

# Management Exchange Programme 2022 Report for Emma Duffy

## Chicken Gender Determination

### Travel Itinerary

May 10th and 11th, British Pig and Poultry Fair, Stoneleigh Park, Warwickshire

May 31st - 2nd June, VIV Europe 2022, Utecht, The Netherlands

### Introduction

I started selling coloured hybrid laying pullets during the coronavirus lockdown in 2020 after our riding school had to close. Following the success of selling the pullets, I started breeding and rearing some pure breed poultry. Pure breeds have become a passion of mine now and I am focused on rearing and selling different breeds of poultry, including rare breeds, to the public.

Traditional British pure breed hens, such as the Sussex, are able to lay sufficient numbers of eggs for most domestic household needs. They are long lived and have good natural immunity compared to hybrid layers, which need comprehensive vaccinations to survive. Hybrids are a cross between several breeds, and the final hybrid pullet is a product of 3 or more generations of out crosses. The Sussex breeds true everytime. It shocked me to find out that the Sussex, a breed husbanded commercially for eggs and meat production in the last century is actually listed as Priority on the Chickens Watchlist by the Rare Breed Survival Trust ([Chicken watchlist | Rare Breeds Survival Trust \(rbst.org.uk\)](#)).

The Sussex breed of chicken is obviously not going to meet commercial requirements for egg and meat production as it is not cost effective. Commercial brown hybrid layers, such as Lohmann Brown, have been genetically selected to perform as optimally as possible in the egg laying industry. However, as previously mentioned, most of the British pure breeds will meet the needs of the domestic keeper market very well. So, the question arises, why do hybrids dominate the domestic sector?

Hybrids are cheap and they are bred by specialist companies in their tens of thousands. The hybridisation also allows for females to be selected as day old chicks as they can be identified by their down colour or wing feather growth. The males are culled and go into the animal feed chain. By contact, most pure bred chickens can not be sexed until much later in the rearing process. If you are breeding and marketing pure breeds for egg layers, the males become a big problem both economically and ethically. With some breeds, it can be as late as 12 weeks before males can be identified by development of their secondary sex characteristic, such as comb growth and saddle feather development. That is a lot of feed, space, time and energy gone to waste as there is a very limited market for cockerels. Again, pure breed birds are not

even viable for meat production due to the time it takes to reach good carcass weight. It is nearly impossible to find a market that covers the production costs for the unwanted pure breed males if you are rearing in larger numbers. The cockerel issue is a reason why few commercial farmers rear pure breed poultry. If the males could be eliminated at a day old, like their hybrid counterparts, or in an ideal world, not even hatched, then this would make rearing and producing pure breed laying hens for the domestic retail sector a much more viable and attractive option.

The commercial hybrid chicken, such as ISA Browns, Lohmann Browns etc. are produced via genetic selection from several generations of crosses from pure breeds, traditionally White Plymouth Rocks and Rhode Island Reds. The grandparent stock can only be sexed using vent sexing. Vent sexing is a very specialist technique where small differences in the cloacal opening of males and females can be identified in the day old chicks. Repeatedly accurate vent sex training takes many years. Vent sexing would be one way of identifying males as day olds, and it does happen, however it is not possible to develop the skills to do this very easily due lack of training opportunities in the UK and Europe. Indeed, there is one remaining vent sexing school left in Japan.

During my research for different chicken sexing techniques, I came across a method called *in ovo* sexing. This literally means sexing the chicken whilst still in the egg. As of 2022, in Germany, all eggs sold have to originate from pullets produced from the *in ovo* sexing technique. The German Government has outlawed the culling of male day old chicks as they have deemed the process unethical. I will discuss more about the *in ovo* sexing techniques later on.

The Farming Connect Management Exchange Programme has given me the opportunity to further investigate the *in ovo* techniques of selecting for females which are still in the egg and to see if this technology could be potentially utilised in the UK poultry industry to produce 'Free of Chick Culling' eggs. I have also been provided with the chance to explore to see if some of the sexing technology used in the commercial industry could be adapted for use in the domestic and pure breed poultry sector, including rare breed preservation.

## **Research visits and findings**

Unfortunately during the time frame for organising the research visits for the Management Exchange Programme, the UK and Europe were under avian flu restrictions which resulted in no outside visitors to commercial hatcheries and farms. This limited my choice of places that I was allowed to visit to learn more about *in ovo* commercial technology.

The first visit I undertook was to the Pig and Poultry Fair held at Stoneleigh Park in Warwickshire. The fair saw producers, suppliers and the allied industry come together for two days of talking, sharing ideas and planning ahead. The fair hosted 335 exhibitors and 40 plus expert speakers in the forums. Taking part in the poultry forum allowed me to learn more about issues affecting the commercial egg industry. It was very eye opening to hear how the

detrimental effects of the unprecedented increase of feed costs due to the Russian/Ukrainian war are having on producers. The price of eggs is no longer reflecting their true value or their cost of production. During one of the discussions, the speaker asked the room of over 100 farmers in the egg industry how many of them would be expecting a profit at the end of this year (2022). Nobody raised their hand.

One of the exhibitors at the Pig and Poultry Fair that I visited with is a poultry supplier that is the UK representative from the Respeggt Group, headquartered in both Germany and the Netherlands. Founded in 2019, the company was set up to meet the challenge of ending chick culling in Germany. The company provides technology to hatcheries and laying hen farms in Germany and the Netherlands (a main supplier of eggs imported into Germany) that are passionate about supporting their ethos of 'Free of Chick Culling'. Until now, they are responsible for already having delivered more than one billion Respeggt Eggs® and more than five million Respeggt laying hens into the supply chains of table egg production.



The UK Respeggt representative mentioned that they had just received the first UK delivery of 6,000 NOVOgen brown chicks produced from the Seleggt® process. These will grow into the UK's first batch of hens where the requisite for destroying male day-old chicks has been completely eliminated. The same UK poultry supplier also has the monopoly on supplying day old pure breed female chicks that have been vent sexed and imported from a commercial hatchery in France.

By using the patented Seleggt® process, Respeggt can prevent the hatching of male chicks, thus saving them from an ethically questionable fate. This process is based on endocrinological gender identification in the hatching egg, which uses hormone analysis to determine whether the chick developing in the egg is male or female. On the ninth day of the incubation process, a small drop of liquid is extracted from the eggs. This is a non-invasive procedure

meaning that the inner part of the hatching egg is not affected and is therefore left unharmed.

The drop of liquid extracted from the eggs is analysed using a marker. A distinctive colour change in the sample immediately indicates whether the hatching egg is male or female. According to the result of the test, the eggs are sorted into male and female eggs. The male eggs are then used to produce high-quality animal feed .

The female eggs continue incubation until the chicks hatch. As a result of the gender identification process, only female chicks hatch after the 21 days of incubation, which become laying hens for Respeggt Eggs®.

During my visit to the Pig and Poultry Fair, I found out about another conference that was being held in the Netherlands. This conference would be hosting representatives from two other companies involved with *in ovo* sexing technology as well as exhibiting the Seleggt® *in ovo* sexing technology currently used in commercial hatcheries.

### **VIV Europe 2022, Utecht, The Netherlands**

VIV Europe, is an EXPO event held every 4 years and is recognised as the top platform for the poultry industry and an international event for all professionals in the animal protein production industry.

The EXPO was very broad ranging in topics, exposing me to many interesting topics surrounding the poultry industry beyond gender determination. Seminar topics included talks by a professor of economics who highlighted the ethics of rearing all male chicks in relation to humans - including the environmental cost of feed production for males and the resources that are thus diverted from people living in third-world nations who lack food. There was a seminar by a neurologist who had determined when a growing embryo can feel pain.

During my visit I arranged meetings with representatives Respeggt/Seleggt and two other companies, PlantEgg and In Ovo BV, who also perform processes of gender identification in the hatching egg on the ninth day of the incubation process. The event also hosted a groundbreaking seminar on *in ovo* technology that I attended.



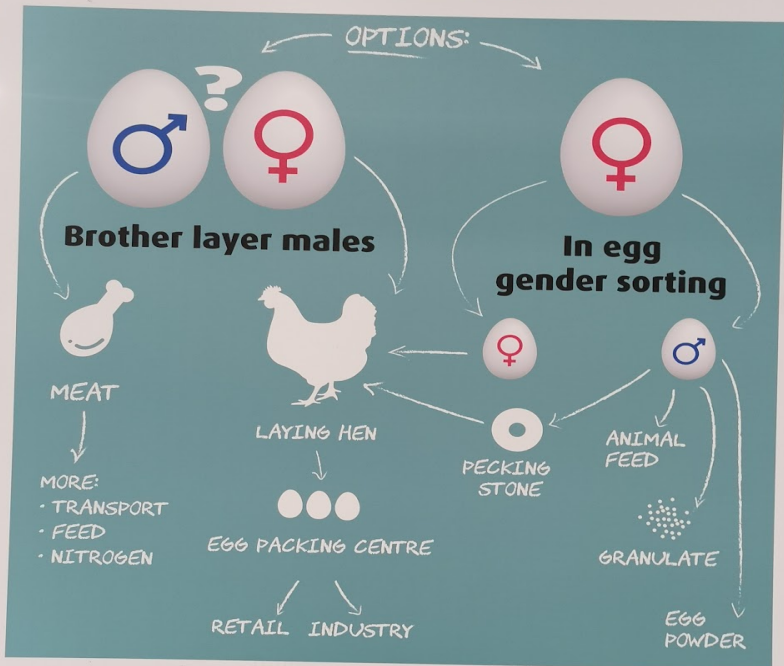
## **PLANTegg**

The PLANTegg process is a PCR based method for gender determination of hatching eggs. This molecular genetic method is based on the fact that the chickens have different gender chromosomes. The PCR technology makes the genetic differences that are found in the allantoic fluid inside the egg visible. The gender can be determined at an early stage of incubation with high precision very quickly (within one hour). The eggs from which male chicks would hatch can then be sorted out and used for other purposes.

The PLANTegg technology has been scaled up into an industrial applicable system that is installed in hatcheries and is able to screen 300,000 eggs per week. The PLANTegg screening machine is leased by hatcheries that are capable of producing a minimum of 2,500,000 layers per year. The company takes a fee of around 3 Euros per 17 week old hen produced.

# Innovative & sustainable gender sorting

## NO MALE CHICK CULLING







Products made from the PLANTegg discarded male eggs include pecking stones and soil conditioner pellets.

## **In Ovo BV**

I met with Bram Uljee from In Ovo BV, from the Netherlands. In Ovo BV has developed a high throughput screening machine called ELLA which gender-types the egg instead of the chick. This gives the hatcheries the option to hatch only females, which is better for animal welfare and sustainability. ELLA can screen both white and brown eggs, at an early stage, with high accuracy and with high-throughput. The machine is able to screen more than 10 million eggs per year, resulting in 5 million point of lay females per year. The gender selection process relies on using a unique biomarker that is only found in female eggs.

As of January 2022, In Ovo BV and Lohmann Deutschland collaborated to bring ELLA technology to Germany. Lohmann Deutschland have applied In Ovo's gender typing technology to their Dorum facility to hatch chicks without chick culling. The same technology has also been adopted by the hatchery Het Anker in the Netherlands, and two machines have been installed in hatcheries in Switzerland.

## **Respeggt Group**

The Respeggt group showcased their SELEGGT Circuit machine at VIV Worldwide Europe 2022 with live demonstrations. The egg gender sorting machine has already gained four years of practical experience in the hatching egg industry, and the technology is continually developing. For the later reason, the technology itself is not sold, but is offered as a free service to hatcheries at no extra cost. Only when the subsequently produced table eggs are sold, is a charge of around 3.3 Euros applied to the packing centres, or a licence fee is charged per laying hen.

Other countries where the SELEGGT Circuit machines are not required by law in hatcheries can still benefit from the innovation. Female chicks produced from the Seleggt® process can be exported. For example, a minimum order of 7,000 chicks can be imported into the UK, so pullets produced free of chick culling can be raised.





The SELEGGT Circuit machine doing a live demonstration at the VIV Europe 2022.

## **Dominant Genetika**

Also during my time at VIV Europe, I spoke to one of the exhibitors from Dominant Genetika, based in the Czech Republic. This poultry breeding company specialises in the export of the

Dominant CZ brand of hybrids, a comprehensive range of highly productive speciality coloured laying hens, to domestic and world markets. I learned that 10,000 Dominant CZ day old female chicks are imported into the UK from the Czech Republic each month to a sole distributor. The Dominant CZ hybrid hens are raised and sold to poultry retailers around the UK, and are marketed by different colloquial names, forming the backbone of poultry retailed to domestic poultry keepers. The pullets that I originally bought and sold during lockdown would have been from Dominant CZ.

## **Conclusions**

Legislation that came into effect in Germany this year (2022) to ban all chick culling has meant that viable alternatives have had to be implemented by the German egg industry. Germany's Federal Administrative Court ruled that in 2019 that animal welfare concerns outweigh the economic interest of farmers who wish to practise chick shredding (a method used to eliminate male chicks), and deemed culling unethical. Other European countries are also following with Germany's decision to make chick culling unethical and therefore illegal.

Three *in ovo* gender selection processes have been independently developed, Seleggt, PLANTegg and In Ovo (ELLA) that have been recognized and implemented as sustainable solutions to end chick culling. At the moment, this technology is too expensive to be used on a small scale to sex pure breed chicken eggs. Outputs of 5,000,000 pure breed female chicks per year are not presently feasible. However, I do feel the *in ovo* sexing technology could be adapted to a smaller scale and be utilised for the production of female only pure breed chicks. The industrial scale egg sexing machines, such as the SELEGGT Circuit, could be installed in UK hatcheries if ethical legislation in the UK or consumer demand created the need. In fact, some of the *in ovo* technology companies that I spoke to were very keen to see if the egg industry in Wales would be adopting a free of chick culling agenda.

One important fact that I learned from my time with the Management Exchange Programme is that British pure breed poultry is also threatened by the number coloured hybrids that are imported into the UK for the domestic market. Over 52,000 Dominant CZ chicks and/or pullets are imported and consequently sold to small holders and domestic keepers. Similarly, an unknown number of pure breed chicks are imported from France to UK poultry wholesalers.

*In ovo* sexing technology theoretically could be adapted and utilised to produce female pure breed pullets in the UK. Pure breeds such as the Sussex would then become economically, environmentally, and ethically sustainable. A much more attractive option for poultry breeders, rearers, retailers and farmers who are interested in tradition, conservation and a niche product.

I have been inspired by my research into *in ovo* technology for Farming Connect so much so that I am going to start a Research Masters Degree in BioInnovation at Aberystwyth University this September. My aim is to develop an *in ovo* commercial based assay that can be used by small scale breeders to sex pure breed eggs before they hatch. The aim of this research is to help UK poultry farmers to produce pure breed birds more economically and to improve animal welfare at the same time.