Effects of phasing out cage farming in Europe

Australian Eggs global leadership scholarship report

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Foreword

This project was conducted to find out what caused the push to phase out conventional cages in Europe, and now the push to phase out enriched cages. It aimed to gather information that would shed some light on how significant the phase out of cages would potentially be for Australia in terms of economics, and flock management and health based on how it has impacted Europe.

This project was funded from industry revenue together with funds provided by the Australian Government.

This report is an addition to Australian Eggs Limited's range of peer reviewed research publications and an output of our R&D program, which aims to support improved efficiency, sustainability, product quality, education and technology transfer in the Australian egg industry.

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Acknowledgments

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I would like to thank the representatives of the following organisations, for all of their work in organising my meetings with producers and accompanying me to farms, as well as for the information that they provided as a part of my report:

- Big Dutchman – Vechta, Germany
- EW Nutrition – Visbek, Germany
- KAT – Bonn, Germany
- Geflügelzuchtbetriebe Gudendorf – Ankum, Germany
- Agromix – Lunteren, the Netherlands
- Hy-Line UK Ltd – Warwickshire, United Kingdom.

I would also like to thank the producers themselves, who welcomed me on to their properties and shared with me their experiences and knowledge about their industry.

Finally, I would like to thank my colleagues at Day Eggs for not only encouraging me to accept the scholarship but for supporting me during my travels and whilst I put together this report.

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1 Introduction

The dynamics of the Australian Egg Industry are shifting. Consumers are concerned now more than ever about where their food comes from and it has been both retailer and consumer demand that has resulted in a significant push throughout the industry to move away from any further investment in cage egg farming towards heavy investment in alternative systems such as barn and particularly free range. Those that are heavily interested want to know that animal welfare is at the top of our priority list when it comes to farming. Without a doubt the perception currently in Australia is that animal welfare is better in these alternative systems, because birds are able to move freely and display natural scratching behaviours, thus the systems are more aesthetically pleasing. These beliefs, coupled with a strong push from animal lobbyist groups, have forced the Australian Government to step in, and its proposed new set of Animal Welfare Standards and Guidelines gives rise to the potential for our current conventional cage systems to be phased out over 10 or 20 years in favour of alternative systems such as free range/barn/aviary or furnished cages (nest/perch/space/forage). Furthermore it leaves the potential for cage systems to be phased out altogether.

Whilst we here in Australia are only just starting to deal with the concept of phasing out conventional cages, Europe has already made this move with countries such as Germany and the Netherlands phasing out conventional cages completely, allowing only fully enriched systems to produce for the cage egg market. The dynamics in Europe, however, are also changing. European countries are now moving towards the full phase out of all cage systems with a potential deadline to be completely cage free by 2025. Australia seems to follow trends set by Europe so there is the potential that the current changes being made there will affect us down the line also.

For this reason, I decided to focus my scholarship on the 'effects of phasing out cage farming in Europe'. I travelled to Germany, the Netherlands and the United Kingdom (UK) to visit farms and speak with producers about their personal experience dealing with the original phase out of conventional cages and now the push to phase out enriched cages. For the farms that I visited running alternative systems, I focussed my questioning on how producers are managing their systems and what challenges they are facing relating to bird health and food safety.

The aim of my travel was to gather information that would shed some light on just how significant the phase out of cages would potentially be for Australia in terms of economics, and flock management and health based on how it has impacted Europe. I also hoped to gather information on what we are and are not doing well regarding flock management by comparison with Europe, and any potential improvements that we can make to help us better manage the alternative systems that we do have, in the light of potentially phasing out cages.

2 Methodology

The information provided in the findings of this report was gathered through face-to-face interviews conducted on farm with producers in Germany, the Netherlands and the UK. A set list of questions was asked at each farm to gather information on flock management and health, marketing and politics, to get a general consensus of the day to day farming practices used across different sites as well as what rules and regulations they are required to follow. For further information I also had meetings with associated regulatory bodies, and laying hen supplier companies and poultry equipment manufacturers to gain information from their perspective on how their businesses have changed in conjunction with the phase out of cages. All producers and companies interviewed were also asked their opinion on cage farming and range stocking density.

I was accompanied to each farm by a farm supplier representative who acted as an interpreter between myself and the producers when there were language gaps. The information provided within this report from my site visits is to the best of my knowledge accurate based on the translations done during these conversations. The identity of the companies and farms that I visited during my travels has been kept anonymous throughout this report to protect individuals' privacy; only non-identifying information has been presented in my findings.

Overall the number of producers interviewed for this project was small and I must emphasise that their opinions, whilst used for this project, do in not reflect the overall opinions of the entire layer industry through Europe and the UK. This was a pilot study used to gain a basic understanding of the reasons behind the phase out of cages and how

the layer industry in each of the countries visited has been affected by the changes, and how they are managing the new systems that are being used today.

3 Findings

3.1 Push for change – the cause

The changes to the European layer industry regarding the phasing out of cages started to make real headway in July 1999 with the introduction of *Europe Council Directive 1999/74/EC*. The directive came about after years of revising minimum standards for the protection of laying hens kept in battery cages and scientific developments regarding the welfare of hens under various systems of rearing[1].

Within this directive Chapter II, Article 5 specifically focuses on welfare pertaining to unenriched cage rearing system with the directive establishing in Point 2:

"*Member States shall ensure that rearing in the cages referred to in this chapter is prohibited with effect from 1 January 2012. In addition, with effect from 1 January 2003 no cages such as referred to in this chapter may be built or brought into service for the first time*"[2].

This provision meant exactly what it said – that, as of 2003, no further investments could be made throughout the European union into unenriched or conventional cage rearing facilities and that, as of 2012, no bird could be reared in such an existing facility.

It was at this point also where the requirements that the following space requirements for cage rearing came into play in European systems. Unenriched cages in rear were required to provide:

"*1. No less then 550 cm2 per bird of floor space.*"

"*2. A minimum of 10 cm of feed trough space per bird.*"

"*3. A continuous drinking channel of the same length as the feed trough or No less the two independent drinking nipple points in each cage.*"[3]

In Australia, we adopted these same requirements across all cage systems three years later and these are still the current requirements that we follow, as outlined in *Primary Industries Standing Committee – Model Code of Practice for Welfare of Animals, Domestic Poultry 4th Edition, 2002*.

At the time of the publication of the *Council Directive 1999/74/EC*, the European union was only looking to phase out the conventional 'battery' cage. At this point there was no push for a full cage system phase out, so for producers to continue producing cage eggs, they were obligated to upgrade their systems to fully enriched cage systems or they could choose to stop producing cage eggs and invest in the newer alternative systems.

[1] Source: Council Directive 1999/74/EC – laying down minimum standards for the protection of laying hens, OJ L 203, 3.8.1999
[2] Source: Council Directive 1999/74/EC – Chapter II, Article 5, p. 5
[3] Source: Council Directive 1999/74/EC – Chapter II, Article 5, p. 5

For those who chose to invest in enriched cages, the provisions required for these new systems were also outlined in the directive under Chapter III, Article 6 – stating:

"Member states shall ensure that after 1 January 2002 all the cages referred to in this chapter comply at least with the following requirements:

1. *laying hens must have:*
   - (a) *at least 750 cm2 of cage area per hen, 600 cm2 of which shall be usable; the height of the cage other than that above the usable area shall be at least 20 cm at every point and no cage shall have a total area that is less than 2000 cm2;*
   - (b) *a nest;*
   - (c) *litter such that pecking and scratching are possible (sand bathing area and scratch pad);*
   - (d) *appropriate perches allowing at least 15 cm per hen;*
2. *A feed trough providing no less than 12 cm of space per bird;*
3. *At least two nipple drinkers or two cups must be within the reach of each hen in each cage."*[4]

This directive allowed for an almost 12-year transition period for producers to upgrade their old cages for new fully enriched ones.

During this transition period while the new enriched cage systems were being developed and installed, hundreds of millions of dollars were also being invested in alternative systems such as free range, barn and organic. These systems were installed by those starting out in egg farming around the same time and by those who did not want to risk investing in the new cages that had the potential to be phased out in the future.

Investing in alternative systems rather than enriched cages turned out to be a good move by producers. At around the same time that the transition period was due to end, major retail giants started implementing large changes to their product purchasing policies relating to the purchase and sale of cage eggs. They started initiating the phase out of all cage eggs from their stores starting with those produced in conventional cages. This was a way for them to promote to their customers their strong stance and focus on animal welfare, and the supply of goods sourced only from what they deemed as sustainable and ethical farming systems.

There was a push by German supermarket chains in particular to have all eggs produced in conventional cage systems completely gone by 2010 with Aldi North (Aldi Nord) in Germany banning the sale of eggs produced by hens reared in battery cages in 2004. In July 2017, Aldi published its National Animal Welfare Purchasing Policy, which stated:

"*We only sell eggs from barn, free-range and organic farming with certification for alternative hen-rearing systems (KAT certification).*"[5]

Aldi North has committed itself to be completely cage free including for all home brand products containing processed eggs, with the conversion to be completed by 2021 at the latest[6].

Aldi UK has pledged a similar stance, stating:

"We are committed to sourcing 100% of our own-label shell eggs from cage-free hens by 2025."[7]

[4] Source: Council Directive 1999/74/EC – Chapter III, Article 6, p. 5

[5] Source: Aldi North – The National Animal Welfare Purchasing Policy, July 2017 https://www.cr-aldinord.com/2017/wp- content/uploads/sites/4/2018/05/ALDI-North-Germany_National-Animal-Welfare-Purchasing-Policy.pdf

[6] Source: Aldi North – https://www.aldi-nord.de/verantwortung/lieferkette-food/tierwohl-bei-aldi-nord/das-goldene-ei.html

[7] Source: Aldi UK – https://www.aldi.co.uk/about-aldi/corporate-responsibility/resources-for-our-products/animal-testing-and-welfare

Along with Aldi, other major retailers across Europe and the UK such as Asda, Lidl and Tesco have also pledged publicly to phase out the sale of cage eggs by 2025, each stating:

"At Asda we are committed to moving to a cage free system of egg production by 2025."[8]

"Cage Free 100% of shell eggs and eggs contained as ingredients in Lidl UK products must be sourced from cage-free hens by 2025."[9]

"Tesco will transition to 100% cage-free eggs, moving to alternative sourcing methods, such as barns, free range and organic. Tesco will stop sourcing eggs from caged hens by 2025."[10]

In addition to the comments made by major retailers, animal welfare groups in Europe have also publicly announced their stance on the phase out of cage farming systems, with groups such as the German Animal Welfare Association (Deutscher Tierschutzbund), stating:

"In the products of many companies, billions of eggs are processed from agonizing cages. Many consumers do not know this - and they are not informed about it. We call for the elimination of caged eggs in products and a clear labelling of the egg source on the packs, so that consumers can also make a choice in favour of the animals and avoid products made with caged eggs."[11]

By 2010, all conventional cages in Germany were shut down and by 2012, as per the directives order, the remaining conventional cages across the majority of Europe were abolished also. The market share in production systems shifted in quite a short period of time with most countries settled in their holdings by late 2016/2017.

With the proposed ceasing of sales by major retailers of eggs from all cage farms by 2025 the following market information will change again.

3.2 Changes to market share

Investments in alternative systems started prior to the documented completion date for the phase out of conventional cages in 2012. The data presented below show just how market share in each alternative system, as well as in enriched cages, changed during the transition period for the three countries that I visited as well as for several others in Europe.

Table 1 below shows the changes seen in layer hen number for Germany, the Netherlands and the UK as well as several other countries around Europe.

[8] Source: Asda – https://sustainability.asda.com/poultry-products

[9] Source: Lidl UK Specific Farm Animal Welfare Policies – https://www.lidl.co.uk/en/Animal-welfare-11045.htm

[10] Source: https://www.tescoplc.com/little-helps-plan/reports-and-policies/animal-welfare-policy/

[11] Source: No egg out of torment – https://www.tierschutzbund.de/aktion/kampagnen/landwirtschaft/kein-ei-aus-quaelerei/

Table 1 The ten EU member countries with the highest laying hen inventory in 2010 and 2015[12]
Hen number data in 1,000 hens

	2010			2015	
Country	**Hens**	**Share (%)**	**Country**	**Hens**	**Share (%)**
Italy	49,575	13.7	**Germany**	51,791	13.5
Spain	46,592	12.8	**Italy**	48,199	12.6
France	45,531	12.6	**France**	46,770	12.2
Germany	41,729	11.5	**Poland**	41,916	11.0
United Kingdom	38,911	10.7	**Spain**	41,266	10.8
Netherlands	33,448	9.2	**United Kingdom**	38,991	10.2
Poland	32,781	9.0	**Netherlands**	32,838	8.6
Belgium	9,264	2.6	**Belgium**	8,893	2.3
Sweden	6,519	1.8	**Portugal**	8,770	2.3
Romania	6,215	1.7	**Hungary**	8,211	2.1
10 countries	310,565	85.6	**10 countries**	327,645	85.6
EU	362,628	100.0	**EU**	382,774	100.0

The number of birds in 2010 in the 10 countries listed in Table 1 is approx. 310.5 million, increasing by just over 17 million by 2015. The overall number of laying hens throughout Europe increased from 362.6 million to approx. 382.8 million birds – an increase of just over 20 million birds from 2010 to 2015. Germany had the largest gain in bird numbers, with an increase of approx. 10 million layers in the five-year period. This gain was attributed to its earlier phase-out of conventional cages in 2010 ahead of other countries and the directive date of 2012.

The market share in production systems also changed at the time, representative of the phasing out of conventional cages and investment into alternative systems. The figures shown in Table 2 are those for the market share of each production method across several European countries in 2010, including Great Britain (GB). Table 3 represents the change by 2016. The hen number data in Tables 2 and 3 are in 1,000 hens.

Table 2 Market share of different production methods in 2010[13]

Country	Hen number (total)	% cage	% enriched cages	% barn	% free range	% organic
Germany	41.729	0,0	16,8	61,8	14,2	7,2
France	45.531	42,2	35,5	3,9	13,4	5,1
Italy	49.575	55,9	15,3	25,8	0,8	2,1
Netherlands	33.448	38,2	2,1	43,4	13,2	3,0
Poland	32.781	67,2	23,3	8,2	1,2	0,1
Spaine	46.592	81,4	13,6	1,8	3,1	0,1
GB	38.911	26,1	22,5	5,7	42,5	3,2

[12] Source: Original document MEG-Marktbilanz Eier und Geflügel 2016. Table taken from The EU egg industry, Hans-Wilhelm Windhorst – University of Vechta, Germany https://zootecnicainternational.com/focus-on/eu-egg-industry/

[13] Source: The Big Dutchman Experience, p. 11, 03.07.2018 - Original document MEG-Marktbilanz Eier und Geflügel 2016

Table 3 Market share of different production methods in 2016[14]

Country	Hen number (total)	% enriched cages	% barn	% free range	% organic
Germany	50.849	10,6	62,4	18,0	9,0
France	47.306	69,5	6,5	17,3	6,7
Italy	62.073	65,1	30,2	2,7	2,0
Netherlands	31.356	15,8	63,8	15,8	4,6
Poland	38.669	87,5	2,3	10,0	0,2
Spaine	39.182	93,2	2,4	4,0	0,4
GB	37.853	42,9	5,7	48,8	2,6

Germany's market share between 2010 and 2016 only slightly increased in each of the production methods as they had already phased out conventional cages by 2010, so the statistical data showed the investments it had already made at that point in time.

The other countries represented were slightly behind with their phase-out of conventional cages, so between 2010 and 2016 they were seen to have significantly increased their market shares in the different production systems. The Netherlands increased its market share in enriched cage – with a 13.7% increase achieved by 2016 and, for barn, a 20.4% increase in market share between 2010 and 2016.

Great Britain increased its market share in enriched cages by 16.8% over the six-year period and instead of investing in barn they remained steady at 5.7% and invested in free range systems, increasing their market share by 6.3% by 2016.

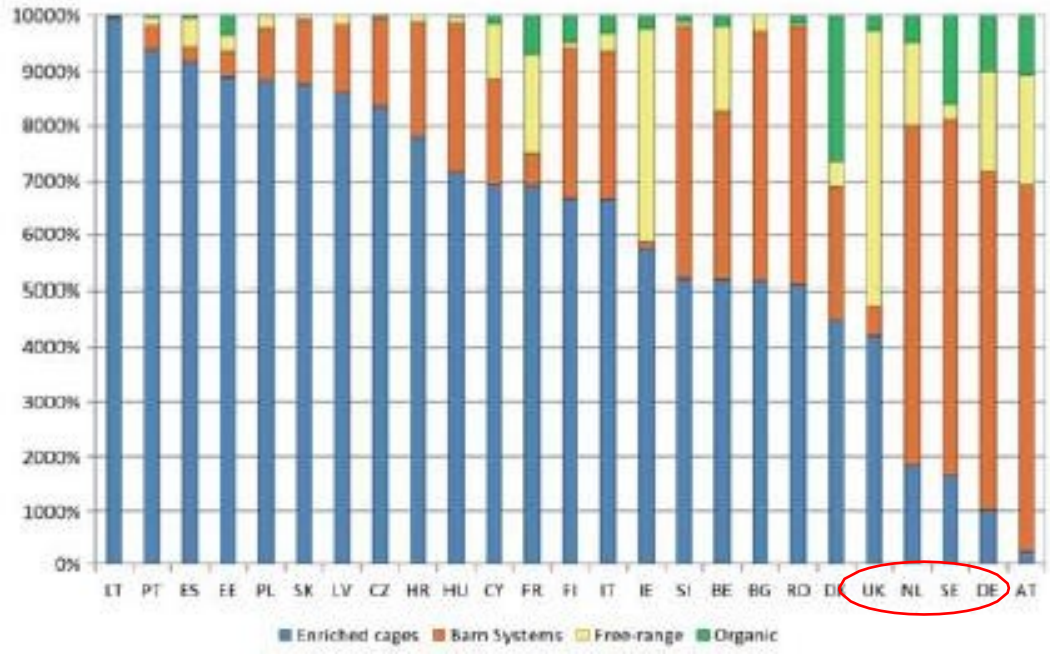

Figure 1 Housing system in laying hen husbandry in EU member countries in 2015[15]

[14] Source: The Big Dutchman Experience, p. 12, 03.07.2018 – Original document MEG-Marktbilanz Eier und Geflügel 2016

[15] Source: Table taken from The EU egg industry, https://zootecnicainternational.com/focus-on/eu-egg-industry/

Figure 1 above shows the market share of the different production methods for different countries within the European union in 2015. With DE=Deutschland (Germany), NL=the Netherlands and UK=United Kingdom all at the far-right hand side of the graph showing some of the lowest market shares in enriched cage production and highest market shares in alternative production systems in 2015 when compared with the other countries within Europe.

In June 2018, laying hen numbers across the different production methods were released by European Commission CIRCABC. These are presented below in along with Australians current figures for a comparison.

Table 4 2018 total hen flock size per production method and number of farms per European country[16] – 2017 total hen flock size per production method for United Kingdom[17] – 2017 total hen flock size for Australia including state break down of individual state holdings (%)[18]

Country/Stocking Density		Enriched Cage		Free Range	Barn		Organic
DE	Maximum capacity (in number of birds)	3,631,054		9,764,018	33,163,317		6,096,269
	Number of production sites	211		2,481	2,828		1,314
NL	Maximum capacity (in number of birds)	6,234,000		5,487,000	20,608,000		1,997,000
	Number of production sites	69		246	512		184
UK	Maximum capacity (in number of birds)	18,240,000		18,430,000	570,000		760,000
Australia	Maximum capacity (in number of birds)	Total hens (across all production methods) = 19,321,567					
		NSW/ACT	WA	QLD	SA/NT	VIC	TAS
	Individual State holdings (%)	31.55	8.17	28.54	3.16	27.02	1.56

As can be seen, there are substantially more barn production birds in each of the European countries. Germany's total hen numbers are currently sitting at approx. 52.6 million birds across the four production methods, and the Netherland's total hen numbers have increased since 2016 and are now sitting at approx. 34.3 million hens across the four production methods. By 2017, the UK had an estimated 38 million laying hens, with Australia sitting far below with 19.3 million birds.

With bird numbers increasing each year and the overall public push from welfare groups and retail giants to phase out all cage systems, consumers' knowledge of egg farming and their perception of it has come to the forefront.

Consumers are becoming more and more interested in where their eggs come from and if they are being sustainably farmed in conditions that promote good animal welfare. This has put an emphasis on the need for good alternative production systems that can accommodate the changing welfare requirements set out by the different retail and accreditation parties and the expectations of the consumer.

The types of systems available, as well as the practicality and management of them, is something that I looked at in depth as a part of my project. All producers interviewed were asked what type of systems they were using, how they were managing them and the challenges they were facing with them.

Below is a brief overview of the types of systems that I observed during my travels and the approximate cost per bird based on producer figures to set up an alternative system in light of the phase out of cages.

[16] Source: European Commission CIRCABC Pigmeat, Poultry, Eggs – Updated 1 June 2018 https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp

[17] Source: Egg Info – Industry Data, August 2018 – https://www.egginfo.co.uk/egg-facts-and-figures/industry-information/data

[18] Source: Australian Eggs Annual Report 2016/2017 – https://www.australianeggs.org.au/who-we-are/annual-reports/#item-818

3.3 Equipment and system upgrading

After the introduction of *Council Directive 1999/74/EC*, poultry equipment manufacturers started developing new enriched cage systems and new alternative production systems that would meet the new requirements set out within the scope of the new legislation. There are a number of different manufacturers in Europe and the types of systems available vary depending on the manufacturer.

Big Dutchman is one of the largest and most commonly used poultry equipment manufacturers in Germany, also becoming popular worldwide, including Australia, with producers installing Big Dutchman alternative systems. As a part of its development process the company conducts its own in-house research on new design concepts, including research on additional products for systems such as lighting, prior to releasing them to the market for purchase[19].

During my travels I observed mostly Big Dutchman systems, therefore the information below is a snapshot of the progress that it has made as a company since the phase out of conventional cages, and of its current available systems.

3.3.1 Enriched cage systems available

In 2000, one year after the directive was published, Big Dutchman started research projects on farms within Germany looking at the prospects of its newly developed enriched cage systems. With the information it gained from its research, in 2002/2003 it was able to release to the market its early models of the enriched cage system including the EV625a EU[20]. This system was designed to optimise lay efficiency and welfare, incorporating the large floor space dimensions, nest boxes, perching and dust bathing required by the directive. This was followed by the introduction of the EV1250-EU60 (Image 1) in 2006. This system is 3.618 m in length per individual cage, and 1.25 m wide, providing an overall useable floor space of 4.52 m2 and an allowance of 60 birds per group[21].

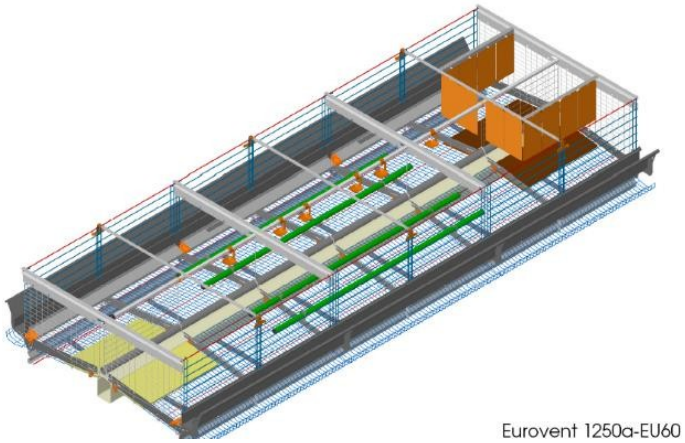

Image 1 EV1250-EU60

[19] Source: In house tour of Big Dutchman Headquarters, Vechta Germany

[20] Source: Big Dutchman 2018 – https://www.bigdutchman.de/de/legehennenhaltung/aktuelles/detail/kleingruppenhaltung-sehr-gute-ergebnisse.html

[21] Source: The Big Dutchman Experience, p. 39, 03.07.2018

The EV1250 system was then followed by the EV1500 or AVECH II (Image 2). which is available in varying sizes to house groups of 20, 30, 36, 40, 60 or 72 hens depending on personal preference[22]. This cage has the same internal floor space as the previous model and still contains all of the same contents as the earlier model but differs in its base dimensions, being 3.015 m in length and 1.5 m in width.

To date Big Dutchman's newest version of the enriched cage is the EV2240 (Image 3)[23].

Image 2 EV 1500-EU60

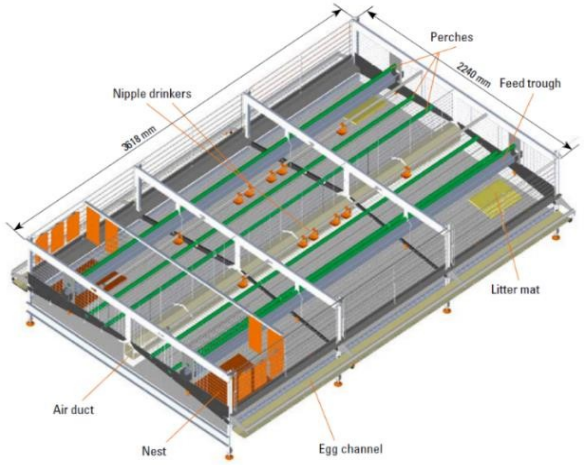

Image 3 EV 2240

This cage system is 3.618 m in length like the EV1250-EU60, however, the width far surpasses all other cages developed by Big Dutchman. An EV2240 cage has a central division panel splitting the cage in half length wise, with each side measuring 1.12 m wide, giving an overall useable floor space of 4.05 m2 per side and an allowance of 54 birds per side or 108 birds per group total[24]. This system also differs from the rest as it allows for the producer to convert the system to cage-free if the need arises.

[22] Source :Big Dutchman Manual 2016 – Eurovent EU The enriched colony system for layers https://cdn.bigdutchman.com/fileadmin/content/egg/products/en/egg-production-enriched-colony-systems-EUROVENT-EU-Big-Dutchman-en.pdf

[23] Source: The Big Dutchman Experience, p. 43, 03.07.2018

[24] Source: The Big Dutchman Experience, p. 43, 03.07.2018

3.3.2 Cage facilities observed

I visited two farms during my travels where I was able to see enriched cage facilities. One farm in Germany had two sheds on site, one containing 45,000 hens and the other 37,000 hens, in fully enriched KV1500 cages (Images 4, 5 and 6, own images) similar to that of the EV1500.

Image 4 KV1500 Enriched Cage

Image 5 Nest box in KV1500

Image 6 Litter matt in KV1500

The second farm was in the UK and that farm had four colony cage sheds, three of which contained approx. 190,000 hens each, and 1 containing approx. 91,000 hens. These hens where kept in enriched colony cages produced by Italian manufacturer Tecno, with perches running along the width of the cage instead of length (Image 7, own image) like with the Big Dutchman system.

Image 7 Tecno Enriched Cage – UK

3.3.3 Aviary systems for barn, free range and organic available

As with cages, there are multiple manufacturers producing different types of aviary systems for barn, free range and organic but the information below focuses again on those produced by Big Dutchman.

In the early 2000s, Big Dutchman's work on alternative systems was present but small in comparison to where it sits now. In 2008, when it was starting to become very clear that conventional cages would be gone prior to the directive date, Big Dutchman's focus on alternative systems intensified, and the number of different types of systems that it developed and produced increased substantially. By 2014, Big Dutchman had nine different cage free systems available all stemming from their four base designs that were originally available between 2000 and 2003.

Currently Big Dutchman has six main styles of alternative cage free systems available for purchase, ranging from the Natura Step 24-18 V16 2T (Image 8)[25] to the Natura Nova 264 Twin (Image 9)[26] and the Natura 70 V13 2 Level (Image 10)[27].

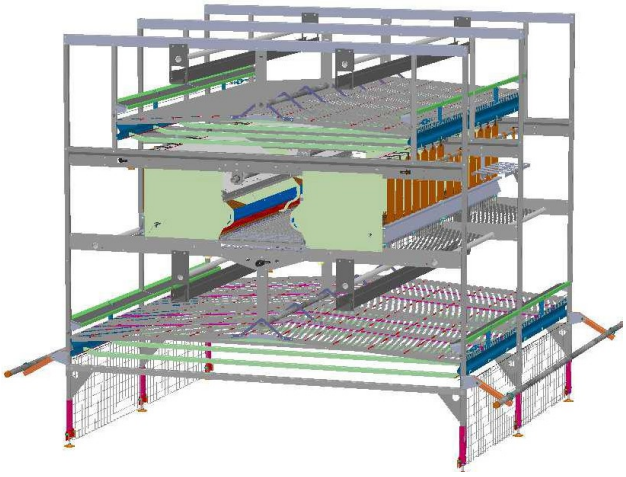

Image 8 NATURA Step

Image 9 NATURA Nova/Nova TWIN

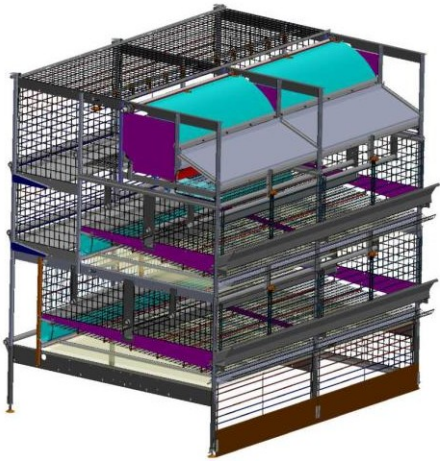

Image 10 NATURA 60/70

[25] Source: The Big Dutchman Experience, p. 25, 03.07.2018
[26] Source: The Big Dutchman Experience, p. 25, 03.07.2018
[27] Source: The Big Dutchman Experience, p. 25, 03.07.2018

Each of the systems shown above are open systems that are specifically designed to have set areas for the birds to undertake different daily tasks. They include independent feeding areas, drinking areas, nesting areas and resting areas to reduce the stress on the birds by minimising the number of activities in any one given area. All systems allow free flow underneath for a littler area where birds can jump down to during the day, to scratch around in, allowing more space on the system for birds to go about their business.

3.3.4 Big Dutchman aviary systems observed

Of the Big Dutchman systems available on the market today, I was able to observe during my travels the Natura Nova 70 (Image 11, own image), Natura Nova 280-15, Natura Step 24-18 (Image 12, own image), and the Natura Primus rearing system (Image 13, own image), all of which, producers were having great success with. The birds were evenly distributed across the system on all farms, with very few misplaced eggs observed, and the birds were able to move up and down through the different tiers of the systems to drinkers and feeders with no clear obstructions seen.

Image 11 Natura 70 – barn flock

Image 12 Natura Step – organic flock, transportable

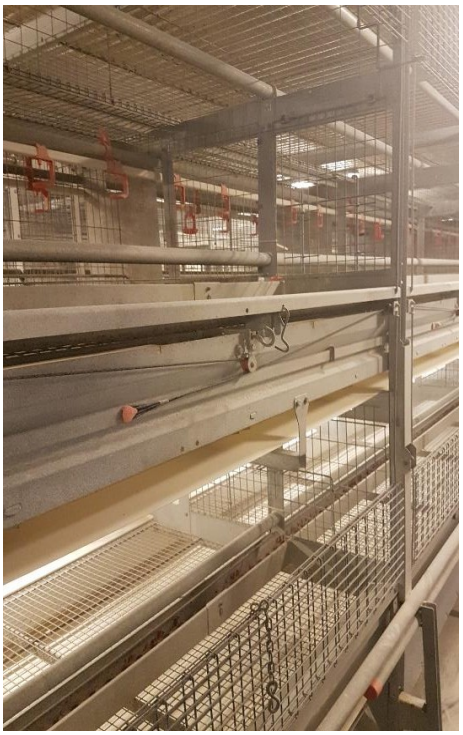

Image 13 Natura Primus rearing

3.3.5 Other aviary systems observed

Other than Big Dutchman equipment I did also get to see other types of alternative systems whilst I was away. These were produced by Jasen, a UK manufacturer, and Fienhage.

In Germany, I saw the Fienhage Easy 100 system (Image 14)[28] and (Image 15 and 16, own images). This system differed most from all other systems as the floor on the system had an inwards slope, which allowed any misplaced system eggs to roll back down into the grate in the centre and on to the egg belt, reducing the need for staff to collect misplaced system eggs, making the system slightly more efficient.

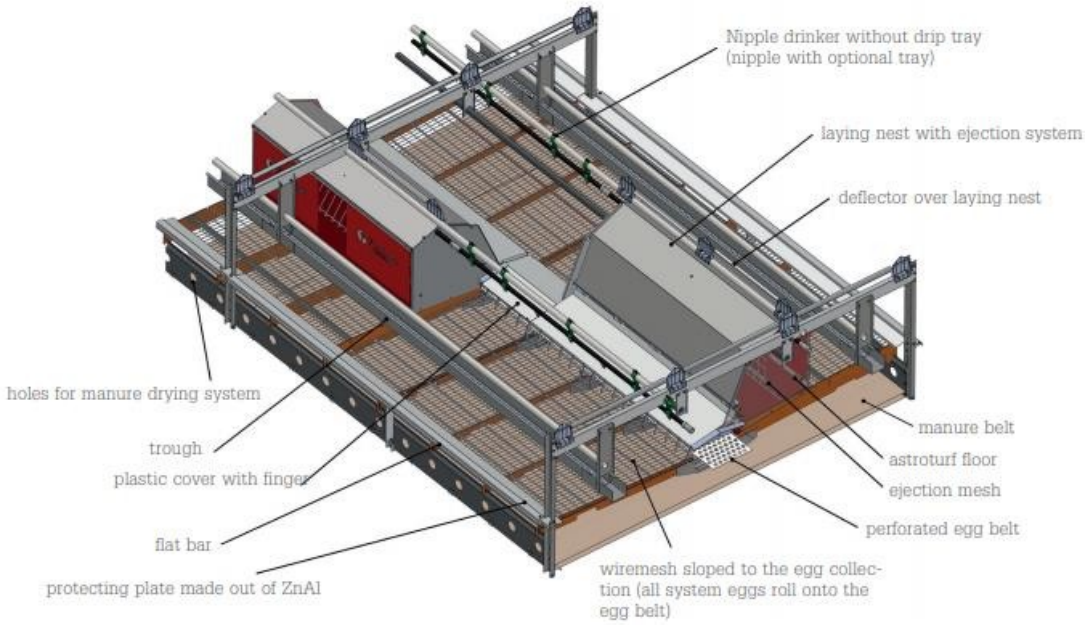

Image 14 Fienhage Easy 100

Image 15 Fienhage Easy 100 System

Image 16 Fienhage rollaway collection grates

In the Netherlands I observed both a rearing alternative system called Nivo-varia (Image 17, own image) by Jansen and a laying house alternative system by Jansen called the Comfort 2 Inside Aviary System (Image 18, own image).

[28] Source: Fienhage Poultry Solutions, Equipment Brochures © 2018 – http://www.fienhage.com/produkte/prospekte.html?file=files/cto_layout/fienhage/downloads/prospekt_easy_100_e.pdf

Image 17 Nivo-varia rearing

Image 18 Comfort 2 Inside Aviary System

In the UK, on the first farm that I visited, the company had just invested and installed a new rearing system with the equipment coming from Newquip, a UK distributor of Big Dutchman. Unlike the Primus rearing system, however, this new rearing setup was a jumpstart type system (Image 19, own image). For their layer houses, free range and organic sheds, they ran half slatted, half floor litter sheds. Each shed had on the slats a back to back central nest box system, feeders and drinkers with either perching or angled slats for birds to move between the slatted area and the floor (Images 20 and 21, own images).

Image 19 Newquip (Big Dutchman) floor rearing shed

Image 20 Half slat, half floor Big Dutchman organic

Image 21 Half slat, half floor Big Dutchman free range

Apart from the UK where the alternative systems viewed were half slatted and half litter, all of the sheds that I saw contained multiple aviary systems next to each other with a 1.5-2.0 m gap between each system. This gap enabled birds to jump down and scratch on the floor, and it was also a path that staff could walk along to monitor the birds and the shed equipment.

3.4 Cost – setting up an alternative system

At each of my farm visits across Germany, the Netherlands and the UK, I asked producers about their financial inputs associated with the setup of these new alternative systems. Because of the sensitivity of the question, most of the producers were only able to give me rough figures in terms of per bird costings. It was clear from our conversations though that the pricing was highly dependent on the system itself – whether barn, free range or organic due to the different internal space requirements. It also depended on the number of birds housed in free range and organic sheds, as that influenced the amount of land required outside for ranging.

Suitable agricultural land for free range and organic farming is hard to come by in Europe and most of the producers I met already owned the land that they used for their hens to range, so they did not have to pay at the time of setup for any extra space. Land value is high throughout Europe and it can be up to an additional 50% of the cost of developing a shed just for the range area, depending on the size of the farm and number of birds housed.

3.4.1 Barn

Out of the three main alternative systems the barn system is on average cheaper to set up when compared to free range and organic, as winter garden structures are not required nor are pop holes or the additional land area. I found that these systems were most commonly installed on farms where conventional cages were previously used.

Producers had little surrounding land around their sheds and wanted to keep their farms going but did not want to fully invest in enriched cages.

I was lucky enough to visit an egg producer in Germany who had actually converted his conventional cage sheds into enriched cages. I spoke with the owner, and the cost to him to upgrade the systems in 2009-2010 was approx. €12 (euros) or A$19 (Australian dollars) per bird, based on the exchange rate at the time of writing of €1=A$1.59. per bird. At that time, he went from a total of 180,000 conventional cage hens to 110,000 enriched

cage hens when he upgraded because of the changes to spacing. He further went on and converted a total of four of the original conventional cage sheds into barn sheds at a cost of €30 or A$47.70 per bird per shed.

This particular producer was classified as large in Germany – the owner had three production sites as well as his own rearing site where he reared his own pullets. As a part of his layer transition, the producer had also converted an old cage rearing shed into an aviary rearing shed and installed new Natura Primus rearing systems to accommodate the barn flocks he was now running.

The prices in the Netherlands in relation to barn systems were not much different, with one family converting from conventional cages to barn in 2010 at a cost of €25 or approx. A$39.80 per bird. This family then went on the add a winter garden to their shed and convert it again to free range production in 2016. The family already owned the land so there were no additional land charges, just the cost of constructing the winter garden and adding pop holes to the house. The producer was unable to provide me with any approximate cost for this infrastructure, however, he did speak of the additional cost of ownership rights associated with each hen in the Netherlands, which I had not heard of until that point.

I was advised by the hen supplier and the producer that all producers in the Netherlands must pay €25 per bird for one 'hen right', that is the right to own that one chicken, and this must be paid for every hen in the flock. This associated cost instantly doubles the cost of converting in the initial conversion year to €50 or approx. A$79.50 per bird. The hen's rights scheme was spoken about in conversations during my travel through the Netherlands but I could not confirm this cost through online publications.

3.4.2 Free range

The free range farms that I saw while away were all, bar one, established by people who were looking to move into dual agribusinesses. The producers already had the land available to run free range systems as they were farming other livestock such as cows or pigs, and were simply looking for another venture that would bring in extra income.

From conversations that I had with laying hen suppliers and producers, I was able to determine that free range farms in Europe are hard to set up from scratch not only because of the application processes but also because of the low availability of good land and the price of it.

One producer in Germany was able to give me an approximate price for land in 2011 when he was converting from pig farming to free range egg farming. He approximated that at the time the base price for 16 hectares (40 acres) of land was around €1 million, which currently equates to approx. A$40,000 per acre in the area he lived. I was also advised while in the UK that currently the price of agricultural land acceptable for poultry farming is sitting at around £15,000 (Great British Pounds) per acre, which equates to A$26,300 (based on the current exchange rate of £1=A$1.75).

In comparison, currently in South Australia a producer can pay as little as around A$5,500-6,000 per acre for land zoned for primary production depending on the area[29]. The cost difference is associated with the national amount of free land available.

Regarding the costs associated with just building and setting up an alternative system shed in Germany, the price again was dependant on the equipment purchased and number of birds housed. The same gentleman who gave me an estimate of land value was also able to give me an estimated setup cost for his flock. He advised that in 2011, he paid around €40 or approx. A$63.70 per bird to set up his 40,000-bird free range shed – just the shed itself and internal equipment, not including land.

[29] Source: Rural View Real Estate – https://www.ruralview.com.au/portal/search?rm=search&mapsearch=0&sur=&sor=listed&con=S&lal=1000&lah=2000&ptr=u&portalview=rural&portalsection=buy&jpday=1&bs=20&prl=0&prh=0&pt=liv&pt=lar&cs=sa

Another producer advised that in 2014 he had spent €1.4 million or approx. A$2.23 million to put up one free

range shed containing the Fienhage Easy 100 system with 35,000-bird capacity. This also equates to around €40 or approx. A$63.70 per bird.

The information I received whilst in the UK suggested that the cost of setting up a 16,000-bird free range shed again, not including land for ranging, was between £30-35 or A$52-61 per bird.

3.4.3 Organic

I visited four organic facilities during my travels – two in Germany, one in the Netherlands, and one in UK.

The first German organic shed visited was a small tow around shed (Images 22 and 23, own images) with a 2,000 bird capacity, and purchased to allow production of a niche market product for the producer who primarily ran a barn production system. This producer was not able to give me any estimated cost of setup nor was the other organic producer in Germany.

Image 22 Tow around concept, organic shed – Germany

Image 23 Bird access to range, organic shed – Germany

The organic farm that I visited in the Netherlands held 12,000 laying hens. The estimated cost for this producer to set up one organic shed was an around €80 or approx. A$127.40 per bird.

In the UK, the estimated cost of setting up one 3,000-bird organic shed was equivalent to the cost of a 16,000-bird free range shed, so between £30-35 or A$52-61 per bird.

When comparing all three systems in pricing based on the figures given to me by producers, the difference between the barn and free range equates to approx. €10 or A$16 per bird, and the difference between free range and organic equates to approx. €40 or A$63.70 per bird. There is over double the cost when changing between free range and organic when compared with changing from barn to free range. These prices are only estimates, however, taken from a small sample size of farms in Germany and the Netherlands. The prices exclude both additional land purchase costs and the hen right costs as mentioned above.

3.5 Flock size

During the two weeks that I travelled around Germany, the Netherlands and UK for my scholarship I managed to visit 13 different farms two of which ran at least 2 of the three main types of alternative systems mentioned above. The breakdown of the production systems visited can be seen in Figure 2 below.

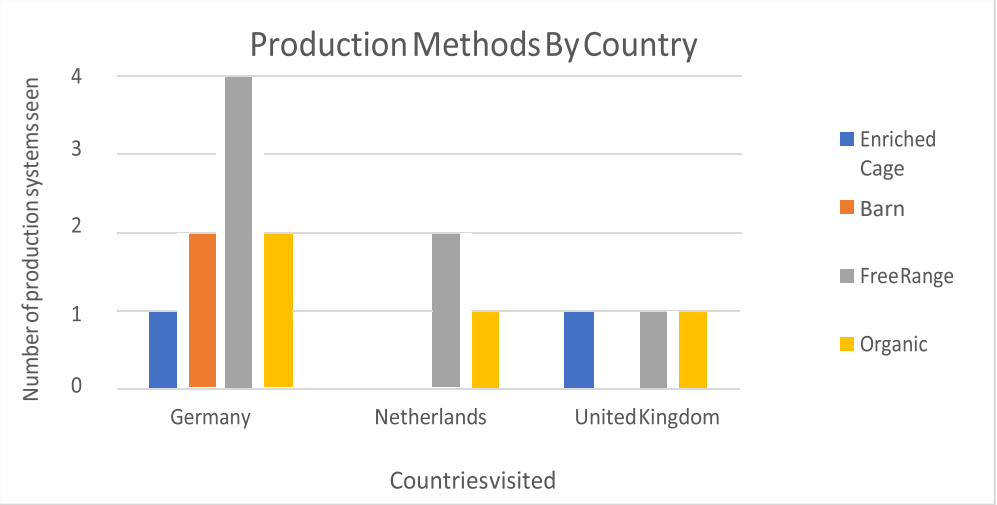

Figure 2 Breakdown of countries visited, by type of alternative productions systems seen and the number of each system in each country

The farms that I visited varied in size in regards both to the number of sheds and birds that they housed in lay. Like we do in Australia the farms can be classified as small, medium or large, based on the number of birds that they stock.

For this project the classification of each farm into small, medium or large was done using information gathered from breeder farm representatives (day old chick suppliers) with whom I spoke whilst I was away. I spoke with a representative from Hy-Line, Lohmann and Agromix who supply Hy-Line, as well as Lohmann and H&N birds, and the classifications were estimates from them based on their experience working in the industry.

In Germany, farms are classified small, medium or large if they stock on average the following number of birds in any given system:

- Small < 40,000 barn, <30,000 free range, < 50,000 enriched cage
- Medium 40-45,000 barn, 30-40,000 free range, 50,000 enriched cage
- Large >45,000 barn, >40,000 free range, >50,000 enriched cage.

In the Netherlands, the rep was also able to break it down per production system. Farms are classified small, medium or large if they stock the following number of birds:

- Small <30,000 barn, <15,000 free range
- Medium 30-100,000 barn, 15-40,000 free range
- Large >100,000 barn, >40,000 free range.

In the UK, for large scale commercial farming, farms are classified small, medium or large if they stock the following number of birds:

- Small < 100,000 hens total
- Medium 100-700,000 hens total
- Large >700,000 hens total.

Below in Table 5, I have presented the flock size information for the farms visited, broken down by country and producer, with the average number of birds per producer and labelled as to whether they were considered small, medium or large in their respective countries.

Table 5 Classification of farm by country/farm size, based on number of birds and their representative production method

Country/ Producer/Production Method	Number of Birds	Classification of Farm
Germany		
Producer 1 - Barn	32,000	Small/Medium
- Free Range	0 – Depopulated, 7,000 bird capacity	
- Organic	2,000	
Producer 2 - Enriched Cage	44,000	Large
- Barn	92,800	
- Free Range	55,500	
Producer 3 - Free Range	40,000	Large
Producer 4 - Enriched Cage	82,450	Medium
Producer 5 - Free Range	36,000	Large
Producer 6 - Organic	15,000	Small
The Netherlands		
Producer 7 - Free Range	44,000	Medium
Producer 8 - Free Range	24,000	Small
Producer 9 - Organic	12,000	Small
United Kingdom		
Producer 10 (One Farm)		
- Enriched Cage	600,000	Very Large
- Free Range	160,000	
- Organic	15,000	

3.6 Flock management

When it comes to managing the new alternative systems, Europe and the UK have about an 8-10 year head start on Australia. Whilst Australia still has alternative production systems installed, conventional cage and enriched cage production still account for around 50% of our National Grocery Market, with free range at around 40%, barn around 8%, and speciality (i.e. organic) around 2%[30].

With free range becoming more and more popular, it is imperative that producers in Australia have good techniques in place in order to manage these alternative systems, to make them efficient whilst maintaining high animal welfare and food safety standards.

In Europe and the UK, I focussed the majority of my questioning around flock management and health. I asked about the breeds of bird used, daily shed management routines, and behavioural management techniques, as well as about nutrition, stocking density regulations, vaccination schedules, and disease management.

[30] Source: Australian Eggs Annual Report 2016/2017 – https://www.australianeggs.org.au/who-we-are/annual-reports/#item- 818

In addition to the normal challenges, Europe, as of 2016, implemented the phase out of beak treatment in all flocks with the deadline to have all flocks completely beak trim free as of August this year. The phase out of beak trimming in Australia hasn't been focussed on heavily yet, however, I was particularly interested in how producers managed their birds without the trim as there is potential for us to go down this avenue in the future and information gained now can only help with a smooth transition for us in future should we need to focus on it.

Below are the details that I gathered from my visits to farms and the conversations that I had with producers and suppliers. The information is based on my own observations as well as previously mentioned producer and supplier knowledge and opinion.

3.6.1 Layer breeds

Germany

The breed of birds that I saw in Germany varied slightly, even within single companies. They included Lohmann Brown, Bovan Brown, Dekalb White, and LSL Lite. The farms had their preferences of breed based on temperament, production, shell quality and consumer demand; even so the predominant breed seen was the Lohmann bird.

Producer 4 (Table 5), who ran one of the two the cage facilities visited, housed only Lohmann birds with the majority being LSL-lite birds. The producer did have 8,000 Lohmann Browns also housed within the two sheds because he had a small produce market customer who favoured brown cage eggs over white.

Producer 2 (Table 5), the large barn/free range operator in Germany, also stocked Lohmann birds (both white and brown). From my observations he ran white birds in his barn systems and brown birds in free range. When I asked why the producer advised that he preferred white birds in barn as they were friendlier than their brown counterpart and performed better in the barn setting.

The Netherlands

In the Netherlands, the breeds on the farms visited also varied slightly. I viewed both H&N white flocks and H&N brown flocks being used for free range and organic production. Lohmann birds themselves were not as widely used in the Netherlands when compared with Germany.

United Kingdom

The production farm that I visited in the UK had a total of 775,000 laying hens housed on it. The main breed across the site was the Hy-Line Brown bird – of all the cage birds some 600,000 were Hy-Line. This farm also had one shed housing the British Blue hen, which produces a niche market blue egg (Image 24; own Image 25). The company also had Bovan Browns housed in the organic sheds.

Image 24 Pallet of collected blue eggs

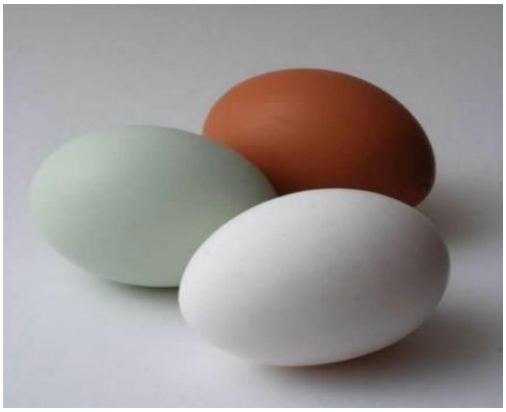

Image 25 Comparison between brown, white and blue eggs[31]

For the egg market across both Germany and the Netherlands, the predominant colour of bird was the white bird, i.e. consumers favoured a nice clean white egg. With the exception of the blue egg the UK follows a similar trend to Australia with the preferred egg on the market being a brown egg, thus brown birds are more commonly kept.

3.6.2 Daily routines

In terms of the day to day routines on farms, when producers were asked about theirs, they gave feedback that when compared across all three countries was overwhelmingly similar.

Farmers would conduct full checks on their sheds once in the morning around 8:00am. During this check, they would look at the main shed parameters, i.e. feed, water, lights and ventilation, as well as checking for any misplaced eggs, mortalities or mechanical issues. After this check, they did not spend any further time in the sheds unless something required fixing or the manure system was due to be run. The birds and systems would then be fully checked again in the afternoon at around 3:00pm.

In Europe, I only encountered one alternative system farm that conducted three full checks a day, having a 1:00pm check as well as the 8:00am and 3:00pm checks, and this was due to an increased amount of floor eggs in the shed. Other than this the sheds did not require any additional checks.

When I asked the farmers why they only did two checks a day, one gentleman from Germany said:

"Why would I want to be in there stressing my birds out when I don't have to be, if all is ok in the morning then as long as the alarms are working I don't need to be in there until the afternoon check."

This same ideology was followed fairly unanimously by all of the producers that I met and it seemed to have a positive effect on the birds. Farmers experienced little to no smothering in their sheds, birds were not pushing up around my feet whilst I was walking through the sheds, instead they all moved away from me.

[31] Source: Google Image Search – British Blue Hens – https://www.popsci.com.au/science/find-a-blue-chicken-egg-congrats-your-chicken-has-a-virus,380240

Production was also an indicator of good management routines, with all bar one cage facility having production in the mid to high 90% range until up to 50 weeks of age. One producer that I visited allowed me to have a good look at his production results, which showed production at 97.6% at 38 weeks of age having been between 96-97% for nine weeks. Other producers were consistently achieving 96% at 40-41 weeks of age also.

Misplaced eggs did not seem to be an issue on the European farms with the exception of the one German farm whose floor egg number was sitting at approx. 1.5% or 400 eggs per day. Other than that, the total misplaced eggs were on average across all other European farms around 120 per day with between 25-45 of those being actual floor eggs, the remainder system eggs.

I asked the producers how they managed to keep their floor egg numbers so low, and their comments came back as a combination of because they had pullets that utilised the system fully from day one and because their sheds contained ample lighting throughout, including under the systems to reduce dark spots (Image 26).

I was informed that it was common practice for producers come back at night after placement of each flock to ensure that all birds are up off the floor after lights out. Any birds left on the floor are picked and placed onto the system until all birds are roosting by themselves. Litter has to be provided on the floor upon placement of new flocks, so training of new flocks is still crucial and is done using staggered light dimming sequences to encourage birds upwards and the nightly pickups are done to ensure perching, all to minimise the chance of misplaced eggs.

Image 26 Strip lighting under aviary system to illuminate dark spots on the floor and minimize floor eggs

Having minimal misplaced eggs and keeping to only two main checks a day reduced the labour requirements for the poultry farms, increasing their labour efficiency. On average, shed checks and manure only took up around three hours of the working day, with collect and clean being around four hours per day.

The single shed farms were mostly dual agribusiness farms and I was advised that it was the husband who ran the farm and did the bird work, while the wife collected the eggs and cleaned the machine and egg room. With the total number of hours required for the birds so low, the remainder of the day for the producer was spent managing his other agribusiness, pigs or cows being popular.

For the larger farms with multiple sheds and systems the work hours were longer, similar to Australia at around eight hours a day. This included the cage facility in Germany where the producer had two egg collectors working at once. One collector sorted the eggs as they came into the farm packer while the other stacked the trays and placed the stacks on the pallets. During the day, the producer spent his time going through and thoroughly checking his cages, conducting preventative maintenance, running manure belts and keeping the sheds in pristine condition.

In the UK, the farm that I visited had one onsite overseeing manager who was responsible for all of the 775,000

birds. Each free range and organic shed had a collector who collected the eggs at the front of the shed and cleaned the egg room, but who also did the shed checks and floor walks. The cage sheds were inline and the eggs fed straight into the grading floor situated next to the sheds.

The overall approach to the day to day shed routines was practical and very efficient. Producers made the best use of their automated systems ensuring that they took full advantage of the alarm systems that were available to them. From my observations they conducted preventative maintenance when required and any additional spare time was spent ensuring that the farms were kept immaculately clean both inside and out.

3.6.3 Manure management

In terms of litter removal routines, the majority of sheds that I saw in Europe had automated litter removal systems, which were situated on the floor underneath the systems. These systems were run for one hour a day to remove the bulk of litter from the more inaccessible parts of the floor, under the manure belts. Floor litter on all bar one farm was visibly dry and friable; there was no hard caked on litter observed anywhere on the floor.

The automated litter removal setup comprised a motorised pulley with hinged scrapers that ran in a loop underneath two adjacent systems (Image 27). The concept is that as the pulley system moves (left or right) the corresponding scrapers, depending on direction, open and drag the litter from under one system down to the end of the shed. The litter is pushed out through a gap under the system on to the cross conveyor at the back of the shed for it to be run into a manure storage shed outside. The pulley system then reverses direction causing the scrapers that were open to close and forcing the ones under the adjacent system to open, removing manure from under that system.

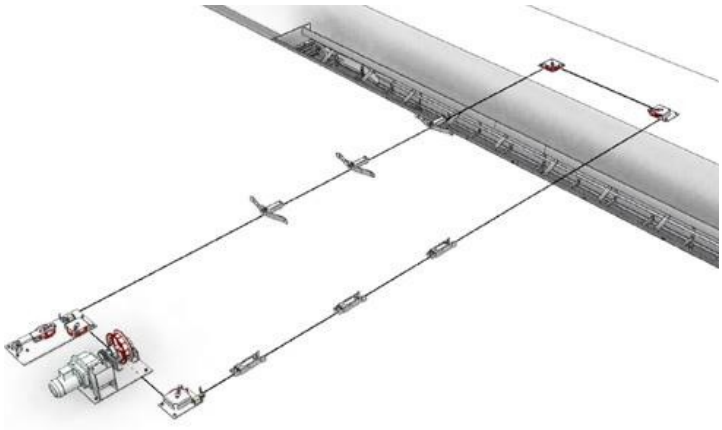

Image 27 Litter removal system SV102 by Geerts Smederij B.V – the Netherlands[32]

There are different types of this product available for purchase, with well-known equipment manufacturers such as Jansen Poultry Equipment creating their own version of the system using flat blades instead of hinged ones. The Jansen product is called the AutoShov® litter removal system (Image 28).

[32] Source: Geerts Smederij B.V – http://www.geertssmederij.nl/StrooiselverwijderingSV102.aspx

Image 28 Jansen AutoShov® litter removal system[33]

Having this automated system has further reduced farm labour costs, making them more efficient by removing the need for staff to be in the shed manually removing floor litter on a daily basis.

I asked each producer if they removed litter off the floor manually from their sheds in addition to automated litter removal under the system, and for the most part the answer was no. Floor litter between the systems was only removed at the end of each batch. Only one producer in Germany advised that he removed litter manually during the life of his flocks, and it was done at around 45 weeks of age. I also had one producer in the Netherlands who removed litter manually, and that was done every two to three months and only to provide manure to his biogas facility on site.

Other than this the manure belts are run on average once a week and, like the floor litter, manure is sent out into the storage shed next to the bird shed where it is collected once a month or when the farmer calls to have it removed. Due to lack of free space in Germany and the Netherlands manure is transported into neighbouring countries to be used as fertiliser on broadacre farms or as fuel at a cost to the producer of around €15-25 or A$24-40 per tonne.

Whilst there is a cost associated with disposal of manure, the availability of an automatic litter removal system ensures greater efficiency in the management of the shed, reducing labour costs, and to an extent offsetting the removal cost. The system also aids in minimising the stress to the birds associated with litter removal.

[33] Source: Jansen Poultry Equipment – https://www.jpe.org/en/products/layers/other/autoshov-litter-removal-system/

3.6.4 Behavioural management techniques

Producer

As outlined above, maintaining the day to day routines in a layer shed is a good way to minimise the chance of stress in the flock – stress that could potentially lead to pecking behaviour.

Within the Egg Industry there are breeds of bird that are well known to be more sensitive to change than others. Too high an intensity or the incorrect type of lighting, along with nutritional issues, or increased stocking densities or a break in normal routine, can set off behavioural issues. In these situations, birds will start to peck at each other to either obtain the nutrients they need or to relieve their boredom or stress related issues. This pecking can further evolve into cannibalistic behaviour if not identified and acted on, which is a major animal welfare concern for the entire industry. Beak treatment via infra-red laser or hot blade is currently used as a preventative measure in laying hen behavioural management to minimise the damage caused by pecking, as needed, in Australia and the UK.

As previously stated, in 2016 Europe, while in the midst of investing in alternative system growth, also made the decision to phase out beak treatment across all flocks. During the transition period over the last two years, producers across Europe have been learning how to perfect their techniques relating to the management of birds with fully hooked beaks (Images 29 and 30, own images).

Image 29 Hooked beak on Lohmann Brown Bird

Image 30 Non-beak trimmed H&N Brown

Across all farms the same management techniques were observed. Birds were given chaff or chopped hay on the floor in rearing to provide mental stimulation. Upon placement into their laying houses and throughout their laying life hens were provided with bales of alfalfa hay in bags hung from the ceiling or placed in racks (Image 31). These were used as an indicator to producers to see if their birds were pecking or not, as well as for mental stimulation.

Pecking stones were also present in all sheds at a rate of approx. one stone per 800 birds (Image 32). The pecking stones not only provide mental stimulation by giving the birds something to focus on, but they also provide a sort of natural beak filing, taking the sharp tip off the end of the hook. I was advised that in instances where producers did have issues with behaviour on untrimmed birds after peak, that their mortalities increased to 15% by depopulation.

Normally when all was going well and with no disease issues mortalities could be maintained at between 2-5% for the life of the flock.

Image 31 Alfalfa bales for identification of pecking, and mental stimulation

Image 32 Hanging pecking stone in barn shed

On some farms, though not all, I also observed bags of wheat at the front and backs of houses, which the producers would throw small handfuls of on to the floor in different areas for the birds once during the day, as an extra activity for them to scratch around and look for.

In addition to providing mental stimulation, lighting was a tool used to minimise pecking behaviour in sheds displaying pecking behaviour. I was advised that it was common practice for producers to start out with their lighting at around 80% intensity when the flock was in peak production, and as the flock aged they reduced the intensity as the birds got slightly more agitated, until by end of flock it was at about 20% intensity. The figures given to me were only estimates and none of the producers could give me specific lux readings in their sheds.

3.6.5 Nutrition

While I did ask producers questions relating to nutrition, I did not focus on it to the same extent that I focussed on other aspects of farming such as routine management and disease management.

The overall common factor across Europe and the UK was that mash feed was the preferred feed type of choice. Mash allows for a good mix of both large and small feed particles, providing the best possible uptake opportunities for the birds. Producers on average ran their feeders between four and six times per day, and some ran the same ration after pre-lay all the way through, while others that I spoke with preferred to phase feed their flocks.

Pricing of feed was also something that was fairly consistent across Europe. For free range flocks the price was around €250 or A$402 per tonne, with organic sitting at around €470 or A$750 per tonne based on the price given to me by the organic producers with whom I spoke.

All producers visited in Europe bought their feed from local feed mills, while the UK farm had its own mill so its per tonne feed costs were substantially lower. Europe's feed was mainly corn or maize based, whilst the UK is similar to Australia in having wheat-based diets only using maize when the wheat prices are too high.

3.6.6 KAT welfare requirements – stocking density

Other than what is outlined above, another tool used to prevent behavioural issues is not one established by the producers, but one that has been established by egg certification bodies such as KAT (Association for Controlled Alternative Animal Husbandry) in Germany. KAT certification is similar to the Lion Code in the UK and the new ESA standards in Australia. It is a favoured certification stamp for major retailers that ensures transparency with origin of product, high standards of animal welfare and high-quality food safety. The German based association KAT has quite a far reach with countries like the Netherlands, which exports eggs into Germany and which also ensures KAT certification on its farms.

KAT was established mainly to oversee accurate traceability of eggs from alternative systems only, however, as a part of the system it incorporated its own set of requirements relating to each of the three alterative production methods. Stemming from the German animal welfare livestock farming directive and egg marketing standards as well as others, KAT developed minimum requirements for all three alternative production methods in relation to stocking densities, both within the house and on the range[34].

The maximum stocking density in regards to total useable floor space (floor+system) in any given barn or free range shed is nine birds per m2 if you wish to have certification with KAT. For organic, this drops to six birds per m2[35].

The reduced stocking density in the shed lends itself well to aid the reduction of stress on birds and to minimise the chance of behavioural issues associated with overcrowding. Furthermore, the regulations state that in one shed the group sizing of a flock in free range and barn can never be more then 6,000 birds per house unit or group; in organic it is 3,000 birds per house unit or group[36].

To achieve this, all sheds are divided into multiple sections depending on the overall number of birds that the shed can house. One of the free range farms I visited had the shed divided into eight sections with 5,000 birds per section and a total of 40,000 birds in the shed (Image 33, own image). An organic farm I visited had five sections, with 3,000 birds per section and a total of 15,000 birds in the shed (Image 34, own image). The organic shed used heavy white plastic to cover the divisions so that birds could not see each other, in order to minimise movement of birds forward against the dividers and to minimise stress.

[34] Source: KAT – The Association, https://www.was-steht-auf-dem-ei.de/en/kat-association/index.php
[35] Source: KAT – Barn Rearing, https://www.was-steht-auf-dem-ei.de/en/kat-association/rearing-systems/index.php
[36] Source: KAT – Organic Rearing, https://www.was-steht-auf-dem-ei.de/en/kat-association/rearing-systems/index.php

Image 33 Shed in Germany – 8 divisions of mesh fencing – total 40,000 birds, 5,000 birds per group

Image 34 Shed in Germany – 5 divisions blocked out so birds can't see each other – total 15,000 birds, 3,000 birds per group

3.6.7 Range access

In addition to internal stocking densities KAT also has stipulations relating to range size and access. For producers to be KAT certified they must have a cold scratch area or 'winter garden' on either side of their shed, with the total area equating to at least 50% of the shed's internal floor space[37]. This area is used as a buffer between the shed and range area (Image 35, own image), with pop holes opening into the winter garden and range each day. Only under veterinary instruction can birds be kept in from ranging, in which case the winter garden pop holes are still opened and this area is available for birds to scratch in.

Image 35 Pop holes between shed and winter garden area

[37] Source: KAT – Free Range Rearing, https://www.was-steht-auf-dem-ei.de/en/kat-association/rearing-systems/index.php

For free range hens the winter garden area needs divisions like it has in the shed, however, the range area does not, and the birds are free to interact once completely outside. For organic birds, however, the divisions within the shed must be continued on through the winter garden and also out into the range (Images 36 and 37, own images).

Image 36 Winter garden divisions for organic flock – the Netherlands

Image 37 Range divisions for organic flock – Germany

In addition to these requirements range area stocking density across Europe, irrespective of certification body, is a maximum of 2,500 birds per hectare or 4 m2 per bird[38].

[38] Source: Council Regulation (EC) No 1804/1999, Annex VIII, Section2: Poultry 24.8.1999 – https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:222:0001:0028:EN:PDF

As a part of my questioning I asked all free range and organic farmers their opinion on the range stocking density to see whether they believed it was a good amount for the birds or too much, and every farmer said the same thing – that it was far too much space, which the birds never used.

Their comments included:

"The birds don't need 4 m2 each, they use maybe ¼ of the space given." – free Range producer, Germany

"4 m2 is only good because the range stays green where the birds don't reach, there are no welfare benefits to 2,500 bird per hectare over the higher densities used elsewhere. The addition of trees and shade is better than the extra space." – large free range producer, Germany

"The birds never use all the space, they don't need it." – free range producer, the Netherlands

I asked this question specifically because of the debate in Australia relating to maximum stocking densities of 10,000 birds per hectare vs 1,500 birds per hectare. Not only did I get producer opinion on the matter but I was conscious to make sure that I observed land usage on the ranges also to see if it matched with their comments.

My general observations where that the first 35-40 metres surrounding the shed was heavily populated, approximately 70% of the actual ranging birds were within this area, with 27% travelling between 40 and 100 metres out from the shed and the remaining 3% going beyond 100 metres. Image 38 and 39 (own images) show range utilisation on two of the farms I visited. I was advised that producers end up having to go out and mow the paddocks as the birds don't travel far enough to keep the grass down.

Image 38 Range utilisation on a farm in Germany
Birds were out ranging at the time photo was taken, with only two birds at the back of this range (circled in red), one in the shelter on the right and, another three visible under the front shade shelter on the left.

Image 39 Range utilisation on a farm in the Netherlands – distribution of birds in the range

The time of year that I was travelling was summer in Europe, and the agricultural area was in a drought with average daily temps of 27-29°C. Having said this, they still had to slash and mow the outer areas of their ranges due to over growth. The areas within 35-40 metres of the sheds, as seen above, did not require any attention.

With temperatures rarely getting over 30°C, producers aren't even required to invest in cooling systems. The ventilation consists normally of chimney fans and small stir fans, with only the cage facilities and one free range farm that I saw having tunnel extraction fans.

3.6.8 Disease management

The main issue facing free range and organic producers is in fact that birds are allowed access to the outside environment. Putting birds into cage systems where they were removed from the outside environment and contact with their own litter served as a preventative measure as a part of disease mitigation for laying hens. In the process of converting to a cage free industry Europe has inadvertently increased the risk of its laying hens contracting poultry diseases.

I was very interested to find out from producers their experiences with disease on farm and if they at any point had to use antibiotics or change their management routines to combat the presence of a disease.

When asked, it was unanimous that the main disease of concern for the entire poultry industry throughout Europe and the UK is avian influenza. High pathogenic avian influenza can have devastating impacts on producers as it spreads rapidly, causing serious disease with high mortality (up to 100% within 48 hours) in most poultry species[39].

In the event of an outbreak, the local veterinary authorities immediately apply movement restrictions to any farm within a 10 km radius of the affected property[40]. During this time, producers cannot allow entry to any person not authorised to be in the secured zone, on to their farms – no visitors, no supplier reps. Only feed trucks are allowed, and they are all stopped prior to entry and thoroughly sanitised.

[39] Source: European Commission – Avian Influenza, https://ec.europa.eu/food/animals/animal-diseases/control- measures/avian-influenza_en

[40] Source: Council Directive 2005/94/EC, 20 December 2005 - Section 2 Protection, surveillance and further restricted zones Article 16, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32005L0094&from=EN

I myself while organising my visits to farms had to ensure with my contacts that the regions to be visited, not just the farms, had not had any outbreaks of avian influenza within the last six months. This was crucial as outbreaks of highly pathogenic avian influenza (HPAI) of subtype H5N6 were confirmed in poultry in the Netherlands and Germany in early 2018[41].

I was advised that for any area deemed to have avian influenza present, producers are required to keep their birds locked in, with shed and winter garden access only. Birds must be kept inside until authorised by a veterinarian that it is safe to let them out again to range. During this time producers can still market their eggs as free range for up to 16 weeks. After 16 weeks, if birds are still required to be kept in due to presence of disease, then the eggs must be labelled as barn.

This causes issues in itself, but more so with income as the price difference between a barn egg and free range eggs can be 2.5-4.0 cents per egg[42]. One producer in the Netherlands advised that he had been required to keep his flocks in twice in the last two years due to avian influenza and for one time the birds were kept in for 25 weeks, meaning that for nine weeks he had to sell his eggs at a reduced cost. He was particularly annoyed by this as the flock was producing at 95% production. The producer was due for around €0.105 (10.5 euro cents) or A$0.168 (16.8¢) per free range egg, but for barn getting only around €0.075 EUR (7.5 euro cents) or A$0.121 (12.1¢) per egg.

Other than avian influenza the most common health issues seen on farms were *E. coli* infections, black head and one gentleman from Germany even provided information about a disease one of his flocks had, which sounded potentially like Spotty Liver Disease based on his description.

As a part of asking producers about their disease challenges I did also ask if they had ever had to use antibiotics on their farms before. I got mixed answers from producers with this question. I was lucky that most of the farmers were open with me about any time they had to use antibiotics and it was generally for treatment of *E. coli* infections or *Clostridium* infections, but their use was not common. When required they would contact their local state region veterinarian who would prescribe the antibiotic for them.

I also then asked producers "What are your views on cage production". Again, I got some mixed results but the underlying opinion was that it was the best way to house the chickens.

One producer who had experience with multiple systems stated:

"Cage production is a good thing as there are less health problems. We never had to do as many vaccinations and the production % was always better. The only negative is that the birds don't look as nice because of the cage."

One of the free range producers stated:

"Free range has good and bad points. I believe the emotional welfare of the bird is better but there is more disease in free range."

I linked my antibiotic question with my question relating to producer views on cage production, as I believe that they are inadvertently linked. I did get a very direct answer from a producer regarding his views on cage production in conjunction with antibiotic use. He stated:

"In all of the years I have been farming I never once had to use antibiotics on cage birds, now with free range I actually have to use them."

[41]Source: European Commission – Avian Influenza, https://ec.europa.eu/food/animals/animal-diseases/control-measures/avian-influenza_en

[42] Source: MEG-Marktbilanz Eier und Geflügel 22.06.2018 as PDF provided by Big Dutchman

I will mention that there were four farms visited where producers had never had to use antibiotics; this included both a free range and organic farm.

3.6.9 Disease prevention

Just like in Australia Europe, and the UK has strict vaccination policies in place as a part of its disease prevention strategy. There was not a lot of variation seen between the different farms in either Europe or the UK but there are substantial differences between Australian vaccination programs and those of the countries I visited.

The differences are simply because of what disease are present their compared to here in Australia. Figures 3 and Figure 4 show the basic vaccination plans for both the Netherlands and Germany.

Dag	Plandatum:	Enting:	Uitvoering:	Soort entstof:	Uitvoerende:	B
0		Marek	injectie	Nobilis Rismavac	broederij	
0		Gumboro	injectie	Mérial Vaxxitec	broederij	
0		IB Primer	spray	Poulvac IB Primer	broederij	
0		IB 4-91	spray	Nobilis IB 4-91	broederij	
0		Coccidiose	spray	Paracox 8	broederij	
0		Inlegvel onderzoek	onderzoek	40 stukjes inlegvel	opfokker/chauffeur	
7		Salmonella	drinkwater	Avipro Salmonella Vac Duo	opfokker	
14		NCD	spray	Mérial Avinew Neo	opfokker	
35		IB Qx	spray	Nobilis IB Primo Qx	opfokker	
49		Salmonella	drinkwater	Avipro Salmonella Vac Duo	opfokker	
49		NCD	atomist	Nobilis ND Clone 30	opfokker	
63		TRT	spray	Nobilis Rhino CV	opfokker	
70		Bloedonderzoek NCD	onderzoek	30 buisjes bloed	dierenarts	
70		Mestonderzoek Salmonella	onderzoek	2 paar overschoenen	dierenarts	
84		Pokken + Trilziekte	vleugelprik	Intervet PD+AE	entploeg	
84		ILT	oogdruppel	Nobilis ILT	entploeg	
84		injectieentingen	injectie		entploeg	
98		IB Qx	atomist	Nobilis IB Primo Qx	opfokker	
105		Bloedonderzoek NCD+Mg+AI	onderzoek	30 buisjes bloed	dierenarts	
105		Mestonderzoek Salmonella	onderzoek	2 paar overschoenen	dierenarts	
105		Wateronderzoek	onderzoek	1 watermonster	Dierenarts	
105		hennen opsturen voor sectie	onderzoek	10 stuks via Miedema	opfokker	
105		Wormonderzoek	onderzoek	1 mestmonster	dierenarts	
106		Salmonella	drinkwater	Avipro Salmonella Vac Duo	opfokker	
119		transport naar afnemer				

Figure 3 Vaccination program in the Netherlands, provided by breeder company

NCD=Newcastle Disease, Inlegvel onderzoek=40 samples for testing, TRT=Turkey Rhinotracheitis, Bloedonderzoek=blood sampling, Pokken=Fowl Pox, Trilziekte=Avian Encephalomyelitis (AE), Mestonderzoek=manure sampling, Wateronderzoek=water sampling,
Hennen opsturen voor sectie=hens sent for autopsy.

Krankheit	Lieferant Impstof	Vaccin	Batch Nummer	Handlungs-weise	Datum Impung	Unterschrift Tierärzt
Ziekte van Marek	MSD	Nobilis Rismavac	1834316/00	Injectie	30-01-15	
Marek/Gumboro	Merial	Vaxxitek	43V440	Injectie	30-01-15	
Bronchitis	MSD	Nobilis IB MA5	A182AP01	Spray	30-01-15	
Coccidiose	MSD	Paracox 5	A236B	Spray	30-01-15	
Coccidiose	MSD	Paracox 8	0544B	Spray	30-01-15	
Salmonella	LAH	Avipro Salm. Vac E	E021200	Trinkwasser	04-02-15	
Bronchitis	MSD	Nobilis IB 4-91	A180BN01	Spray	12-02-15	
NCD	MSD	ND clone 30	A205AJ01	Spray	16-02-15	
Bronchitis	Zoetis	Poulvac IB QX	19756D5	Spray	20-03-15	
Salmonella	LAH	Avipro Salm. Vac E	E021200	Trinkwasser	27-03-15	
NCD	Merial	Avinew	L417059	atomist	31-03-15	
Trilziekte	LAH	Avipro AE	E025301	Trinkwasser	17-04-15	
PD	Zoetis	Poulvac Chickenpox	1304862	Wingweb	30-04-15	
ILT	MSD	Nobilis ILT	A052AJ01	Augentropfen	30-04-15	
ND + IB²	MSD	Nobilis IBMulti+ND	D506A12	injectie	30-04-15	
Salmonella	MSD	Nobilis Salenvac	T112ZA02	Injectie	30-04-15	
Bronchitis	Zoetis	Poulvac IB QX	19756D5	Spray	14-05-15	
Salmonella	LAH	Avipro Salm. Vac E	E021200	Trinkwasser	22-05-15	

Figure 4 Vaccination program for a German free range farm, provided by producer

As can be seen, *Salmonella* vaccines are present in both programs. Because of the risk associated with *Salmonella* Enteritidis, it is a legal requirement to vaccinate all flocks with *Salmonella* as a part of the food safety program in Europe. Not included on these programs, Cholera and Rotlauf, which translates to erysipelas, were vaccinations given to some of the other flocks I saw.

During lay it is standard practice in Germany for farmers to vaccinate their flocks every six weeks for Infectious Bronchitis (IB), and across Europe sampling of manure for *Salmonella* testing is done every 15 weeks, with samples being sent to the laboratory for isolation. Additionally, once a year an external veterinarian will come out to the farm and also do testing for *Salmonella*. I was advised that if *Salmonella* is found, all eggs from the positive flock must go straight to pulp; this continues until swabs come back negative for *Salmonella*. If the flock is old then the shed gets depopulated and a thorough cleanout is undertaken to try to remove the *Salmonella*.

3.6.10 Biosecurity

In addition to their vaccination procedures, all farms visited had biosecurity protocols in place to prevent the entry of disease into the sheds. I was required to suit up in disposable overalls at each site and put on boot covers prior to entry. I was also required on every site to dip my feet in the footbaths provided and step from their classified dirty area straight into the clean after dipping without placing my feet back into the dirty area (Image 40).

Image 40 Boot dip and clean area prior to entry to poultry shed

Of all the sites visited in Europe, only three got me to sign in on a visitors' log, which asked for basic information including the date of visit, my name, email address, car registration number and signature. I did not see any visitors' logs in Europe that required the same content that would be required here in Australia, such as previous visits to potentially contaminated farms, or recent travel overseas.

When visiting the UK, I was asked to sign a full declaration form prior to entry asking for basic contact details, which then went into detail with some of the following questions:

1. Have you been to another poultry farm in the previous 4 days?
2. Have you been abroad on holiday/business in the previous 4 days? If yes which country?
3. in the past 4 weeks have you visited a country where avian flu has been reported?

The biosecurity for this particular company was quite strict, with their declaration form even covering the use of media devices. Of all the practice and paperwork that I had seen, this most closely matched the procedures found in Australia.

4 Conclusions

The aim of this project was to find out what caused the push to phase out conventional cages in Europe, and now the push to phase out enriched cages. I travelled to Germany, the Netherlands and the UK, visited farms and spoke with producers about their personal experience dealing with phasing out cages, and their experience with managing the new alterative production systems. My hope was to establish just how significant the phase out of cages would potentially be for Australia, in terms of economics, and flock management and health, based on how it has impacted Europe.

During my travels, I learnt that with the introduction of the phase out of conventional cages, producers had to learn quite quickly how to integrate new alternative systems into their farms and manage them, in order to achieve the same production that they were achieving in the conventional cage systems. Well-developed routines were established, with producers taking complete advantage of the technology that they have, using it as a tool to highlight issues and, in so doing, reducing their time spent in their shed identifying issues. Being able to rely heavily on their equipment has meant that producers can cut back to conducting two main checks a day, reducing their overall labour costs.

Investments made into automated litter removal systems have also played a role in reducing farm costs.

Overall the day to day shed management that I observed was very efficient. I believe that it is in this particular area that we in Australia could improve. Whilst we are efficient, from my experience there is room for improvement with our management techniques in sheds.

Whilst travelling it also became apparent that the current push to phase out all cage eggs from supermarkets is virtually the same as in Australia, in that it is not being done so much by the consumer, but by animal lobbyist groups and the major retailers themselves. Retailers are vying for the attention of consumers and are promoting the sale of eggs produced in what they determine to be the best production methods, based on perceived better welfare. In so doing, they are boycotting the enriched cage system because to them it is perceived to have poor animal welfare.

In addition, I learnt from producers that with the original changes came substantial financial costs associated with converting systems across, and for those who are new to the industry that there were also substantial costs associated with constructing a shed with the new style systems, even excluding the cost of range area.

I discovered that when it comes to who determines the minimum welfare requirements for each system, Australia is not to dissimilar to the countries I visited. Both industries whilst having set animal welfare guidelines and directives, is heavily dictated by accreditation bodies such as KAT. Their requirements surpass the minimum standards provided in the guidelines and have become the baseline requirements for the major supermarket chains. The certification is so popular that it is looked for on cartons by consumers as a guarantee of true to labelling and high-quality animal welfare.

With regards to flock management and health there was a resoundingly clear opinion through the industry that alternative systems, particularly free range and organic systems, whilst having positive attributes do come with an increased risk of disease.

Ultimately when you put birds on the ground and allow them to range you lose your ability as a producer to control some of the key welfare factors associated with flock management. Firstly, the birds will come into contact with their own faeces more regularly, and can potentially be exposed harmful bacteria or viral pathogens. Discussion on-farm determined that this was experienced by some of the producers.

Secondly, through ranging the hens are exposed to all types of weather conditions as the outside environment cannot be controlled. In Europe this can result in stress associated with very cold weather or cold snaps. It really only impacts the free range producers, as ranging requirements for free range birds state that birds must be

given access to the range every day once pop holes first commence opening. In Australia, external environmental stress is usually associated with very hot weather. During these hot spells if producers wish to keep their flocks inside for any longer than three days to protect them, they are required to seek an exemption from their retail customers and justify why the birds should be kept indoors.

Lastly, through ranging the ability to maintain full biosecurity is reduced. Therefore you cannot completely control disease movement, whether it be by wild birds, pests or simply the wind. Flocks are heavily vaccinated during rear but, irrespective of which country you are in, vaccines are not absolute and diseases like avian influenza, which would have detrimental impacts on the industry, are not readily vaccinated against. To combat this Europe allows lock-ins in times of disease presence, but If lock-ins begin to occur more frequently for extended periods of time then producers will begin to run into other issues, including financial issues. There are issues associated with the change in the status of production method and the reduced income due to market price difference between eggs from different production systems – e.g. let the birds out and there is potential for disease, keep the birds locked in and the producer suffers; it is a double-edged sword.

With avian influenza of such large concern throughout Europe, and other poultry disease popping up now and then, the idea of completely phasing out cages seems counterintuitive to protecting the longevity of the egg industry in Europe. Major disease challenges will not only impact producers but if national egg stocks drop this will impact egg prices all the way through to the consumer. In saying this, biosecurity practices across the industry in Europe seemed underwhelming considering the risks and, in comparison to what I have experienced here, with the only exception being what I experienced in the UK. I do believe even more now that Australia has some of the strictest biosecurity standards that could help provide slightly more protection to our flocks, should we move in the same direction as Europe with our production methods.

Overall there are pros and cons with all systems, however, the focus needs to be on improving the current systems that we have, not simply phasing them out because they don't comply with the perfect perception of farming. Having seen what producers in Europe had to do to transition to alternative systems, and the current challenges they face, it makes me believe even more so that logic and fact brought about by scientific research needs to be at the forefront of making decisions that inevitably will not only impact welfare but that will also have major financial and economic impacts on our industry.

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