A Nuffield Poultry Study Group Report

Study Tour sponsored by

Elanco, EW Group, Hy-Line, Big Dutchman, Lohmann GB Limited

Study Tour to Germany
22 to 28 October 2016

Report compiled by Werner Strydom 2014 N.Sch
NUFFIELD FARMING SCHOLARSHIPS TRUST (UK)

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“Nuffield” travel awards give a unique opportunity to stand back from your day to day occupation and to study a subject of interest to you. Academic qualifications are not essential but you will need to persuade the Selection Committee that you have the qualities to make the best use of an opportunity that is given to only a few – approximately 20 each year.

Awards are open to those who work in farming, growing, forestry, or otherwise in the countryside, and sometimes to those working in ancillary industries, or are in a position to influence those who do. You must be resident in the UK. The normal age range is 25 to 45 but at least one younger candidate each year will receive an Award. You must have spent at least 2 years working in a relevant industry in the UK. Pre- and post-graduate students are not eligible for an Award to support their studies.

The Nuffield Arden Award is unique in that there is no age restriction and the subject is set by the Selection Committee. An Arden Award is offered every 2 years.

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Closing date for completed applications is the 31st July each year.
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Chairman’s Foreword

The aims of the Nuffield organisation are to promote agricultural education and to advance the standard of farming through the provision of Scholarships. Over the last 60 years the Nuffield Farming Scholarships Trust has provided over 1,600 people – with a background in agriculture, its associated industries and the rural community – the chance to travel to expand their knowledge and understanding.

Today, agriculture is a worldwide business with lessons and opportunities that can be taken from all corners of the globe. Just as the first Nuffield Scholars came back with new ideas some 60 years ago, so today’s Scholars return with new thinking, thought provoking solutions and innovative practices in all areas of food and farming to benefit themselves, as well as their industry.

The Nuffield Poultry Study Group is comprised of individuals who have been awarded Scholarships whose business interests and careers are mainly connected with the egg and poultry meat industries. The group was formed to try and continue to develop the benefits of Nuffield on an ongoing basis. Over recent years we have travelled both in Europe and further afield in order to understand the global marketplace, look at new ideas and how industries are investing for the future. In each country we have developed a network of friends and business contacts that have been mutually beneficial.

Our thanks are extended to all our hosts for their enthusiasm, effort and kind co-operation. We especially appreciate the time they have set aside to show us all aspects of their business and this will help us develop a clearer understanding of the German food and agriculture industry. We would like to acknowledge and give special thanks to the EW Group and Hyline both as sponsors and also for their help in putting together a thought provoking and stimulating programme and also to Elanco, Big Dutchman and Lohmann GB for their support of this study tour.

Dr Helen Houghton, Chairman

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# Nuffield Study Tour – Itinerary

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<td><strong>Saturday 22nd October 2016</strong></td>
<td>Depart from London Heathrow Terminal 5 to Berlin.</td>
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<td><strong>Sunday 23rd October</strong></td>
<td>Berlin river cruise, followed by lunch and afternoon sightseeing tour.</td>
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<td><strong>Monday 24th October</strong></td>
<td>Depart from hotel to walk to British Embassy. Presentation and discussion with Embassy team on German market. Presentation from ZDG (industry body representing both eggs and poultrymeat). Visit to Storkower Geflugelmas (Broiler unit).</td>
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<td><strong>Tuesday 25th October</strong></td>
<td>Train departure from Berlin to Bremen. Short guided city tour of Bremen. Transfer from Bremen to Cuxhaven. Lohmann Tierzucht GmbH, presentation on breeding, day old culling and beak tipping.</td>
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<td><strong>Wednesday 26th October</strong></td>
<td>Transfer from Cuxhaven to Hogenbogen, Visbek. Presentation on EW Group and EW Nutrition. Visit to Pilzland, mushroom growing facility. Transfer to Wildeshausen for dinner and discussion with F. Ripke president of KAT.</td>
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<td><strong>Thursday 27th October</strong></td>
<td>Visit Natura rearing farm to see aviary rearing system, laying unit and Barn laying unit. Visit Big Dutchman International HQ, Vechta.</td>
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<tr>
<td><strong>Friday 28th October</strong></td>
<td>Presentation on Wing project, a vision of modern, market orientated poultry production. Visit to Heidemark Turkey Slaughter plant. Transfer to Hamburg airport. Depart from Hamburg to Heathrow.</td>
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**Nuffield Poultry Scholars attending the tour:**
- Aled Griffiths
- Andrew Hignett
- Andrew Riley
- David Tromans
- Dr Helen Houghton
- John Reed
- Karen Simpson
- Mark Williams
- Matthew Davies
- Mike Tyers
- Rachel Watkins
- Stephen Throup
- Steve Pritchard
- Werner Strydom

**Guests and Sponsors attending the tour:**
- Jonathan Griffiths – Oaklands Farm Eggs Ltd
- Louise Long – Hy-Line UK Ltd
- Omead Serati – Hy-Line UK Ltd
- Sophie Malkin – Elanco Animal Health
Monday 24th October – British Embassy Berlin

Our study tour began with a visit to the British Embassy in Berlin. We were welcomed and given a short tour of the Embassy by Kirsten Raath (Senior Trade Advisor) who then gave a joint presentation with Suzy Townsend (1st Secretary Environment & Energy). They gave us an insight into the German poultry market. We finished the session with a very interesting discussion on how Germany views Brexit and how this is likely to affect the future relationship between Germany and the UK.

Figure 1 - The Poultry Study Group visit of the British Embassy in Berlin.

Main points from their presentation:

- Area of Germany: 357 000 km² with a population of 80.5 million people. Average life expectancy in Germany is 80.9 years.
- GDP per capita: $47,000
- A Minimum Wage was introduced on 1 January 2015 and is currently at €8.50 per hour.
- Ethnicity: Germans 91%, Turks 2%
- 2015 Migration: 1.1 million
- Germany is the second biggest agricultural producer in the EU with over 285,000 businesses (90% share of family businesses).
- Economic structure: Services 68.6% GDP, Industry 30.7%, Agriculture 0.8%
- Major Industry: car manufacturing, engineering, chemistry.
- Third largest importer of agricultural products after China and USA. Discount supermarkets are very successful as the German consumer is very price driven.

- In 2015 Germany consumed 19.6 kg per capita consumption of poultry meat (12.6kg chicken and 6kg turkey). The consumption of turkey over recent years has increased since the introduction of turkey sausages. The annual production of poultry meat is 1.8 million ton. East Germans consume more poultry than West Germans.

- The German poultry industry employs 45,000 employees.

- Annual turnover of poultry and poultry products is in excess of 9.5 billion Euro of which 1 billion is eggs and egg products. The German layer industry houses 37 million laying hens producing 11 billion eggs each year. Germans eat around 218 eggs per person per year. 63% of hens are in barn systems and 14.5 are in Free Range systems. There are still some hens in colony cages but these are to be phased out by 2025.

- Germany is a poultry exporter and importer. 700,000 t are exported each year and 550,000 t imported mainly from The Netherlands, France, Austria and Poland. 71% of the eggs consumed in Germany are home produced.

Monday 24th October - Zentralverband der Deutschen Geflügelwirtschaft (ZDG)

Following the visit to the British Embassy we travelled to the offices of ZDG for lunch and afternoon presentations. ZDG is the body representing the whole German poultry industry. Their aim is to strengthen the German poultry industry which includes lobbying politicians and working with the media. The activities of ZDG are funded by its 8600 members. We were hosted by Dr. Günther Zengerling, Dr. Dirk Höppner, Lydia Hartmann and Dr. Eva-Maria Näser.

Overview

Dirk gave an overview of the German poultry industry and explained that, due to its history there is a big difference in the layout of farms in the different parts of Germany. Farms in the west of Germany tend to be small family run businesses whereas farms in the east tend to be far larger and commercial. Lower Saxony is the most dense poultry area in Germany. Pork is the preferred protein with poultry second and beef 3rd. The consumption of these three proteins has been very stable over the past 5 years. Germany is about 110% self-sufficient and produces more broilers than its processing capacity so a lot of broilers are processed in Holland and Poland. 87% of the poultry meat exported from Germany is to other EU countries. 93% of poultry products imported into Germany are from other EU countries.

The permitted stocking density for broilers is 35kg/m² at thinning and 39 kg/ m² for birds at depletion. Broiler flocks are routinely thinned in Germany.
The poultry meat market in Germany
It was interesting to learn that together, Aldi & Lidl have 31% of the German market and other
discounters have an additional 18.8% of the market. The fact that more than half the market is
controlled by discount retailers puts a big price pressure on processors and producers.

The German broiler industry is very integrated and 3 of the biggest broiler processors manage 80%
of the industry. Turkey producers tend to have more flexibility and producers can buy their poult
from anywhere (one poult supplier has an 80% market share). Eggs producers can buy birds from
any genetic company and sell eggs to which ever packer they prefer.

The German egg industry
Germany is around 60% self-sufficient in eggs. Conventional laying sheds must have a minimum of
3% of the floor space as windows, and organic sheds a minimum of 5%. Retailers are committed to
stopping the sale of eggs from colony systems by 2025. Enriched cages have been allowed since
2006 but are now being phased out.

55% of all eggs sold in Germany are sold in discount supermarkets with 34.5% sold in Lidl and Aldi
and 20.4% in other discounters. Aldi (North) has not sold caged eggs since 2006 and the rest of Aldi
since 2009.

Some people are concerned that the move away from colony cages might lead to an increased use
of antibiotics in the laying sector. Colony caged systems rarely use antibiotics where barn and Free
Range systems tend to use more. There is also a debate around the environmental impact of moving
away from caged systems as the environmental footprint of Free Range and barn systems can be
higher than colony systems.

Animal welfare
NGO’s lobby very hard with retailers to ensure they influence what retailers sell. There are three
main welfare areas that currently get a lot of media and NGO coverage. These are beak tipping, the
disposal of male chicks in the layer industry and the move to welfare outcome measures as a means
of monitoring welfare.

There is a ban on animal mutilations in Germany so routine beak tipping is not permitted. Currently
beak tipping by infrared is allowed as an intermediate treatment in specific cases only. Despite this,
most layer flocks are still beak tipped. This is a controversial issue and is due to be reviewed in
2017. There is a risk that following this review, beak tipping might be banned completely which is a
concern to specifically the turkey sector. Some retailers are already refusing to sell eggs from beak
tipped hens. The argument is that the industry is trying to change the animal to fit the farming
system but it should be the other way around.

Disposal of male day old chicks.
Since male chicks do not lay eggs, these chicks are disposed of after hatching and sold as food to
birds of prey and to zoos. Due to their genetics, male chicks cannot be reared economically for meat.
There has been an aim to phase this practice out by 2016 but a final decision is yet to be made.
NGO’s argue that German animal welfare legislation is unclear as it does not specifically legislate
against disposing of animals for economic reasons. There is a lot of research being done into sexing
eggs before the chicks hatch. To date a sexing system that can sex eggs fast enough has not been developed. There are 11 hatcheries supplying layer chicks in Germany.

**Welfare indicators in turkeys**

The Welfare Law in Germany has changed so that every producer needs to monitor the welfare of broilers and turkeys through welfare indicators. Germany has developed a specific animal welfare programme in conjunction with NGOs, government and producers. Turkey producers that participate can stock their sheds higher than producers who do not participate. The stocking density for participating producers is 58kg/m² for toms and 52kg/m² for hens. The monitoring is based on slaughterhouse data and compares each producer against the rest of the industry. An evaluation is made twice per year and producers are ranked based on the outcome of the mortality, dead-on-arrivals and the level of footpad dermatitis for the flocks processed during that period. Producers falling in the bottom 25% are required to formulate an action plan in conjunction with their vet. Where producers fail to show an improvement the Official Veterinarian is able to take action and reduce the farm stocking density. This approach helps to drive continual improvement in the industry.

**Antibiotics**

There are two parts to the goal of reducing antibiotics used in the German poultry industry. The first is managing the application of antibiotics and the second is the monitoring of antibiotics used. There are two databases used for this in Germany. The first is a government database for animals produced for food. This database includes the monitoring of antibiotics sold to the poultry industry. This gives the government a useful tool to monitor the trends. It does not differentiate between different species.

The second database is used by the industry. All broiler and turkey producers must supply their antibiotic usage data and every 6 months producers are ranked to highlight the 25% of highest medication users. Producers falling in the bottom 25% are required to produce an action plan in conjunction with their vet. Producers remaining in the bottom 25% will be investigated by the Official Veterinarian. The Official Veterinarian can enforce a lot of pressure to improve performance. This includes reducing permitted stocking density, higher biosecurity, better hygiene and longer turnarounds to name a few.

The level of antibiotics used is reducing across the poultry industry in Germany and there is frustration with the lack of a standardised monitoring system across other EU countries. Different systems used by different countries make it very difficult to benchmark levels between countries.

**Public relations**

ZDG is very active in communicating the positive message of work being done in the poultry industry. Their audience tends to be younger people and they use several social media sites to convey their message.

Their aim is to:

- Get critics to talk to the industry rather than talking about it.
- Create a realistic relationship between critical content and real conditions.
- Establish open dialog between all parties.
• Involve the public in the industry.

One of their campaigns is called The Chicken Carta which is a voluntary scheme for the industry to follow. Another is a website called Infopool which provides visitors with an ‘easy to navigate’ website with information and videos about how birds are reared. [https://www.gefluegel-charta.de/](https://www.gefluegel-charta.de/)

There is also a drive to get consumers closer to poultry so they have introduced an interactive stable tour which even includes recorded sounds inside a chicken house. [https://www.deutsches-gefluegel.de/erzeugung/wir-die-erzeuger/gefluegelhof](https://www.deutsches-gefluegel.de/erzeugung/wir-die-erzeuger/gefluegelhof)

ZDG have created a dedicated school website which is designed to provide poultry information to teachers to help get poultry into school curriculums. [www.gefluegel-macht-Schule.de](http://www.gefluegel-macht-Schule.de)

**Monday 24th October – Broiler Farm**

In the afternoon we travelled to the farm of Henry Meerbeek in Storkow near Brandenburg. Henry has been a tenant on the farm since 1992 and bought the farm in 2010. When he started, the site reared 200,000 broilers per flock. The site was expanded over time and today provides housing for 360,000 broilers per flock. The chicks were 10 days old at the time of our visit. 30% of the birds are thinned at 1.8 kg (at around 31 days) with the remainder reared on to reach 2.5kg liveweight (at around 39 days). In addition to Henry and his wife there are two other full time members of staff. When Henry arrived on the farm in 1992 there were 18 employees but after reunification in 1992 several left or got moved into different positions.

![Figure 2 - Visiting the broiler farm of Henry Meerbeek.](image)

The broiler farm is very close to the processing plant which is owned by Plukon Food Group. Plukon bought Friki a number of years ago and currently owns 4 slaughter houses in Germany. Due to its proximity to the processing plant the farm often receives unannounced visitors.

All the sheds are heated by radiators which are warmed by burning gas produced at Henry’s Anaerobic Digester which is near the broiler houses. The AD plant uses chicken litter from the farm and maize. When demand exceeds gas supply, LPG is used to top up the gas demand. Wood pellets are used as bedding for the chicks. Henry uses 800 g/m² wood pellet which costs €75 per ton. The performance of his previous flock was very good and the birds had very low levels of pododermatitis
(0 FPD in 3 houses, 10% in 3 and 30% in 3). The flock achieved a feed conversion ratio, or fcr, of 1.58, 3.5% final mortality and the average weight was 2.08 kg.

The farm is on an anticoccidial rotation programme. Maxiban is used in the summer followed by 4 flocks of Sacox and Monensin in winter. Half of the current flock is from Ross parents and half is from Cobb parents. To manage growth rate, and to reduce the risk of skeletal abnormality, Henry gives the Cobb birds 8 hours dark (in one block from day 7) where Ross sheds will be on 6 hours dark from 7 days. The dark period is started in the early afternoon so the lights are on from midnight. This helps to get the birds active during the coldest part of night. The site is equipped with feed weighers which allow Henry to blend locally sourced whole wheat into the feed rations. Cobb birds will be given up to 10% whole wheat where Ross tends to be given less, or not at all, as Ross birds often reject the whole wheat. No antibiotics were used during Henry’s previous flock. As in the UK, the farm operates an “all-in-all-out system” (all the birds are taken off site before the next flock is placed) and will have around 7 clear days between flocks.

Birds are vaccinated for Infectious Bronchitis at hatch and a second dose is administered on farm at 10 days. The birds are vaccinated for Newcastle and Gumboro disease. Henry doses acid into the drinking water to reduce the pH to around 4. This helps with the digestion of the feed as well as to keep the bacterial loading in the drinking water at a low level.

Since 2009 all new build broiler houses have been built with windows (equivalent of 3% of the floor space). The requirement is for the windows to be spread evenly around the shed and not be concentrated in one part of the shed.

Henry is very positive about the future for broiler production in Germany despite the high cost of building new broiler facilities. New broiler sheds are very expensive and the estimated building cost is around 20€ per available chick space.

Figure 3 - Old Soviet style houses on the right with more modern houses on the left.
Tuesday 25 October - Lohmann

On Tuesday morning the group departed from Berlin’s main train station heading for Bremen via Hanover. We were met in Bremen by Dr Michael Lüke who was our host for the next few days. After lunch in the Bremen Ratskeller restaurant we were treated to a guided tour of Bremen city centre. Following the tour we headed to the office of Lohmann in Cuxhaven.

Lohmann

We were welcomed to the Lohmann offices by Dr Mattias Schmuts. Dr Schmuts is a geneticist who works in the Research and Development department for breeding production. Dr Schmuts gave us an overview and the history of Lohmann since its inception in 1932. Today Lohmann is part of the EW Group of companies.

To reduce the risk of restrictions during an outbreak of Avian Influenza, Lohmann has grandparent stock in 5 countries outside Germany (Denmark, Canada, USA, Brazil and Spain). Lohmann has a feedmill in Lower Saxony and all their feed produced is heated to 85°C to kill feedborn pathogens.

The three biggest suppliers of parent stock to the layer industry belongs to EW Group and together owns around 60% of the world market share of layer parent stock (Lohmann - 29%, Hyline - 25% and H&N with 7%).

Dr Schmuts gave an overview of the 3 different breeds Lohmann has on the market. He explained how birds in colony cages lay more and larger eggs. Colony cages also have a lower mortality compared to alternative systems. Birds in alternative systems need more energy and the first area the hen will conserve energy is by laying smaller eggs.

Since 2000 there has been a 30% increase in eggs consumed worldwide and to keep up with this increase Lohmann's parent stock sales have increased 3 times over this period.

Breeding Programme

Dr Schmuts then gave an overview of other traits they are selecting for and how this is done. He explained how Lohmann geneticists need to continually select for high egg numbers. If they were to stop selecting for this, the number of eggs laid each year will reduce by around 2 eggs per generation. This is because the bird's natural selection process does not favour high egg numbers. The genetic improvement achieved through the selecting programme increases the number of eggs laid by 1 egg per year so to achieve this, bearing in mind the birds natural selection against high egg numbers, Lohmann needs to aim for a 3 egg improvement. A lot of the increase in egg numbers comes from selecting a bird that is more persistent.

They also select against birds that shows traits of laying eggs while sitting on perches and selecting for birds that continue to lay eggs for longer.

Pure line birds are not beak tripped so feather quality and feather pecking can be monitored. On average Lohmann removes around 10% of families showing poor feather quality each year.
Dr Anke Förster
Dr Anke Förster gave a good overview of how the industry has selected birds that today are specialised for meat or for eggs. This has led to ethical questions being raised about the disposal of male layer chicks.

German position on disposal of male chicks
Germany banned conventional cages from 1 Jan 2010 and the rest of Europe followed in 2012. Retailers pledged to stop using eggs from colony cages by 2025. Lohmann is doing a lot of research and development into ways of removing the need to dispose of male layer chicks.

Dr Förster explained that Lohmann is currently working on two options for male broiler chicks. One is crossing different families to produce males that can be reared economically. The other is to determine the sex of the embryo before the chick hatches.

Lohmann-duel
This breed is a cross between a layer and a broiler strain and was created to see if the male offspring can be reared economically while the females are good egg layers.

In summary the advantages and disadvantages of this breed are as follows:

- The males are big and the females are very small.
- When in lay, the hens don’t peak like conventional flocks and production drops off quicker.
- Egg quality is poorer with lower egg weight, poorer shell strength and paler eggs.
- When reared like a broiler, the males will only reach 2.986kg at 70 days where a broiler male will reach this weight at 42 days.
- The breast meat yield is lower and the quality is also poorer than from conventional males.
- From an economic point the females need to subsidise the males staying alive.

Sexing the embryo in the egg
There is a lot of research conducted into determining the sex of the embryo in the egg. This process is called in-ovo gender determination. To be successful in a commercial environment the process must be:

- Early in the incubation cycle
- Fast
- Reliable
- Must not have an effect on the embryonic development or the productivity of the laying bird
- There must be a use for the male eggs
- Cost efficient
- It must be accepted by the consumer

Currently there are two areas of research into in-ovo gender determination.

Endocrinology
This is the analysis of the sex hormones in the allantoic fluid. The problem with this is that the hormones can only be detected after 13 days so we need to find an alternative that allows earlier detection, preferably before day 10.
Spectroscopy
This process works by shining a light through specific tissues in the egg and recording how the light scatters. This light fingerprint indicates if the tissue is from a male or a female. The problem with this technique is that a 12mm hole needs to be drilled in the egg to allow the light to reach the desired tissue. Research has shown that hatchability is below 10% if the hole is drilled before the incubation process starts. The hatchability improves dramatically if the hole is drilled between 3 and 4 days. This process is showing encouraging results but need a lot more refining before it can be used commercially.

Dr Michael Lüke
Finally Dr Michael Lüke gave us an overview of the status of beak tipping in Germany. Most non caged hens are being beak tipped in Germany. Pressure groups have been targeting retailers to stop buying eggs from beak tipped flocks and since the government is considering the total ban of beak tipping the industry has decided to implement a voluntary ban on beak tipping.

Feather pecking is often not predictable and can start very quickly with devastating consequences. The causes are not yet fully understood but research shows that there are several factors playing a role. Environment, genetics, feeding and nest box design all interact to cause birds to start feather pecking. Stocking density, lights (intensity and flickering) and diet have also been shown to play a role in feather pecking. Trials have shown that mortality in non-caged, commercial, non-beak trimmed flocks can be as high as 43%.

The consequences of banning beak trimming are generally an increase in mortality which leads to fewer eggs being produced. It also leads to poorer feather coverage which causes an increase in fcr as the bird uses more energy to stay warm.

Some retailers have been working with producers to introduce training programmes for farmers and staff to prepare for life without beak tipping. There are also numerous research programmes conducted to study the issues.

Conclusion on beak tipping
Banning beak trimming will make Germany less competitive against other countries. There will also be no turning back once the ban is implemented. The industry will have to rely on auditing bodies to ensure all imported eggs are also reared in non-beak tipped systems otherwise the German industry will be severely disadvantaged. It is critical that the industry and government cooperate to avoid legislation being enforced on the industry. The voluntary ban on beak tipping is a positive move towards proving that the industry is working on the matter and is learning how to manage non beak tipped flocks. Government data indicates that 70 to 80% of flocks are currently being reared without having been beak tipped.
Wednesday 26 October – EW Group

On Wednesday morning we arrived at the headquarters of the EW Group and were met by Erich and Dirk Wesjohann whose family business owns around 50% of the broiler genetics and 60% of layer genetics used in the world. In addition to the chicken genetics they also own turkey and salmon genetics, a feed company and an animal health business. Their products are sold in around 160 countries around the world. The EW Group had a turnover of 2.3 billion euro in 2015 with 35% of this from broiler breeders and 27% from layer genetics.

Dirk gave us a very interesting and informative presentation of the history of the business and how the different businesses work together to achieve the group business objectives. He explained that the EW Group is driven by research and development and the equivalent of 10% of their annual sales go into R&D. Their vision is to improve animal welfare and reduce the need for antibiotics. He then went on to discuss all the businesses and their main products.

Figure 4 - The Nuffield Poultry Study Group with Erich and Dirk Wesjohann outside the EW Group headquarters.

**Broiler breeders**

Main points discussed:

- It takes 5 to 6 years for the pedigree genetics to filter down to commercial level. At broiler level one male and ten hens will be the great, great parents to 48 million broilers.
- World phosphorus (P) supplies are running low. The development of Phytase allows the release of P from plant material which was not previously possible as animals can't get P from plants.
- Feed conversion ratio, or fcr, is by far the most important trait to customers worldwide. Linked to fcr is water intake. As drinking water gets scarcer the need for broilers with better gut health is increasing. Broilers with the healthiest gut drink the least amount of water.
• Consumers want more breast meat so this area will continue to feature in the breeding programme. In addition to yield, there is a host of other traits being selected for. The term given to this process is “Balanced Breeding”. Today there is about a 40% focus on welfare traits for both turkeys and broilers. As we move forward the welfare share in the breeding programme will increase.
• Despite a proportion of customers in developed countries wanting slower growing breeds the world market will demand efficient protein from fast growing breeds.
• Bird weight and mortality have improved together.
• Leg health has been part of the selection criteria since 1970. Today geneticists use leg scoring, gait scoring and X-ray to select birds with the best leg health.
• It is important to breed a more robust bird to improve welfare and reduce inefficiency.
• The selecting against Wooden Breast in broilers should remove this problem from the end of 2017.

Sustainability
30 years of genetic selection has led to big improvements in fcr, water intake and CO₂ produced. Worldwide, the annual saving of grain required in the chicken industry equates to the amount of grain produces on land 1 ½ times the size of the German grain production area. Worldwide, the annual saving in water required is the same amount of water as 1.3 times the total amount of tap water consumption in the USA each year. Worldwide, the annual amount of CO₂ saved is the equivalent to the CO₂ output of 22.6 million cars.

EW Nutrition
After lunch we had a presentation by Ludger Johannes, MD of EW Nutrition, and Timo Rothstein, Product Manager Specialist Poultry. They gave us a very interesting presentation on the use of Secondary Plant Compounds extracted from plants like rosemary and oregano. Most have an anti-microbial effect against bacteria. The product they developed also stimulates appetite in livestock. They presented data from several trials most of which show a benefit to the performance of the birds.

Future challenges to the industry
Dr Lüke then gave a short presentation about future challenges to the industry. He started by explaining that the key challenge will be to feed the world population. We need to raise production in the world by 50% by 2050. Meat consumption will increase as the middle class grows and consumes more protein. The demand for meat worldwide will increase by 50% between 2001 and 2021. The most likely protein that will help us meet this demand is fish and poultry due to their good fcr.

Dinner with F. Ripke president of KAT
The group were privileged to have dinner with Mr Friedrich-Otto Ripke. Mr Ripke is the president of KAT which is the body that was set up 20 years ago to put an end to the mislabelling of eggs and improve traceability. KAT was the first traceability system in the food industry. Mr Ripke gave a short presentation on the history of how KAT came about and what the different areas are that KAT is involved with. The areas he discussed included the KAT central database, the KAT print code and labelling as well as their cooperation with animal protection bodies.
We visited the Pilzland mushroom farm near Visbek, Rechterfeld. We were welcomed and shown round by Johannes Lücer - Managing Director for Pilzland, Henri van den Brake - Site Manager and Philip Horst - IT / translator. The Visbek mushroom farm is one of the most modern mushroom plants in the world. The Single Bed System used here has been developed on site and has since been patented in Europe. This system is very good for the staff as there is no bending involved in the picking process. Pilzland uses a few independent growers to grow the speciality mushrooms. All mushrooms produced are certified by national auditing bodies. Germany is around 65 to 68% self-sufficient in mushrooms. The remainder is imported from countries such as Holland and Poland.

The site is the company’s main complex and they have two more mushroom growing farms in Germany, one near Berlin and one in Bavaria. There are plans to build a fourth site in the near future. Pilzland grows a mixture of mushrooms with Brown and White mushrooms grown on the main site and specialty mushrooms like Oyster, King Oyster and Shiitake mushrooms grown on the other two sites. A lot of the standard mushrooms are exported to Scandinavia and the organic mushrooms are exported to Austria.

German mushrooms are a bit more expensive than imported mushrooms and this is due to the cost of labour. Despite this, consumers like buying local produce so retailers use local labels on their produce. Regional marketing also helps to protect against imports from Holland and Poland. Most of the mushrooms are marketed under the Pilzland label but there are some retail customers who insist on having their own label.
Pilzland’s strategy is to have as much of the process in-house. Apart from buying the spores, everything else, from preparing the substrate to delivering the final product, is done by Pilzland.

Production on site is currently at 195 t per week with the other two sites at 35 and 70t per week (330t total) with plans to increase to 400t in the coming months. There are 700 employees on site who are predominantly woman from Romania. The women tend to be on a three month rotation which works well for those who have family commitments and don’t want to be away from home for too long.

Pilzland uses around 1900t of substrate each week. Straw based horse manure is used to provide the structure of the substrate and broiler litter to provide the nutrients. 1 t of horse manure is used with 130kg of broiler litter. Horse manure is fermented and sterilised before being seeded. It is important that the substrate is free of ammonia as this kills the spores. All organic mushrooms are grown on organic straw and organic chicken litter.

Mushrooms are 93% water so water management is critical in mushroom production. Once the substrate has been prepared, and the spores sown, the beds are watered with 20 litres of water per m² per day for the first 5 days and 70 to 80 litres per m² per day in the growing phase. Water is pumped at 7 bar to ensure the droplets are small enough and reach the whole bed. In addition to water and temperature, CO2 and humidity also gets monitored and controlled.

The growing cycle is divided into two stages. The first stage is the germination phase where the substrate is placed on belts on 4-tier racks. Substrate is added to the beds to achieve 80 kg/m². The centre of substrate needs to be kept at a constant 25°C to ensure optimal growing conditions. A layer of black peat is placed over the manure to aid water holding and germination. After 13 days the substrate is pulled into the growing room with a special crane system. Interestingly, pulling the substrate through to the growing room allows oxygen into the substrate which encourages more mushrooms to grow. Once the mushrooms are big enough, harvesting can start. Beds are picked between 7 and 10 times per day to ensure the mushrooms don’t get too big. Mushrooms double their size every 24 hours so it is vital to keep ahead of the growth. All the mushrooms are picked by hand. Each person picks around 35 to 45 kg per hour. The first flush of mushrooms normally yields around 20 kg/m². The beds are then left for 3 days to allow the mushrooms to recover and start growing again. Around 12 kg/m² is harvested on the second flush. Waste compost is sterilised before being sold to agriculture companies to be used as garden fertiliser.
Flies can be an issue due to the manure used. Pilzland don't use any chemicals and uses nematodes as a biological control measure. The nematodes attack the fly larvae and help to keep numbers under control. They spray around 2.5 million nematodes per m².

Pilzland main challenge is to reduce the cost of labour used in the growing process. For this reason they are constantly working to come up with novel ideas to reduce the amount of labour required to harvest the mushrooms. At the time of our visit the company was trialing an automatic packing robot. This removes the need for a person to cut the stems and manually pack the mushrooms into a box. The company admitted that they still have a lot of work to do before this system can be operated to save labour.
Thursday 27 October – Farm Visits

Martin Prang, Area Sales Manager for Big Dutchman, arranged 3 farm visits for the group. All the farms had layer equipment installed by Big Dutchman.

Pullet Rearing Farm

We started our day by visiting the farm of Theo Gärke near Döthen. Theo grows 150 ha of potatoes and also rears pullets on the 300 ha family farm. Theo is part of a farming cooperative and the group supplies their potatoes to a Lays crisp plant in Holland. When asked which of the potatoes or chickens makes the best margin he explained that the long contract with the pullets gives him more security than potatoes but potatoes often makes more money. The market for potatoes can be very volatile so it can be very good financially but also very poor.

The farm consists of 5 pullet rearing houses holding a total of 200,000 birds. The house we visited currently stocks 40,000 birds where previously the house stocked 60,000. The stocking density allowed is 25 kg/m² of usable floor space. Legislation around stocking density has forced him to down stock the sheds over recent years. This, and environmental conditions his farm needs to meet, has pushed the cost of his production up and eroded his margin.

We were supplied with coveralls and over boots before entering the pullet house. The farm operates a barrier system and the farmer changes footwear before entering the house. Hay and Lucerne bales are used for environmental enrichment. Other enrichment includes 3% windows in the roof and pecking blocks.

Birds on site were 11 weeks old and the breed was Lohmann Brown which Theo rears on contract for Lohmann. The birds and the feed are supplied by Lohmann and the birds are sold back to Lohmann who does all the marketing and selling of the birds. The pullets will go out at around 17 or 18 weeks. Vaccination is mostly done through the water. The vaccination strategy depends on what Lohmann requires for their customer.

Each of the three tiers are split into smaller pens so birds can be kept together during brooding. 120 chicks are placed in each pen when the chicks are delivered. New chicks are all placed on paper in the middle tier. This makes it easier to inspect the birds and ensures the chicks are off to the best
start by having good access to feed and water. After two weeks, half of the birds are moved into the bottom tier. After three weeks the tiers are all opened for the birds to start moving around the whole shed. Birds are encouraged to go back into the tiers every night. Lights in the isles are dimmed while the lights in the tiers remain on to encourage the birds to roost. Birds that don't roost themselves are picked up and placed in the tiers by hand. It is important that all the birds roost in the tiers so that the droppings can be removed on the belts rather than stay on the floor.

Due to environmental conditions some farmers have to use multi-tier systems as they are prevented from using litter in the houses. Reducing ammonia emissions is the most common reason for this practice. Several laying farmers prefer to have hens reared in multi-tiered rearing systems as they get better performance from these hens as the hens are used to climbing into the tiers so will lay eggs in the nest boxes rather than on the floor.

None of the birds on site were beak tipped. According to Theo it is vital to start managing birds from a young age to reduce the risk of pecking. It can add as much as 4 cent per egg in lost production with non-beak tipped birds. Theo explained that in his opinion having lower stocked sheds, environmental enrichment and reduced light levels all play a role in reducing pecking.

We visited a second rearing shed on a different part of the farm. This shed was able to stock 26,000 birds in a two tiered system. Theo explained the differences between this system and the three-tiered system and how they need managing differently. The site was empty at the time of our visit. A layer of Silicate was spread over the floor and equipment to control Red mite infestations. Theo explained that he prefers using the two tier system as it is easier to manage the birds.

**Laying farm**

We then visited Klaus Honerkamp and his egg packing business called Honerkamp based near Melle. It is a 3th generation family egg farm producing Free Range, organic and Barn eggs. The farm used to be a small mixed farm until the farm diversified and moved into egg production. Klaus packs and markets his own eggs and supplies local supermarkets who are interested in selling locally produced eggs (produced within 50 km from the store).
We visited the Barn laying shed which was on two floors. The sheds are divided into 3 pens of 6000 birds each. The birds were Lohmann Brown, 28 weeks of age and production was at 94%, average egg weight of 62.8g and flock mortality at 0.2%. Only one of the two houses had been beak tipped. From 1 January some retailers will not be selling birds from beak tipped flocks. Klaus decided to leave one flock untipped to give him the option to supply the desired product to the individual customers.

Klaus provides the birds with white pecking blocks to give them something to peck at. This is one of the strategies to help reduce birds pecking each other. The birds like pecking the blocks so much they need replacing every 4 weeks. Klaus explained that he is still learning how to manage the untipped birds and that it will take time to perfect a system without the ability to tip.

Klaus mixes his own feed on site and can tailor the diet to the production or the need of the birds. The diet the birds were on was made up of 30% wheat, 30% maize, 26% soya, 8% limestone, 4% oil, and 2% minerals.

We were interested to learn how Klaus manages to keep his auditing and traceability accurate with eggs from 3 production systems packed in the same packing plant where space is limited. He explained that he must have robust systems to demonstrate to auditors that the eggs were produced where the label says. His electrician wired the packing centre so that only one of the packing lines can work at any one time. While the barn eggs are packed the organic and Free Range Packers are turned off. In addition to this the Organic and Free Range eggs get stamped in the shed before they are moved into the packing plant.

**Thursday 27 October – Big Dutchman Head Office**

We were welcomed to the Big Dutchman head office by Ulf Meyer (Head of Region for Europe Middle East and Africa) and David Nieuwenhuizen (Sales Director for Europe). Ulf gave us an overview of Big Dutchman from its inception in 1938. Today, the business has 870 staff on site and has an annual turnover of €800 bn. The business is heavily driven by research and development and there are 300 engineers working on developing new equipment for the Big Dutchman range of products. This site loads 150 trucks per day and all deliveries to Europe, the Middle East and Africa are shipped from the site.

We were given a tour of the site and were shown the new distribution shed which is the size of 3 football fields.
Friday 28 October – Wing Project

Prof Dr Hans-Wilhelm Windhorst and Desiree Heijne from the University of Vechta gave a very good presentation on the Wing Project they have been working on since 2012. They both work for the Science and Information Centre for Sustainable Poultry Production. Their research is in partnership with the University of Vechta and the Lower Saxony Poultry Association (largest poultry association in Germany). The project was started in 2012 and is funded until 09/2019. Their team is made up of 10 people and consists mainly of researchers.

Their objectives are:

- To concentrate the worldwide scientific research in poultry production.
- To give an overview on ongoing and future research projects.
- To give a realistic overview of the world poultry industry.

They provide scientifically based information to the industry, students and researchers. They also publish scientific papers in some of the world’s leading periodicals. In addition to this, they present at national and international conferences. They also organise local conferences. They have a databank for literature and more than 7000 articles are available online and a photobank with photos of different housing systems. They produce statistics on poultry production and trade as well as maps and graphs and liaise with journalists, students and researchers.

One of their ongoing projects is called The Transparency Initiative and the aim is to encourage people and families not working in agriculture to visit poultry farms. The group conducts surveys to understand people’s view of the production systems before and after visiting a poultry farm. Visitors are asked a host of questions around their background, employment status, education and age. The results of the two surveys are compared and scientifically analysed. From 2012 to date they have opened 13 different layer farms, 12 different broiler farms, 9 different turkey farms and completed 5500 interviews. The farms have all been in the Lower Saxony area. On average visitors travelled 30 km to reach the farms. All the farms opened were family owned farms and many are part of a mixed farming business. They always try to open farms as close as possible to slaughtering so visitors can see how much space is available.

Before visiting a farm urban visitors were more sceptical than rural visitors and woman between 40 and 50 were most sceptical about intensive poultry farming. The results indicate that overall, visitors were about 10% more positive towards intensive poultry once they have seen a farm than before their visit. Another interesting finding is that the higher level of education a visitor had, the more sceptical they were towards intensive farming. A worrying finding is that 41% of teachers were sceptical before visiting an intensive farm. Once teachers had visited a farm the level of scepticism reduced by more than half.

The conclusion of the study is that we critically need to be more open about our industry. We need to allow the public to see all the good work being done on poultry farms every day. We need to open farms closer to the cities as urban people are more sceptical than rural people. We need to engage more with high schools and try to get school children engaged. Opening farms is a win-win for producers and consumers.
Friday 28 October - Heidemark Turkey Processing Plant

The penultimate visit of our week in Germany was to the Heidemark turkey processing plant near Ahlhorn. We were welcomed and shown round by Christian Woltering, Technical support for the farms, and Joerg Hurlin, Technical coordinator for the EW Group.

![Image of the Nuffield Poultry Group outside the Heidemark processing plant]

Figure 13 - The Nuffield Poultry Group outside the Heidemark processing plant

Around 35 million turkeys are processed in Germany each year. The German market has grown by 4% in the last year, made up by more weight due to killing toms (turkey male) rather than more birds processed. Germany is around 85% self-sufficient in turkey production. Germany imports some of the higher value turkey products and exports some of the less valuable products. There are 4 turkey processing plants in Germany.

Heidemark was started in the 1960’s and today processes around 18 million birds per year. They process 58000 birds per week at the Ahlhorn plant and 5000 birds per week at a different processing plant nearby. Of these, 60% are toms and 40% are hens. The plant has the capacity to process 3000 toms and 3900 hens per hour and operates two shifts over 24 hours from Monday to Friday. The plant at Ahlhorn was one of the first turkey processing plants in Germany. The plant consists of two divisions. One produces fresh turkey products and the other further processed products. All the turkeys processed by the company are stunned with CO₂ before being processed. The company supplies predominantly the discount retailers and a lot of the company’s growth has been on the back of the growth of Lidl. Most of the products supplied to retailers are packed under the retailer label. The company also supplies Halal birds to the market. Halal birds are also stunned with CO₂ before being processed. The company invested in an air conditioned lairage (holding area where the birds are rested on the way to slaughter). They allow the turkeys to rest in the lairage for about an hour before the birds are processed. They found this helped improve the quality of the meat.
There are around 35 company farms rearing turkeys for Heidemark, supplying around 20% of the total number. The rest of the birds are reared by independent growers, some of whom are totally independent while others are paid a management fee to rear the birds. Around 3 million birds are supplied each year from farmers in Poland. Most of the toms are reared in Germany and a lot of the hens are moved to Poland and reared there. Hens reared to 16 weeks and toms to 22 weeks.

The majority of the birds are reared in open sided houses and on straw bedding. 80% of the genetics used are Aviagen genetics. Due to the density of poultry in Lower Saxony, chicks are reared in a different area for the first 5 weeks. Toms and hens are reared together before they are separated for the growing cycle. This also helps to reduce restrictions in the event of an Avian Influenza outbreak. This is when the hens are taken to Poland for rearing.

Stocking density for toms is 58kg/m² and 52 kg/m² for hens. The company vets perform routine serology and monitor the flock health to determine what vaccination strategy to employ. The farms in the area have been seeing an increase in Blackhead over the past three years.

The company has done a trial with non-beak tipped flocks and found that the flocks had a lot of problems with cannibalism, and mortality was four times higher than in the control flocks. The only effective treatment for cannibalism is the reduction of light levels which is very difficult in open sided houses. Special permission needs to be obtained before the sides can be closed. Infrared beak tipping is due to be reviewed in 2017.

German retailers give products a 5D-score to promote German produce. If a poultry product was hatched, reared, fed and processed in Germany the product is able to be sold with a 5D mark. Every stage of the production cycle that might happen outside Germany will reduce the D-score. D stands for Deutschland. Heidemark aims to achieve 5D status on as much of their products as possible.

**Friday 28 October – Fish Farm**

The last visit of the 2016 study tour was to the only fishery belonging to forestry office in Lower Saxony. The group was shown round by Regina Dorrie and Friedrich von Heydebrand.

The fishery is near Ahlhorn-Teichwirtschaft and is situated within a mature forest of Larch, Douglas Fir and Oak trees. The forest is owned by Landesforsten who controls around 15,300ha of forest.

The site is a carp fishery started by the Cistertian Monks in 9th century. The area covers 120ha and each year 30t carp, 2t tench and more than 4000 pike are caught by net or line. Ponds are managed by being emptied in winter and restocking in Jan/Feb. Trout need 1 ½ years to grow.

Sport fishing for carp returns more income per kg than catching the fish for eating. The typical growth rate for carp is: 4weeks - 1g; year 1 - 50g growing over summer to 500g; year 2 - 1.5kg; year 3 - 3kg

The smoking facility on site can smoke fillet in around 1-2 hours.

The group enjoyed a fresh smoked trout salad for lunch.
Conclusion

The German poultry industry exceeded most of the groups’ expectations. Producers are extremely passionate about what they do. The cost of production is paramount as most poultry products are sold through discount supermarkets. Automation is a key part of keeping overheads low and being able to make a margin. Despite the low cost of production the German industry is under a lot of pressure to deal with some of the more ethical sides of intensive farming. The potential ban on beak tipping is forcing the industry to change the production systems used and how birds are managed in the systems of the future. The disposal of male chicks from the layer industry is raising big ethical questions and will need to be addressed very soon. Reducing the amount of antibiotics used in the poultry industry is closely monitored to ensure producers use less and less each year.

Having seen how determined and committed producers, integrators and the authorities in Germany are I have no doubt that Germany will rise to the occasion and lead the way for the rest of Europe to follow.