned over sooner at one year as fertility drops in older birds.

Meat birds are hatched weekly and processed at four or five weeks of age. Replacement breeding stock comes from this progeny so breeder numbers are maintained.

7.4 Production Size, Husbandry and Shedding

Australian quail flocks range from 2000 to 330 000 birds in size (this is an estimated figure). Breeding stock is usually housed in cages in a shed with artificial lighting. Cages are preferred to pens for breeding

stock, as quail will bury their eggs in litter, making egg collection difficult. The mating ratio is usually about three hens to one male. Meat birds are usually reared on the ground in sheds with a deep litter floor.

Artificial lighting is necessary for breeding stock as daylight hours must be maintained between 14 to 18 hours for birds to breed.

Compared to other game birds, the growing of quail is done under intensive (as opposed to extensive) husbandry conditions. Quail farms therefore require less land area to set up and can set up closer to more populated areas. The proximity of many farms to large population centres is also due to the fact that many farms initially started up as 'backyard' or part-time hobby operations.

Quail eggs are incubated for 17 to 18 days. If necessary, they are stored for up to one week (sometimes up to two weeks) on site before setting. All producers have their incubation facilities and breeder birds together on the one site.

Production and breeding shedding is usually naturally ventilated but air movement in shedding may be assisted by the use of fans. Quail housing is usually set up to maintain adequate air flow but to minimise drafts which can adversely affect the growth of young chicks and increase mortality figures. Larger operations will have automated feeders and drinker lines, particularly in the breeder cages where it is more difficult to manually feed the birds.

7.5 Size and Densities of Quail Flocks

Industry Populations

Market size and competition has seen a slow attrition of quail farms in Australia. Ten to fifteen years ago the number of people starting in the industry equalled those leaving. However, the influx of new producers has slowed and almost stopped since 2000. This has left the Northern Territory with no quail producers and Queensland with only one. Both of these producers reported ceasing production because of lack of local marketing opportunities.

The number of farms in New South Wales has remained steady but the number of independently owned farms has decreased. Of the remaining farms, some are increasing the number of birds produced annually but most are maintaining the same number of birds in the flock.

Thus, a trend appears to be developing for quail production to be done by fewer producers and more in the southern areas of the country, regions with more people and larger nearby markets.

States without any local quail producers import processed quail products from interstate as refrigerated or frozen products.

Individual Farm Populations

The quail producers interviewed around Australia in 2009 report that there has been no significant change in the size of their flocks in the last three years. Some producers, as they near retirement, are producing less birds per week than they did three years ago. Others feel that the economic climate has had an impact on some of their markets and as a result they have scaled back their weekly production. Victorian quail farms would produce between 2000 and 4000 birds a week while the largest producer in New South Wales would produce nearly 52 000 birds a week.

As quail are not seasonal breeders, eggs are set every week and birds processed on a weekly basis which means that the population of birds remains relatively constant on a farm. Customer orders for quail meat may dictate whether producers set and process more or fewer birds in any individual week. Unlike the

integrated chicken industries, producers have closer relationships with customers and individual customer orders therefore feature more actively in the farmer's decision about how many eggs to set in a given week.

Mixed Species Farming

Four quail farms in Australia are known to have other species of poultry on the same property. The other species include chickens, ducks, pheasants, partridge, guinea fowl and pigeons.

These producers are aware of the potential for disease to move between species but are not concerned about the risk because their farming operations were small. A larger Victorian producer had implemented a biosecurity protocol on their property and because of this does not process quail and other species from other growers in their farm slaughter facilities.

7.6 Dynamics Within the Quail Industry

Establishing and Maintaining Basic Genetic Stock and Production Stock

The only producer to recently start a new quail operation got his initial birds from another producer. In 2005, all responding quail farms were maintaining closed flocks with no exchange of breeding stock. Flocks are maintained through farm breeding programs that generally try and grow birds with good commercial traits while avoiding inbreeding of stock. As previously mentioned, it can become necessary to introduce new breeding stock to prevent inbreeding. Inbreeding results in a drop in reproductive and production performance. Several farmers mentioned introducing new stock to the farm in previous years.

Feed and Water Supplies

All producers responding to this survey fed a commercially milled diet to their birds. This was sourced from several different feed mills, none which were shared by any other quail farms. However, one of the feed mills in Victoria is used by local chicken meat and egg layer properties. One Tasmanian producer sourced their feed from a mill in New South Wales.

Water is generally sourced from town supplies if the farm is in a semi-urban area, otherwise most surveyed got their water from a bore. Bore water was usually not treated unless it was being chlorinated for use in the farm processing facility (water chlorination for abattoirs is a food safety requirement). **Farm Waste Disposal**

Smaller quail farms would dispose of their waste in domestic skip bins which were then taken by the council to the nearby refuse depot. Most quail farms, however, had landfill pits on site for dead birds or reject eggs. Litter was often used by local producers as fertiliser on pasture or crops.

Horizontal Contacts Between Industry Flocks

The type and frequency of horizontal contact between the quail industry and other poultry industries is similar to that of the game bird industry. These contacts will be covered in the following chapter on game birds. Refer to section 8.8 for further information.

7.7 Summary

- Quail farms are more common around populated areas of the country.
- Most quail farms are small independently-owned and operated properties on which birds are born, raised and processed. Very little movement of stock occurs on and off these properties.
- One large-scale producer has adopted a vertically integrated structure and moves chicks and birds between properties. This probably accounts for over 90% of the live bird movements of quail in Australia. This occurs around Sydney and central NSW.
- Quail farms have little contact with poultry farms. However many of the farms are located in areas near clusters of broiler, egg or breeder chicken farms. The most common contact between these industries maybe through feed mills which supply some quail farms as well as chicken properties.

Chapter 8: The Game Bird Industry

The species of birds traditionally hunted in various parts of the world (including the United Kingdom, Europe and North America) for food or sport are considered game birds. The game bird species farmed in Australia are pheasants, partridges, guinea fowl and quail.

This chapter deals with farms producing pheasants, partridge and guinea fowl. Although sometimes grouped with game birds, quail and squab production are dealt with in separate chapters.

8.1 Description of the Game Bird Industry

Species of Game Birds Farmed in Australia

The breed of pheasant almost exclusively farmed in commercial operations in Australia is the Mongolian Ringneck Pheasant (*Phasianus colchicus mongolicus*). The achievable carcass size of this breed, good reproductive output and ability to begin breeding within their first year of life are the reasons why this is the preferred commercial breed. Other breeds of pheasant are bred and grown in Australia but more for ornamental purposes.

The Indian Chukar Partridge (*Alectoris chukar chukar*) is the partridge breed used exclusively in commercial enterprises in Australia. Of the game bird species, they are considered to be one of the more easily raised in captivity.

The helmeted Guinea Fowl (*Numida meleagris*), a game bird species originating in Africa, is popular because of its gamey meat flavour. Some people do not classify guinea fowl as game birds, however, they will be considered under the umbrella of 'game bird' in this chapter as they are often farmed along with pheasants and partridges.

The game bird farms identified in this survey farm one or more of the above species and commonly have other commercial bird species on the property as well.

History, Current Outputs and Estimated Economic Value of the Game Bird Industry in Australia

In Australia, game birds have been farmed commercially since the late 1960s. In comparison to the chicken meat and egg industries, growth in the game bird industry over the last four decades has been much more gradual. Several factors regulated this slow, long-term growth. These factors are:

- The greater cost of production of birds. Australian pheasants and partridges have a food conversion rate (FCR) of 4.5kg or 5kg feed to 1kg gain in live weight. In comparison, a modern day broiler chicken has an FCR of 1.8:1 or 2:1.
- The small size of the domestic market, mainly due to Australian consumers not routinely eating game bird meat.
- Game bird products are more expensive and thus vie for market share in the highly competitive gourmet food markets.

In 2009, producers involved in the game bird industry reported that the market demand for game bird

products was strong. Pheasant, partridge and guinea fowl meat sold for about $20 per kilogram in 2009. Production of game bird meat is still seasonal with fresh meat only available for 3 to 4 months of the year and frozen meat available at other times.

A study by RIRDC in 2003 estimated the number of pheasants, partridges and guinea fowl processed annually in Australia (see Table 8.1).

Species	Head of Bird Processed	Estimated market Value (Millions $)
Pheasant	60 000	1.26
Partridge	18 000	0.3
Guinea Fowl	40 000	6.2

Table 8.1: Number of game bird processed annually in Australia (RIRDC, Leech et al, 2003).

At the time of the 2003 survey, the net economic value of these species was collectively 7.76 Million dollars per annum.

Pheasants and partridges, aside from the table meat market, are also occasionally sold live by producers to game shooting properties. However, the number of birds sold for this purpose is low and the market is erratic. No producer surveyed this year reported selling any birds to shooting properties in 2004/05.

From the research conducted in this survey, it appears the number of producers remained relatively steady between 2003 and 2005, with none of the larger game bird producers leaving the industry. Additionally, producers have not reported any significant changes in the number of birds produced annually. The exception would be one Queensland producer dropping the size of their guinea fowl flock from 1000 to 150 birds. However a new producer in South Australia started growing guinea fowl in 2005, almost compensating for this drop.

Pheasant feathers are sold to the fly fishing industry and are occasionally used for decoration in the fashion and craft industries. The market for feathers is very small, although one small producer (semi-retired) in Far East Gippsland Victoria, specialises in feathers and pelts for these markets.

8.2 Structure of the Game Bird Industry

In 2009 it was observed that larger producers in the game bird industry are adopting the vertically integrated structure seen in the chicken meat, duck and turkey industries.

The majority of game bird producers can be found in New South Wales and Victoria but game bird properties exist in South Australia and Tasmania as well. Commercial producers tend to run small scale independent operations with maximum farm capacities of 150 to 21 000 birds.

Approximately 17 operations were identified by the 2005 survey through contacting processing plants that handled game birds in 2005. Many other properties are known to have smaller populations but are not involved in commercial farming. These properties include hobby breeders and organic farms, particularly vineyards and orchards, using small flocks of guinea fowl as a form of natural pest control.

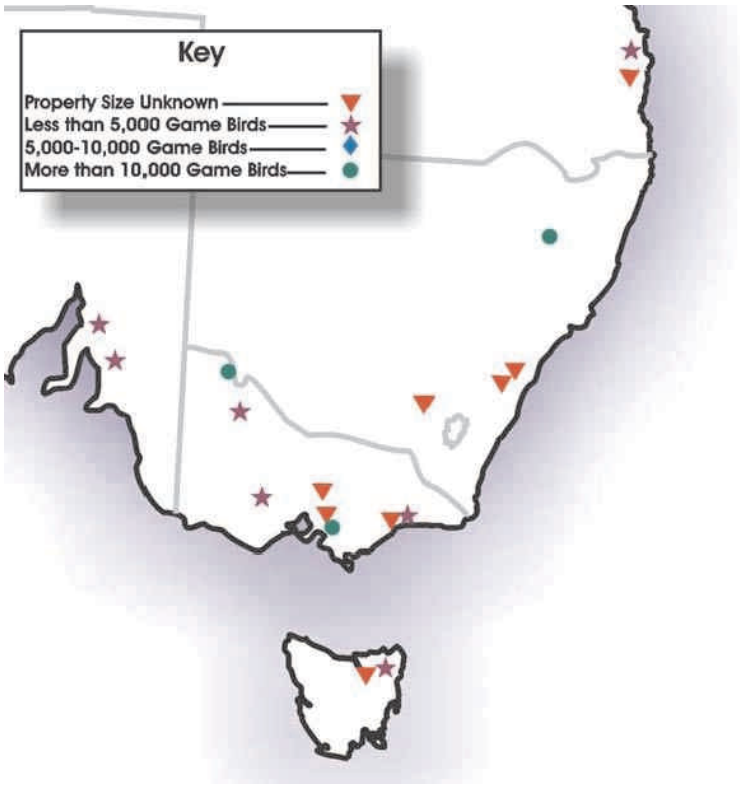


Figure 8.1: Distribution of Game Bird Farms in Australia in 2005

Of the 18 game bird farms identified in 2005:

-16 produced birds for meat

-1 produces birds only for feathers and pelts

-1 produced fertile eggs for sale to other producers

-2 are potentially winding down from commercial production within 12 months

-1 started commercial production within the last year

-10 could not be contacted/did not wish to participate in this survey

Most producers classified themselves as independent but one sold product to be marketed through a large quail company and another chose to market their products under the brand name of the processor in Victoria. No commercial producer association exists in any state in Australia. This is in contrast to the hobby breeders of game birds who run state-based branches of The Pheasant and Waterfowl Society.

Each game bird farm bred, incubated and grew their own breeding and grow-out bird stock. As each producer essentially has a closed gene pool from which to breed from, genetic selection pressure is low or non-existent in breeding programs. Any selection would potentially narrow the gene pool of that property and be detrimental to flock production in the future. Guinea fowl may be the exception as artificial insemination of hens was reported by DPI Queensland to have occurred on some farms in the mid 1980s (QDPI, 1994).

Distribution of Game Bird Farms

The distribution of game bird farms has remained concentrated in the eastern states of Australia since 2005. In Victoria, new game bird properties have commenced operating since 2005. A new property specialising in growing out game birds such as pheasants, partridge and guinea fowl opened near Wycheproof in 2007. This farm receives day-old stock from a large game bird farm near Swan Hill. It is owned and operated by a poultry processor in Wycheproof.

One company is also building (in 2009) a large game bird breeding complex near Sebastian, Victoria. This property will have two sheds and eight canvas covered "eco-shelters." Approximately 5000 breeder guinea fowl, 5000 pheasant breeders, 2000 partridge breeders, 2000 silkie chicken breeders, and 10 000 quail breeders and replacement breeding stock will be run on this property when it becomes operational. Fertile eggs will be transported to a new hatchery in Serpentine, Victoria. Day-old chicks will be distributed to five new contract growers in the Wycheproof region. Each of these growers will have two semi-controlled environment sheds/shelters that can house between 10 000 to 12 000 birds.

Each shed will grow the birds under artificial light and will be temperature/ventilation controlled by computer, allowing previously seasonal breeding birds to produce fertile eggs all year around.

In South Australia, the game bird farm at Kapunda is in the process of relocating and expanding in 2009 They will continue to process their birds at the poultry processor in Kapunda.

In Queensland, no game bird farms could be identified in 2009. In Tasmania, the producer Scottsdale Gamebird Enterprises has ceased operation although still currently licensed with the food authority

Game farm properties are scattered widely and there is very little geographic clustering of properties (refer to Figure 8.1). Properties need to be close to a reliable potable water supply but do not necessarily source the other major consumable inputs of their farm (feed and litter) from locations close to their property, despite there often being a feed mill or saw mill/litter source within 50km of the property. It is common for producers, where possible, to stay with the one supplier of feed and litter for a number of years. Of the properties surveyed, none shared common feed or litter suppliers.

Most game bird properties have on-farm processing facilities and process their own birds. Those who do not have these facilities have arrangements with a nearby poultry processing plant to process their birds for them. The two known examples of this occurring involve the producers sending birds to a processor who also processed squab and emus as well as several mammalian species.

Marketing of product is usually done by the producer themselves. Occasionally a producer may supply to a distributor who then locates markets for the product.

8.3 Establishing and Maintaining Flocks

With most game bird farms established for many years, they already have a breeding program in place to maintain their bird numbers. Newer producers wanting to build up breeding stock must initially buy birds from an established producer. All producers will then maintain their own breeding program on farm.

On a typical game farm, breeder birds are housed separately from the growing birds in naturally ventilated sheds or pens. Game birds have seasonal breeding patterns with:

- pheasants normally breeding between October and January
- partridges normally breeding between October and January
- guinea Fowl breeding between September/October and May/June.

However, while game bird production in Australia has traditionally been seasonal, with breeding in the warmer months when daylight hours are the longest, the introduction of controlled environment sheds

means that breeding stock may now be able to breed throughout the year.

Grow-out stock can also be raised throughout the year, rather than the traditional 14 to 16 weeks in February to June, making fresh meat available all year around. This would be a significant change to the way the industry operates and is able to market its product, as customers have always preferred to be able to purchase fresh product over frozen. In other parts of the world, the peak demand for fresh game meat is at Christmas, however, Australian producers have not previously been able to provide the market with fresh produce in December.

Some producers are now producing birds as seasonal products and are planning to do so for the foreseeable future. The marketplace is encouraging them to adhere to this production system as the product is seen as naturally produced and attracts a premium price for the fresh meat sold.

Pheasant breeders are kept for one or two years, depending on the farm. If breeders are maintained for two years, a rotation of half the breeding stock occurs every year. Similarly, breeding partridges are used for one to two years. Guinea fowl males are often kept for one year while the females may be bred for a maximum of three years.

The next generation of breeding stock are selected from the progeny hatched that season. To improve the odds of picking healthy stock as breeders, some farmers choose the breeding stock from a few mid-season hatches where chick vitality is more reliable and the eggs have been stored for no longer than one week before setting.

8.4 Production Unit Size, Husbandry and Shedding

The number of birds on a game bird farm fluctuate, however, the maximum number of birds (of multiple species) on a site may range from 150 to 21 000.

Game bird species are generally allowed to free range in netted pens or in large flight aviaries (as partridges and pheasants can fly). Alternatively, they may be grown in open pens if one of their wings have been clipped to prevent them from flying. Birds from the age of six weeks are generally tolerant of cooler temperatures and can roost outside at night. Some growers allow vegetation to grow in the pens during the fallow season to give next season's birds some shelter and to relieve boredom and minimise cannibalism.

Game bird chicks are housed in a brooding shed and require conditions much like young chickens. A heat source is placed in the pen and the corners of the pen rounded off to prevent smothering. A litter substrate is used in the brooding pen. Smooth, low-grip, surfaces are to be avoided as leg problems such as splay-leg can result. Pheasant and partridge chicks are generally raised in low light environments as they can both rapidly develop cannibalistic behaviour. The brooding shed is often adjacent to the netted pens to facilitate easy movement of stock between the two. From three weeks onwards the chicks are allowed to free range outside during the day. From six weeks onwards they are closed out from the brooding shed.

Some farms choose to free range the different types of stock separately, while others allow the different species to mix in the same pen. This decision is driven by the design of the farm and types of enclosures available on the property.

Breeders are housed separately from the growing stock. This may be in a breeder shed or separate breeder pens.

Egg collection is usually done three times a day in the breeding season. As eggs are laid on the floor, regular collection minimises the number of dirty eggs and reduces the chance of pheasants and partridges developing the habit of egg pecking. Guinea fowl breeders are often housed in smaller pens during the breeding season to make egg collection easier as this species tends to try and hide their nest locations

when free ranging or in large enclosures.

Eggs are set once a week. Between collection and setting, they are stored in an on-farm egg room at constant temperature. Eggs in the earlier sets and later sets may be stored longer to get sufficient egg numbers to place in the incubator. In these species, as with chickens, storing the eggs for periods longer than a week can have a negative effect on hatchability, however, this practice is necessary to best utilise farm incubator facilities.

Species	Incubation Time (days)
Pheasant	26
Partridge	25
Guinea Fowl	27

Table 8.2: Incubation time of game bird species

Partridges, pheasants and guinea fowl are grown for approximately 14 to 16 weeks and then processed. If being weighed, the weight of the bird dictates the time of processing more than bird age, as markets often want a carcass of a certain dress weight. In a typical season, target weight is achieved at 14 to 16 weeks in all three species.

8.5 Size and Density of Flocks

In seasonal production systems, the number of game birds on a farm is greater over summer than in winter. However, environmentally controlled sheds/shelters now make it possible for previously seasonal game bird breeding to occur through the year. Grow-out farms will be able to have consistent stock numbers on their farms though out the year.

With the seasonal breeding patterns of game birds, the number of birds on a farm will vary throughout the year. The farm population is at its lowest between the end of the processing season and the start of the breeding season. Bird numbers will be at a maximum in a 4 to 5 week period at the end of the breeding season but before processing begins (see Figure 8.2). In good seasons, birds may lay eggs longer and the gap between the start of processing and the end of hatching becomes much smaller.

Growers usually process a batch of birds weekly depending on the market demand but some may process in fewer batches (i.e. twice a season) particularly if they only grow small numbers and they don't have on-farm processing facilities. Fresh birds that cannot be sold will be frozen to ensure continuity of supply in the off season.

If a market cannot be found for this season's birds, the birds are processed regardless and stored as frozen product while buyers are found. This situation is not ideal and most producers will be able to sell some if not all of their product fresh. Most producers endeavour to ensure markets exist before breeding commences.

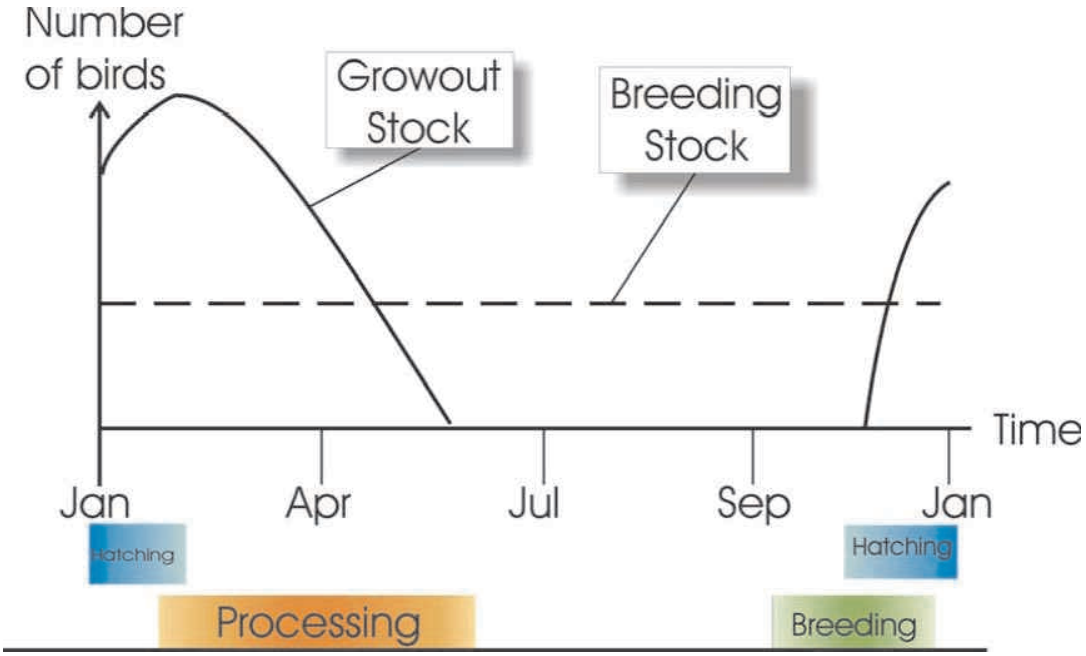


Figure 8.2: Illustration of the fluctuation in a game bird farm population over one year

8.6 Mixed Species Farming

It is not uncommon to find several commercial species of birds on the one game bird property. Few producers specialise in production of just a single game bird species and thus these three species are often found concurrently on a property. Quail, squab, ducks and small flocks of table egg laying chickens are other avian species that are commercially farmed on some of the properties surveyed. It was not uncommon for producers to breed some ornamental avian species of birds on their property as a hobby or as pets.

8.7 Dynamics Within the Industry Sector

Other poultry industries have quite separate facilities for genetic and grow-out stock, however, in the game bird industry the two types of birds are housed on the same property with breeding stock producing grow-out stock and replacement breeder birds being chosen from the grow-out stock. Thus, the movement of genetic stock and production stock will be considered together.

Establishing and Maintaining Basic Genetic Stock and Production Stock

As already discussed, most properties maintain closed flocks and rarely move live commercial stock on and off their property. The exception is when new game bird properties start up and must source their stock from another producer.

When game shooters pick up stock from farms, birds are usually transported by the farmer or the buyer in cars or on utility trucks.

Feed and Water Supplies

Most game bird farms surveyed watered their birds from a property dam, rainwater storage tanks or mains supply (if near a town). Dam and rainwater was not treated with chlorine or sanitised in any way. Town water supplies used by the farms in this survey were treated.

All farms surveyed bought commercially prepared rations for their birds. Two farms also mixed grain from their own farm or from nearby properties. Some farms had their rations prepared in mills from other states.

8.8 Horizontal Contacts Between Industry Flocks

As will be seen from the entries below, the type and frequency of horizontal contacts between game bird farms is substantially different from those in the commercial chicken industry. Generally, the frequency of people, stock and equipment moving between game bird farms is much lower than that occurring in the bigger integrated industries.

Husbandry Equipment Suppliers

Equipment suppliers are a possible point of horizontal contact between game bird farms. There are examples of small-scale poultry equipment suppliers who specialise in supplying equipment to smaller poultry operations such as game bird farms. One such supplier exists in Melbourne Victoria, and is known to supply equipment to game bird properties, quail properties and backyard flocks in Victoria and sometimes interstate.

Some game bird farmers have also bought second-hand shedding infrastructure from chicken farms that have closed down or upgraded their facilities. Second hand equipment can be attractive to small farming operations due to its low price and due to the fact that enough equipment can be bought for the farm plus extra equipment to be used for spare parts. Examples of the kind of equipment that may be bought like this are feeding pans and drinker lines. Understandably, there is a possibility that equipment may bring disease agents from the chicken farm to the game bird farm, however, second-hand equipment has often been removed from a chicken shed for a substantial period of time and left sitting in a part of the farm removed from the production sheds. In this situation, the significant horizontal contact that may carry disease is going to be on the boots or vehicle of the producer who picks up or delivers the equipment to the farm.

Flock Placement

When new flocks are being set up, stock must come from another farm. This is always a type of horizontal contact that carries a high chance of introducing disease to a farm. Game bird stock are not vaccinated or tested for disease. However, most producers operate closed flocks once established and few new farms are starting up in the industry. Therefore, the frequency of this type of contact is very rare.

Disease would be more likely to spread through the movement of other commercial or non-commercial species as these are moved on and off the farm more frequently.

Feed Manufacture

As most game bird farms buy commercially heat-treated feed for their birds (usually turkey rations or specific game bird rations) from stock feed mills, this is a potential source of contact with other poultry industries. Larger game bird properties store feed in silos and have a feed truck deliver feed to the

property. Unlike chicken farms, on-farm sanitation of vehicles is rarely practised. Feed delivery vehicles could therefore be vectors to carry diseases to game bird properties. However, because stock numbers are usually not very high compared with chicken farms, the interval between deliveries of feed is greater and feed delivery vehicles visit the farm less frequently. Small producers will often buy their feed from a stock feed distributor and pick up the feed themselves.

Vaccinators and Beak Trimmers

No vaccination is carried out on game bird farms, therefore, contract vaccinators are not used in this industry. Beak trimming is rarely carried out and if it is done the farmer usually carries out the procedure on the farm.

Veterinarians

Veterinarians are rarely called to game bird properties.

Processing Plants, PickUp Crews and Transportation of Birds

At the end of the grow-out phase, stock are picked up by the producer themselves and either processed on site or transported by the producer (by farm vehicle-light truck/ute) to a nearby abattoir. General practice is to clean plastic carry cages at the abattoir before returning them to the farm.

Egg Collection and Distribution

All eggs on game farms are usually stored and set on the same property.

Farm Waste Disposal

Waste generated by a game bird property includes used litter, dead birds and reject eggs. Because properties are usually small, these are routinely discarded on-site in a pit, in a composting bin or used as fertiliser on-site or on the paddocks of nearby properties growing crops, fruit or vegetables. Offal waste generated at an on-site processing facility is also disposed of in this way. Offal generated at off-site processing facilities is combined with offal of the other species processed at the facility and sent for render or pet food production.

8.9 Summary

- Game bird farms are distributed across five states in the east and south east of Australia.
- All game bird properties were small, independently-owned and operated properties.
- Very little movement of stock occurs in Australia. The most common off farm movement of stock involved small numbers of birds being transported between a farm and a processing facility.
- Game bird farms have limited contact with other poultry industries. The most common horizontal contacts occurred via feed trucks or at processing facilities.

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Chapter 9: The Goose Industry

9.1 Description of the Australian Goose Sector

There is no structured goose industry in Australia and the industry is basically a backyard hobby industry that small processors have exploited for the small processed bird market in years past. Very few geese are slaughtered for human consumption through processing plants because supply from any producer will be as small as five or six birds. Geese are now kept for aesthetic purposes because they look nice on properties and are inexpensive to keep since they gain most of their nourishment from grazing. They act as pest controllers in vegetable and orchard crops and also serve as effective watchdogs on account of their territorial instincts.

There is a demand for goose feathers but the supply in Australia is very limited. Demand for goose meat is low and likely to remain so while the productivity of Australian stock remains low compared with overseas. Christmas, when goose is a favoured dish in the northern hemisphere, is unlikely to become popular because suitably sized goslings are out of season at that time.

9.2 Structure of Sector

The Departments of Agriculture and Primary Industries in the various Australian states did a great deal to promote geese as a viable poultry enterprise in the 1960s and 1970s. These efforts were thwarted by two factors. The egg-laying season in the southern hemisphere is in spring (laying in August/September hatching in November) which leaves just two months to grow a gosling to a good weight by Christmas. It usually takes four months to achieve a suitable market weight for geese to be a popular poultry meat. The second reason for geese not being favoured as a basis for a poultry sector is the poor genetic base of available stock compared to that available overseas.

9.3 Establishing and Maintaining a Flock

Embden, Toulouse and Chinese varieties are available in Australia. The Toulouse is the largest and can weigh up to 15 kg and lay 30 eggs per season in spring, however, they are not good at sitting on and hatching eggs. Their grey pinfeathers also detract from the dressed carcass. Embden geese, on the other hand, have a pure white plumage which favours their dressed carcass, however, they are slow to mature and also lay only about 30 eggs per season. Chinese geese come in two colours, white and brown and are good layers, laying up to 100 eggs per season or averaging 60-70. Young birds carry more weight than the heavier Toulose and Embden breeds at an earlier age, however, hatchability is notoriously low adding to their inefficienct production.

9.4 Production Unit Size, Husbandry and Shedding

Being maintained for aesthetic or pest control purposes, goose flocks are rarely kept above 10 birds nowadays. Geese are nervous and temperamental and prefer to be tended by one person which makes their commercialisation difficult. Geese are hardy animals and generally remain disease free and can withstand cold better than other poultry breeds. Although they can survive without shelter after two weeks of age, heat supply to goslings is required up to that time and basic shedding is usually supplied to ensure

protection of birds.

9.5 Flock Size and Density

The failure of goose meat to become popular at Christmas in Australia means that goose husbandry has not become an economic venture despite being pushed by state departments of agriculture and primary industry over a number of decades. Any marketing of geese is on a direct approach between grower and purchaser. Small numbers appear at live bird sales but have declined over the last 20 years, being replaced by the much more popular duck.

9.6 Mixed Species Farming

Fanciers of geese often also keep a few ducks and/or other poultry for the purposes of supply of other poultry products.

9.7 Dynamics Within the Industry Sector

Establishing Flocks of Basic Genetic Stock

A small number of specialist breeders can supply stock to new people wanting to keep a few geese.

Development of Genetic Stock

i Management of Genetic Stock

The holders of the various geese breeds are all small producers and no significant effort is able to be made in maintaining or bettering the production characteristics of their birds. One producer in Victoria is attempting to establish a goose farm using a cross of Chinese (good layer but small) and Embden (larger but poor layer) breeds as production stock. This venture proposes to rear goslings by intensive farming, but only 60 goslings were reared last year.

ii Feed and Water Supplies

Geese can be supplement fed to improve growth rates and this supplement would be purchased from small suppliers of poultry feed or prepared on site. Water supplies to geese on hobby farms is unlikely to be secure from contamination by wild birds.

iii Farm Waste Disposal: Reject Eggs and Dead Birds

Being grazers, geese are not a problem for disposal of manure and litter. Being kept in small groups means that dead birds are not usually a problem to deal with and geese are particularly hardy, healthy animals when reared extensively.

iv Factors Influencing Genetic Stock Performance

The availability of poor genetic stock and Australia's location in the southern hemisphere has not assisted a goose sector or industry to develop.

9.8 Horizontal Contacts

The goose industry is essentially a backyard industry. There would be little contact between geese that are essentially kept as grazers and the other poultry breed sectors. When taken to live bird sales, birds are usually purchased for slaughter and owners often have an arrangement with smaller specialist processing plants for disposal of small numbers of excess geese.

Chapter 10: Specific Pathogen Free (SPF) Production

10.1 Description of the Australian SPF Sector

SPF fertile eggs are essential in the production of many poultry veterinary vaccines and in some human viral vaccines. Chickens hatched from these eggs may also be used as sentinels in disease control or quarantine programs, or for the diagnosis of or research into avian and mammalian diseases.

There is a single commercial supplier of SPF fertile eggs and chickens in Australia. It operates egg production, hatchery and grow-out facilities for SPF fertile egg and chicken production.

The chickens at this facility are raised under strict biosecurity guidelines, in filtered air positive pressure housing, with weekly serological monitoring to ensure their pathogen free status.

Due to the strict biosecurity rules governing this facility, there is no contact between this flock and any other poultry farms or industries.

Feed is irradiated to prevent entry of disease. Contractors that deliver products and dispose of wastes to the farm do so under strict isolation and biosecurity guidelines and do not have contact with other commercial poultry flocks. Farm workers and staff are supplied with reject fertile eggs for home egg consumption, as they are banned by the company from having any contact with other poultry eggs.

10.2 European Pharmacopeia SPF Egg Status

The Australian facility operates under the European Pharmacopeia 5.2.2 standard which means that Chicken Anaemia Virus (CAV) positive eggs are unacceptable in its “Premium Plus” SPF eggs.

Chapter 11: Live Bird Sales

Australia, compared with other overseas countries like the USA and particularly SE Asia, has few and small live bird sales and these are mainly confined to the sale of fancy fowl and poultry for back yard production, hobby or life style purposes. Some sales are undertaken by distribution through regional produce stores. These stores hold small numbers of pullets which are supplied in smaller numbers for back yard use.

In a recent study by University of Sydney researchers, 51 bird sale and auctions were identified in Australia, with NSW holding more sales (15) than other states. Most venues hold sales regularly (ranging from biannual to weekly sales), with only ten being held annually. Annual and biannual sales are generally organised by poultry club associations, and more frequent sales are organised privately. Low numbers of birds (<1000) are sold at live bird sales venues in Australia.

Based on case studies at three of the larger live bird sales venues, there are few links between the live bird markets and the commercial poultry industry, as no shared personnel, vehicles or equipment were identified at the venues studied. Moreover, the low number of animals sold through the live bird sales, and the characteristics of the sale and producers selling through these locations, suggest that live bird markets are most likely to pose a low biosecurity risk to the commercial poultry industry in Australia.

In addition to a small number of trader markets, sales of fancier birds by enthusiasts and bird associations that are conducted in many centres across the states both within and outside of urban areas. Larger live bird sales venues are identified below.

The locations of the main bird sales and auctions in Australia are shown in Figure 11.1

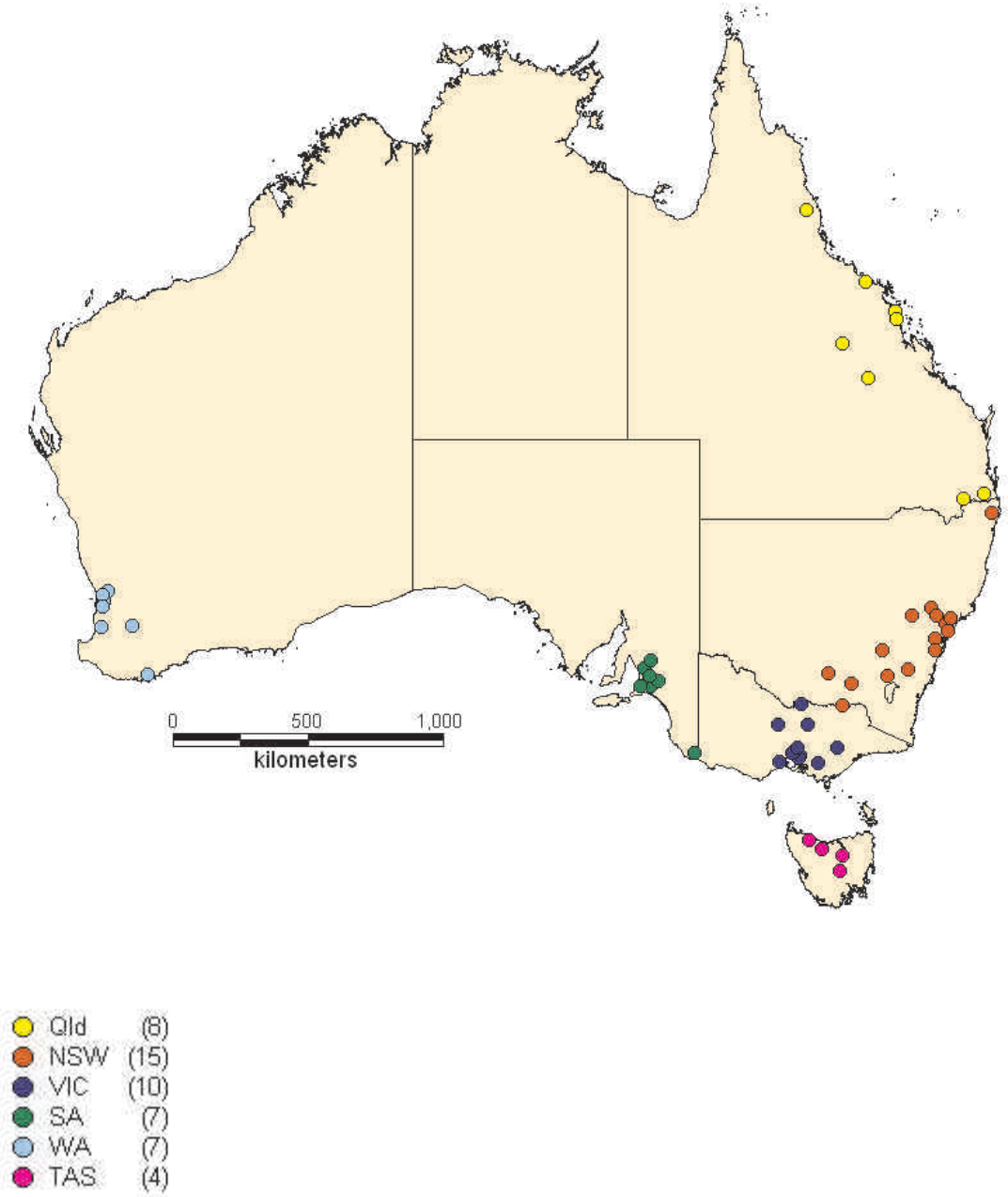

Figure 11.1: Location of the main bird markets in Australia

11.1 South Australia

There is a market sale on Wednesday every second week located at Gawler Trotting Track**,** to the north of Adelaide and in the direction of the Barossa Valley. Sales vary between 500 and 1000 birds per week, predominantly chickens (hens) turkeys, geese, and small birds such as parrots and budgerigars.

Poultry come from small holders all over South-east of South Australia to Port Augusta in the north.

About 70% of poultry sold at the markets are purchased for home slaughter, while 20% are sent for processing and 10% kept by poultry keepers.

Birds are held in cages supplied by the sale point and these are washed and cleaned after each market.

The market serves a purpose in being able to dispose of excess birds that owners are reluctant to kill. This is fairly typical of specialist backyard and hobby breeders who use such markets as an avenue to sell their excess roosters, usually for meat.

11.2 Victoria

There is a live bird sale at Huntly near Bendigo, central Victoria, that operates monthly on the first Saturday of each month at the Bendigo Livestock Exchange. The auction is run by the local Lions Club. Around 1000 small birds and up to 1000 large birds are sold each month. The whole gamut of poultry species is sold. Sellers are largely hobby farmers within a 50km radius of Bendigo, although good breeding stock are also sold as ornament birds for hobby farms and bird fanciers. Buyers are attracted from a wide circuit and it is believed that some stock is sold on to other smaller sales. Cages (supplied by the Livestock Exchange) are kept off the ground and are washed and disinfected following each sale.

A live bird auction at Scoresby is run in outer east Melbourne, and bird movements are through the southern Melbourne metropolitan areas and the Mornington Peninsula, an area of high intensity poultry production. The auction operates each Wednesday and sells 150 to 200 birds per week. Chickens, pigeons, geese, ducks turkeys, pheasants, quails, and guinea fowl are the main selling lines. The sales are largely to private people who either eat (60-70%) or retain their purchases (30-40%) as ornaments, and 95% of birds presented each week are sold. Birds are largely supplied by hobby farmers and kept in the crates that were used at the Dandenong Market. Unsold birds are not returned to owners.

The Mernda Market is largely held for cattle and sheep sales but also holds a weekly poultry sale each Monday. The market is set on the northern boundary of the Melbourne Metropolitan area. This is not an intense poultry area. Weekly sales are about 100 birds comprised largely of cockerels, roosters, hens, ducks, geese and quail. Sellers are largely hobby farmers that come from about a 20 to 30 km radius but may travel up to 100 km. Purchasers are largely dealers who sell birds from roadside on the weekends and slaughterers. All birds are sold each week and cages are supplied and washed out after each sale day.

11.3 New South Wales

There is a weekly auction at McGrath's Hill which sells around 1000 birds per week, including chickens, pigeons, geese, ducks, turkeys, fancy birds, quails, guinea fowl and pet birds. The vendors are mainly hobby farmers and birds are purchased for home kill (60-70%) or to poultry keepers (30-40%).

11.4 Tasmania, Queensland, Western Australia

No sales of any size were identified by local primary industries personnel operating in Tasmania, Queensland and Western Australia. Poultry sales appear to be direct from poultry farmers to purchasers but aviary and fancy bird associations operate local markets. Bird sales in Tasmania, Queensland and Western Australia were either infrequent (monthly-annual), or sold very low numbers of birds.

11.5 Summary

In contrast to the United States and South-East Asia, there are no continuously populated live bird markets in Australia, and existing live bird sales are not large or well established. Increasing urbanisation, the decline of the small farmer, council and food safety regulations, and increased feed costs, have all contributed to an overall reduction in bird sale activity at markets in Australia.

Chapter 12: Small & Mixed Poultry

12.1 Description of the Industry or Industry Sector

There are a number of poultry enterprises that by their nature do not fit the model of integrated poultry production for the sale of eggs and/or meat. One such area is the production and sale of pullets to small producers, homes and hobby farms throughout particularly remote areas. Another area is the production of specialist poultry products including, organic, yellow birds and cockerels.

The source of supply of such livestock is varied and can be from the large vertically integrated operators, medium size independents, or small operations with the capacity to breed and hatch poultry.

The major layer hatcheries can now achieve some cost recovery for day old males which were previously culled and disposed of as hatchery waste. Some of these are now purchased by grow outs who supply into the Asian cockerel market. As NDV vaccination is mandatory in all states, these birds are vaccinated.

The meat chicken companies also sell small numbers of day old broilers to niche market operations who may produce organic chicken meat, poissons or yellow meat birds. With fluctuations in day old chick availability from the primary suppliers, these small niche producers can be faced with unreliable supply and are thus unable to meet a constant level market demand.

Free range poultry producers supply a niche market with about 10% of chicken meat (approximately 44 million birds) and 10 to 15% of eggs sold in Australia are marketed as free range. The majority of free range eggs and chicken meat sold is produced by large integrated companies who adjust their husbandry systems on properties also carrying intensively reared birds. It was estimated that independent free range growers were processing about 200 000 birds per week which would approximate 25% of total production of free range chicken meat. There are some small and medium sized suppliers of free range poultry and these enterprises are covered in this chapter. While the majority of the free range producers are in Queensland, agents are located in Cairns in Queensland, to Dubbo and Taree in NSW. The enterprises purchase day-old chicks from the large integrator companies, raise the poultry to market specifications and then sell the processed birds.

Free range egg production is carried out by a diverse range of small and medium enterprises, although there are a few producers with up to 80 000 birds. Most commercial producers of free range eggs have 10 000 to 15 000 chickens, a number that has been increasing as producers become more comfortable in husbanding chickens free range. There is growth in the sector at the present time.

The major integrated duck companies do not sell their stock to small growers, so independent free range duck producers have to obtain production stock from small independent hatcheries.

12.2 Structure of Industry/Sector

As indicated above, the sector of the industry outside of the major integrated companies is independently owned and operated by producers supplying niche markets. If supplying meat birds, producers may have a processing plant on the property. These niche producers otherwise obtain their supplies of feed and other materials from the same sources as the intensive industry. Free range producers are usually more remote from urban areas which assists in obtaining permits to farm in this fashion.

12.3 Establishing and Maintaining a Flock

Production stock for pullet distributors may be supplied by an integrated company. For free range producers of chicken meat, it is also possible to get stock as day-old or brooded stock at three weeks of age from a range of integrated companies to grow out on property. One company purchases ready to slaughter poultry and processed them in the company processing plant to specifications that enables the product to be sold to restaurants in Sydney at premium prices.

12.4 Production Unit Size, Husbandry and Shedding

While some producers have no bird raising facilities and sell only day-old chicks obtained as eggs from other sources, others maintain egg layer breeding stock. Stock may be hatched, reared and then sold to markets as ordered. Small numbers of chickens will be sold to anyone at the gate and freighted to anyone else requesting stock. Housing of the stock is usually in conventional naturally ventilated housing.

There is some activity in producing alternative shedding for these birds. “Eco shelters” (www.ecoshelters.com.au) are being built and utilised as they are generally of lower capital cost and are satisfactory for the size of shedding required. Feeders and drinkers are obtained from poultry equipment companies or second hand equipment from decommissioned conventional poultry farms. Some preliminary observations indicate that this style of shedding may not offer optimal growing conditions in the extremes of ambient conditions.

Independent free range poultry operators on the whole have small operations that are producing/processing 100 000 or less poultry per year. Being free-range means that growing stock are supplied access to outside runs. All birds are fed inside the housing facility which may be hutch or naturally ventilated housing. Two companies reported that they were producing organically certified birds that attract a particular premium price at market. Currently this market is not influenced by production from the large integrated companies. However sourcing organic certified feed can be difficult and cost has increased significantly in due to drought. The source of raw feed materials and of amino acids and other additives has become a significant point of debate in the organic industry. The great majority of readily available meat meals are not considered authentically organic by some organic proponents. The same view applies to various amino acids and some vitamins. In May 2007 the newly formed Standards Australia Technical Committee (FT-032) held its inaugural meeting to develop an Australian national domestic standard for organic food production.

12.5 Flock Size and Density

The size of niche poultry production units is controlled to a degree by the large integrated companies who compete for market share against each other and who set a bench mark price for the product. This factor probably influences the decision to produce organically certified poultry that attracts a higher premium price. Poultry grown in this sector is subject to the same welfare codes as the wider poultry sector Profit margins may be smaller for organic product than free range because of higher feed costs. There is also a need for a constant supply of market birds, so producers supplying free range and other niche markets are all multi-age properties. Most are family run and their feed costs are likely to be higher than for the large integrated companies.

Difficulties can arise with poultry processing licensing authorities where processing techniques or carcass preparation are outside the normally allowed guidelines. This may includes such things as feet left on. In these cases, processors have to demonstrate bioequivalence with standard processing in regard to food safety.

12.6 Mixed Species Farming

Small free range poultry farms may have mixed poultry species that include quail, ducks, turkeys and chickens. On such properties, quail are often bred on site while ducks, chickens and/or turkeys are purchased as day olds from hatcheries that sell stock.

Although three species may be maintained free range on a property, each is provided with separate runs and housing and all are fed inside housing to reduce the likelihood of wild birds feeding.

12.7 Dynamics Within the Industry Sector

Independent Duck Breeder Sector

Establishing Flocks of Basic Genetic Stock

The small independent free range chicken meat operators are not particularly interested in developing separate genetic stock as they can readily obtain fertile eggs and/or day-old chickens or three-week old brooded birds from the large integrated companies with genetic material that is being upgraded through importations.

Free range operators are not in the financial position to set about establishing genetic stock that could compete with what they can obtain through suppliers.

Persons wanting ducks to raise free range have to obtain their stock through independent duck farmers that are maintaining a genetic stock. There are a number of independent breeders of Pekin ducks that can supply ducklings as the large companies do not allow stock outside of growers contracted to their company. There are independent breeder companies in all eastern states and they also contractually bind growers to prevent the release of their stock to other people.

Development of Genetic Stock
Management of Genetic Stock

Genetic stock is managed through grandparent and parent stock as with the larger companies.

The numbers of commercial independent breeders of ducks in eastern Australia is less than ten and their operations would be seriously affected if the larger integrated companies decided to release birds for breeding. This sector's size of operation does not allow for anywhere near the type of genetic selection programs of the larger integrated companies.

Feed and Water Supplies

Feed used by the independent duck breeders is obtained from commercial suppliers in a locality close to their operation. Water supplies sourced from underground are not sanitised.

Live Bird Disposal

Genetic breeding stock is processed at the end of its productive life through either a small on-site processing plant or an independent processor. Sometimes breeders are killed on site and buried or disposed of at a rendering plant.

Farm Waste Disposal: Reject Eggs and Dead Birds

The distance from urban areas and organised waste disposal facilities has farms disposing of reject eggs and dead birds through either burial on site or composting on site.

Husbandry and Dynamics of Production Stock

Management of Production Stock

Independent duck breeders' production stock and genetic stock are frequently run on the same property and the same conditions apply as for genetic stock.

Feed and Water Supplies

Same as for genetic stock.

Live Bird Disposal

Same as for genetic stock.

Farm Waste Disposal: Reject Eggs and Dead Birds

Same as for genetic stock.

Factors Influencing Production Stock Performance

The main limiting factors on performance apply for production stock as for genetic stock. Small independent producers have higher costs of production but lower input costs due to using family labour and land that is also used for other purposes. Included in the lower costs are reduced costs associated with obtaining expert advice assisting with the 'natural' image.

12.8 Horizontal Contacts

Facility Builders/Suppliers of Basic Materials

The housing facilities on free range farms are generally of a lower standard than on integrator properties and there is a high potential for contact between wild birds and production stock.

Husbandry Equipment Suppliers

Equipment suppliers are the same as for the conventional farms and feeding is all supplied inside housing except in a few instances. This is undertaken to minimise the loss of feed to scavenging wild birds. New production units are often built using old building materials and old equipment such as feeders and nest boxes recycled from integrators upgrading their facilities. There is less automation on small farms.

Flock Placement

Independent producers of ducklings will supply as many ducklings as they can but markets determine what birds can be placed, processed and sold.

Feed Manufacture

Commercially manufactured feed is heat-treated. Some producers with specific markets mill their own feed and using pre-mixes produce feed for perceived 'taste and texture' that better satisfies their markets. Organic producers must source all their feed components from organic certified growers. Home mixing at a time of increased costs provides some opportunity to reduce costs.

Vaccinators

Vaccination of free range chickens is carried out in the hatchery and no further vaccination is applied to chickens grown out for meat production. Pullet producers vaccinate birds as required up to the point where they are selling them to farmers and hobby people and this is done in-house or by a contractor.

Veterinarians and Service Personnel

Veterinary or technical input to the small independent producers is generally limited unless there is increased mortality or production or carcass trait issues such as follicular Marek's disease. Free range chicken growing has seen the re-emergence of diseases that largely disappeared with the intensification of the poultry industry back in the 1970s. This has led to veterinarians becoming involved in the treatment of outbreaks of disease and the use of medications to limit production losses. Coccidia are a case in point and in the last few years attenuated strains of a number of *Eimeria spp* have been developed and are now being used where there is the potential for moisture build-up in soil or litter and for *Eimeria* oocysts to sporulate and produce disease. Blackhead (histomoniasis) is another disease that has re-emerged. There is more contact between veterinarians and the free range poultry industry now than there has been for many years.

Processing Plants/Pick Up Crews (Broilers and Layers)

The small free range growers of ducks and chickens frequently have their own processing plant which enables them to produce to the specification of their market.

Egg Collection and Distribution to Sale Points

Meat birds are being considered in this section.

Transportation

Day-old chicks from independent hatcheries in southern Queensland can be sent all across Australia by plane, road, rail and bus. One major pullet distributor in Queensland sends small consignments of birds across state borders and has distributors in trucks delivering pullets across northern, central and southern and inland Queensland and northern New South Wales. The pullet sales by the large distributor in New South Wales are undertaken largely by buyers picking up birds from the holding facility. Arrangements can be made for the transport of small consignments.

Transportation of day-old chicks and ducklings for free ranging operations is frequently undertaken by the purchaser as they are often close to the hatchery.

Disposal of spent hens and ducks from breeders is either through slaughter arrangements with a co-operating processing plant or by slaughter and disposal on site.

Pet Food Manufacture of Waste Materials

The small processing plants handling chickens and duck processing plants do not save materials for pet food manufacturers. The requirement for additional freezer capacity and procedures to collect the materials has not made it worthwhile to do.

Rendering of Industry Waste Material

Small processing plants in rural areas with large acreage mostly dispose of their waste to burial, landfill or compost, depending on the size of the operation. Where this is not practised, disposal is through a cartage contractor or by delivery to a red meat abattoir that has rendering or a rendering contractor that collects.

Fresh Litter Suppliers

In the rural areas rice hulls, wood products or straw are used as fresh litter for all species. For the free range producers, these products are usually not supplied by the same contractors supplying areas of high poultry density and associated with the large integrated chicken and duck industries.

Litter and Manure Disposal

In the rural areas, it is usual for waste litter and manure to be used for cropping after spreading on site or in that locality.

Contact Between Sectors

There is still contact between the various sectors within this industry but minimal contact with the major commercial operators. Chick sales from larger operators are usually at the hatchery and into disposable cardboard chick boxes.

The major pullet distributors in Queensland and New South Wales distribute poultry over a wide area of Australia.

Distributors with hatcheries in southern Queensland distribute poultry from limited sources.

Contact between the small free range producers and conventional poultry industries would be largely through:

- distribution of production stock from independent breeders and/or hatcheries that originated from integrator company stocks
- distribution of feed from feed manufacturers through vehicle delivery
- animal health services.

In general, the small independent producers have lower performance standards than industry but can be rewarded by higher profit margins. The outlook for free range poultry appears to be good, with producers increasing their production both on existing and new ventures.

Appendix 1: Egg Industry Data - 2009

Production – Australia:	333.9 million dozen eggs per annum - 2008/09 (Source: Australian Egg Corporation Limited)		
Flock size:	19.693 million hens - as at 30 June, 2009 (Source: Australian Egg Corporation Limited)		
State flock percentages:	NSW/ACT 34% Victoria 34% Queensland 20% WA/NT 6% SA 5% Tasmania 1% (Source: Australian Bureau of Statistics, cat. no. 7121)		
Retail prices (average):	$4.47 per dozen - June quarter, 2009 (Source: Australian Bureau of Statistics, cat no. 6403)		
Number of egg producers:	417 - as at 30 June, 2008 (Source: Australian Bureau of Statistics, cat. no. 7121)		
Gross value of production at farm gate:	$463.5m per annum - 2007/08 (Source: Australian Egg Corporation Limited)		
Grocery/retail sales volume:	109.805m dozen - 2008/09 (Source: AZTEC)		
Grocery/retail sales value:	$444.5m - 2008/09 (Source: AZTEC)		
Grocery/retail production market share 2008	Cage eggs: Barn-laid eggs: Free range eggs: (Source: AZTEC)	***volume*** 67.8% 5.5% 26.8%	***value*** 54.3% 7.1% 38.6%
Grocery/retail branding market share 2007	Generic labels: Proprietary labels: (Source: AZTEC)	***volume*** 58.5% 41.5%	***value*** 46.1% 53.9%
Egg product exports – 2008:	Egg pulp Shell eggs (Source: Australian Bureau of Statistics)	***volume*** 246mt 172mt	***value*** $0.560m $1.495m
Egg product imports – 2008:	Egg powder: Egg pulp Eggs preserved/cooked (Source: Australian Bureau of Statistics)	***volume*** 1,038mt 305mt 417mt	***value*** $8.763m $0.907m $1.034m

Appendix 2: Chlorine Dioxide for Water Sanitation in the Poultry Industry

With the environmental concern of furans and dioxins being produced by the chlorine based bleaching process in the paper industry other alternative oxidative agents were examined. Chlorine dioxide was found to be the reagent of choice being a more specific oxidative reagent because of its fundamental different chemistries to chlorine and producing less toxic by-products.

While chlorination is an effective method of water sanitation, in the 1970's concerns were noted about the possible link between increased cancer rates in man and chlorination of potable water. This was believed to be associated with the production of trihalomethanes (e.g. chloroform).

Chlorine dioxide has the advantage that is does not specifically react with the majority of natural organics in water and thus does not produce trihalomethanes. It also does not react with bromides, ammonia or chlorinated fatty acids. This lack of reactivity with these organic and inorganic components of water not only results in the reduction of potentially harmful by-products but also allows for the more effective sanitation of the water using levels of chlorine dioxide as low as 0.1ppm.

Chlorine dioxide because of its ability to oxidise phenols, humic acid, sulfides and iron is effective in removing odour and taste from potable water.

Chlorine dioxide is produced from the reduction of sodium chlorate using sophisticated and technically safe generation plants.

Chlorine dioxide is quite unstable as a gas and 10% mixtures are explosive. Thus chlorine dioxide is usually generated on site.

To overcome this problem of stability and transport, sodium chlorite is produced from chlorine dioxide and as a much more stable product can be transported. This is sometimes referred to as stabilised chlorine dioxide. Using smaller scale dosing equipment chlorine dioxide can be formed by reacting stabilised chlorine dioxide with an acid (phosphoric acid, citric acid or hydrochloric acid). This is the typical means by which chlorine dioxide is currently being used in the sanitation of potable water by councils, at plants generating waste water, horticultural products and finally the sanitation of water for livestock.

The other significant advantage of chlorine dioxide is its ability to remove biofilms, including algae from water reticulation systems. This means in poultry houses for example water lines are kept free of biofilm build up as seen on cooling pads, drinking line site tubes and within water lines. Chlorine does not do this. When chlorine dioxide is first added to a reticulated drinking system there is a release of this biofilm initially causing more reagent demand.

Chlorine dioxide unlike chlorine demonstrates effectiveness in a wide range of pH conditions and its sanitation rate is much faster.

Stabilised chlorine dioxide either as sodium chlorite solution or anhydrous is now finding its way into many products including mouth washes, topical drops, chlorine dioxide release tablets and finally tooth pastes.

Chlorine dioxide is now extensively used in cooling towers.

Many of the larger commercial poultry operators are now becoming aware of the limitations of chlorine either because of its potential heath impacts in food processing areas or as a result of the understanding that chlorine is not a reliable and effective water sanitiser under conditions of variable and high organic loads. Not uncommonly chlorination systems in the poultry industry are not operating effectively and are only perceived to be of value.

With the shortage of water more farms are looking at chlorine dioxide and in some cases ozone as their primary source of surface water sanitation. Some operators using mains water still use chlorine dioxide because of the positive impact it has on controlling biofilms and extending the life of equipment.

Chlorine dioxide is more costly either in capital equipment and / or cost of reagents.

Stabilised chlorine dioxide is currently at around $10.00 per litre (about 1,000% more costly than chlorine) and the automatic dosing systems can cost around $5,000 to $15,000 depending on the degree of sophistication which may include monitoring and alarm add-ons. When using lower cost precursor reagents, sodium hypochlorite, then the cost of generators increases 10 fold. There are some safety issues associated with the precursor compounds and also the technical control of generator equipment.

Chlorine dioxide can be purchased in its stabilised form for immediate application to surfaces.

Chlorine dioxide is now used in the fumigation of libraries, fogging of hatcheries and sanitation of anthrax affected premises.