



**A Nuffield Farming Scholarships Trust
Report**

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**What is the future of colony
egg production in the UK?**

James Corbett

July 2018

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A Nuffield (UK) Farming Scholarships Trust Report



*"Leading positive change in agriculture.
Inspiring passion and potential in people."*

Date of report: July 2018

Title	What is the future of colony egg production in the UK?
Scholar	James Corbett
Sponsor	The British Egg Marketing Board Research and Education Trust
Objectives of Study Tour	<ul style="list-style-type: none">• What are the options for the UK egg market going forward?• What is happening in other countries?• What is the definition of "cage free"?
Countries Visited	USA Australia New Zealand Norway
Messages	<ul style="list-style-type: none">• No production system is perfect – trade-offs have to be made• The definition of "cage free" differs from country to country• There could be a market for barn egg in the UK, if customers and retailers want it• There needs to be an affordable egg offering on supermarket shelves

Executive Summary

The global egg industry is at the start of a period of significant change. What's more, the change is happening fast. For the last forty years, cage and colony egg production has been the dominant egg produced and sold across the world. That is now changing as barn and free range egg production are increasing and, in some countries, legislation is being brought in to ban the production of caged egg. This change is coming about after pressure from NGOs over perceived animal welfare concerns, and large multinational companies are focusing more attention on how and where they source their agricultural products.

Currently the UK egg market is predominantly split between colony and free range egg production, with the split around 45% and 55% respectively. Retailers and some food companies have made commitments to stop selling and/or using colony eggs from 2025, preferring to have cage free eggs instead. This is a relatively short time frame to change a supply chain that only very recently invested in the colony egg production system.

The main aim of the report was to look at what was the alternative to colony egg production for the UK and how other countries in the world were tackling the same question. In most other countries there is a proportion of barn eggs which is an indoor, non caged production system. However, this has never really established itself in the UK with only a small number of eggs produced under this method. Producers and packers were visited in USA, Australia, New Zealand and Norway as these had strong correlations to the UK market or consumer trends.

Customers are wanting more cage free eggs - but what does cage free mean? Is that more free range eggs or is it more barn eggs? The answer is different for each country. There are a number of factors that influence this such as climate, affordability and disease. However, in both choices different interpretations are appearing. These were clear to see in things like production system design, size and scale and marketing.

The UK has by far the most developed free range egg market. A choice needs to be made whether the market moves to predominantly free range egg, or whether the barn egg sector is grown considerably. Whatever the outcome it will require substantial investment, and it is key that the right decision is made. It is important this is made with full customer and retailer support to allow commitment and confidence to be built on. The UK egg industry is one of the best in the world and part of this is down to its customer focus and ability to adapt. Its continued success depends upon continuing to be successful at these, but it has an important decision to make.

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DISCLAIMER

The opinions expressed in this report are my own and not necessarily those of the Nuffield Farming Scholarships Trust, or of my sponsor The BEMB Research and Education Trust, or of any other sponsoring body.

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Chapter 1: Introduction

I live on a farm in Wiltshire with my wife Laura and our two children. My wife is the third generation on the farm and was a dairy farmer until a couple of years ago. Now she is slowly building a herd of White Park Cattle and Boer goats for meat production.



Figure 1: The author,
James Corbett

I grew up with my brother on a family farm which my parents started in 1975. My parents were egg producers and farmers, and in the early days my mother looked after the production and my father sold the eggs. From an early age I remember my parents encouraging my brother and me not to return to the farm until we had gained skills and experience elsewhere which we could bring back to the family business.

I have always been confident with numbers and spread sheets. After obtaining a first class honours degree and a postgraduate Masters degree in International Financial Analysis at the University of Newcastle upon Tyne, I decided that a career in accountancy was a good place to start. I joined Deloitte (previously Deloitte & Touche) in their Agricultural and Food team in Cambridge. Over the ten years I was with Deloitte, I worked with a number of both large and small farmers, as well as food businesses. I was very fortunate to gain experience in seeing how large food businesses interacted with retailers and

customers as well as acquisitions, mergers and disposals.

After I left Deloitte, I joined Stonegate which was at the time the UK's second largest egg packer. It was also an egg producer and pullet rearer. I became Managing Director of Stonegate and remained with the business for a number of years until the part sale of the business in 2016. I am now the Managing Director of the remaining part which became Ridgeway Foods - a producer and packer of colony egg, and pullet rearer.

I would like to thank the BEMB Research and Education Trust for their generous sponsorship and support through my Nuffield Farming Scholarship.



Chapter 2: Background to my study topic

In the last 24 months, the global egg industry has seen many discussions and debates over production systems, especially in developed countries. Animal welfare groups have been placing enormous pressure on retailers over concerns of intensive production methods in the poultry industry. For example, in the USA we have seen large food companies such as Walmart making a commitment to a 'cage free' egg supply chain. The UK has not escaped this movement with the supermarkets announcing a phasing out of colony egg by 2025 due to animal welfare reasons. The move came after Aldi in Australia announced the same move, following a long campaign by animal rights campaigners.

Across the world, the type of egg production method varies country to country. The four production methods are organic; free range; barn; and colony or caged production. Each system is a variance of three key pillars - cost of production, resources utilised and perceived animal welfare differences. The balance of how these are used in each production method varies. Currently at UK retail level, approximately 37% of eggs consumed are from colony caged systems compared to 63% from alternative systems.

The last 10 years have seen a growth in alternative systems at the expense of colony or caged egg. As the trend continues or accelerates it will have a significant effect on the egg industry. In the UK, one of the main factors leading this is the perceived benefits to animal welfare, and recent retail pricing has made the shelf price differential between colony and free range much smaller.

It is not just eggs that could be caught in this movement away from intensive livestock management. Many other proteins such as broiler chicken or dairy face similar challenges, because of the intensification of the way they are managed. In certain countries around the world, animal rights organisations have considerable power. As a result the sourcing via different agricultural production methods is now appearing in the Corporate Social Responsibility plans of many retailers.

In normal circumstances a free market will decide what is produced depending upon customers' buying habits. The impact of decisions made by retailers will provide challenges to a market place. A supply chain will need time to react and invest to meet retailer requirements. The customer will still expect value in the products they buy, albeit produced by a more costly production mechanism.

A significant proportion of eggs is sold through retailers and a reduction in colony eggs sold in stores, (for whatever reason), will require a fundamental restructure of the UK egg industry to replace the current colony egg consumption. It is important to understand what the future trend might be and what are the factors influencing any movement. In Germany they have committed to a country-wide ban on colony cage production systems by 2025.

The caged egg has always been seen as the value offering to customers. A big question that needs answering is: what will be the value offering going forward?

What is the future of colony egg production in the UK? ... by James Corbett

A Nuffield Farming Scholarships Trust report ... generously sponsored by the BEMB Research and Education Trust

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Chapter 3: Where did I go and why

The hardest part about planning where to travel overseas was picking countries where examples of what they were doing would have relevance here in the UK. While the concept of cage free appears to be clear in its definition, how the market is interpreting it in terms of production systems differs. The growth of cage free – i.e. away from caged and colony egg production - is progressing faster in developed countries rather than developing countries. So while egg consumption per capita is far greater in countries such as China, India and Brazil, I felt the answers to my questions were to be found in markets similar to the UK's.

I visited the United States of American (USA) twice during my Nuffield Farming study trip. It is a vast country with a substantial population and this lends itself to operating agriculture on a large scale. The space has meant that large farms with over a million laying birds in a number of multi-storey sheds have been built in recent years. The USA has also seen a very strong demand in recent years for cage free eggs and new sites have been built to supply this demand. New sites means new equipment and new designs and it was partly this I wanted to see.

I have always felt that the Australian egg market has many similarities to ours. Apart from the obvious language and cultural comparisons, it does seem to be a favourite destination for one or two UK egg buyers wanting a change of scenery for a few years. Just like the USA and the UK, they are starting to see an increased demand from retailers for cage free eggs. I was keen to understand what their market was going through. Unlike the UK which has an established free range market, the Australian egg industry has only recently defined a free range code of practice setting out rules and practice for how free range eggs are produced.

I wanted to go to New Zealand to see how they were dealing with the demand for cage free. I knew that they were going through an update in their egg laying protocols which would define egg production for the next 10 years. For me it would be interesting to see what the findings of this were and how this would influence investment by egg producers.



Figure 2: The perfect view - across the road from a chicken farm in New Zealand



I also want to point out why I did not carry out any significant travel in Europe. Having worked in the egg industry for a number of years I have been fortunate to visit a number of farms in Holland, Germany and Italy in that time. Holland has a well established barn egg production market and one that I have seen a few times including new ideas such as the Rondel system. I wasn't sure this was the obvious answer to what was needed in the UK and so I wanted to look further afield.

Finally I wanted to look at some of the initial thoughts being considered in the UK. Barn egg has been sold in only one retailer (J Sainsburys) for a number of years as their entry level "Basics" range. It's a range I don't think the consumer understands and one that has not seen growth in a number of years. The barn production system supporting these sales is underinvested and I would personally not be surprised if Sainsburys were to drop this line going forward and sell free range eggs only. In view of the news of a proposed tie-up between Sainsburys and Asda it will be interesting to see what will happen in terms of the eggs sold by each business.

Terminology relating to the housing of laying hens in the UK

System	Housing
Battery cages	Conventional battery cages, each cage (depending on size) housing approximately 4-6 hens in a barren environment. These were banned in the UK from 1st January, 2012.
Colony	The only form of "caged egg" in the UK and EU now is the colony system. Birds are housed indoors in large cages holding, dependent on their size, 40-80 birds in one colony. Such cages include a scratching area, perches and nest boxes.
Barn	Hens are housed in sheds and able to move freely throughout. Perches, nest boxes and material for dust bathing are provided but hens have no outdoor access
Aviary	Hens are kept in sheds with freedom to move throughout; and perches, feeding and drinking lines, and nest boxes are provided in several different tiers. Birds have no outdoor access.
Free range	Similar to aviary, the hens are in sheds but have outdoor access during the day. They are housed at night.
Organic	Always kept on a free-range system but additionally must be fed only organic feed and housed on organic land.



Chapter 4: A snapshot of the picture today

Eggs are a very popular food all over the world. They are eaten on their own, as part of a dish, or as an ingredient in a recipe. This popularity ultimately leads to countries across the world having large egg-laying chicken flocks. In essence an egg is an egg – easily recognised and known by everyone.

However, eggs come in different colours and sizes and are produced from different production systems. As I mentioned before the main production methods are organic; free range; barn; and colony or caged production. Across the world there are some common characteristics in these production methods but there are also some differences country to country. For example this could be stocking density inside a barn shed or outdoor ranging space for a free range shed.

Another big difference is the one between colony and conventional cages. The largest number of caged birds across the world are kept in a conventional cage with the colony cage being seen predominantly in the European Union (EU). In the EU the movement from conventional cages to the colony system was a legislative change under The Welfare of Laying Hens Directive (EU Council Directive 1999/74/EC with effect from 1 January 2012 and prescribed requirements for the housing system).

Appendix 1 at the end of this report shows the main egg producing countries in the world who are members of the International Egg Commission, and their national flock numbers as from the Commission's Annual Review (September 2017). Retailers and food companies across the world have made commitments about moving all or some of their egg purchasing to cage free by a future date. This date varies from country to country but 2025 is certainly popular amongst many including in the UK. You can see by the sheer number of birds in colony or conventional cage system, that this move will mean a significant change to the global egg industry.



Figure 3: This large banner was hanging above the egg fixture in an Australian supermarket

The percentage movement to a cage free system (whether it be barn or free range) will be different in each country. For example some already have an established free range industry while for others they could be introducing free range for the first time. There are also other considerations such as the land, labour and resources needed to facilitate the change.



One other big factor to consider is the cost of production. The colony and conventional systems have a lower cost of production than the cage free alternatives. This cost of production will be a key factor determining the growth of cage free production in each country.



Figure 4: A new cage free site in a remote location in the USA



Chapter 5: What is cage free?

It should be a very simple question to answer. However, although this word is being used across the world it doesn't explain to the consumer which production system has been used to produce the eggs. "Cage free" includes organic, free range and barn systems – all production methods where the birds are not enclosed in a colony or cage. To make matters more complicated, the production methods have different definitions depending upon the country and relevant legislation in place. While organic and free range eggs will primarily mean the chicken has access to outdoor space, stocking densities, feed composition, and the amount of outdoor space per bird could well differ.

Certainly in the UK free range has become a brand itself. The Oxford English dictionary defines free range as:

"(of livestock, especially poultry) kept in natural conditions, with freedom of movement"

The term is probably better known in relation to egg production but is also being used with outdoor pork and by assurance schemes such as Freedom Foods. It is a word that is easily understood by consumers too.

When we talk about cage free, I still believe the detailed definition is in its infancy across the world and is one that is not known well by consumers. Overseas, I would say that the term cage free is generally used to describe barn egg production. In the UK barn egg production has struggled to grow in sales volume. Traditionally consumers have not really understood what it means and have either opted to pay more for free range or less for colony egg. One country where barn egg production has grown is in Holland. In recent years there has been a growth in aviary barn production systems, a more open system.



Figure 5: An egg carton in an Australian store



On my travels I have been able to see new barn egg (or caged free as it is being called) systems in practice. One thing I have found is that it is difficult to define what “good” barn production looks like. Over the last couple of years, equipment manufacturers have been rushing to get their cage free equipment out in the market place. There is a substantial difference in how you manage the bird in a colony or caged environment compared to when they are in a barn. Egg producers have had to adapt and learn these differences.

It is definitely a steep learning curve for many. I have talked to many people during my travels and visited a number of farms. When looking at the differences they are experiencing between cage free and the caged system, the main issues found are:

- Increased floor eggs
- Increased system eggs¹
- Increased mortality
- Increased feed consumption
- Increased pecking/aggression

All of the above factors have a negative impact on profitability and raise the cost of production. In addition the working environment for the staff is harsher. On some farms dust masks, safety glasses and bump hats are now used regularly. Staff are getting scratched by the birds when carrying out their duties (the white bird in particular has a longer toe nail than the brown bird). In areas where it is difficult to attract and retain staff, this is not helping with the recruitment process.



Figure 6: Another egg carton in Australia

¹ System eggs are eggs laid on the system instead of in nest boxes. For example eggs laid on muck belts, standing areas and off perches – but not on the floor.



In the UK the growth in free range over the last decade or so has meant we have now been managing birds in non cage systems for a number of years. Therefore we have learned how to manage the non-caged bird and get the best out of her. We have changed and improved our management techniques over time to learn the differences needed as opposed to the colony or caged systems. However, I would question whether we currently have enough experience of barn egg production in the modern systems to have all the answers. The example I would give is that we know that multi-aged colony sites work well and any challenges can be controlled to limit the spread between sheds. We know that multi-aged free range sites do not work in terms of production and management when compared to single-aged sites. So where does barn sit in this example? We simply don't have enough evidence from enough sites to answer that.

I would question whether we currently have enough experience of barn egg production in the modern systems to have all the answers.

For me, if there is a future in barn egg production in the UK, the choice of whether it is an intensive or aviary-styled system could be a deciding factor. The aviary system, I believe, is a more open design and furthest away from colony and cage systems. The difference will be clearer to the consumer. However, the industry should engage with customers and welfare organisations as it starts on this journey to ensure the correct decision is made before substantial investment is committed.



Figure 7: An egg carton in New Zealand - strong marketing against caged eggs



Chapter 6: Is free range the answer?

In the UK the free range egg market is well established. Consumers understand the concept and the market is well defined and structured.

Traditionally in the UK we have seen a three-tier structure in terms of cost of production between the different types of system. Retail pricing typically mirrors this. Organic eggs have the highest cost of production as organic land and organic feed cost substantially more than the non-organic equivalents.

The free range egg cost of production is more than colony, and producers get paid a premium for their eggs. When travelling to other countries to see free range egg production in operation, there are common themes as to why. For example, producers told me free range egg production has on average higher mortality than colony or conventional cage egg production. Bird performance (number of eggs) is worse and there is potentially an increase in the number of second quality egg. In addition, there is a requirement for land for the birds to range on, and the cost per bird to build a new shed is substantially greater.

In the USA, antibiotic usage is very topical especially in the chicken meat sector and you will see meat being sold as “antibiotic-free” on supermarket shelves. There is a significant amount of work ongoing in the UK to reduce levels here too. In Europe there is focus on antibiotic usage in all protein production and measurement of this is starting to take place. As colony and cage egg producers told me, their production methods have on average very low levels of antibiotic usage compared to free range egg production. The movement to more free range egg production will provide greater challenges in managing this issue.



Figure 8: An egg carton in Australia promoting a vegetarian diet



Figure 9: An "egg" for vegans using plant based protein. As seen in the USA.

We also cannot ignore the greatest challenge to free range poultry – the growing threat of Avian Influenza. Although this has been around for decades there have not been many episodes in the UK. In 2014/2015 the US poultry industry was hit hard by avian influenza. In a very short time, over 50 million birds were slaughtered costing the US poultry industry £1.3 billion in trade losses². This loss was a small percentage of the US egg laying flock but, in comparison, it would be more than the whole of the UK egg laying flock. Since, the US poultry industry has invested millions in increasing its bio-security on farm.

In 2105 we also saw avian influenza in a UK egg laying flock for the first time in over a decade. This was an isolated case but it was a stark reminder of the destruction of the disease. The economic impact was substantial as the UK lost its country-free status meaning that exports of poultry meat were stopped. During 2016 and 2017 more cases of avian influenza were detected in wild birds but not in a commercial poultry operation. We can't dismiss the fact that the risk we will have another case in a UK commercial poultry flock, in the near future, has increased significantly in recent years. This risk will increase as the UK free range flock size continues to grow.

We also cannot ignore the greatest challenge to free range poultry – the growing threat of Avian Influenza.

If the UK moved to a free range egg market only, given the current bird numbers, a large land requirement would be needed for the additional 17 million birds. On a rough calculation based on 1 hectare per 2,000 birds, this will mean 8,500 hectares (or 21,000 acres) would need to be found and allocated to free range egg production. This is a large land mass to find, but not unachievable.

On the assumption that the sheds built will be 16,000 birds per shed, this equates to 1,062 sheds. These sheds will require planning permission and in some case IPPC permits. This is again not unachievable but it would take time to put this supply chain in place.

² Costs of US avian flu outbreak in 2014/5, Tony McDougal, Poultry World, 5 January 2018



One factor I did see on my travels was the problem of fowl-sick land. This occurs when the range area outside the free range shed builds up disease in the ground after repeated flocks. This can be managed by analysing the soil on the range and undertaking a management plan to balance out the soil health and by resting the land. However, very little land is rested in the UK between flocks. It will take around 10 years to see the full effect of this lack of resting, but over time the production levels of the farm will drop as birds pick up more challenges and disease issues.

In Australia I saw a farm where there were two sheds in separate fields and the production alternated to allow one site to rest each time. This is easily done in Australia as land is much cheaper than in the UK, and therefore would be difficult to replicate here. Over the last few years we have started to see the effect of fowl-sick land issues appearing in the UK. As the UK free range flock increases in the future, we will undoubtedly start to see more and more of this.

Beak tipping is something the industry is monitoring and evaluating regularly. The majority of UK's egg laying birds are beak tipped at the hatchery before they go to the rearing farm. In this process the hook at the very end of the beak is removed and if an aggression problem in the flock occurs, a very sharp weapon has been blunted. Germany has banned this process, and Holland is moving away from it where they supply the German market. In 2015 there were discussions in the UK about a ban but the evidence did not support this and so it was not progressed.

There is always a risk of aggression coming into a flock of birds, but the risk is reduced in a colony system. If there is any sign of aggression in colony or barn egg systems it can be more easily controlled, whereas in free range it is more difficult.

The majority of recently built commercial free range sheds contain 16,000 birds. This is probably a far higher number than is perceived by the public. Free range sheds have grown from smaller sheds 10 – 15 years ago to the large sheds they are now. This is only a perception point but one the free range industry will have to tackle going forward as the spotlight will be focused more on this type of production.

6a. Liquid egg flocks

Eggs are also a very important food ingredient and are used in a number of recipes and food manufacturing products. In many countries in the world this supply of egg to processors for the liquid egg market is provided by producers who have dedicated sites producing egg for processing. In the UK nearly all of the liquid egg comes from second quality eggs which have been downgraded due to imperfections. This could be for example a small crack, misshape or a dirty egg.

There are a number of benefits in having flocks producing only for the processing market. This includes guaranteed supply and simple traceability back to the farm. In the UK it has been more commercially viable for a producer to sell eggs to a packer as table eggs, rather than to a processor for liquid. This is one of the reasons that a substantial proportion of the liquid egg currently used in the UK is sourced from overseas.

Liquid egg is another area where supermarkets and retailers need to give the UK egg market direction. A commitment to buy British cage free egg for their own-label products, would also provide an



increased demand for either barn or free range eggs and help grow the market in these products. This would provide greater certainty to producers who were thinking of producing barn eggs.



Figure 10: Liquid egg products on sale in a supermarket in the USA

6b. White eggs

In the UK the vast majority of eggs on sale in supermarkets are brown eggs. However, other countries in the world sell white and some sell both. The colour comes down to a breed choice and a lot of why each country has each colour is down to history, tradition and regional breeds. As genetic improvements have increased over the last 20 years, there are some minor differences between the brown and white bird. These include, for example, feed consumption, egg numbers and docility.

The white bird is the bird of choice for the liquid egg market across the world. Eggs are processed and sold in their liquid form as whites, yolk or whole egg for example. The end user of the product will not know if the shell was brown or white. On a supermarket shelf the difference is very clear. The UK has been a brown egg market for long time. Over the years, retailers have tried white eggs in small quantities or promotions but they have never really taken off with the customer.

If the UK was able to embrace white eggs then I do think there would be some benefits. Some of the characteristics of the bird would assist producers as we move to a position where beak tipping will end and it would also help in terms of lengthening the laying cycle. In order to get white eggs into retailers and the customer buying them, it would need to be supported by informational advertising. This would need to explain the fact there is no difference, just the egg shell colour. It would be an easier proposal for the liquid egg market to adopt but I don't think it will happen until we have more producers with designated flocks for processing.



Chapter 7: Retailers

I have never worked for a supermarket but I would love to have done so.

I am a huge supporter of the retailers in the UK. I find them absolutely fascinating. I have been fortunate to work with a number of them, and with one very closely as a strategic partner. In the UK, the majority of people do their main food shopping at a supermarket meaning the latter have a very powerful shopping window; while in Australia and New Zealand, for example, there is still a strong presence of markets which provide an alternative.

For a supplier, supermarkets are a fantastic way to grow your business and I have always found them receptive to new ideas and innovation. Shelf space is very valuable and if your product doesn't sell it will be delisted very quickly. The UK supermarkets are extremely competitive with everyone trying to drive footfall, frequency and penetration.

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What I really enjoy is seeing how consumer trends and patterns play out. Decisions are made at retail level (sometimes with the supplier and sometimes without) but there is always a prediction on what the likely customer reaction will be. Sometimes it's the surprising outcomes that reveal the most.

For example, in April 2014 one UK retailer announced an aggressive round of price cuts to over 30 basic food products. These items included baked beans, tomatoes, butter and eggs. A six-pack of medium free range eggs was reduced from £1.38 to £1. Not surprisingly over the coming weeks and months other retailers made their own price cuts. Today that same pack is retailing at £0.89. In the last three years we have seen an increase in the volume of eggs purchased and consumed. Eggs are back in fashion: healthy, nutritious, and customers love them. We are also seeing customers buying more of them. The eggs bought per capita in the UK has risen sharply. The number had been fairly stable at around 185 eggs per capita for a while but this has started to climb and will probably break the 200 eggs per capita by the end of 2018.

Back in 2014 I did not think that a drop in the retail price of eggs would have driven the volume increase like it did. It is not the sole reason for the volume increase but in my opinion it was a significant factor. The price drop of free range eggs made the difference between them and colony eggs much smaller. Customers did put an extra pack of eggs in their basket and for some colony egg buyers it meant they could now afford the choice of buying free range eggs.

The point I am making is that the retail price of eggs is in the sole hands of the retailers. I am fairly sure that if the free range egg price increased back to £1.38 for six medium like it was four years ago, free range egg sales would fall. However, total egg sales would not fall as much as some people would buy colony eggs instead. Since the announcement from UK retailers to phase out colony eggs by 2025, colony egg sales have not fallen substantially. I believe there are still a lot of people buying colony eggs because of their price advantage.



When I was in Australia I saw cage free barn eggs on promotion and retailing for less than caged eggs. It was not surprising customers were reaching for these instead of caged because they were cheaper. In the USA the demand by processors for liquid cage free egg has been leading the expansion. I saw there was a clear pricing structure in supermarkets with cage free eggs being more expensive than caged eggs. In late 2017 the USA's two largest egg producers halted their expansion of cage free as demand was not keeping up with the supply program. It appears that consumers were happy buying caged egg at the lower price. Both companies will now see how the market moves forward from here.



Figure 11: A very busy retail fixture in a supermarket in Australia

So why is this important to the UK? Well it comes down to the retailers and what they want to sell. The decision to phase out colony eggs was a retailer decision and not a customer-driven one. If it was, then cage egg would be delisted as demand would be falling away at a faster speed than it is. The retailers now have a decision to make. Either they become free range only, or they want barn egg as an entry level egg. The increase in free range egg and/or increase in barn egg will require new capital investment and therefore this cost will need to be factored into the cost of production.

*If barn egg is a path
retailers want to go
down then producers will
need long term
commitments from them.*

If barn egg is a path retailers want to go down then producers will need long term commitments from them. Producers will not want to invest or even be able to raise finance if this is only a short term decision before the supermarkets move to 100% free range eggs. This is why supermarkets need to think carefully while we are at this cross roads, before diving in.

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If there is not an affordable egg available for consumers to purchase, then they will stop buying eggs or look for alternative places to buy eggs.



Figure 12: Egg fixture in a supermarket in USA



Chapter 8: Legislation

As part of the European Union, the UK has a baseline for legislation in the egg industry. Over the years the UK egg industry has made additional policies on top of this baseline, through government legislation or codes of practice such as the Lion Code or Freedom Foods.

I have always been a supporter of the open market where government legislation is the last resort: the idea being that the market moves by its own accord, therefore not requiring intervention.

Germany was the first country to use legislation to ban colony egg production from 2025. It now finds itself an importer of barn and free range eggs from the rest of Europe.

When government legislation comes into play then it disrupts market forces.

In February 2018, France announced a ban on colony egg production from 2022 but only on eggs sold in supermarkets. This comes from a promise by President Macron to the WWF in 2017. The ban does not include processing eggs but, with many retailers already starting the move, it was surprising to the French poultry industry that the government has intervened with legislation.

When government legislation comes into play then it disrupts market forces. The French egg industry has already stated that 2022 is too soon for the industry to react. It will lead to an increase in costs as some producers will look to build either new barn or free range systems in a short time. This will increase competition for equipment and will ultimately inflate the cost as demand and supply become unsynchronised.



Chapter 9: The “C” word

A cage: it is a very emotive word.

In the Collins Dictionary³ it is defined as:

“A cage is a structure of wire or metal bars in which birds or animals are kept”

A message I have heard many times on my travels is that *“poor welfare equals poor performance”*. I can understand where egg producers are coming from. A sustainable egg business is not viable if you have no eggs to sell. Chickens will not lay eggs if they are ill or suffering from poor welfare conditions.

One American egg producer told me his cage egg performance was better than his barn performance. I don’t think any egg producer will argue against the fact that a good colony or cage egg flock will outperform a good barn or free range flock. It’s one of the reasons that free range egg producers need a premium for their eggs compared to a colony egg producer. The greater output and performance of caged egg production leads to a lower cost of production than the other production systems.



Figure 13: A large new cage free farm in USA

There are also differing opinions on the perception of a cage. Across the world there is the conventional cage system, and the colony system predominantly seen in Europe. However, can restricting outdoor access such as in a barn system still be called a cage albeit a large one? Certainly

³ <https://www.collinsdictionary.com/dictionary/english/cage>

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there is a view from certain parties that free range should be the only option for egg laying birds. The colony system and the conventional cage are very different systems and the colony system allows for greater movement in the egg laying system. There is certainly a perception that as the birds are in a cage that must mean bad welfare conditions for them.

When the colony system was introduced in the UK it was poorly communicated to the public. There is still a misunderstanding amongst some in the UK that battery cages are still in use. Egg cartons and packs still display the egg type as “caged egg” and so it is understandable that consumers still think that the productions systems are the same.

In this report I am not looking to explore which production system is better, and I don't think it's that simple. Plenty of research has gone into this subject with each production method having its own positives.

When the colony system was introduced in the UK it was poorly communicated to the public. There is still a misunderstanding amongst some in the UK that battery cages are still in use.



Chapter 10: Feather covering

Research work into feather cover has been going on for a number of years by some very intelligent people all over the world. Many learnings have been found and improvements made either genetically or in terms of management. Yet as we still continue to research this area, I still think there is much more to understand. It is also a subject that people have strong opinions on. While I do not have the answers, I just want to share some of the comments and observations I have come across during my travels.

Now to be clear, I am not talking about the process of induced moulting. While it is not allowed in the EU, the process does take place in some countries. Many egg producers across the world are experiencing farm break-ins and film footage being posted onto social media or in newspapers. It doesn't matter which production system it comes from, but one image or theme that appears regularly is chickens with poor feather cover. The implication is that poor feather cover equals poor welfare.

In my experience this is not always true. Poor feather cover does not categorically mean poor welfare. However, it can be an indicator. Veterinarian Peter Cargill says:

“Poor feather cover in laying hens is not solely a direct consequence of poor welfare conditions. There are a number of other factors that could lead to this, such as the age of the bird and nutrition. Poor feather cover is seen in all production types including free range and is usually found when the birds have been exposed to some sort of stress or challenge.”

No two flocks are the same in egg production. I have seen very well-feathered 76-weeks-old colony birds and I have seen very poor-feathered 40-week old free range birds. The loss of feather is due to a stress on the birds which could have come from disease, lack of nutrition or another challenge placed on the flock. Genetics and breed will also play a role in this. I have spoken to producers who have had consecutive flocks using the same rearing shed, breed, feed ration, staffing etc but have seen very different results relating to feather cover. Certainly in the UK I believe a lot of focus is placed by customers on the appearance of the bird even if production levels and mortality levels are both excellent. On my travels I saw a barn flock that on paper was performing well and ahead of any breed standards but when I saw the flock the feather cover was at 50% (in my estimation).

It is easy to spot in a flock whether feather loss is down to aggression and feather pulling, rather than a challenge on the bird. At a producer meeting in the USA I remember a farm manager telling me that, as humans, we lose our hair as we get older. Some people lose it sooner than others. Birds lose feathers as they age too, but it doesn't mean they are badly treated. Unfortunately a poorly feathered bird is not pleasant on the eye whether it be in a cage unit or in a free range shed. In a caged or barn unit the environment is temperature-controlled and the bird has access to feed and water close by. In a free range shed where the bird ranges outside it may find it colder with a reduced feather covering.

I am sure that research work will continue into feather cover work. Egg producers will continue to seek improvements in this area in the hope that one day we can find a balance of consistently well feathered birds flock after flock.



Chapter 11: Intensification

Big is bad apparently. If you are a farmer that is a statement you have probably heard and if you are a large farmer, it is an accusation you will have received. One of the things you soon realise when you travel is how small the UK is as an island, while at the same time how densely populated it is. You can drive from top to bottom in a day and queue hours in the traffic too.

Every country will have parts that are inhabitable due to terrain, weather or logistics but there is no hiding the fact that the UK does not have a lot of spare space. Travelling around the USA, Australia and New Zealand you can see large farms and scale farming in play.

Consider this hypothetical cage free (barn egg) example:

There is a large six-lane highway road that runs north to south. Within 10 miles west of the highway there are five egg farmers. Each farmer has eight sheds of 25,000 birds spread over four fields. This totals 1 million birds in 40 sheds in the 10 mile area. Whilst 10 miles east of the highway there is one farmer with 1 million birds in 10 sheds which are a mixture of double and triple decker level sheds.

The space per bird on each site is exactly the same. The cost of production of the egg will be far lower for the egg farmer east of the highway, as he/she will obtain economies of scale and incur a lower capital cost to build.

This is where it comes down to perception. If both sites are well run sites then there is no difference in the egg quality, taste or bird welfare. However, the single large site would be labelled “intensive” and “a factory farm” by some.

In the USA I visited a number of large sites. They are well run and incredibly impressive in terms of construction and operational running, with some very good people working on site. Even for me, the scale at first is something that is staggering. However, when you break it down it is no different than running the same number of birds but on smaller sites. It’s actually less lorry movements of feed and eggs because you can use bigger lorries.

Scale however gives significant operational efficiencies. These deliver a lower cost of production which ultimately gives a lower cost of the eggs on the supermarket shelf for the consumer. A win-win - or is it?

In the UK it is relative. We don’t have the space to do this and people don’t want to live by these sites. Certainly in the USA these sites were not near any towns and the only properties nearby were staff housing.

Farming on this scale is not just within the egg industry. Dairy farms, pig farms and broiler farms across the world are built on scale sites. The dilemma we have in the UK is: if we don’t want to see these sites being built, then we have to understand the cost of production will be higher and ultimately will lead to higher prices on the supermarket shelf.



Figure 14: A large cage free farm and packing centre in USA

In 2009 and 2010 the UK saw its first large-scale dairy farm looking to be built at a place called Nocton in Lincolnshire. There was huge media interest and it was labelled a “super dairy” and a “battery farm for cows”. The story is well documented on the internet but the outcome was it was never built.

When I joined the egg industry in 2010, I remember one of the first decisions I was part of was signing a contract for a free range producer building a new 16,000 bird shed. There were only a few 16,000-bird sheds around at the time; most were 12,000 or less per shed. Today in 2018 you would look to build your free range egg site with two back-to-back 16,000 bird sheds as minimum, and build a 64,000-bird site if you could.

Scale is not something the egg industry should be afraid of and it is certainly something consumers should not be concerned about either. The industry needs to bridge the gap between perceptions and take the consumer with them on the journey.



Figure 15: Large cage free site in USA (front)



Figure 16: Large cage free farm in USA (back)



Chapter 12: Rearing

To build a solid house you need good foundations. To have good egg production you need a good pullet.

Around the world a number of egg producers also rear their own pullets. The value in a pullet lies in its ability to perform at its best at the laying farm. Many producers rear their own pullets and don't rely on individuals or companies to rear their birds for them. However, as this is not always possible, in some countries there are companies and individuals rearing pullets for a number of different egg producers. Where this happens in the UK the market is heavily focused on producing pullets at a certain price point.



Figure 17: A good quality chick is important too.
(Historical photo, source unknown)

I have always believed that rearing is the key to good performance in the laying shed. As such, the companies I have worked for have always reared their own pullets and have invested in rearing systems. The strategy has always been to achieve the best pullet to transfer to the laying farm. This may not deliver the cheapest pullet but we knew any additional cost could be recovered by performance on the laying site.

We have also reared birds for other people in the market. One of the things that has always surprised me has been the very few visits made during the rear by the egg producers who were buying these birds. While we kept information on body weight and evenness of the flock, we found that this information was rarely asked for by many customers.

When I travelled overseas I found the larger egg producers shared my views and I saw plenty of modern rearing systems. This was delivering really good results on the laying farms. The UK rearing market has not had a significant amount of investment in it over the last 15 years. As laying sheds have increased in size over the years, the rearing sheds have fallen behind. This means that some egg producers have found themselves in a position of having to have pullets from different rearing farms. This is not an optimum position from either disease or bird performance perspective.

The UK rearing industry needs investment. Nearly all colony egg producers rear their own birds but this system cannot be used for barn or free range pullets. As barn or free range bird numbers increase to replace colony birds then the rearing capacity needs to increase too. The increased risk in Avian Influenza (AI) and bio-security requirements will all add pressure on these old sites.



The challenge is that the investment required will increase the cost of pullets and it is uncertain whether egg producers will be willing to pay the increased cost. The rearing supply will increase, but only when the economics makes it viable to do so.



Figure 18: Modern rearing farm in USA



Chapter 13: What is the best production system?

If you have read the title to this chapter and are now looking for me to give the answer, I am afraid I must disappoint you. I am not sure you can give one answer for all stakeholders involved in the production, management and consumption of eggs as they will have competing requirements. Research and analysis of housing systems has gained momentum recently and with the market movement to more cage free, there has been a demand for it. I am no expert in this area but I can see that there will be a differing of opinions.

The Coalition for Sustainable Egg Supply (CSES) is “a multi-stakeholder group comprised of leading animal welfare scientists, academic institutions, non-government organizations, egg suppliers, and restaurant/foodservice and food retail companies”⁴. This included United Egg Producers, McDonalds and Michigan State University for example. Their aim was to evaluate the colony and aviary (barn) system against the conventional cage system in the USA. The report was published in March 2015 and was based on two flock cycles over four years. The report looked at food affordability, worker health and safety, environment, food safety and hen health and wellbeing. In the final report, Dr Janice Swanson said:

“With these science-based research results, we have a better understanding of hen housing sustainability and can provide that information to industry stakeholders to support informed decision-making.”⁵

Dr Joy Mench added:

“The research found there are positive and negative impacts and trade-offs associated with each of the three hen housing systems. Depending on the goals and perspectives of a food production company, egg producer, or other food system stakeholder, those trade-offs may be weighed differently”⁶

The report sets out the positives and negatives of each system and there are trade-offs to be had on each system compared with the current conventional system in the USA. For example the aviary system scored well on bird behaviour against the other two systems but poorly in worker health and safety and environment.

At the International Egg Commission conference on 13 September 2017 in Bruges, Peter van Horne⁷ presented a paper on the “Analysis of layer housing systems”. The paper was looking at the housing systems from a sustainability point of view. The main components of sustainability were People (social dimension), Planet (environment) and Profit (economics). Depending on their weighting, these three factors could have a direct relationship on the choice of housing system. For example, if economics is

⁴ From www2.sustainableeggcoalition.org

⁵ Dr Janice Swanson, CSES co-scientific director, and professor of animal science at Michigan State University. Quote taken from a the final press release on www2.sustainableeggcoalition.org

⁶ Dr Joy Mench, CSES co-scientific director, and professor of animal science at the University of California, Davis. Quote taken from a the final press release on www2.sustainableeggcoalition.org

⁷ Peter van Horne is a senior economist at the LEI Institute of Wageningen University and Research Centre in the Netherlands

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the main focus then the colony system produces the lowest production costs. If the main focus is the environment it would show that free range has the highest CO₂ equivalent per kg of egg, 13 percent higher than colony egg production⁸.



Figure 19: ⁹ (taken from Peter van Horne's presentation to IEC Conference 13 September 2017)

Further work has also been carried out in the Netherlands¹⁰ in assessing the sustainability of egg production systems. The research paper published in October 2014 found that colony egg production was the most sustainable of the four productions systems in the Netherlands when looking at social, economic and environmental indicators. In the paper the authors describe how *"indicators were selected within the social, environmental, and economic dimensions, after which parameter values and sustainability limits were set for the core indicators in order to quantify sustainability"*.

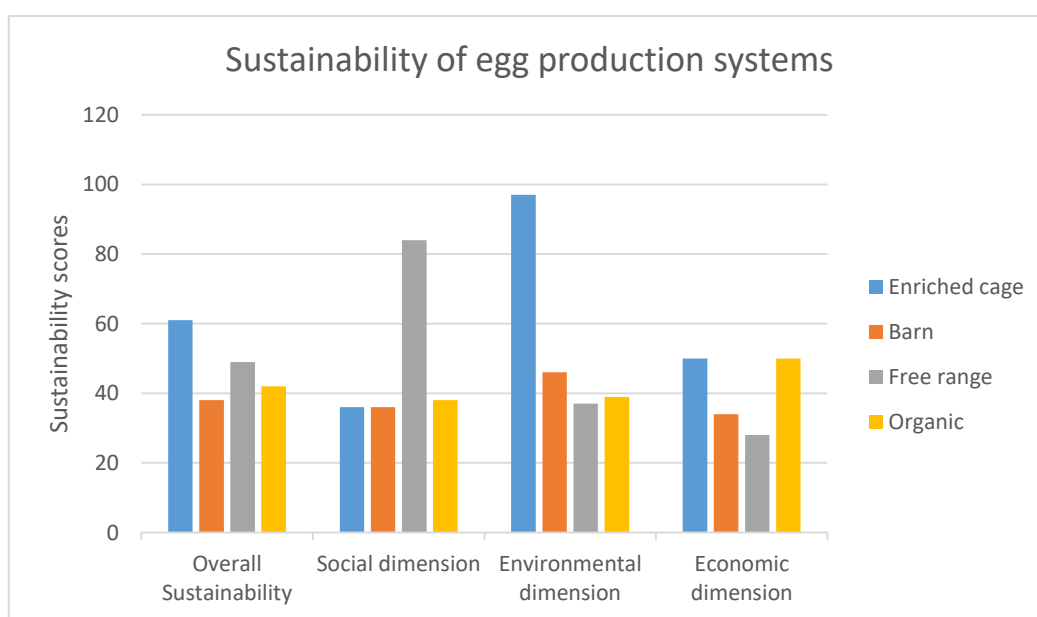


Figure 20¹¹

⁸ Blonk in ABN Amro report 2011

⁹ Taken from Peter van Horne's presentation to IEC Conference 13 September 2017

¹⁰ E. D. van Asselt, L. G. J. van Bussel, P. van Horne, H. van der Voet, G. W. A. M. van der Heijden, and H. J. van der Fels-Klerx, Poultry Science 94,1742–1750

¹¹ E. D. van Asselt, L. G. J. van Bussel, P. van Horne, H. van der Voet, G. W. A. M. van der Heijden, and H. J. van der Fels-Klerx, Poultry Science 94,1742–1750

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While colony egg was the most sustainable, free range had the highest score in social dimension. The authors acknowledge that their study included only a limited number of welfare indicators with the core ones being housing density and percentage mortality over 20 weeks. They conclude that their results are comparable with Shimmura et al¹² where the welfare assessment was based on the five freedoms. (*The five freedoms are: freedom from hunger and thirst; freedom from discomfort; freedom from pain, injury, and disease; freedom to express normal behaviour; and freedom from fear and distress. As developed by the Animal Welfare Council - FWAG 2009*).

One of the main reasons UK retailers are moving to cage free sales is after pressure from NGOs and welfare groups. At the World's Poultry Science Association's meeting in April 2018, Dr Vicky Sandilands¹³ challenged whether the evidence presented in favour of cage free systems is balanced. In an article in the Poultry World magazine¹⁴ which reported on Dr Sandilands's presentation, it describes how she presented her views set against the five freedoms. For example non-cage systems are more likely to experience injuries and disease than colony or cage systems, because birds move around and increase the risk of keel bone damage and other injuries. In addition, Dr Sandilands says that non-cage systems offer no clear advantages over colony cage systems and that dominant birds may displace other birds from feeding in linear trough systems where these offer the minimum length per bird. This could challenge the freedom from thirst, hunger and malnutrition.

This relationship between the competing priorities of stakeholders, customers and policy makers is key, and understanding it is very important when making decisions.

This relationship between the competing priorities of stakeholders, customers and policy makers is key, and understanding it is very important when making decisions. What is obvious is that there will be trade offs to be made for each production system type. The balance over which is more important will ultimately have to be left to the market and to consumers to make the choice. When making the decision there will have to be greater understanding and transparency as to what these trade offs are.

¹² Shimmura, T., M. B. M. Bracke, R. M. De Mol, S. Hirahara, K. Uetake, and T. Tanaka. 2011. Overall welfare assessment of laying hens: Comparing science-based, environment-based and animal based assessments. Anim. Sci. J. 82:150–160.

¹³ Dr Vicky Sandilands works at SRUC in Ayre, Scotland

¹⁴ Welfare versus natural behaviour: a fine balance by Jackie Linden - Poultry World magazine, No 4 2018
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Chapter 14: Discussion

2025 is fast approaching. Egg packers are in discussions with their customers on what egg type they will require to replace colony egg – but what will they choose?

When I was in Australia, an egg packer commented to me that it is obvious barn egg would replace colony or caged egg across the world. Free range egg would of course increase in each country but the increase would be small as its cost of production would mean it couldn't become the value egg for all. It is true that in most developed countries, there will predominantly be a move to barn egg production as the replacement for colony or caged egg. This will create three clear choices for the customer: organic; free range; and barn as the value egg.

However, could the UK buck this and move to a 100% free range retail market? It is certainly a strong possibility. A barn egg supply chain in the UK will require significant capital investment and this will drive up the cost of production (substantially above colony egg) and hence the price required for it. With free range egg currently positioned on supermarket shelves at a slightly higher price than colony egg, it doesn't give much room for barn egg. Given the cost of this investment, I believe the industry will wait and follow what the retailers choose as the numbers are just too big, and long term commitment will be needed.

Another point for consideration is that free range egg could become a loss leader for retailers or a product with a very low/negligible margin. It certainly wouldn't be the first or only product to be sold this way.

It all comes back to trade offs. What do retailers want to sell? Where to they see their trade offs in the different production systems? They will need to offer eggs to their customers at an affordable price. If they choose to make that egg a free range one, then the trade off may have to be a lower margin than achieved in previously years. What happens to their liquid egg products – will they be free range or barn? Will they even be British egg?

Whatever the answer is, there is plenty of change coming to the UK egg market in the next 8 years.



Chapter 15: Conclusions

1. No production system is perfect. Each system has positives and negatives and there are trade offs to be made on each.
2. There is no agreed definition of what “cage free” stands for across different countries in the world.
3. Equipment manufacturers have developed different designs for cage free systems and some of these are relatively new. These designs will need to be updated in the coming years with feedback from producers.
4. The UK free range market has some big challenges ahead if it is to become the dominant egg production method for the UK.
5. There is a market for barn egg on the retail shelf if retailers want it. There could also be a demand for UK liquid barn egg using designated flocks. However, will it be from an intensive barn production system or a more aviary-style system?
6. In my opinion, a significant number of people buy eggs based on price. Eggs need to be available in supermarkets at an affordable price for customers – no matter which production system they come from.



Chapter 16: Recommendations

1. The UK egg industry needs clear guidance from retailers and customers if they want barn eggs in their egg offering going forward: or will it be 100% free range? This guidance needs to be communicated as soon as possible.
2. Long term commitments for barn egg supply will need to be given in order to support producers and allow investment to take place.
3. The industry should engage with external groups such as welfare groups and customers in discussions on what type of production system to build for the future.
4. The UK rearing market needs investment in new facilities in order to meet demand and produce good quality pullets.
5. If barn egg production systems are built in the UK there needs to be clear and transparent communication to consumers about barn eggs and the differences when compared to free range.



Chapter 17. After my study tour

The Nuffield Farming Scholarship has been an extremely valuable journey. It has given me opportunity to travel and see how other countries are looking at my topic. On a personal note I met a number of fantastic people over the last 18 months. I have visited some great businesses and seen a fair few chickens!

More importantly it has provided me with time. Time to think, time to reflect and time to challenge myself. Work and family commitments make us all time-poor. Aside from having a Nuffield Farming Scholarship it is almost impossible to find this amount of time to focus on a subject and visit other businesses in other countries facing the same questions.

There have been a number of key learnings that I have been able to take back to the business. A number of these are small changes or more efficient ways of doing things. I have seen some key pieces of machinery that will improve the business and I have been able to compare what we do with others, as I visited their businesses.

The road to 2025 for colony egg production has only just started but it will soon be here. Decisions will need to be made, planned, finance obtained and birds “on the ground” if the UK poultry industry is going to invest in barn egg production - or more free range egg production. The industry and individual businesses will have to work closely with their customers over the next few years to ensure that investment decisions are made in a timely manner. Ideally this needs to be with little market disruption, in terms of supply and demand, but we all know this is almost impossible to achieve.

Whatever my company decides to do as a business will be discussed in detail internally, before any decisions are made. However, as a direct result of my Nuffield Farming Study Tour I know I have a substantial amount of information to share as we go through the process. In addition, I know there will be a number of people in the industry who will be very interested in what I have seen and learned during the last 18 months.

Finally there was one other key point that I gained from my Nuffield Farming Scholarship. You can never stop learning from visiting other businesses. We hope that we will see ideas, innovations and good working practices to bring back and enhance our businesses and industry. However, just like saying no is sometimes more important than saying yes, I saw a number of things that have helped my understanding and thoughts in terms of what not to do.

James Corbett



Figure 21: The perfect office chair!
(Photo taken by the author in an egg-themed restaurant in the USA)



Chapter 18: Acknowledgements

I would like to thank the Nuffield Farming Scholarships Trust and the BEMB Trust for their generous support and help in letting me complete my Nuffield Farming Scholarship.

The support of my wife Laura was invaluable during the last 2 years when I first started with the idea of applying for the Scholarship. My periods of absences from home while travelling meant the responsibility of looking after children was not shared.

A big thank you to my family and work colleagues who allowed me to have the time off to complete this and spend a substantial amount of time outside the business.

Many thanks to my mentor Jen Hunter who was there for me when needed, and her words of advice and support.

There are a good number of people to whom I owe a substantial amount of thanks for their time, support, knowledge and for being fantastic hosts. Without them this would not have been possible especially as access on farms across the world has become more difficult with the recent avian influenza outbreaks. Of these people, many were very happy to help, but did not want acknowledgement and I am very grateful to you all.

Special thanks to Hy-line International, Lohmann, Sunny Queen and Huhtamaki. In addition, a big thank you to Paul Horan at Huhtamaki for his contacts and putting me in touch with his colleagues overseas.

See Appendix 1 on next page:

National flock numbers for 2017, as from the International Egg Commission's Annual Review.



Appendix 1

The table below shows the members of the International Egg Commission and their national flock numbers for 2017, as from the Commission's Annual Review.

	Layers (m)	Cage %	Barn %	Free Range %	Organic %
Argentina	43,100,000	87%	9%	4%	0%
Australia	20,582,000	55%	9%	36%	0%
Austria	6,570,540	2%	66%	21%	11%
Belgium	7,837,405	50%	33%	13%	4%
Brazil*	92,777,402	100%	0%	0%	0%
Canada	25,191,978	91%	7%	1%	1%
China	1,350,000,000	90%	1%	9%	0%
Colombia	49,931,586	70%	30%	0%	0%
Cyprus	350,300	68%	18%	12%	2%
Denmark	3,400,000	41%	27%	6%	26%
Finland	3,900,000	60%	33%	2%	5%
France	48,598,000	69%	6%	18%	7%
Germany	45,100,000	10%	63%	17%	10%
Hungary**	3,806,973	86%	13%	1%	0%
India	214,700,000	100%	0%	0%	0%
Iran	52,600,000	100%	0%	0%	0%
Ireland	3,381,000	56%	1%	41%	2%
Italy	41,000,000	62%	32%	2%	4%
Japan	134,569,000	95%	4%	1%	0%
Mexico	158,658,764	100%	0%	0%	0%
Netherlands	35,000,000	18%	63%	14%	5%
New Zealand	3,637,366	77%	2%	20%	1%
Poland	36,200,000	75%	15%	10%	0%
Portugal	6,450,000	95%	3%	2%	0%
Russia	148,000,000	100%	0%	0%	0%
Slovakia	6,118,177	81%	18%	1%	0%
South Africa	24,801,065	86%	0%	14%	0%
Spain	43,611,976	93%	2%	4%	1%
Switzerland	2,651,551	0%	25%	60%	15%
Turkey	98,597,000	97%	1%	1%	1%
United Kingdom	37,000,000	50%	2%	46%	2%
USA	308,960,000	89%	7%	0%	4%
	<u>3,057,082,083</u>	<u>88%</u>	<u>5%</u>	<u>6%</u>	<u>1%</u>
Europe	328,324,371	55%	26%	15%	4%
Rest of the World	2,728,757,712	92%	2%	5%	1%

* The number for Brazil is chick placements and the percentages are 2016 as no number was submitted for 2017

** The number for Hungary is chick placements

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