A Nuffield Farming Scholarships Trust Report

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The Nuffield Poultry Meat Award Syndicate
Aviagen, Cobb and Hubbard

Does the broiler industry need to change to feed an increasing population?

Claire Bragg

October 2014

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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: October 2014

Title	Does the broiler industry need to change to feed an increasing population?
Scholar	Claire Bragg
Sponsor	The Nuffield Poultry Meat Award Syndicate – Aviagen, Cobb & Hubbard
Objectives of Study Tour	To understand the role broiler meat will play in feeding a potential 9.5 billion people in 2050 and in doing so find out if/how we will have to change current production methods.
Countries Visited	UK, France, Canada, Netherlands, Australia/Tasmania, New Zealand and America
Findings	Poultry meat is an extremely efficient, healthy, relatively inexpensive form of protein which has the potential to play an enormous role in feeding an increasing population. The three main breeding companies are constantly adjusting and improving the genetics of their breed, therefore the industry is already changing. The areas of concern for the industry will be:- Land (housing, feeding people and animals will be a future battle) Energy usage for optimum climatic control Water and Public perception.

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CONTACT DETAILS

Claire Louise Bragg
Frogmary Green Farm
West Street
South Petherton
Somerset
TA13 5DJ

Tel : 07803 945 273
Email: info@frogmarygreenfarm.co.uk

Nuffield Farming Scholars are available to speak to NFU Branches, Agricultural Discussion Groups and similar organisations

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Southill Farmhouse, Staple Fitzpaine, Taunton, TA3 5SH
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email : director@nuffieldscholar.org
www.nuffieldscholar.org

1.0. Personal Introduction

Me, Claire Bragg

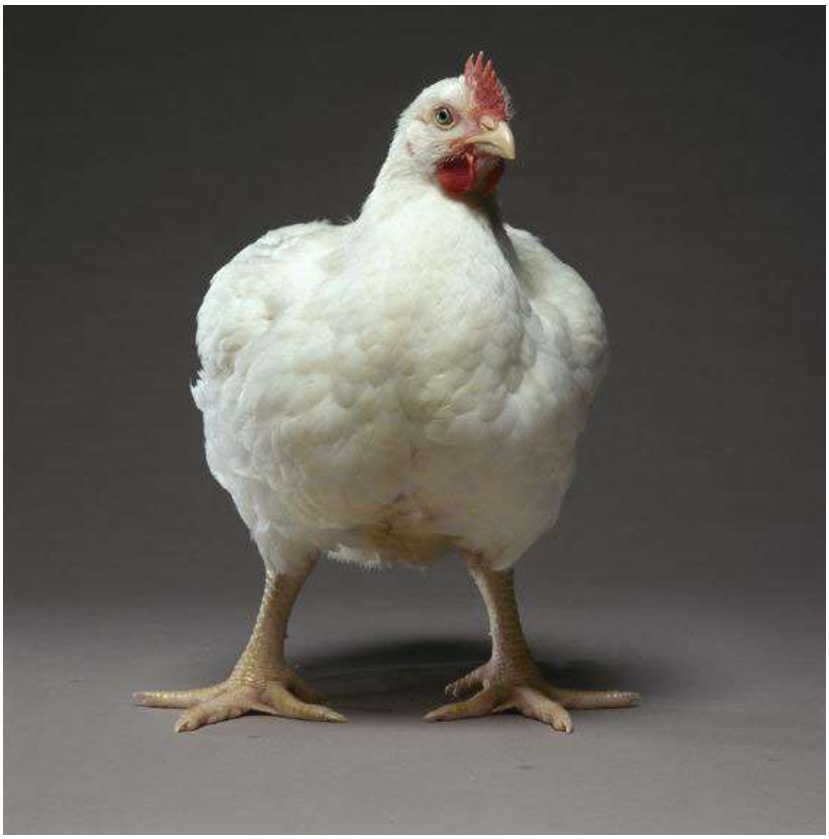
Nowhere in my family history does there appear to have been any farmers and in theory I, likewise, was not on a path to have entered into the agricultural world; but through having an odd brain that enjoys accountancy I was employed by a company who packed potatoes, to work within their accountancy and admin team. It was here that I was asked by a rather clever farmer (Nick) to help with his accounts for a few hours each week and to whom I am now married. Hence my rather unusual route into the world of agriculture.

We live on the edge of South Petherton in Somerset, farming 500 acres of potatoes, maize and grass leys, we run a contracting business for potatoes, minimal tillage, drilling and dung spreading. We also rear broiler chicken - five houses over two sites producing 618,000 birds per annum under the RSPCA Freedom Food scheme and, on a third site, one house producing 224,000 birds per annum under the Red Tractor scheme. My roles on the farm include accounts, administration and education along with the chicken.

Until 2006, chicken were not part of our farm life. Nick's Uncle David had reared broiler chicken since the late 1950s and as a child Nick had grown up with them although not having daily contact or management of them. In 2006, Uncle David passed away and Nick inherited his poultry business which at the time amounted to two very old chicken sheds, six miles away, which could produce 120,000 birds pa. Nick knew that the chickens had produced a good return in the past, so we took on the management of the sheds, completely renovated them and the site, to make the-day-to-day running easier and less time consuming. After 18 months we realised that broilers would become a very large part of our future, so we set about building sheds on our home farm, which we own, rather than on the existing site which is rented on a three-generation tenancy (Nick being the last generation).

Whilst researching broiler sheds we were introduced to a ventilation specialist, Paul Draper, through whom we came up with the idea of installing a biomass woodchip boiler to heat our new broiler sheds. In January 2010, eight months after two new sheds were built, the boiler was up and running – the first in the UK, but which is now becoming common practice. Keeping to the style of new ideas, in 2012 we included a viewing gallery in our 3rd shed to show the general public how indoor-reared broiler chicken are produced, as there is a common misconception that as the chicken are indoors they will be in cages and in the dark. In the first six months of 2014 approximately 2,000 people have visited our viewing gallery.

Education features strongly on the farm. We feel it is our duty to explain to the general public how and where their food is produced; to show that the UK has exemplary standards of food production and that the public should have confidence in purchasing British produce. The environment is also a valuable tool to farmers and, with the help of LEAF, FWAG and the Bumblebee Conservation Trust, we have been able to show, on our farm, that intensive farming does not necessarily mean that we do not care about our land and surroundings.



White broiler chicken

2.0. Background to My Study Tour

On the 31st October 2011 the world population reached 7 billion; by 2050 the UN suggests that this figure could be 9.5 billion.

Area	2010 Population	2050 Population	% Change
World	6,916,183,000	9,550,945,000	+38.10
Asia	4,165,440,000	5,164,061,000	+23.97
Africa	1,031,084,000	2,393,175,000	+132.10
Europe	740,308,000	709,067,000	-4.22
China	1,359,821,000	1,384,977,000	+1.85
India	1,205,625,000	1,620,051,000	+34.37
UK	62,066,000	73,131,000	+17.83

Source: http://esa.un.org/unpd/wpp/unpp/p2k0data.asp (July 2014)

"The world population is predicted to grow **from 6.9 billion in 2010 to 8.3 billion in 2030** and to **9.5 billion in 2050**.
By 2030, food demand is predicted to increase by 50% (70% by 2050). The main challenge facing the agricultural sector is not so much growing 70% more food in 40 years, but
making 70% more food available on the plate."

Source: http://www.un.org/waterforlifedecade/food_security.shtml

I feel exceptionally passionate that chicken is an efficient form of protein and is well placed to feed the masses. At the moment we, as an industry, can satisfy demand but would we be able to do this in 2050 - with potentially 9.5 billion people on the planet - with our existing systems?

Whilst discussing my Nuffield Farming Scholarship with fellow growers they all came up with their own ideas as to what I should concentrate on, so I have a feeling that this will become an eternal quest for the answer to my self-imposed question! I decided that although many topics would be spoken about during my meetings and visits, I would try to concentrate on future innovation whilst being mindful of practical problems and solutions.

Initially I had thought I would like to travel to some of the countries which were not as advanced as ours to gather a greater understanding of how the industry works around the world. However, as time and money were both precious, it soon became clear that I would learn more if I concentrated on countries that were industry leaders to see what the future could hold.

3.0. Study Tour

I visited the following countries and chose them for the reasons shown.

Dates	Country	Reason
2012, 2013 & 2014	UK	Due to biosecurity it is unusual for broiler growers to visit other farms & I wanted to know if the way we rear broilers at home is the same as others!
July 2013	France	Visit Hubbard headquarters – to discuss genetics, marketing and a meeting with CEO Mr Grimaud who had taken on his own research about feeding the population (although not from a poultry perspective)
September 2013	Canada	Canada has a quota system for rearing broilers and I wanted to understand the benefits of their market
December 2013	Netherlands	Visit with Cobb to see their trial commercial farm
February 2014	Australia	To view large scale broiler farms and to understand what other countries are concerned about with regards to future production
February 2014	Tasmania	Visit Robert Nichols N.Sch who has a fully integrated broiler business to find out how the system works
February 2014	New Zealand	Visit Tegel who reports to have the best feed conversion rate in the world – what were they doing differently?
March 2014	America	Visit to Cobb headquarters to discuss what their aims and goals are. Meeting with Dr Susan Watkins to discuss water quality, usage and supply

4.0. UK

A broiler grower in this country does not usually get the opportunity to visit other farms/sectors of the industry due to high bio-security. Therefore I am extremely grateful for those who gave me the opportunity to view their sites and took time to discuss their procedures, thoughts and ideas.

4a. St David's Poultry Team Ltd – Exmouth, Devon

We are clients of St David's Poultry Team Ltd based in Exmouth, Devon and through this contact, one of the founding members, Richard Turner MA Vet MB MRCVS, spent an enlightening couple of hours with me to discuss his views on general mortality in broilers and antibiotics versus probiotics.

Mr Richard Turner of St David's Poultry Team

Richard is an incredibly knowledgeable and entertaining talker, from whom I learnt a tremendous amount. We discussed many topics which included such wide ranging subjects as:

- Cleanliness of the farm is critical to the reduction of the use of antibiotics.

  If the parents, hatchery and transport are correct there is no need for antibiotics; correct usage of disinfectants at the correct rate is imperative.

- Quality of food – solubility of protein.

  Each farm, due to the integrity of the gut health in the birds it houses, has its own maximum protein uptake, the newer and cleaner the farm, the higher the level of protein the chicken can digest.

  Feed mills are creating an "average" feed for the average farms; we should be looking at adding our own on-farm additives to make the feed correct for the farm's protein capability.

- Antibiotic reduction incurs costs; it is easier to use antibiotics than to go for a probiotic holistic view.

  Generic versions of antibiotics make costs more affordable.

  Probiotics help gut flora; classification should be checked to ensure that it is a chicken probiotic i.e. *Lactobacillius* – with acid gut development, antibodies are being produced to kill/reduce "bad" bacteria.

- In America, the litter is retained, the chicks are put on a probiotic and any cocci will evolve earlier in the crop at about day 14 (whereas in Europe, it is later between days 20-30) – due to the earlier infection in the bird, there is more chance of recovery before processing.

Knowing that antibiotic resistance is a hot topic at the moment, it was interesting but slightly scary to hear that in the Netherlands there is a national database for the usage of antibiotics. Growers and vets are named and shamed if they use antibiotics too often – how does this fit with animal welfare? Would a human family be named and shamed if their child was ill and needed more than one dose

of antibiotics? Controversially, I would question whether we humans are also to blame with regard to antibiotics resistance – on the 5th August 2014 the BBC reported that the proportion of patients given antibiotics for coughs and colds had risen by 40% this century – food for thought. http://www.bbc.co.uk/news/health-28648785).

4b. PD Hook (Hatcheries) Ltd – Cote Hatchery visit

Mr James Hook

James Hook gave me an invaluable tour of his hatchery at Cote. Having never seen how a hatchery works I had not given a great deal of thought about all the work involved with positioning of eggs to fulfil the retailer's future requirements. The Cote site hatches approximately 2 million chicks a week from 25 breeder sites of which none are more than 2 hours away. The eggs are collected twice a week and approximately 60% of all eggs are from their own farms, ensuring an extremely high standard of production and parent flock welfare.

As is always the case, the hatchery operation is far more complex than expected. James showed and explained the whole procedure from receipt of eggs (with stamp of breeder site and date), incubation (including the heat 37°c, humidity levels at 80% and the fact that the eggs are turned automatically to replicate the mother's actions), transferral to hatching trays by robotic suckers, hatching, vaccination against infectious bronchitis and grading - before the chicks are placed into trays for delivery to the farms.

Whilst walking around the site I was struck by how much time James had for all his employees, knowing all by name, what they did and, in return, each employee was pleased to be recognised and discuss any issues with him. There was very little turnover of staff which helps to keep continuity within the systems. With their stringent cleanliness, Richard Turner's view of all divisions needing to be correct to keep the use of antibiotics to a minimum was confirmed.

4b. 2Sisters Food Group – Lincolnshire visit

Andrew Gibson, 2Sisters' Agriculture Manager, organised for me a tour of three of their own farms and their processing plant at Scunthorpe. It was to be my first visit to company-run farms and it would be of great interest to see if the way we ran our sheds was similar or could I pick up new ideas. Steve Kirk (Regional Farm Manager) was my tour guide for the few days I was with them.

I visited three very different farms in respect of age of buildings. The first farm was an older site with plans on hold to build new houses so it was down on its usual capacity but it had just had a delivery of chicks both that morning and the day before. As it is such a large company they have a dedicated team who attend each farm on chick-fill day to help unload all the chicks. This makes a huge amount of sense; the more people you have to help the faster the chicks are in, settled, eating and drinking. The chicks looked to be a good weight and came from a sensibly aged parent flock so in theory it should be a good crop. Procedures on the farm are very similar to ours except for the use of a form of chlorine tablet put through the drinker line to aid leg strength.

The second farm was a very modern site with identical houses facing one another, the chicks were about two weeks old and looking good. This site is used for trials to see how improvements to rearing and cost savings can be made; their current trial was looking at the ventilation of houses to see if less gas could be used. Having walked two houses under different conditions I know that I preferred the house with greater ventilation and gas usage – but here is the dilemma: what is right for the flock is not always what is right for the planet or your pocket.

The third farm was an older site which had just been thinned the day before. The farm manager was very interested in my Nuffield Farming studies, asked lots of good questions and told me his thoughts on my topic along with his thoughts on rearing. The birds were looking good and healthy, the litter was very good considering the problems they told me about trying to retrospectively fit windows into the house whilst trying to keep good ventilation.

Having visited all three sites, I was pleased to see that their procedures were not too dissimilar to ours and that they had the same kind of problems and thoughts as we did. It also made me realise that my studies are not going to be as simple or straightforward as I had hoped!

My next visit was to the 2Sisters processing factory in Scunthorpe where after an in depth discussion with Andrew Gibson about the role 2Sisters plays in marrying up the producers' and retailers' requirements, Flo (Senior Shift Leader) gave me an amazing tour of the processing plant. Flo is incredibly knowledgeable about the whole site and was able to give me such detailed information about how the lines work and how chicken are selected for each product that my mind was running at the same speed as the chickens went through the lines! I am absolutely positive that anyone picking up a chicken from a supermarket shelf would not have a clue about the level of hygiene, cleanliness, efficiency and work their chosen product has gone through. Running the production lines is an extremely complex procedure bearing in mind the non-standard product being processed – chicken is a natural product which cannot be fitted into exact size bands.

4d. Breeder farm visit - Devon

Through Hook2Sisters I was privileged to visit a breeder farm, with the strict assurance from me - due to very stringent bio security rules - that I had not had any contact with broilers for 72 hours prior to my visit. Jonathan Holman showed me around the site which consisted of two sheds rearing

1,226 cockerels and 15,466 pullets (Cobb 500), the chicken were 34 weeks old at the time of my visit and lay approximately 12,454 eggs per day.

The birds are 18 weeks old at time of arrival and will productively lay eggs until they are 70 weeks old although the table below shows the optimum age of the parent flock for hatch of fertile eggs:-

Breeder Age (weeks)	Hatch of Fertile Eggs (%)
25 to 33	>90.2
35 to 50	>91.8
51 to 68	>88.6

(Figures from Cobb Hatchery Management Guide)

As with indoor-reared chicken these birds had full roam of the whole shed; in fact the only difference were the nesting boxes set up higher in the middle of the house. These are kept slightly darker to give the pullets a stress free environment in which to lay their eggs. The eggs are removed from the houses on an automatic conveyor system and then graded before being taken to the hatchery.

The parent flock is fed once a day to keep them at their optimum weight for reproduction with the pullets being fed from feeding lines with a wire grill over the top to prevent the cockerels from taking their food and, in reverse, the cockerels' feeding lines were higher to prevent the pullets from taking their ration. Having spoken to Dr Zuidhoff at the University of Alberta *(see "Canada" section for details of his research – Chapter 6*) about his proposed system of feeding the parent flock I was struggling to see the practical implementation on farm; although it must be said that there is always a way to make something work, if it is the correct thing to do.

5.0. France

Through the generosity of Hubbard and my host Jim Hunnable, I spent a delightful time in France meeting their representatives and farmers to understand how their business works with regards to genetics, markets and public perception.

5a. Kercouchan, Cohiniac – Gilles Loyer

My first visit was to a Label Rouge Broiler Farm belonging to Mr Gilles Loyer. In France, Label Rouge broilers are deemed to be the superior choice when buying whole chicken and equates to approximately 25% of the whole market. To be recognised as Label Rouge the following guidelines have to be adhered to:-

Maximum Number of Birds per House	4,400
Stocking Density	< 11 birds/m^2
Max kg/m^2	25
Broiler House Size	400m^2
Range Size	8,800m^2 = 2 birds/m^2
Maximum Number of Houses per Farm	Four
Average Number of Houses per Farm	Two
Minimum Age	81 days
Average Weight at Point of Processing	2.2kg
Average Daily Weight Gain	28g
Maximum Daily Weight Gain	32g

Gilles Loyer's chicken shed

Inside one of Gilles Loyer's chicken sheds

There were two houses on the site; in one house the birds were 60 days old and although the sides were open to allow the birds to range, the majority were in the house with a small number immediately outside. None were ranging in the body of their outside space even though it was dry, the sun was not too bright and it was a pleasant temperature. They looked extremely well and mortality was very low at 0.86% (cumulative) which appeared to be explained by the lack of stress being placed upon the birds.

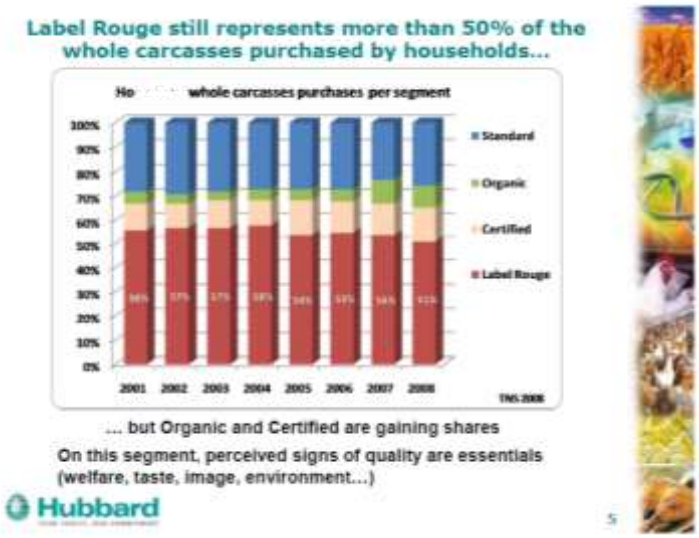
In the other house the birds were also a Hubbard breed (Male S77 x Female JA57) but these particular ones were called "Naked Necks" and, as the name implies, there were no feathers around the neck. It was explained that this breed was used in hotter climates to help the birds adjust for the heat. I was fascinated by them. The birds were 73 days old, with a cumulative mortality of 3.48% but the most staggering fact was that there had been no mortality in the previous 5½ weeks, yet again reiterating my thought that a slower growing breed has less stresses put upon their bodies and therefore reduces mortality. I was also interested to see that these birds were more interested in the outside world, ranging quite happily and freely compared to those in the other house.

Naked Neck Label Rouge Chicken

Ranging Naked Neck Label Rouge Chicken

5b. Chateauborg – Claude Toudic (EMEA Technical Manager)

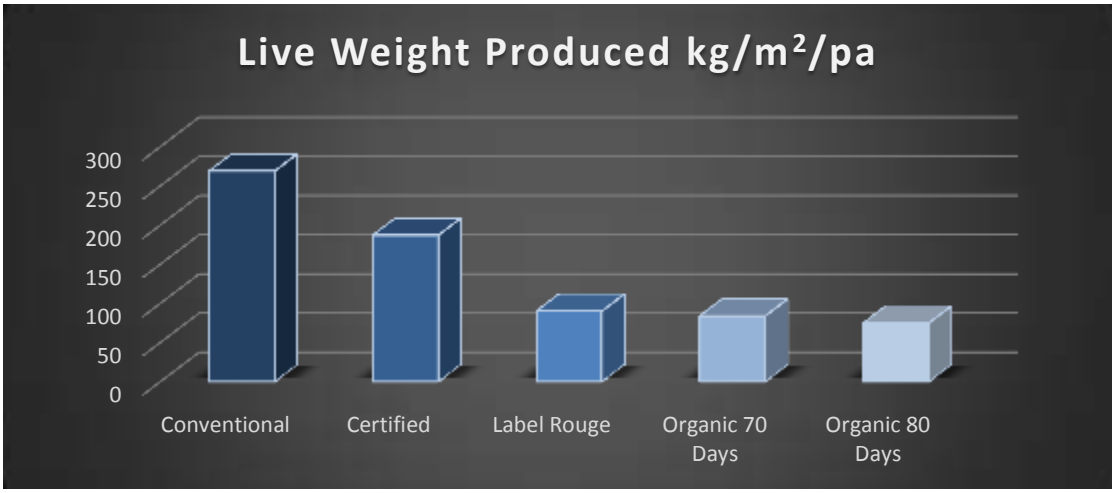
Claude gave me an in depth presentation titled "French Quality Products – Strengths & Weaknesses". It was interesting learning that France has three styles of production – Conventional (UK equivalent is the Red Tractor Standard), Certified/Free Range, and Label Rouge which has a processing age ranging from 34 to 81 days, which is a much wider range than the UK's equivalent 39 to 70 days. They are questioning whether a "premium" range would have a place; this would be along the lines of the UK RSPCA Freedom Food standards. I was also interested to see that their Label Rouge range has not decreased in age of processing in 30 years (it was 81 days in 1980 and still is now) whereas their Conventional range has decreased from 51 days in 1980 to 34 days in 2010 – how much was this down to public expectation/ perception?



In 2008, 51% of whole carcass purchases were Label Rouge chicken compared to approximately 27% of conventional chicken; whereas, if purchasing portions, 72% of the public would select a Conventional chicken

portion and less than 10% would select portions from a Label Rouge chicken. It is believed that for cut-up portions consumers are less concerned with welfare and quality traits and are looking more for convenience and price – is this due to the product being purchased not resembling the animal reared?

I was forming a view that if we could reduce mortality in broiler chicken through reducing the stress levels on the birds we would become more efficient producers. However, a slide Claude showed me made me think of the saying "one step forward two back"! If we were to reduce mortality the quickest and easiest step is to increase the length of time it takes to get to the required weight but, as the table below suggests, it also vastly reduces the productivity of the poultry house.



5c. Roussay – Frederic Grimaud (President Groupe Grimaud)

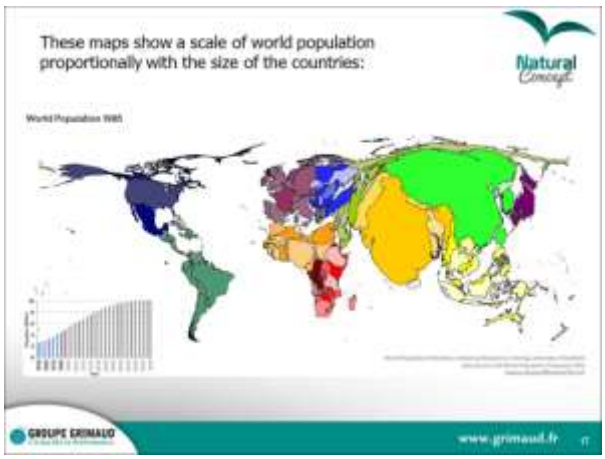
I was extremely fortunate to have a meeting with Frederic Grimaud, President of the Grimaud Group which owns Hubbard.


Frederic Grimaud & Jim Hunnable

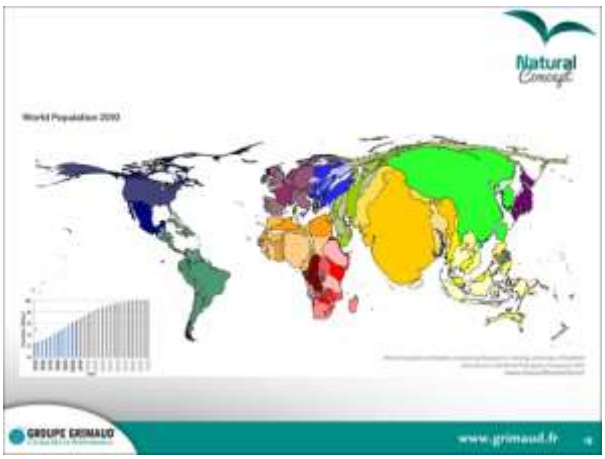
Groupe Grimaud has two sides to their business: one being breeding a diverse range of animals including chickens, pigs, ducks, guinea fowl, rabbit, pigeon, aquaculture etc., and the other side is bio-pharmacy serving both human and animal health. Frederic took the time to explain the history of the group, how the business works and their ethics within their industry.

Frederic has also been studying feeding an increasing population although this was in general terms and not with a specific view to chicken. He and his team have created an ideology called "Natural Concept" on which they have spent a tremendous amount of time and resources to set up a policy for their company to work towards, one of the slides from his presentation clearly shows his commitment to this:-

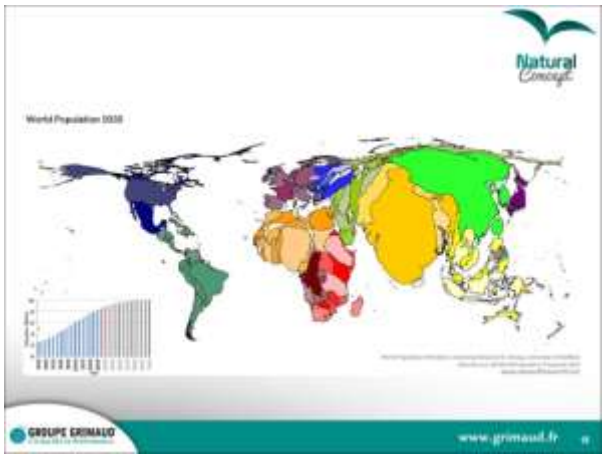
The whole presentation was fascinating and Frederic was extremely generous with his time and patience when I was asking a multitude of questions. He is totally of the belief that if we look after our planet we can look after ourselves. Many slides were fascinating but I was particularly impressed with the following set of images, which give a pictorial indication of which countries are predicted to have a population explosion.



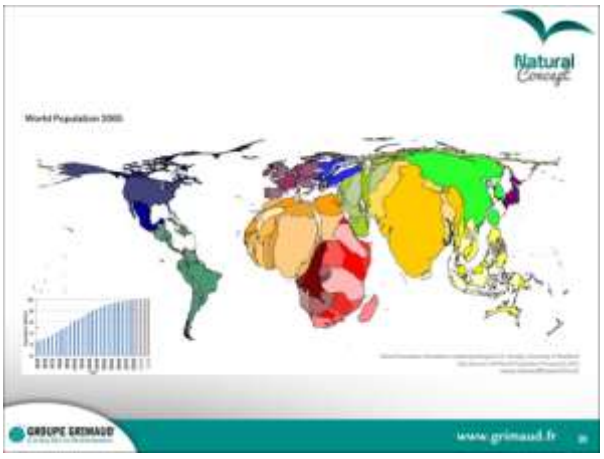
World population 1985



World population 2010

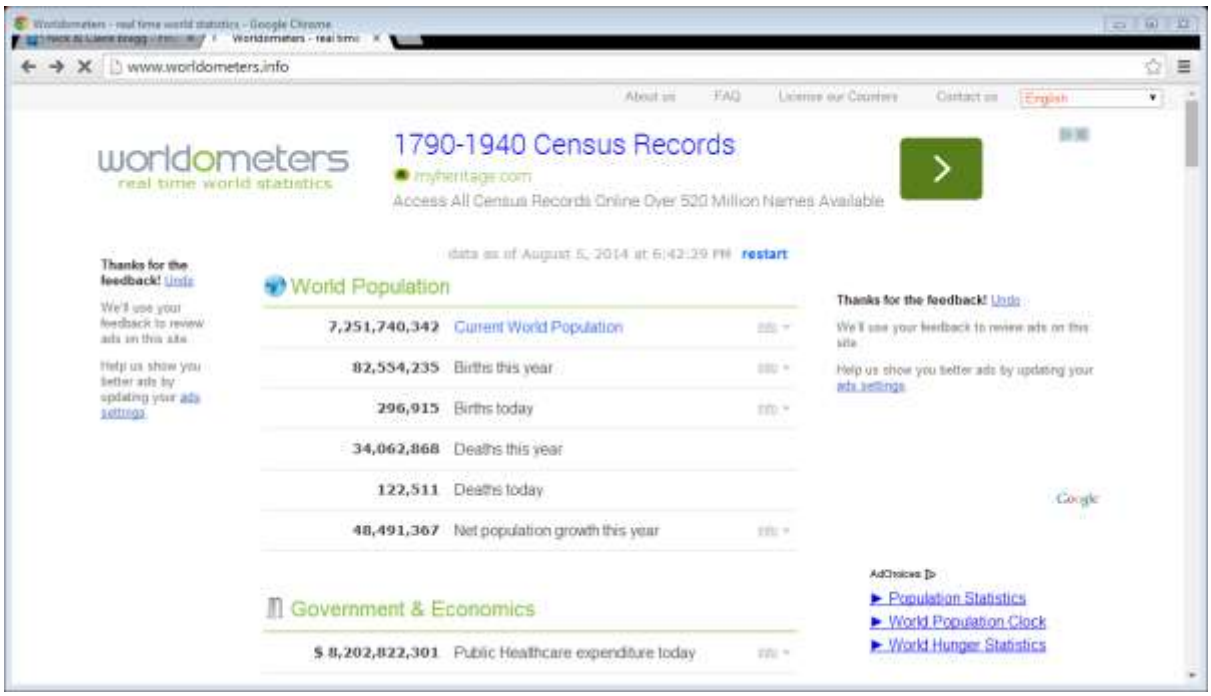


Predicted world population 2035

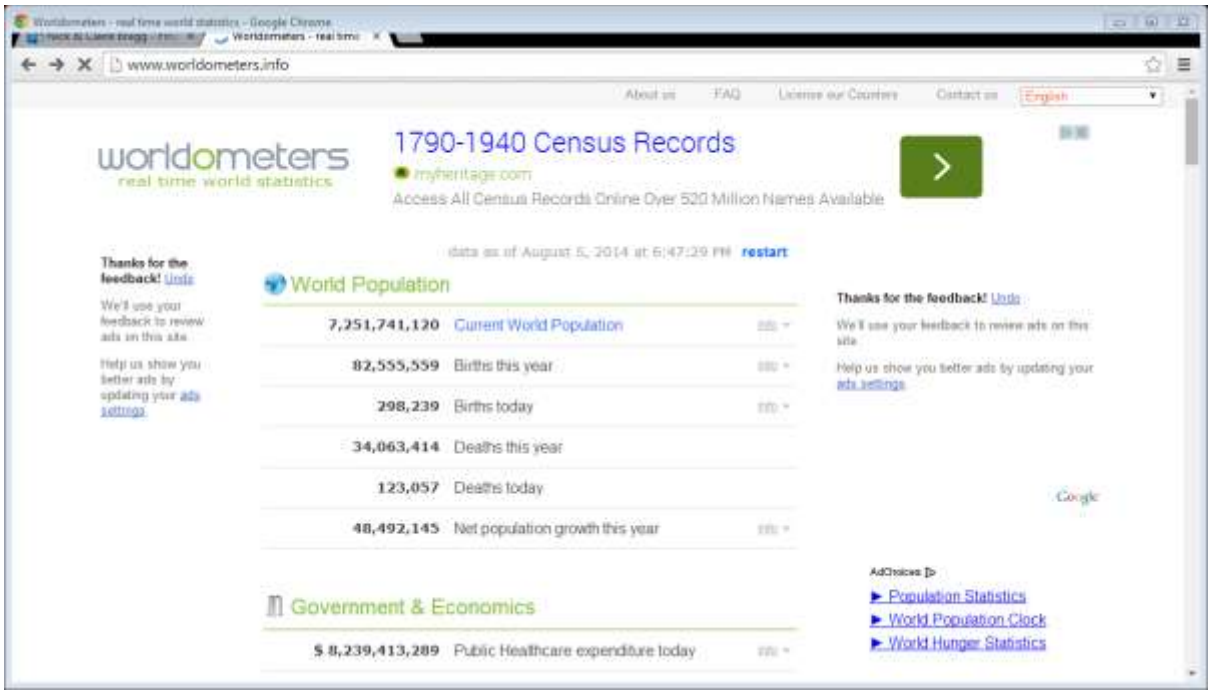


Predicted world population 2085

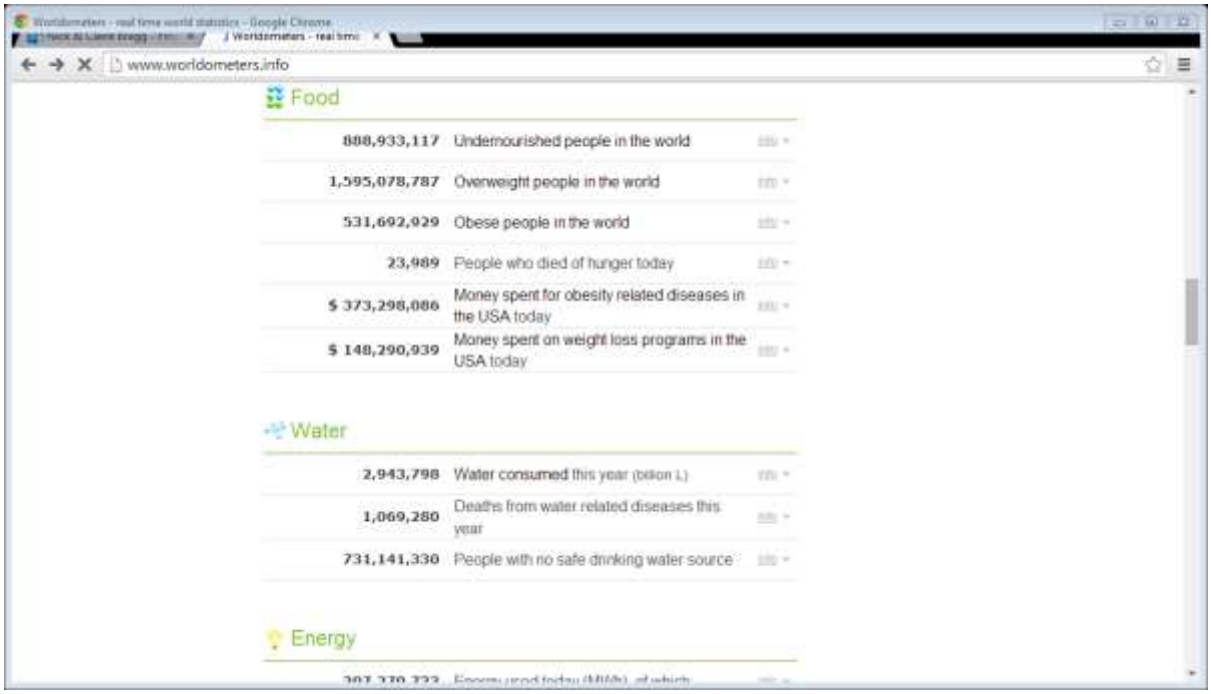
One last golden gem given to me was the website “worldometers” (http://www.worldometers.info/) which gives real time world statistics (data from the UN). If you have any doubts about the scale of population increase take time to look at the numbers changing every second:-



And five minutes later:-



But perhaps more poignant are the figures for obese people compared to undernourished – is there not a way of sharing food across the world?



5d. Hubbard R&D site, Chateauborg – Frederic Fagnoul (Geneticist)

My last meeting in France with the Hubbard team was perhaps, from my perspective of wanting to know what the future held, the most important – Frederic Fagnoul is one of Hubbard's Geneticists.

We spent an intense few hours working through a presentation of Hubbard's Breeding Programme and Alternative Products. As with all the Hubbard gentlemen Frederic was generous with his time explaining to a layman the complexities of genetics within the broiler world. I learnt more in this meeting than I could ever have imagined and realise that the possibilities are endless of what we as broiler producers/breeders can achieve. It was also a relief that changing the genetics meant studying the pedigree flock and breeding from birds deemed to be the best - rather than some kind of test tube approach.

From 1 pedigree chicken 45,562,500 broilers can be produced

As a Hubbard grower I wanted to know (selfishly) how long it took for the changes in the pedigree flock to be seen on our farm – it's 5 years - and what their area of current selection were:-

- Weight/FCR (Feed Conversion Rate)
- Conformation/Breast Yield
- Skeletal Quality & Robustness
- Liveability
- Colour
- Individual Fertility and Mating Behaviour – in male lines
- Number of Eggs – in female lines
- Individual Hatchability – in female lines
- Behaviour/Aggressiveness – in female lines

I wasn't too surprised by the selection, although I perhaps hadn't give much thought to egg production within the broiler side of the industry - but the chicken have to be produced somehow! We had quite a long chat about FCR (food conversion rate) and where it could potentially reach. Currently poultry meat has the best FCR of all farm animals at an average of 1.6 but fish apparently are as low as 1.2 - so could we improve to get as low as this? The benefits of improving the FCR would obviously have a beneficial effect on the competition for cereals.

Currently poultry meat has the best food conversion rate of all farm animals at an average of 1.6 but fish apparently are as low as 1.2

It was on the drive back to the airport that Jim Hunnable (Manager of Sales and Business Development for Hubbard) started a conversation about the possibility of a dual purpose chicken which could be reared in countries where suitable storage was not an option. The chicken would be free range, reared by a farmer in the area - the females to produce eggs and the males to become meat for the local population. This was a subject we could not answer in the car but one I keep coming back to and one day I will find out if this already happens on a commercial basis or whether there is a straightforward answer as to why it doesn't happen.

6.0. Canada

During the Contemporary Scholars' Conference in Ontario I learnt that Canada has a quota system for the production of broiler meat. Since we did not see/speak to any broiler growers during this conference I was curious as to how the system worked so decided to return to Canada later in the year to find out more. Having researched which areas of Canada reared broilers I sent e-mails to the state's chicken associations and received the best response from Alberta and visited the state in September.

6a. Karen Kirkwood – Executive Director, Alberta Chicken Producers

Alberta Chicken Producers is a farmer-run, non-profit Marketing Board that regulates chicken production in Alberta by working closely with their producers and industry partners. They are governed by a board of five elected Directors and administered by the Executive Director and staff of six full-time employees. Alberta Chicken Producers' membership consists of 240 certified and licensed chicken producers in Alberta.

Karen was a delight to talk to about the Canadian quota system, explaining in plain English how it worked and what the benefits were. In essence the quota is part of the nation's Supply Management System. This system came into effect in Canada under government regulations in the 1970s to address prior volatility in price and supply of Canadian dairy and poultry agricultural commodities. This system ensures the orderly marketing of poultry and dairy products; and all industry stakeholders, including the hatching egg, chicken, processing, retail and food service industries work together. The Canadian Government supports this system. The overriding idea is to protect the quality of the chicken purchased in the Canadian shop whilst giving price stability to the grower.

Karen Kirkwood

Anyone wishing to grow boiler chicken has to have quota units, which can be purchased or leased from other producers. Alberta has just over 6 million units, with one unit equating to approximately 20kg chicken/pa. An average farm would have a quota of between 20,000 to 30,000 units and this equates to about 2 x 30,000 bird sheds. The price of quota fluctuates depending upon demand and the health of the market. The current value of the quota confirms that it is a good industry to be in. In addition to the price is the availability, broiler chicken produces a sensible return and it is rare for a farmer to stop producing, unless he/she is ready to retire. Retirement generally means that the quota is transferred down to the next generation, or sold to eager young people wanting to get into the industry.

There is very little export of broiler meat from Canada as the domestic market is their main concern. Under the 2013 WTO (World Trade Organisation) Agreement, Tariff Rate Quota is allocated each year through import permits. Tariff Rate Quota is allocated to permit holders to a maximum of 7.5% of domestic production in the previous year. Supplemental imports may also be allocated to fill a specific need, to a maximum of 0.7% of domestic production in the previous year. In other words they are looking after their own growers exceptionally well.

Alberta Chicken Producers' Board is authorised through The Marketing of Agricultural Products Act and Regulations to set the minimum live price paid to producers every eight weeks; the board has worked with processors to implement a live price MOU (Memorandum of Understanding), which ensures long-term stability and predictability in price for all stakeholders.

Alberta Chicken Producers' Board Keys to Success are shown below.

- **Strategic Planning:** Alberta Chicken Producers' conducts an annual Strategic Planning process, involving participation, collaboration and input from our Processors and Alberta Hatching Egg Producers. Priorities and Measurable Outcomes are developed as a tool for the Board of Directors and Staff to administer over the course of the year.
- **Strong Stakeholder Relationships:** working closely with our industry partners, we can adapt to changes in the market and address industry issues efficiently and effectively.
- **100 % On-Farm Food Safety Certification:** mandatory requirement of our registered Producers' licenses to market chicken. All registered chicken producers are certified annually under this third-party audited program.
- **100 % Animal Care Certification:** mandatory requirement of our registered Producers' licenses to market chicken. All registered chicken producers are certified annually under this third-party audited program.
- **Emergency Preparedness:** Alberta's poultry industry has taken a lead in developing a comprehensive Emergency Response Plan. Each registered chicken Producer in Alberta has a copy of the Plan, and the plan is tested through Table-Top exercises annually.
- **Biosecurity:** biosecurity is a mandatory component of the On-Farm Food Safety program, and best-practices are incorporated into our Producer Emergency Preparedness Plan.

6b. University of Alberta – Dr Martin Zuidhof (Associate Professor)

Dr Martin Zuidhof and Claire Bragg

Dr Zuidhof is a leader in the Poultry Research Centre, an effective partnership between the University of Alberta, Alberta Agriculture and Rural Development, and the poultry industry. His research focuses on nonlinear models of growth and yield of poultry, as affected by nutrition, management and genetics.

Karen Kirkwood had suggested that Martin would be a fascinating gentleman to meet and discuss his research project – she was correct on every level!

Martin's project is to look at the un-balanced way the

parent flock is fed to keep them at their optimum weight for reproduction. Chickens have a rigid hierarchy and when it comes to feed time; the dominant birds push to the front and gorge themselves; the smaller, submissive birds are left waiting for a chance to get any feed that is left after the larger birds are satisfied. Either way, neither end is at their optimum weight which then has a knock on effect to the quality of the egg.

Martin has created a feeder system which, in very simple terms, weighs the bird prior to eating and calculates how much food is needed to keep it at the optimum weight. In essence he is trying to do within the poultry industry what the dairy/pig industry has been doing for years. Martin had an infectious enthusiasm about his research which you couldn't help but get caught up with, especially when he let slip that he had named the dominant chicken Amanda (after a contestant within Canada's Big Brother!) who would enter the system dozens of times a day to see if she could trick it into giving her more food.

This research project is still in its relative infancy and prototypes are constantly developing before being scaled up for a commercial trial. Having visited a breeder site in the UK I am struggling to see how this new equipment can be installed from a financial and space perspective but, from a grower's view, I would love to see this system in action if it improves the quality of the chicks we buy. I also have to say that from having met Martin with his enthusiastic personality I wish him every success and really hope that this feeder system becomes the norm in the future.

6c. Edmonton – Maple Leaf Consumer Foods

Outside Maple Leaf's Edmonton processing plant

To complete my trip to Canada, I visited the Edmonton processing plant belonging to Maple Leaf where I met Frank Maenhout (Manager Technical Services & Industry Relations) and Ken Rice (Technical Services Representative, Western Canada). We spent an hour in their offices discussing the Canadian broiler industry and comparing it to the UK industry. They are working with the industry to ensure the proposed new standards meet the needs of all stakeholders.

We forget how big Canada is and, due to the large scale of the country, their growers were between one and four hours away from the processing plant which creates a multitude of problems. It can get down to minus 40^{o}C so during transportation the lorries have to stop to let the temperature rise again - quite unbelievable from a UK perspective. Chicks can be transported for up to six hours which often results in dehydration and high seven-day mortality. To compensate for this it is fairly common to have an extra 2% delivered. The industry standard is for 2% extra chicks in all flocks; this offsets start-up issues due to local conditions.

In general it was felt that the quota system works for the country (in Sept 2013, I was told that a quota unit in Alberta costs approximately $175), the consumer was eating Canadian chicken and the producer was getting a fair return. Whilst travelling around Canada I had noticed how patriotic Canadian people are and that they are very proud of their producers, wanting to know that they were eating Canadian produce.

I was taken on a tour of their processing plant which ran on a similar basis to those in the UK. They process an average of 55,000 chicken per day, five days a week by a team of 300 people and it looked to be running efficiently and smoothly. Interestingly they were using a gas within the packaging which allowed for extra shelf life; this was a distinct benefit for the distances travelled. Due to the nature of being in a processing plant I was unable to take anything in with me with which to take notes, so details of this procedure were not recorded. Although the picture to the right does not show it, I noted that similar to the UK the product being run was covered in additional labels for the retailer's benefit.

Outside a Canadian broiler shed

After lunch Ken drove me an hour to one of their contract farmers near Thorsby. It was a new site with two sheds housing 30,000 birds each with a large inter-connecting control room. The rearing system was very similar to that in the UK; the main differences were due to the temperatures they can experience (ranges from +35°C to -40 °C), the lower end of the range proving the most problematic.

In the control room the water pipes, which ran from a bore hole into the sheds, went via a grid system on the wall to allow the water to warm up before going in to the drinking lines for the chicken. The sheds were heated via gas boilers in the control room thus providing an indirect form of heating; I spoke to them about woodchip boilers, thinking they had plenty of wood to burn, but it

was pointed out that they also had an enormous quantity of natural gas which was far easier to use to run boilers. Interestingly one of the houses had fluorescent lighting and the other LED. The LED looked darker but I was told the chicks were more active in this house as the LED is a constant light to the birds whereas the fluorescent is a flickering light.

Control room showing pipework warming up the borehole water

I was asked a very interesting question by the grower: how were UK broiler growers protected from an invasion of growers from another country (i.e. China) - as we did not have a quota system and was I worried about it? It took me a moment to think that one through and I came to the decision that planning regulations and IPPC were enough to put anyone off taking over UK production!!

Inside a Canadian broiler shed

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One last tale from Canada: whilst driving around the countryside I saw a couple of chicken sheds and thought I would call in on the off chance that someone might be willing to chat to me. Sadly no-one was around except a very large dog and a sign that said *"Trespasses will be shot, survivors will be shot again".* I wasn't bold enough to take a photo of the sign and didn't hang around for long either!

7.0. Netherlands

Anthony Taylor of Cobb invited me along with 2014 Nuffield Farming Scholar Werner Strydom, Poultry World's Jake Davies and Oxford University's Professor Marion Dawkins, for a day visit to their commercial broiler testing farm in the Netherlands.

7a. Cobb Commercial Trial Farm – Simmes Family

Anthony Taylor, Werner Strydom N.Sch,
Jake Davies and Claire Bragg

Although Cobb are confident that the chicks they breed and associated rearing manuals enable the grower to get the best returns; they want to be 100% sure that they are trialling their birds under commercial conditions. Anthony explained that this was an ideal situation for all to fully understand how their breeding programmes relate to the real world.

Having all taken our turn to shower in and change into "farm" wear we were allowed to enter the shed. There were 40,000 birds split evenly into 24 pens where food and water could be controlled individually.

The shed was modern with the latest heating, ventilation and computer controls, including a heat exchanger. The environment felt comfortable and the chicks (approximately 15 days old) looked well and active. Ignoring the pens everything else was as per UK sheds except for the lack of windows - which is a debate in itself.

Outside view of commercial broiler shed showing heat exchange unit

We were welcome to walk freely round the pens asking any questions we felt relevant and to discuss what we saw. Martin Gruyters & Anthony Taylor of Cobb explained the whole system thoroughly - how, why and the base controls used on this site.

Base standards used when rearing Cobb broilers:-

- Minimum floor temperature = 28°C
- Minimum litter temperature = 32°C
- On arrival of chicks 50% of floor space should be covered in paper
- Minimum amount of feed on paper = 65g per bird (75g for young parent flock)
- Paper to be placed either side of drinker lines
- Lighting to be evenly distributed with minimum of 20 lux to stimulate activity & help the chicks find food and water.
- Water temperature on chick arrival = 10-14°C
- Water pH should ideally be below 7.5
- Water ORP should be a minimum of 650mV
- Ideal water flow rate = 80mil/min
- Minimum ventilation to optimise airflow, CO2 should never exceed 2,500 ppm
- Heating, UK minimum to be 0.50kw/m^3 of house volume

Internal photos of the Symmes commercial trial farm

Arriving back at Bristol airport less than 24 hours after flying out, I reflected on what I had seen and discussed during the day. It made me appreciate the fact that Cobb spend an incredible amount of time, money and energy ensuring that the chicks we rear fulfil our needs and are not so "high maintenance" that we lack the resources to meet their growing requirements.

8.0. Australia

In Australia I had persuaded fellow Nuffield Farming 2013 Scholars that I could stay with them! After a 24 hour stop over with Trent De Paoli and family in Bundaberg to acclimatise to the weather and time difference, I drove south to stay with fellow broiler growers.

8.a. Queensland

8.a.i. Wamuran, Queensland – Jodie & Wayne Redcliffe

Wayne & Jodie's chicken sheds – north of Brisbane

Wayne & Jodie's farm is about an hour's drive north of Brisbane which they had purchased from Wayne's parents in 2003. The site consists of their family home and seven broiler sheds housing approximately 245,000 Ross birds – reared to 3.4kg in 49/50 days. We spent a morning walking around their sheds looking at their systems, comparing them to those in the UK.

It was my first introduction to cooling pads, something of very little use in the UK! The tunnel inlet end is 6 to 8 bays or approximately 30 meters long. It consists of Munters' 150mm thick corrugated cool pads on the side in front of the tunnel air inlets. Water constantly trickles down them, and is recycled within the system, which cools the air coming into the shed through evaporative cooling.

Close up of the cooling pad material and Wayne showing the constant flow of water – dripping from his elbow

Gable end fans

The gable end wall is filled with large fans which pull the cooled air through, keeping the chickens, although warm, in a condition they were comfortable with. Wayne was getting agitated with the thought of catching the birds two days later in the anticipated heat (40^{o}C). He was wanting an early catch to make good use of the "cooler" conditions; at this time there were rumours of loss of birds at catching through heat stress. Catching up with them later it transpired that it did not get as hot as predicted (although still a great deal hotter than we are used to) and catching went smoothly.

To Wayne's huge amusement I was incredibly jealous of the condition of their litter which resulted in birds with perfect feet, no pododermatitis in sight. Very obviously they had their shed environmental controls set up for optimum performance.

Beautifully friable litter

Perfect feet

Inside one of the Redcliffe's chicken sheds

Apart from the cooling pads the most obvious difference was the lighting level; having walked into the shed from quite bright sunlight outside it was initially difficult to see anything before your eyes became adjusted to the low light levels. I am not sure what the exact lux levels were but, knowing that a new standard of at least 20 lux was being brought in later this year, it was obviously <20. Knowing the quality of the birds and their environment, there was absolutely no reason to criticise it. It made me think more about the fact that chicken were jungle fowl before we domesticated them and therefore are far happier in shady light.

Where/how did we come up with the idea that 20 lux is the correct level for them? Was this scientifically calculated or was it yet another humanised figure?

Jodie is the current President of the Queensland Chicken Growers Association and through her contacts she was able to set up some meetings for me – one to meet David Bray, another to visit Clayton Tully's free-range site and finally a meeting with a poultry broiler service person.

8a.ii. David Bray – Golden Cockerel and Darwalla Milling Company

David Bray and Claire Bragg

After a Health & Welfare meeting, David kindly gave me an hour of his time to discuss the Australian broiler industry. There is no exporting or importing of broiler meat. The average consumption per capita per annum is 40kg and in Queensland they are seeing a market increase of 5% per annum. South Australia's broiler industry is growing the fastest due to good government support and Queensland has excess capacity when it comes to feed milling. Their biggest challenge is water followed by cost of feed and concerns about transportation. Although there are issues, David felt that the future of the industry was looking very good.

8a.iii. Clayton Tully – Free Range Broiler Grower

I was interested to see how free range worked in Australia and Jodie kindly organised a visit to a grower about an hour's drive from them. Clayton Tully's site was new and although I was unable to see any chicken as they were between crops, it enabled us to walk round their site without restriction.

Clayton Tully's Free Range Site

As you can see from the photos, on the previous page, the outside range area is less than the UK's requirement; currently Australia's range size is 2 times the floor area of the shed, whereas the UK Freedom Food Standard is 1m2/bird. The shelter offered at Clayton's farm is currently in the form of an overhead man-made shade rather than natural shelter i.e. trees. The pop holes are relatively standard, although Clayton had created a system which rolled up the side mechanically for ease. As appears the norm in Australia each shed had cooling pads and enormous gable end fans.

Pop holes

Gable End Fans

We in the UK remove all our litter between crops to ensure a thorough washing and disinfecting of the sheds. In Queensland they would like to do this but the price makes it prohibitive. Instead half the litter is removed; the balance is composted within the shed, and it is then spread back out over half the shed and new is brought in just for the half in which they will brood the new chicks. Before we get carried away, we must remember the climate in Australia v UK.

Old and new litter

Jodie Redcliffe, Clayton Tully & Claire Bragg

8.a.iv. Poultry Broiler Service Person – Kelly McTavish

The discussions during the meeting with Kelly McTavish were her views and thoughts on the industry and the future; they are not directly related to her direct association in the poultry Industry.

At the time of the meeting a great deal of change was occurring in the Australia poultry industry regarding customer requirements for 'Third Party Auditing' of welfare in the industry. The major customers in Australia had chosen to use the 'RSPCA - Meat Chicken Farming Scheme' as their method of third party auditing of welfare in the poultry industry.

Claire Bragg, Jodie Redcliffe & Kelly McTavish

We discussed the anxiety that this pending change had caused throughout the poultry industry. We also discussed the current 'Self Imposed' Company Welfare Standards, current Customer Standards and current Government Poultry Welfare that were already in place and the necessity for this additional requirement.

There is always going to be change, life is not static and neither is the poultry industry; it is a basic human survival function that with change comes concerns and anxiety. The poultry industry is a fast moving rapidly changing industry; this should be viewed as an advantage over other rural industries and embraced.

We discussed the education of the public and the need for a better understanding of the quality of the products that we already produce. Farmers need to open up, communicate and educate; with a positive attitude about the Australian poultry industry. Isolation and segregation of farming practices are things of the past; farmers need to be openly proud and assertive of the industry they are so passionate about.

We discussed the isolation of the Australian poultry industry and the effects that a relative small population have on poultry markets. The options in the Australian poultry industry are limited, with a large portion of the market being isolated to two major customers.

Additional concerns discussed were those of urban encroachment and the loss of viable farming land. The most viable land in Australia is in the coastal regions. Unfortunately these regions are very popular places for people to live, thus viable and valuable farming land is being turned into urbanisation; cohabitation of people and farming industries is becoming increasingly difficult.

Kelly is very positive and passionate about the Australian poultry industry and its future in Australia and across the world. The Australian poultry industry produces a high end quality product in both Food Safety and Animal Welfare. This uniqueness needs to be harnessed and enhanced to maximise our potential in the local and world markets.

8b. New South Wales

I drove across to Tamworth in the north of New South Wales, to stay with Guy Hebblewhite N.Sch and his family. Guy is a broiler grower who had contacts for a couple of very good meetings. One was to a large hatchery where although we were not allowed to look around the hatchery due to the very strict bio-security, we had an hour talking to the hatchery manager about their logistics. As was the case with the hatchery I visited in the UK, this hatchery also had a lot more to contend with than I had imagined. I think Guy got as much from this meeting as I did.

After our meeting Guy took me to his farm, about a twenty minute drive outside Tamworth. The site was impressive, looking down a very long farm road to see in the distance what appeared to be a shiny mirage. It turned out to be 8 x new (5 years) 56,299-bird sheds – very envious! Guy has a contract with Baiada to produce Cobb chicken to 3.8 kg over 53 days. The sheds will be thinned three times plus a final depletion – what a lot of work! Eight sheds x 4 catches each crop. In the UK we (currently) only have two catches, one for thinning and one for depletion.

Entrance to Guy's farm

Effect on the land of high temperature and lack of rain

8b.i. ProTen – Ian Curtis (Regional Manager Tamworth)

Ian Curtis from ProTen agreed to have a general conversation about the broiler industry and how ProTen viewed the future.

To understand who ProTen are, I have taken a quote from their website http://www.proten.com.au/

> *"ProTen Limited (ProTen) specialises in the design, construction and operation of high-quality broiler chicken farms throughout Australia and is considered a preferred and leading supplier of broiler chickens in Australia.*
>
> *The business has a strong and proven track record in operational and financial performance and earnings expansion through organic growth.*
>
> *ProTen farms are strategically located in New South Wales and Western Australia and currently comprise a total of 172 sheds. ProTen owns and operates its farms and produces in excess of 40 million birds per annum which represents approximately 7.0% of Australia's current production.*
>
> *ProTen was founded in New Zealand in 2001. The New Zealand operations were sold between 2003 and 2006.*
>
> *ProTen entered the Australian market in 2002 and migrated the company to Australia in 2008 as a public unlisted company."*

In the previous 18 months they had built 48 x 47,000 bird sheds and had plans to build a further 150 over the next two years. They certainly had confidence in the future, although it was made very clear that the development was in association with their integrator and not

with their own thoughts and conclusions. The new sheds are being sited in areas of natural resources (i.e. bedding and feed) with the added product sold away. As previously mentioned, Australia has a problem sourcing bedding at an affordable price. ProTen are currently using rice hull - not one I had come across before, but it isn't in huge supply in the UK!

When asked for views on the issues ahead Ian discussed:-

- Bio-security – cleanliness and hygiene is paramount for the prevention of transferral of disease. New sheds are being built in relatively close proximity and bio-security has to be taken extremely seriously, keeping the potential of disease transferral to a minimum.
- Better Technology – this is not a negative but an issue we as farmers have to make best use of.
- Feed Conversion Rate – breeder companies are constantly working on reducing FCR which is brilliant when we consider the potential battle for food in the future.
- Pressures of markets – it was felt that the supermarkets had a disproportionate share of the market and in having this were making more and more demands.

I thoroughly enjoyed our conversation, which Guy and I continued during the trip back to his family home. The next day I drove on down to Sydney for my final meeting on the Australian mainland.

8b.ii. Dr Tim Walker – Poultry CRC (Program 2 Manager)

Dr Tim Walker Poultry CRC

Whilst organising my "big" trip, Tim had kindly agreed to meet me and suggested where I could stay in Sydney (it was a very good suggestion). On my first morning in Sydney, Tim came and collected me and showed me around the area concluding with a coffee and chat in the rain by the waterside in a very nice café.

To give a bit of background to Poultry CRC - it is an organisation funded by industry and the federal government. Current funding started in 2003 and will terminate in 2017; 95% of the poultry industry is associated with CRC. Their website explains who they are and what they are working towards http://www.poultrycrc.com.au/about-us/ (*see text box on next page*)

The Poultry CRC's major challenge is to help Australia achieve sustainable, ethical poultry production in the face of population growth and climate change.

The Poultry CRC conducts research and drives education and training to help Australia's poultry industries produce more from less, sustainably.

This requires innovative approaches to:

1. maintaining poultry health and enhancing bird welfare
2. improving resource utilisation and reducing environmental impacts of poultry production
3. controlling poultry product-associated food safety issues and enhancing egg quality for consumers

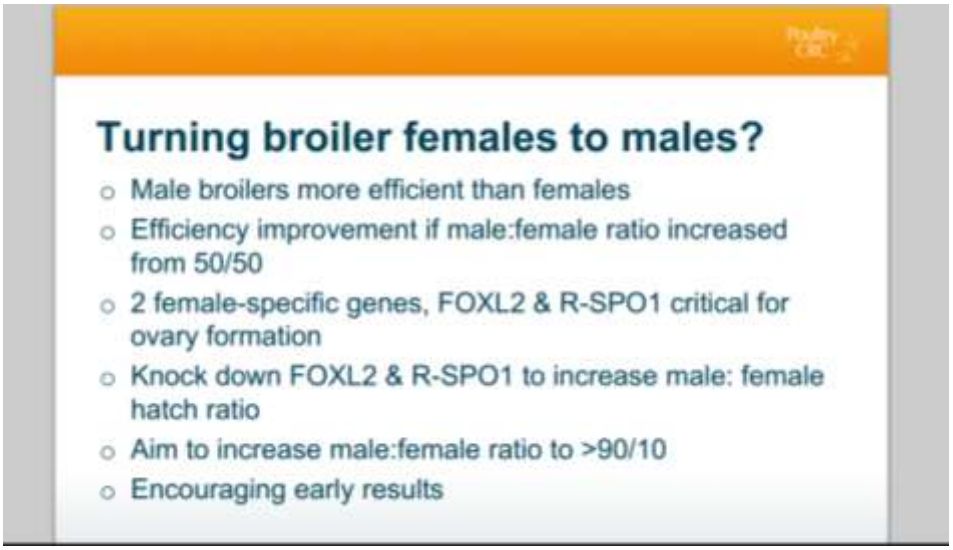
The Poultry CRC is an unincorporated joint venture between seven Essential Participants and is governed by a skills-based board. It manages its research and development programs through a public company, Poultry CRC Ltd. The Poultry CRC is headquartered at the University of New England in Armidale, New South Wales, and has an extensive collaborative network comprising researchers, educators and support staff from its participating organisations.

It is fairly obvious that they are a well-respected organisation with many projects going on at any one time. It is Dr Walker's role to manage the nutrition and environmental research and he took the time to explain all about Poultry CRC and his area. Although Tim had many thoughts/views/ideas on where the industry will be in 2050, which included feed, environment, public perception and water, there were a couple of thoughts no one else had yet said:-

- The faster the growth the more heat the bird generates, which will have a huge impact on hot countries as will the requirement for energy to power cooling units.
- There is the potential to genetically change embryos from male to female for layers and vice versa for broilers.

We appear to be always striving for a lower and lower FCR which in itself is not a bad thing especially when you consider the competition for land, but every good thing has a flip side and in this case it is the extra heat being generated. In countries already struggling to keep the birds cool, could this be a stage too far? The effect on the environment should also be considered; in theory to cool birds down faster/over a longer time will take more energy, which could be in short supply unless renewable energy is more developed and accessible than it is at present.

I can fully understand the theory that for the laying industry there is no requirement for male birds (about 6 billion females required globally each year – sex ratio is 50:50 therefore 6 billion male chicks are discarded as day olds) and the broiler industry produces more meat efficiently with male birds - but changing the sex in the egg?



Screen shot from a presentation given by Dr Tim Walker for the NZ Poultry Industry Conference in October 2012

How far will public perception allow this to go? Education will have to play a huge role in this instance. Once the public understands exactly the logic behind the action they should believe it is the most efficient thing to do - or would they question what else goes on in farming?

In a very non-scientific approach I have raised this subject with people I have spoken to about my studies; those from a farming fraternity understand the logic although have worries about how the public would perceive it and those from a non-farming background (and slightly older in age) are initially aghast that this *could* be done and then horrified that it *would* be done. I think we will need a huge public relations campaign to get the general public (in the countries where high welfare is a major factor) to understand and accept this procedure.

8c. Tasmania

Of all the countries I visited on my travels Tasmania (although I appreciate it is part of Australia) was my favourite; laid back, beautiful countryside, easy to get around, incredibly friendly helpful people - and the list goes on. I only visited one poultry company whilst here but took the time to visit other farming friends.

8c.i. Dairy

Jane Bennett N.Sch was my host for my first 24 hours and kept me entertained with her farming, Nuffield Farming and directorship exploits! She was very generous with her time and made me feel that anything was possible. The second night I was guest of Jane's parents, Michael and Maureen Bennett, who had invited their friends Lyn & Chris Dornauf for an evening meal.

Jane had spent two years in England learning the craft of making cheddar cheeses through which the Bennett family have an award winning cheese company they run alongside their

farming business. Maureen drove me around their farm explaining the background, and then to their shop, which includes a wonderful viewing gallery to see how the cheese is made.

Our next stop was at the Dornauf's "Gala" farm which boasts the first ever robotic rotary milking parlour, what a sight. I could have stayed there for hours watching the cows come in to be milked as and when they wanted; they were exceptionally quiet and relaxed. The photo below gives a far better visual explanation than I could ever write – just look for the tiny red dot towards the top of the picture to see where the robots are lining up the teats to be attached, amazing.

The Dornauf's robotic rotary milking parlour – 1st commercial one in the world

Whilst being in awe of the system and animal welfare it made me realise that other sectors of farming are also pushing the boundaries of technology and just because it isn't possible at the moment doesn't mean it can never be done.

8c.ii. Potatoes

In early 2013 we were contacted at home by a family of seed potato producers from Tasmania who were planning a visit to the UK and would love the opportunity of visiting a few potato growers. In July of that year Peter Wilson along with his wife Julie and sister Karen (with partner Peter) spent a couple of days with us having a busman's holiday! Whilst in Tasmania, and with 24 hours spare, I took up their offer of a return trip. I had such a wonderful time with them enjoying some "potato" time (another large part of our farm is potatoes and potato contracting) so felt very much at home with them. We went and inspected their crops which were only a few weeks away from being harvested; they were

Peter Wilson's Seed Potato Plants

looking very healthy and looked as if they would have a good yield. Again, this is another agricultural sector which is using genetics to enable a plant to adapt to a changing planet and market forces – greater yields, less reliance on water, less reliance on pesticides and insecticides etc.

8c.iii. Nichols Poultry, Sassafras – Robert Nichols N.Sch

Through Jane Bennett (and the Nuffield Farming Directory) I got in contact with Rob Nichols to ask if I could take up an hour or two of his time to find out how he was rearing broilers in Tasmania. Rob kindly gave me 24 hours of his time and his family's hospitality, which was more than generous.

Nichols Poultry is a family run, fully integrated business with breeder farms, hatchery, broiler growing, feed mill, processing and transportation – in other words they have a fully integrated system with full control, enabling the provision of quality products. Their mission statement is:

> *"Nichols Poultry will embrace the best practice Total Quality Management, and lead with a committed environmental focus, rewarded by the knowledge that we are producing a premium product for a sustainable future."*

On the first afternoon Rob took me around the processing plant and feed mill showing how they have had to expand and adapt to the changing markets. Tasmanian people are very patriotic, buying Nichols' branded chicken over supermarket brands to show their confidence in locally grown produce. They have experienced problems due to their increased market share but Rob is an extremely practical, hard working person who appears to be able to overcome everything.

The following morning we went round some of their broiler sheds and their contract growers' sites. The Nichols sheds were as I anticipated – similar to the UK except in a couple of cases where the sides were of material which could be rolled up to aid with ventilation and cooling. I appreciated Rob's practical side when he showed me a strangely shaped square house which he explained was originally built when they were only processing 1,000 birds a day so their sheds were built just to house the daily requirement; now that they were

processing between 12,000 to 15,000 birds a day the three sheds had been knocked into one. How simple and how sensible.

Three x 1,000 bird sheds converted into one x 3,000 bird shed

Manual litter cultivator

It was within this shed that Rob showed me a small contraption they he had invented to be pulled along by the stockman when checking the crop, to cultivate the litter to enable it to be kept in a dry friable condition). Having taken a number of pictures of it I came home to find our own version!

One of the contract growers was a gentleman named Nathan Richardson who had two sheds of an Israeli design (very similar climates). The sheds were relatively new and Nathan was still getting to terms with the intricate details of the systems, he was doing a very good job but was very keen to know what both Rob and I thought of the birds. Poultry is not Nathan's


Broiler sheds with roll down sides

only income stream and he terms himself "Cropping and livestock farmers and agricultural contractors" - sounds very similar. He obviously had confidence in the future of the broiler industry otherwise he would not have invested in new sheds. The future is also looking extremely positive for Rob and his company, although he is very aware of his need to adjust to the changing markets and demands.

An area Rob is also passionate about is renewable energy and in 2008 installed a Vestas V27 wind turbine to reduce their carbon footprint by creating 50% of their own energy requirement. Rob has a separate business "Blowing in the Wind" which in partnership with Joule Logic have installed a wind turbine on Flinders Island; there is an excellent short video explaining all about the venture http://vimeo.com/55829197. The provision of renewable energy is Rob's way of future proofing himself with regards to future energy requirements.

Rob Nichols and Nathan Richardson

9.0. New Zealand

The main reason for my trip to the southern hemisphere was to have a meeting with Bill Williams of Tegel. This company was continually being mentioned in articles relating to FCR (Feed Conversion Rate), reporting to have the best in the world, averaging 1.5 – how??

9a. Auckland, Tegel Foods Ltd: Bill Williams, General Manager, Agriculture Division

Tegel Foods' Office in Auckland

Tegel is New Zealand's market-leading, fully integrated poultry producer. The company is involved in the breeding, hatching, processing, marketing and distribution of poultry products across both the North and South Islands.

Tegel offers a broad range of poultry products from fresh and frozen whole birds and portions to value-added main meal items. It supplies poultry products to supermarkets and other retail outlets in addition to servicing the needs of foodservice customers. Tegel also produces a diverse range of sausages and processed meats. Tegel's operations include four major processing facilities, smaller value-added processing plants, feed mills and breeding & hatching facilities. In all, Tegel employs around 1,700 people. Tegel is wholly owned by Affinity Equity Partners. http://www.tegel.co.nz/

I had an enlightening discussion with Bill Williams about how Tegel manages to get the best FCR in the world. It appears there isn't just one thing; it is the combination of many with an overriding element of attention to detail.

Bill Williams

A brief background of Tegel's systems is that they rear to a maximum stocking density of 38kg/m^2; house sizes range from 700m^2 to 2,500m^2; new sites under development are approximately 18,000m^2; the oldest house is approximately 40 years old and is of a wood construction with posts. Tegel exports about 25% of its production mainly as cooked product, and Tegel has a market share of approximately 52%. New Zealand has zero imports (due to bio-security) and is free of all major poultry diseases (IBD, Newcastle, AI etc.)

The average weight per bird (Ross) is 2.6kg with the males reaching 3.3kg in 41 days. The first thin is when the females reach about 1.8kg, the second thin when the remaining females reach 2.8kg and the remaining males are then left to reach the 3.3kg – the sheds are sexed and split to help with the catching programme.

As New Zealand is disease free, therapeutic antibiotics are not often used; however New Zealand regulations allow the use of antibiotic growth promoter (AGP) to be used in the food. New Zealand producers voluntarily decided not to feed poultry offal or feather meals to chickens but do use

processed animal proteins (MBM) – typically from bovine sources. Tegel has been using pro-biotics for the past six months and are finding them beneficial along with the use of chlorine dioxide in the drinker lines to keep the lines clean and the water a good quality. A four-stage diet is fed and an enormous amount of time and effort has gone into the durability of the feed - pellets take less effort to consume than dust.

Hatchtec – hatch brood tray
http://www.hatchbrood.nl/hatchbrood/gallery2.php

Tegel are always looking at new ideas and methods of rearing. They have had a six month trial of the "hatch brood" system from Hatchtec, the principle being that the chick is kept at the hatchery for the first three to four days of their life where there is optimum environmental control for their every need. Comparing it to one of their "very good" growers they are getting similar results. In Feb 2014 Tegel were still working out if the cost of the new system was worthwhile. They understand that their market will be relatively static due to the small population growth of New Zealand and so domestic expansion is not a high priority, whereas cost efficiency is.

As with all my generous interviewees I asked the question – going forwards what did Bill consider to be the major issues facing the industry?

From an efficiency point of view the simple answer was ongoing genetic improvement; in particular FCR would be more difficult to realise as other bird wellness factors needed to be balanced with this. Continued improvements in diet and animal husbandry work alongside genetic improvements. Bill briefly raised the subject of work with the egg, *in-ovo* feeding (feeding the chicks whilst still in the egg) and egg vaccination. It was only after the meeting, whilst writing up my notes, that I realised that there had been no mention of public perception. This was the first time in any country that this had not been raised – was this due to the public being educated about the poultry industry? Did they have full belief that New Zealand products would be the best with no need to question? Did they care? Bill has subsequently confirmed that public perception is as big an issue in New Zealand as in every other country I have visited.

9b. Auckland, Tegel Foods Ltd – Peter Chrystal – Nutritional Services Manager

Whilst at the Tegel offices I was introduced to and spent an hour with Peter Chrystal who is their Nutritional Services Manager (although he has since moved to work with Baiada). Peter showed me an incredibly complex nutritional programming package – EFG (Emmens, Fisher & Gous) http://www.efgsoftware.net/ to explain what the programme does. It is easiest to quote from their website: (*see textbox on next page)*

"Broiler nutritionists are accustomed to using least cost formulation programs to formulate feeds for their broilers, but until the advent of simulation models, such as the Broiler Growth Model produced by EFG Software, they were not able to predict the biological and economic consequences of using those feeds in commercial broiler operations.

Our latest development is another huge step forward in assisting nutritionists to optimise the feeds and feeding programmes for commercial broilers."

Peter Chrystal

Peter was a great fan of this programme believing it gave them the edge on feed efficiencies, along with their trial site – 96 pens (2x2m) holding between 10 and 20 birds in a commercial environment where they are able to test temperature, lighting v protein and energy. To give myself a greater understanding of the complexities of nutrition Peter gave me a 300-page book "Commercial Poultry Nutrition" published by Spesfeed (Pty) Ltd currently on its 12th edition, and although not read in full (!) I have picked out areas which I feel are relevant for a basic understanding of the food we are feeding to our birds at home.

One part of the book (chapter 2) is all about water and it was the first time in my studies that the actual quality of the water had been mentioned rather than just having it (or in some cases in, as in Australia the lack of it). The chapter starts with the following two paragraphs:-

"Water is often called the fundamental nutrient. Whereas animals may survive for considerable periods without food, without water they would soon die. Water is required by the body for the maintenance of body temperature and for almost all metabolic processes.
In nutritional terms, water is the single most important nutrient that we feed to animals yet, in most instances, it is taken completely for granted and therefore often neglected. Water usually receives attention only when mechanical problems occur."

It is only within the last year that water quality has come onto the radar and interestingly in the next country I was to meet a lady who was very passionate about water quality.

As was now becoming the common theme in all my meetings I wanted to know what Peter thought the future would hold. His answer: a combination of sexing the birds and the feed used was key to FCR. I was beginning to understand that Tegel are a very focused company; intent on producing an extremely efficient bird but without having some of the worries of other countries i.e. land pressures, limited water etc.

10.0. America

A rather long journey saw me fly from Auckland in summer sunshine (28°C) via Sydney to Dallas in Texas and onto Fayetteville in North West Arkansas to mid-winter with snow and thunder storm – what a shock to the system! I had chosen this part of America because it was the home of the University of Arkansas which has a renowned poultry department and the global headquarters of Cobb was a 40 minute drive away at Siloam Springs.

10a. Cobb Head Quarters – Siloam Springs, Arkansas

Cobb's Welcome

Gail Thorpe was my wonderful host for the day, driving me around the snow-covered countryside to meet various members of the Cobb HQ team.

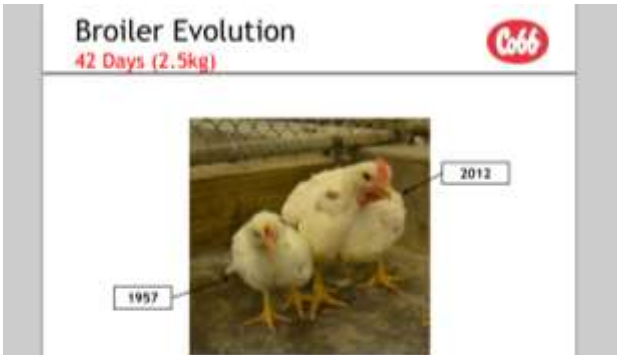
My first meeting was with one of Cobb's geneticists Dr Robyn Sapp. She kindly gave me a detailed and very informative presentation of where Cobb has come from and where they are working towards. I have tried to summarise some of her points in a quick view table with the aid of Jerry Moye's presentation at this year's (Jan 2014) Oxford Farming Conference:-

Trait	1990	2000	2010	2020 Target?
Weight (g)	1588	2041	2495	2948
FCR	2.22	2.02	1.82	1.62
Fat %	1.9	1.7	1.5	1.3
Yield %	67.0	70.0	74.0	78.0
Breast %	15.2	19.2	23.2	27.2

Cobb500™ improvements in SR broilers at 42 days of age

The evolution of the chicken can be *clearly shown by the picture on next page*, taken from Jerry Moye's Jan 2014 Oxford Farming Conference presentation.

Following my meeting with Dr Sapp, I met Jerry Moye (President of Cobb-Vantress Inc) and we had a very enjoyable conversation with plenty of questions flying between the pair of us! Jerry had not heard of the Nuffield Farming Scholarship Trust which gave me an opportunity to promote the organisation whilst discussing my study topic and the opportunities I had experienced.



Looking towards the future Jerry commented on the fact that Europe was leading the conversation about animal welfare and the use of GMO crop seeds – they (Cobb) were constantly reviewing what was happening in Europe to ensure that they were up to speed with market requirements. Also within Europe he had concerns that there has been discussion regarding regulations on the genetic selection process which would have massive implications on their business. In general his comments could be summarised as:-

Claire Bragg & Jerry Moye
(President of Cobb-Vantress Inc.)

1. Cobb would continue to be a leader in the breeder industry
2. Meat yield - market for breast meat was levelling out and there was a world drive for whole carcass utilisation
3. Cobb would be investing in grandparent flocks in China
4. Cobb would be prioritising investment – the UK slow growing welfare breeds are such a small percentage of all broilers grown that this would not be an area for a tremendous amount of time and money being spent on
5. Investment in genetic marker selection will continue.

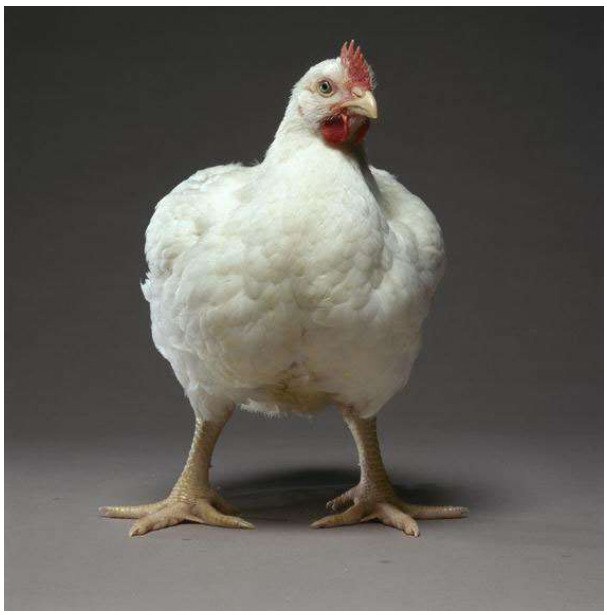
One last area we discussed was that a 2.5kg bird is not what the whole world is looking for. Countries such as Indonesia grow chicken to less than 1.8kg in 42 days as this is all that their consumer wants – they do not have the storage facilities we have in the Western world so require a protein they can cook and consume in one day with no wastage. Another view on "big is not always best" - look at your market.

I was now running half an hour late for my next meeting with Joe Schultz who heads up the lab team at Cobb Headquarters. Due to timings he gave me a relatively fast tour of their lab which has been built with tremendous foresight for design – there is a corridor around the outside of the labs to enable visitors to view what is going on without interrupting the technicians or violating the stringent bio-security. Joe's knowledge and enthusiasm was infectious and although I will not pretend to have understood everything they were doing, I definitely got the feel that they were doing everything in their power to ensure they knew all there was to know about their breed.

Lunch was spent with an incredible character, Pete Sbanotto, who is the Cobb 500 Product Manager. We had a lively discussion about the industry including the many UK industry people he knew! Gail and Pete gave me a weighty copy of the "Monthly Live Production General Run" volume for January 2013 as an example of the monthly statistics compiled by Agri Stats – which the American industry takes as fact. I questioned whether anyone read such detailed analysis and was informed that the pages were pored over as soon as they were issued. To give you an idea of the detail there are tables and tables of data relating to (but not limited to) nutrients per pound of meat, first withdrawal nutrient report, ingredient usage vs performance, broiler feeding schedule, feed medication usage vs performance, adjusted live production cost, broiler house mortality, growth rate report, d.o.a. (*dead on arrival*) and live haul expense – and the list goes on and on, it is the most comprehensive monthly report I have ever read.

Claire & Alisha in front of an original Tyson hatchery van

My last visit and meeting of the day was with Alisha at the Tyson Discovery Centre. Tyson are the parent company of Cobb and are one of the largest producers of meat and poultry in the world. Their turnover in 2013 was $34.4 billion and production was on average 41,000,000 chickens per week. I was at their Headquarters to have a tour of their Discovery Centre and Museum. The centre is a place of innovation; their chefs are working with their customers to create new menus and improve existing ones. I was able to walk around the building looking into their 19 test kitchens and pilot production plant through viewing screens. They also have a section for tasting the new menus through sensory booths where they are able to control what the person is seeing whilst they eat. To give a better understanding of what the centre does there is a short video of the centre and the work they do can on the following website: http://www.tysonfoods.com/Media/Video-Gallery/Discovery-Center.aspx



10b. University of Arkansas, Fayetteville – Dr Susan Watkins PhD

Dr Watkins at the Centre of Excellence for Poultry Science – University of Arkansas

I met Susan Watkins in her office in a deserted university due to the snow (what a difference to the southern hemisphere I had just left!). Time was a little limited due to Susan needing to drive south for another meeting that morning but we had a wonderful conversation talking about Nuffield Farming, her area of research, the university and the welfare standards we work to in the UK.

The university has its own broiler farm (Applied Broiler Research Farm – ABRF) with four sheds (40' x 400') which are run on a commercial basis, serving as a contract grower for a local integrator, whilst being used to investigate:-

- LED lamp durability and lumen depreciation
- Litter windrowing
- Environmentally friendly water sanitation
- Water efficient summer cooling
- Alternative heating systems
- Latest feeding, watering and sanitation concepts

In 2012, the farm had 4.6 flocks with an average depletion age of 45 days at 2.73kg, with a FCR of 1.84. The sheds are run on LED lights which, to the chickens' eye, do not flicker and therefore makes them calmer - there was a 6 year research project on this. Turnaround is about 14-15 days when the caked litter is removed and the balance is pushed into the middle of the shed and rotavated every 2-3 days and then spread out over the floor ready for the next crop.

Susan's research area is water, in particular the quality of drinking water. One of her most recent papers:

> "Comparison of broiler flock daily water consumption and water-to-feed ratios for flocks grown in 1991, 2000-2001 and 2010-2011"
> (http://japr.oxfordjournals.org/content/22/4/934.abstract)

was written along with CL Williams and Dr GT Tabler looking at the differences that exist in daily water consumption and water-to-feed ratios for 2010-11 flocks compared to flocks reared 10 and 20 years ago at the University of Arkansas ABRF. The paper is very interesting to read, making you think a great deal more about the quality of water being drunk by the chick – does it need to be purer than human drinking water? Quality of the water affects the gut and therefore the ability to absorb feed effectively. The results of the research are extremely full but as an overview the following table just shows the mean daily water consumption over the years has significantly increased:-

	1991	2000-01	2010-11
Gal./1,000 birds/day	37.07	42.41	50.32
Litres/1,000 birds/day	168.52	192.80	228.76

But perhaps more interesting is that the water-to-feed ratio decreased in flocks grown in 2010-11 for days 16, 18-20, 31, 34-36 and 40-42 compared to the 2000-02 flocks - in other words water consumption has increased but has become more efficient.

With Susan's expertise in mind, when asking the question about the future, water was firmly at the top of the agenda and she made an interesting comment in that Canada could potentially be a major player in the future when you consider their land mass and water availability (due to the positioning of the Rockies).

11.0. Conclusions

1. The industry does not need to make any specific changes to existing systems, but it must continue to adjust and adapt to changes in the market place, especially with regard to climate and public perception

2. In the UK and other nations who cannot remember being hungry, welfare of the chicken will be paramount in the eye of the consumer.

3. In countries which have a swelling population, priority will be to feed their population and welfare of the chicken will be of secondary importance.

4. There will be a future struggle for land usage.

5. Availability of water and the quality of water will become more and more important.

6. Breeder companies must be allowed to continue to provide genetic research and development for the whole industry rather than individual farmer focused.

7. The future is extremely bright for the broiler industry.

   Advantages of chicken:-

   - Efficiently produced form of protein
   - Low feed conversion rate
   - Healthy protein
   - Not a common food allergen
   - Relatively inexpensive
   - Versatile
   - Lowest carbon footprint of all UK farmed animals:-

UK Farmed Animal	CO2e (combined total of all GHG gasses, including carbon, methane and nitrous oxide)
Chicken	3.2kg/kg of meat
Pork	4.3kg/kg of meat
Lamb	19.6kg/kg of meat
Beef	24.4kg/kg of meat

(figures supplied by AB Sustain)

11.0. Recommendations

1. **Public Perception –** Education and communication are required in the broiler industry to inform the consumer of the welfare standards already achieved, to explain what the chicken requires and not to leave it for the consumer to decide what is best for the chicken. Welfare standards to be set on the basis of scientific background not public perception.

2. **Land –** There will be a greater demand on land for housing and food for both humans and animals. Although free-range and organic systems are perfectly at place within a consumer driven market they do not provide the most efficient usage of land for broiler production; we should look at the scientific requirement of the bird for space and not our humanised belief. Design of sheds should be reviewed, double tier houses to be considered more as the norm rather than the unusual.

3. **Water –** This is most probably the one and only commodity we all require on a daily basis that cannot be produced, we have what we have. Breeder companies must look at the genetics of the birds with an eye on water consumption as well as feed conversion. We as growers must have better regard for the water we use, systematically check drinker lines, regularly sanitising the lines to ensure that the water is the very best quality (a cleaner sample than humans are consuming?) using additives such as acids & chlorines as required.

4. **Energy –** as the growing of the chicken becomes more efficient more resources are required to keep the chicken within their optimal climatic conditions; we need to be aware of what power we are using and consider the use of renewables to provide our requirements. The use of biomass boilers, anaerobic digesters, photovoltaic panels, wind turbines etc will become the norm rather than the exceptional – it will take more work to produce this power but ultimately we will be less reliant on fossil fuels and giving us control of our own resources.

5. **Technology –** we have amazing people and research organisations which are developing innovative ideas to help us improve genetics, feed/feeding, ventilation, rearing etc and the industry needs to be more pro-active and make good use of them, someone needs to be the first to champion these new ideas.

continued overleaf

6. **Markets –** we need to produce only what our markets will take, wastage will not be an option. All parties within the chain – the breeder company, breeding farms, hatcheries, broiler growers, processors and retailers all need to be allowed to retain an equal share of the profit; if one element fails through lack of profit the whole chain is brought down.

7. **Antibiotic usage –** the industry needs to take leadership in reducing routine usage before it is told what they will be allowed to use, which could evolve into a welfare issue. High level bio-security will aid the prevention of transferral of disease and so aid the reduced requirement for antibiotics.

8. **Attention to detail –** chickens have been bred to grow fast and efficiently, growers need to adapt and progress with these changes; to prioritise their workloads to ensure that they can implement the high level of attention to detail required.

9. **Environment –** the broiler industry is generally deemed to be intensive farming on a big scale and as such we need to be mindful of the impact we are having on the immediate environment. Responsible use of water, dirty water separated into sealed tanks, ventilation to be correctly set to reduce ammonia levels, spillages of feed to be cleaned up, control over noise, etc.

"To improve is to change; to be perfect is to change often."
Winston Churchill

13.0. Postscript

Everyone had told me that completing a Nuffield Farming Scholarship would be a life changing experience; what an understatement that is! I have been put out of my comfort zone on numerous occasions, created friends around the world, realised I can do things I never thought I could possibly do before, and that the farm and my husband will survive without me.

With the positivity of the future broiler industry we are in the process of putting in a planning application for three new broiler houses to more than double our numbers. Working with AB Sustain, Agrilamp and Sainsburys we have just started a three-year trial to identify the optimum lighting regime for indoor chicken production. Through Greener For Life we are in the process of installing a 1Mw Anaerobic Digestor to provide electricity for our site, working alongside our biomass boilers to become self-sufficient in our power requirements.

I have been co-opted onto the NFU National Poultry Board to aid with education within the poultry industry. We have become a LEAF demonstration farm – only the second in the country to include poultry. We are finalists in this year's Farmers Weekly Poultry Farmer of the Year and were recognised at this year's Pig & Poultry marketing awards.

This has all happened in 2014 - watch out for 2015 and beyond!

Claire Bragg

14.0. Thanks and Acknowledgements

I would like to thank the Nuffield Farming Scholarships Trust for giving me the opportunity to expand my horizons, increase my knowledge, to make me think hard, put me outside my comfort zone and above all meet such incredibly talented people to inspire me to greater heights. Thank you.

All my sponsors - Aviagen, Cobb & Hubbard - have been very generous with their support but in particular I would like to thank Jonny Lester, Aviagen, for his support when I was starting my studies - he made me think in different ways; to Anthony Taylor, Cobb, who facilitated many wonderful meetings and visits; and finally to Jim Hunnable, Hubbard, who was my host for an amazing tour in France and has been a friendly face at all the conferences in the UK ever since.

My family - especially my husband Nick, who was the one who gave me confidence to attempt the Scholarship and has supported me throughout the whole experience with tremendous love and guidance (and to our friends who invited him out whilst I was away!). To our amazing team at Frogmary – Colin, John, Alex & Cordelia – all of whom have had to take on extra work whilst I have been tied up with my studies.

All my fellow 2013 Scholars; I think we have been the best year ever! We also have a couple of honorary 2013 scholars in Amy Jackson & Caroline Millar who are very dear in our hearts and have provided great wisdom (and fun) in our discussions. Other Scholars I have met in surprising places, the words of advice and support they give is always comforting.

I will also try to thank all the "other" people I have met on my journey, some of which I have not mentioned in my report but have helped me in many other ways including a bed, listening ear and points of advice (I sincerely apologise if I have left anyone out):-

Allen Bates	UK	Anthony Taylor	UK
Anne Beckett	UK	Alan Thompson	UK
Ben Burnett	UK	Richard Turner	UK
Nick Chippendale	UK		
Alison Coleville-Hyde	UK	Jerry Moye	America
Graeme Dear	UK	Robyn Sapp	America
Rodney Down	UK	Peter Sbanotto	America
Gary Ford	UK	Joe Schultz	America
Andrew Gibson	UK	Gail Thorpe	America
Jonathan Holman	UK	Ayesha (Tyson)	America
James Hook	UK	Susan Watkins	America
Helen Houghton	UK		
Jim Hunnable	UK	David Bray	Australia
Helen Hunt	UK	Ian Curtis	Australia
Richard Jackson	UK	Trent & Sue De Paoli	Australia
Steve Kirk	UK	Guy & Genette Hebblewhite	Australia
Jonny Lester	UK	Kelly McTavish	Australia
Steve Lister	UK	Joseph Muscat	Australia
Louise Manning	UK	Jodie & Wayne Redcliffe	Australia

Roy Mutimer	UK	Mega Tait	Australia
Richard Newstead	UK	Clayton Tully	Australia
Sue Reynolds	UK	Tim Walker	Australia
Michel & Monica Camps	Canada	Martijn Grutyers	Netherlands
Terence Hochstein	Canada	Mr & Mrs Simmes	Netherlands
Jake Hoogland	Canada		
Karen Kirkwood	Canada		
Frank Maenhout	Canada	Peter Chrystal	New Zealand
Trevor Prout	Canada	Dennis Fong	New Zealand
Ken Rice	Canada	Linda & Bruce Hornell	New Zealand
Martin Zuidhof	Canada	Barry Richdale	New Zealand
		Norman Sue	New Zealand
		Bill Williams	New Zealand
Frederic Fagnoul	France		
Frederic Grimaud	France		
Celine Le Coq	France	Jane Bennett	Tasmania
Gilles Loyer	France	Michael & Maureen Bennett	Tasmania
Christian Salomon	France	Lyn, Chris & Nick Dornauf	Tasmania
Claude Toudic	France	Robert, Norma, Laura & Peter Eastment	Tasmania
Jean-Jacques Trevidy	France	Robert Nichols	Tasmania
Paul Van Boekholt	France	Nathan Richardson	Tasmania
		Peter, Julie & Karen Wilson	Tasmania

15.0. Executive Summary

The UN is predicting that by 2050 there will be 9.5 billion people on the planet, requiring 70% more food than today. Chicken is an extremely efficient, healthy & relatively inexpensive form of protein and therefore should have a huge role in feeding the population, but can the current production techniques enable the required 70% uplift in productivity?

The worldwide broiler industry is working on many levels dependent on the local market for which it is rearing. A country already struggling to feed their population is concerned about how quickly and how much food can be produced affordably; other countries have issues with storage so only producing food which can be cooked and consumed on the day; other countries which can produce (or have access to) more food than required and which can be stored have concerns about the welfare of the animals being reared for consumption.

Irrespective of which market being reared for, the broiler industry is a dynamic body, already constantly improving and adapting to environmental and market changes. Having travelled to countries on three continents there is a confidence that the industry will continue to provide an excellent quality protein for such a dramatic increase in population.

The reasons why the industry is so positive about fulfilling the future demand are many but include:

- The public's understanding that chicken meat is a healthy, relatively inexpensive and versatile protein, it has become a weekly inclusion on the shopping list rather than a rare treat.
- The advantage over other farmed animals is that there are so few worldwide breeder companies, they are able to concentrate on improving the genetics which in turn allows the growers to concentrate on ensuring that "on the ground" production systems are correct. These companies are not complacent about the need to constantly review their genetic stock to overcome forthcoming challenges i.e. shortage of land for feed stocks - FCR constantly needs to be a priority, monitored and adjusted to keep in line with the mouths to be fed and availability of animal feed; water availability will require the chickens to convert feed with the least amount of water possible etc.
- The broiler industry is unique in respect that the majority of the chickens produced are reared indoors, in an environment of complete control, which allows for small but significant changes to make a vast difference. Researchers and technicians are already looking at ways to advance the conditions within the houses to allow the chickens to have a virtually stress-free existence, enabling market weight to be achieved in a relatively short time whilst maintaining a low feed conversion rate.

However, one large factor which could stand in the way of producing the extra chickens required, is the public perception of broiler chicken welfare. Communication and education cannot be undervalued. The industry must be prepared to put their head above the parapet and speak up about what they are doing and why. Having an understanding public is paramount to moving forwards.