A Nuffield Farming Scholarships Trust

Report

Award sponsored by

Alan and Anne Beckett

Modernising the game industry

Jack Clayton

July 2013

NUFFIELD UK

A Nuffield (UK) Farming Scholarships Trust Report

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

Title	Modernising the game industry
Scholar	Jack Clayton
Sponsor	Alan and Anne Beckett
Objectives of Study Tour	To discover and establish new innovative ways in which to successfully and profitably breed and rear game birds whilst maintaining the highest possible standards of animal welfare and improving public perception.
Countries Visited	America Germany France UK

Findings

- Bio-security is either non-existent or very limited within UK Game Farms.
- Anti-biotic use is abused in Game Farming due to lack of good management and inadequate legislation.
- Permanent housing and enclosures with established cover would both enrich and enable the birds to display more natural behaviour whilst reducing labour time and cost by as much as a third.
- The British weather makes Game Farming a gamble in the UK. By embracing technology with new automated systems it is possible to minimise losses by stabilising the environment.
- The UK is the most sporting nation in the world but suffers tremendous pressure from animal rights campaigns.
- Intrusive devices are unavoidable when intensively rearing a semi-wild species.
- To justify game shooting as a sport every bird shot must be accounted for.

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Disclaimer

The views expressed in this report are entirely my own and do not necessarily represent the views of the Nuffield Farming Scholarships Trust, or my sponsor, or any other sponsoring body.

1. My Background

I enjoyed a wonderful up bringing in rural Herefordshire. Whilst attending Hartpury Agricultural College, Gloucestershire, I was fortunate enough to take up a part-time position working alongside Keeper of the Year 2000, Gary Walker, at The Craddock Estate, Hoarwithy. This fuelled my ambition to work within the industry and the following summer, after completing my National Diploma in Game and Fish Management course, I accepted an offer at Lord Neidpath's 3,000 acre Stanway Estate near Stow-on-the-Wold in Gloucestershire, as under keeper.

After three enjoyable years I moved on from Stanway when the shoot collapsed in the hands of the tenants at the time. Although the shoot was soon to be taken over I decided to gain experience within other sectors of the poultry industry and spent a further year working for Faccenda as a poultry catcher. My desire to see the world soon took over and I travelled for a 6 months' period to the Far East and Australasia.

On my return I worked for P.J Sporting Hatcheries for two seasons rearing 40,000 pheasant, partridge and mallard. With the experience that I had now gained I felt confident I would be able to set up a successful game farm.

In 2006, when I was 23, I was granted a Prince's Trust loan and began trading as JS Game in the same year.

Me, Jack Clayton

I am currently running my own business based in Bradford-on Avon, Wiltshire. Now in my eighth season, I am rearing and hatching inexcess of 120,000 pheasant and partridge poults delivered throughout England and Wales for both commercial shoots and private syndicates.

Game has been my life since I was a young child and it will continue to be so for myself, and now my young family, far into the future. I feel greatly privileged to have been awarded a Nuffield Farming Scholarship and would like to very much thank the Nuffield Farming Scholarships Trust and my sponsors Alan and Anne Beckett for the unrivalled opportunity that they have afforded me. Without the loving support of my wife Hollie I would never have been able to give the utmost of my ability to the Scholarship.

2. Introduction

"Pheasant and partridge enter this world with a handbook '1001 ways to die' - they have all read it!' "

Geoff Wheeler – Gamekeeper for the Upcerne Estate, Dorset

Game birds are very volatile creatures and the smallest upset or oversight can lead to an irrevocable outcome and thousands of £s lost.

The season of 2012, the second wettest summer on record in over a hundred years, held devastating consequences: leaving profit lines in all game rearing businesses looking far more fragile than is comfortable, and mine was certainly no exception. Millions of game birds were needlessly lost nationally due to outdated and weather-vulnerable rearing techniques. Many game farms are no longer trading.

I source stock of varying strains from both local and European suppliers to accommodate my customers' exacting requirements. We hatch and supply day old chicks, and rear pheasant to 7 weeks and partridge to 14 weeks. The birds are then transported as poults to customers' woodland release pens in preparation for the forthcoming sporting season beginning on the 1st September.

The greatest threats, not only to my business but to every other game farmer and gamekeeper are those of disease and public perception. My ultimate ambition is to develop new practices and technologies for breeding, hatching and rearing to maximise production and minimise disease without compromising the welfare of the bird. Moreover, the constant battle against the elements in addition is a variable beyond control.

I strive to produce high quality game birds at competitive prices. Every season is an ongoing challenge to find a good balance between profitability and poult quality.

From my brief experience within the commercial broiler world it seemed that the control of disease is hugely advanced in that industry, not only due to strains that are more resistant to disease but also due to the use of modern technology.

Is it possible to re-invent the game industry bringing it to the significantly higher standard which the commercial poultry industry has already achieved?

JS Game Ltd, my business

3. My Study Tour

At the beginning of my study tour I had aspirations to visit far flung countries such as Estonia and Morocco where I had heard there were new breeds which I had never seen. Game farmers there were also successfully rearing without medical intervention. However, whether it be the language barrier or their desire to keep well guarded secrets close to their chest, I failed to secure any response to my efforts.

I did however, visit the following countries:

Turkey – October 2012

I accompanied the Nuffield Poultry Group on their annual trip away, on this occasion to Turkey. Although this did not directly contribute to my time spent travelling for my Nuffield study subject, not only did I meet some inspirational leaders in the poultry world - which I went on to later visit in their own establishments - but I also witnessed some outstanding poultry companies.

Germany – November 2012

EuroTier. The world's largest exhibition for animal husbandry, held over five days, offered the perfect opportunity to look at poultry housing and production systems and learn everything available to see and hear about new and innovative systems within the poultry world.

France – December 2012

The largest exporters of game birds in the world – a must-see.

America – February 2013

The United States is home to Macfarlane Pheasants Inc, one of the world leaders in game production. Widespread game farming businesses throughout the country offered the opportunity to discover how the Americans rear and hunt, plus the challenges they face in different climates.

UK – Throughout 2012 and early 2013

By travelling extensively throughout the UK I was able not only to look more closely at the game industry as a whole but also to look broadly at the poultry world which encounters similar issues but have already overcome them.

4. Public perception – the sport of kings

The pheasant was originally brought to Britain by the Romans who imported it from Asia in the 1st century BC. It was much favoured by them as a dinner table delicacy. Whilst its culinary popularity remained, it was deemed worthy enough to be shot for sport by a privileged few. The greater the amount of birds shot, the greater the perceived wealth, power and status of the shoot host.

A change came about in the boom time of the 1980s when businessmen making huge amounts of money sought involvement in leisure pursuits that would afford new challenges and pleasures, in addition to elevating their social status.

Many successful businessmen invested financially to develop driven game shoots, which in turn became important venues for corporate hospitality.

British game shoots have flourished in their efforts to satisfy the increasingly discerning demands of the modern game shoot; resulting in Britain attracting visitors from around the world who desire the challenge of the most sporting birds on spectacular shoots.

However, is it socially acceptable in the 21st century to breed a living, moving target solely as a leisure pursuit?

My Nuffield journey began on 19th November, 2012, with a meeting with The League Against Cruel Sports. I arrived punctually at their Headquarters in Goldalming, Surrey, and was advised that the pre-arranged meeting would not take place at their offices but at a Costa Coffee around the corner. The purpose of the meeting was to discuss how I could help to improve some of the welfare issues that troubled their campaigners so much. I was not allowed into their building.

Through discussion it soon became apparent that there was a lack of understanding and knowledge of the game industry as a whole. The few main issues of major concern to The League and at the forefront of conversation were: raised laying cages, biting and snaring. Their perception of gamekeepers was particularly negative and predictably generalising, tarring all as 'heartless murderers'.

Here are the claims on which The League Against Cruel Sports bases their campaign and the responses put forward by myself:

Birds are kept in cages so small it would be illegal to raise chickens in them. That's a long way from the Countryside Alliance's claim that birds are "…wild, free-range and natural…"	Laying Pheasants are kept for an absolute maximum of 20 weeks in cages. They are then re-released and become once again wild, free-range and natural. All commercial hybrid chicken layers however, are slaughtered at the end of lay. Each pheasant cage is 48"x 60" and holds 9 birds – 8 Hens and 1 Cock. This gives the birds 320 square inches of space apiece. The legal space for laying chickens is 116 square inches per bird. This means that The League's above claim is incorrect and in fact pheasants have 176% more space than chickens. Partridge, however, are kept in cages for up to 3 years. This is an extremely long time but unfortunately they have been found to lay (and therefore ultimately reproduce) better in this system.

Chicks are so stressed they resort to feather pecking and cannibalism.	The rearing techniques used for pheasant and red-legged partridge are identical. Pheasant require an anti-pecking device to be fitted at 3 weeks. Pheasant unfortunately have a natural tendency to be aggressive towards each other when kept in close proximity, whilst partridge do not cannibalise or feather peck and require no device. If I am to be honest, it is more likely boredom.
To control this they are fitted with bits. These mutilate the birds and prevent their beaks from closing.	The bit is designed to enable a bird to feed and drink naturally while preventing the closure of the beak at the tip to stop feather or vent pecking. It is fitted at 3 weeks, removed at 7 weeks, and has no lasting effect. Mortality rates would be significantly higher without such devices – as supported by the study 'To bit or not to bit' from The Game & Wildlife Conservation Trust.
Every year millions of birds endure horrific conditions as they are transported from France, Spain and Portugal.	In my experience all stock which has been delivered from overseas has travelled in temperature controlled vehicles with all paperwork filed with the relevant Ministry of Agriculture.
More than half of the 47,000,000 birds released each year never get within sight of a gun. They die from exposure, cannibalism, predation, traffic collision and starvation.	If this figure were correct it would not be financially viable for any shoot to continue running. How many deer, foxes, badgers, or rabbits do you see at the side of the road? The keeper is out until all hours trying to keep his pheasants safe. He feeds his birds all winter long with expensive pellets and wheat. Pheasants and partridges face the same threats and challenges as any other wild animal.
'One for the pot' is a myth. Many more birds are shot than could ever be eaten. Their carcasses are simply dumped in mass graves. These graves often pose further environmental risks.	With hand on heart and my whole life spent within the game industry, I have never seen or heard of any mass graves. Game dealers collect shot birds and pay on average £1.00 a brace, an important additional income for any shoot.
With no mandatory firearm-training requirement in the UK, many birds die lingering deaths after being shot by inexperienced shooters, including children.	No matter how experienced a shot you are, there will always be circumstances or occasions when a bird is injured and cannot be found. However, on most shoots there is a team of experienced gun dogs picking up wounded birds.

As we stood up and I said my thank yous for the time afforded to me I was presented with a DVD to take home and watch called "Gunsmoke and Mirrors". I went away feeling that nothing was or even could be gained from my meeting with The League Against Cruel Sports. Their arguments lacked real evidence and were also contradictory. But I do know that rearing techniques can be improved and alternative devices need to be looked at.

I sat down that evening to watch "Gunsmoke and Mirrors". I have to admit I was most

disappointed. It focused on just a few isolated incidents with little fact and a lot of sad music.

The League Against Cruel Sports states the following on their website:

"The shooting industry makes many claims. Some are half-truths, others are simple lies."

I fully appreciate that some people will simply never agree with animal sport. However, I feel that the the League's campaign appears to be unjust with no room for negotiation.

Game shooting sits firmly in British heritage and a ban would have a devastating effect on our already depleted rural economy. The UK releases 40 million birds every year in comparison to America's 8 million released. However, it is the different *styles* of shooting that I have been most interested to discover.

In the UK driven shooting is predominant. Birds are released into wooded release pens in June, July and August, pheasant at 7 weeks and partridge at 12-14 weeks. They are then gradually acclimatised to becoming totally wild. The fixed shooting season starts on the 1st September for partridge and the 1st October for pheasant and ends on the 1st February. The UK shoots approximately 30-40% of birds released, leaving many to escape unscathed. A small number are caught up again for the following breeding season.

In comparison, America has no fixed shooting season and practises two different disciplines. The first is birds being crated the night before and then released early in the morning in long cover. As the bird has never been out of captivity before, it crouches in the long grass for some time. The guns come with highly trained pointers and flush the bird away and a shot is taken. There is a 90% kill rate on birds that have been released that morning.

The second discipline is where up to 10 guns will surround a small piece of woodland. In the middle of the wood there is a high tower and a platform that is level with the height of the trees. Birds are hoisted up to the top of the tower and released one by one and they are shot individually. The kill rate is approximately 80%. Americans shoot for trophy birds with beautiful tails rather than our sporting high birds.

France export more birds than they care to shoot. Although taking part in driven and walked-up shooting, it is much more of a community event rather than a profitable venture. Even so, birds are only released the morning of the shoot direct from captivity, again making the kill rate much higher than the UK's, leaving the birds much less time to disperse and become comfortable in their new surroundings.

It is a massive effort and full time job in the UK to keep game on your estate; dogging in, feeding every day, pest control and it is also a huge financial burden. However, not only does the UK industry produce the highest quality of sport shooting to be had around the world but the birds enjoy as much freedom as any wild animal.

5. Animal welfare – intrusive devices

Intrusive devices do not allow birds to fully express their range of normal behaviours

When pheasants are reared intensively they require a small plastic ring (bit) or a blinder (spectacle) to be fitted to prevent them from pecking and pulling feathers.

The following devices are used within the UK game industry:

Bits are fitted between the beak and held in place within the nasal cavity using a Bitfitter gun. This prevents the bird from fully closing the tip of the beak limiting its ability to feather peck and inflict injurious behaviour upon other birds. There are several types of bits giving greater flexibility throughout the period of rearing.

A Bits – Used on birds 2-3 weeks

B Bits – Used on birds 3-6 weeks

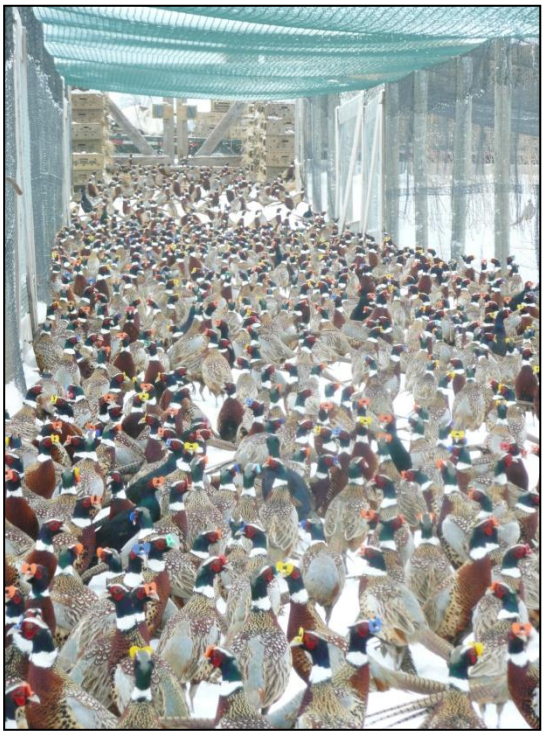
C Bits – Used on birds 6-10 weeks

Bumpa Bits (in various sizes) – used most commonly on caged hens, having an extended front to prevent contact

Spectacles are used to restrict forward vision rather than prevent grasping of feathers. This in turn reduces feather pecking, cannibalism and also egg eating. These devices are clipped on top of the beak through the nasal cavity as shown in the picture on the right.

Clip on Spectacles – used on breeding birds, manufactured in solid plastic.

Flexi Spectacles – used on breeding birds, a bit with a flexible rubber attachment.



Cock birds wearing spectacles
at MacFarlane Pheasants Inc, America

In the UK we are restricted to using only the afore mentioned bits as none of them pierce the nasal passage in any way.

I visited Gibovendee Game Farm in France on 11th December, 2012. We were shown a breeding farm with 40,000 bird placement for both pheasant and partridge in single tier external cages. Firstly we looked at the Red Legged partridge pairs; there were no devices fitted. They were in pristine condition. Next we were shown the over-wintered pheasant hens; there were eight to a cage. They were fitted with an anti-pecking device which it is illegal to use within the UK. This device was one which I have never seen before; it was a shroud which covered and extended beyond the tip of the beak and was held in place with

an arrow pin through the nasal septum. These birds were also in pristine condition.

Whilst in America in February, 2013, I visited many game farms and saw hundreds of thousands of pheasants. All birds were fitted with a solid plastic spectacle which was held in place with a pin rather than being clipped on. It was common practice for them to have spectacles fitted at four weeks of age. These devices remained in place until the birds were sold as fully mature adults. I saw no major feather pecking in any of the birds.

Interestingly whilst in Pennsylvania visiting Mahantongo Game Farm in Dalmatia, I noticed all of their Chukka partridge were fitted using identical spectacles to those on their pheasant. This made it possible to flock-mate large groups rather than using the French pair-system. It is not commonplace to use any intrusive devices on partridge. However, it proved in this case to be a successful venture increasing fertility and reducing mortality. Feather quality was also improved.

Bitting is a hot and time consuming exercise. Most game farms would choose not to bit if at all possible. The Game and Wildlife Conservation Trust, alongside The Game Farmers Association, conducted a study on the use of bits, entitled 'To bit or not to bit' and below are stated the key findings:

- Mortality is higher in flocks of unbitted pheasants because of increased feather pecking.
- Feather pecking constitutes a welfare problem in gamebird flocks.
- Food consumption among bitted birds is similar to that in non-bitted birds.

The Game and Wildlife Conservation Trust found that all of the bitted birds maintained good feather condition throughout the study, whereas the condition of the unbitted birds deteriorated in all cases where feather pecking was evident. In five out of seven cases the condition of the 'unbitted' birds deteriorated so much that they had to be bitted on welfare grounds. At all sites, feather pecking adversely affected the welfare of the birds. Six of the seven farms (one did not comment) considered the non-bitted birds unfit for release, as they would have been liable to chilling in bad weather.

Similarly, the Game and Wildlife Conservation also undertook a study called 'Effect of spectacles on pheasant.' It was found that the body mass index (weight divided by tarsus length) of cocks and hens was not affected by the fitting of spectacles. Incidences of skin damage in both cocks and hens were lower in the spectacled pens.

An alternative method to reduce cannibalism is to beak trim. This is used only in the most severe cases and now considered unacceptable. I did not witness the use of beak trimming in game whilst on my travels. However, it is used widely in the poultry industry where birds are not destined to be released. Game birds' beaks must remain intact as it would be counter-intuitive to remove them. Removal would inhibit their chance of survival once in the wild and therefore would not be financially viable for commercial shooting.

If intensive rearing is to continue, unfortunately the use of such devices is unavoidable in current rearing practices without creating a much greater welfare issue.

Pheasant and partridge, whilst not classed as farmed livestock, are covered by the Protection of Animals Act 1911 during the early stages of the rearing and release process.

Picture on left:

Unbitted pheasant at five and a half weeks
rce: Game and Wildlife Conservancy

The white blinder and black pin, illegal in the UK, can be clearly seen in partridges at Mahantongo Game Farm in Dalmatia, Pennsylvania

6. Breeding – high flying genetics

"The perfect bird would be high flying and would never leave home."

So I asked everyone – *"How do you breed a high flying bird if it either gets shot or flies away?"*

Within the UK there are many types of pheasant that can be released. Each strain has different characteristics suited to different topography. The challenge is that the high flying birds are generally those who wander.

The answer so far has been to cross a high flying strain such as the Michigan Blue Back with a more placid breed such as the Old English Black Neck.

The only establishment that I visited that made any effort to breed a wilder pheasant was Mahantongo Game Farm in Dalmatia, Pennsylvania. Todd and Troy Laudenslager select their breeding stock by simply pushing the birds into a long thin run and selecting from the first few hundred who reach the end first! Certainly not scientific! However, this simple system enables them to select the birds that are the most human-shy. I think this is a good start in selecting the genetics of a bird, but it is highly specific to the American shooting market. The American style of shooting where birds are kept in captivity until the day of the shoot, is so different to our own. Therefore, wandering is never a problem.

In addition to this, Mahantongo put blinders on their breeding partridges, which is not commonplace, but this calmed the naturally skittish partridge which went on to lay two extra eggs over the period of lay. Fertility was not affected by the use of the blinders.

I visited Gib'ocean Game Farm in France who have specifically bred a Polish Ring Neck pheasant and branded it a Bazanty. This became an extremely fashionable breed of bird as it was believed to be a high flyer and a good 'stayer'. This, however, like most fashions has been overtaken by the American Kansas. The Kansas is a lighter weight breed than the Bazanty, which means it can fly higher and faster and it, too, is considered to be a good 'stayer'. Gib'ocean continue to work very hard to keep the line pure by maintaining a completely closed flock of parent stock. Birds are bred in the traditional French cage system and, to ensure fertility is kept to a maximum, the cock bird is moved up one cage in the line per week.

Macfarlane's Pheasant Inc in Wisconsin, USA, have an extensive breeding programme to suit all customer requirements. The types of breed they have developed so far are as follows:

Manchurian Cross Ringneck
The Manchurian Cross Ringneck is the offspring of a male pure Manchurian and a female Chinese Ringneck. The pure Manchurians were imported as eggs directly from the fields of China.

Melanistic Mutant
This melanistic mutant is a pure breed. These large, beautiful pheasants feature an iridescent, greenish-black plumage. A favourite variety for release, they display a remarkable ability to survive and reproduce in the wild.

Chukar Partridge
The Chukar is a small flighty bird. Known for their flying ability and their zebra-like stripes, they are a favourite addition to game bird hunts. These birds hold well in cover and get up and go when flushed. Please note: it is illegal to release these birds within the UK.

K Thunder
What we call the American Kansas. Birds were bred and developed by the late Bernie Janssen, a long-time game bird farmer from Kansas. Bernie bred his birds to have blue backs. The Kansas birds are a small pheasant - the cocks weigh 2.25 - 2.4 lbs. and the hens weigh 1.4 - 1.7 lbs. at maturity. The birds have a very erect posture.

Chinese Ringneck
The Chinese Ringneck is the most popular of breeds. This pheasant is used primarily for stocking and hunting. These hardy birds adapt readily to the wild and are prized by sportsmen for their excellent flying ability and brilliant colours.

Extra Large Ringneck
The largest pheasant breed offered by MacFarlane Pheasants is the Extra Large Ringneck. This breed has primarily Mongolian blood and is a challenging bird for dogs to get into flight as it tends to be a ground runner.

La Gazelle Partridge Farm in Bouznika, Morocco, is the largest successful breeding operation of Barbary Partidge focusing on genetic management. I tried desperately to arrange a visit to La Gazelle, emailing - to mention a few - the Head of Delegation to the CIC and the Head of Hunting Tourism Association for Morocco. Nothing. I also received emails from other people hoping that I could help them make contact.

In such a small industry there is limited funding and research in place. The game industry does not suffer the same pressures to improve that the commercial chicken world receives.

7. Disease control – open to the elements

Using current rearing techniques, bio-security is impossible to regulate and control.

The rearing of pheasant and partridge using current outdated equipment makes bio-security an impossible task. In order to maintain a sufficient level of bio-security, equipment needs to be modernised. Modernisation will not only reduce labour costs but will also dramatically help to reduce the recurrent outbreaks of bacterial and viral infection common in game rearing.

There are a number of diseases which a game bird can contract. The most prominent are listed below:

Hexamita: also called spironucleus, is a single cell organism which is only slightly larger than bacteria.

The organism can spread between pheasants and partridges.

Transmission occurs via direct bird-to-bird contact and ingestion of droppings and contaminated feed or water.

Symptoms include chilling, huddling, ruffled feathers, severe weight loss and watery or foamy diarrhoea.

Coccidiosis: Is caused by an intra-cellular parasite of the intestinal tract of the genus Eimeria. The disease is characterised by enteritis and diarrhoea. Coccidia are host-specific, meaning they only infect one species of bird and are site-specific, meaning every species of coccidiosis colonises only a certain part of the intestinal tract. Thus pheasant cocci does not affect partridge.

Oocysts, tough hard shelled bodies containing infective stages of cocci, are passed out in the droppings and ingested by other birds via contaminated drinking water and feed. Once ingested, the coccidia go through a complex life cycle in the intestinal cells, causing damage and disease. The life cycle can be as low as seven days.

Clinical signs include depression, reduced appetite, ruffled feathers, vent pecking, diarrhoea, dehydration, weight loss and death. Red legged partridge are very susceptible and sudden death (in large numbers) is not uncommon.

Rotavirus: Can be seen in pheasant and partridge, affecting birds from a few days up to seven or eight weeks of age. The route of infection is oral and maximum viral excretion occurs two to five days post infection.

Signs vary with the age of the bird affected. In the first week of life moist droppings and lethargy may be seen. Two to three week old birds suffer lower mortality, but fail to thrive. They are often wet around the vent, huddling and eating less.

Mortality is variable, but can be as high as 80%.

Mycoplasma: (Bulgy Eye) has been recognised in pheasant and partridge since the 1950s. Clinical disease is

most often seen in adult birds although all ages may be affected.

The disease is mainly characterised by respiratory symptoms and sinusitis. Transmission occurs through bird-to bird-close contact, via air droplets, infected litter and equipment (horizontal transmission), and from hen to chick via the egg (vertical transmission). Recovered birds will remain carriers and shedders; therefore, once the flock is infected it will remain infected.

The UK game farms which I visited ranged from stock of 50,000 to 500,000 birds and were uniform in the precautions used for disease control – very limited. On all five of the farms which I toured the only technique used against the spread of disease was a standard foot dip. Noticeably, the content of the foot dips was generally dirty and old, serving no purpose. Unlike my previous visits to chicken facilities I was not asked to avoid contact with any avian species 48 hours prior to any of the visits. This highlighted the difference in bio-security between the two industries.

Again, the issue of bio-security was illustrated in one of the leading game farms in the country. I walked from viewing rearing sheds that had not been cleared of litter from the previous rearing season, into the breeding facility. I was not advised to change or wash my boots. I was a little disappointed that this leading game farm did not practise better security methods but was not at all surprised. This lack of bio-security could have been a contributory factor to the birds looking poor with significant feather loss and an above average number of birds showing signs of blindness, most likely due to ammonia levels within the shed.

A few short weeks later I sat in my kitchen with a representative from the Game Farmers Association. Although this was not specifically for my Nuffield study, I had been asked to join, and the meeting was arranged in the hope that I would sign up for subscription.

I had been left feeling particularly uneasy from my latest game farm visit as the farm in question had actually been a member of the Game Farmers Association. So I put it to their representative that I had recently visited one of their members' facilities and was rather concerned for the welfare of their stock.

"The Game Farmers' Association's rules now require that GFA members MUST follow the code in force in the country where they are operating, so buying from a GFA member provides a guarantee that any eggs, chicks or poults purchased will have been produced to a high welfare standard."

The representative was careful not to comment and instead encouraged me to pay my subscription of £170.00. I decided against.

Traditionally in the UK, game is reared in small 8ft x 8ft huts with an 8ft x 8ft sunning area which leads on to a small grass run. Each shed houses approximately 500 birds. Slightly larger sheds house larger numbers. So, for example, to rear 50,000 birds 100 sheds would be required. It is impractical, in fact almost impossible, to be extremely bio-secure due to massive footfall to feed, clean and check every single unit.

Drinkers and feeders placed in the netted runs which are open to wild bird contact further increase the challenge. The areas around the drinkers and feeders are heavily soiled if not moved regularly and heavy rain can turn the run into a quagmire. Furthermore, it is a hard task to get birds to drink medicated water when dirty infected rain water is so readily available on the ground.

The wooden huts easily leak and flood although most often have a plastic or wooden floor in place. As they are un-insulated, temperature fluctuates immensely, causing disease such as rotavirus, which thrives in such conditions, to take hold.

On 10th December 2012 I visited Grimaud Freres in Roussay, France, a multi-species selection and breeding operator in the service of the waterfowls and festive poultry field. Philippe Lamay showed me around one of their new pigeon squab production houses. I was particularly interested to see their pigeons as they, like game birds, are very susceptible to coccidiosis. We entered the facility and I was asked to put on disposable overalls, plastic boot covers and a hairnet. Once in the barn it seemed a fresh, clean and airy environment. The barn was sectioned into 30 separate enclosures each housing 25 pairs of pigeon. Each pigeon was tagged with an identification number. The floor of each enclosure was wire. This was the definitive reason why coccidiosis and other diseases were not prevalent – the birds were dry and not in contact with their faeces, keeping any potential spread to a minimum. The area below the wire was regularly cleaned and disinfected. This visit really highlighted the fact that if birds are kept in controlled conditions disease can be kept to a minimum.

Whilst visiting Gib'ocean Game Farm in France I was asked to wear plastic disposable boots when in their hatchery. Bio-security was an issue being addressed here; however it was far from the standards implemented by the chicken farms I had visited. No other game farm in France or America asked me to adhere to any similar practice as Gib'ocean's.

Climate is a huge variable from country to country. One of the most interesting facts that I learned whilst in America is that, due to their hot summers and bitterly cold winters, hexamita, one of our most crippling diseases, is unheard of. How lucky they are!

Red Oak Wild Bird Farm in Minnesota used a system where birds were moved from one enclosure to the next larger enclosure within a sizeable barn as they grew. Bedding was not changed between batches and Gary Williamson claimed to have no problems with cross contamination or disease at all.

The use of antibiotics in game rearing has become a tool for bio-security, rather than a last resort once disease has taken hold. As there is such huge potential scope to improve bio-security by straightforward management modifications and small investment in simple practices, use remains higher than is necessary. It is very possible that these latter changes could prove profitable in the long run.

Antibiotic use is however far more regulated in the UK than in America where it can be purchased off the shelf without a veterinary prescription.

8. Game bird rearing – systems and techniques

The current rearing systems and techniques used for producing game birds is the area of study in which I am most interested. I am passionate about improving the game rearing industry and the main obstacle which I believe prevents progress is the current technologies and systems used.

At the beginning of February 2013 I flew out to America where I met Bill Macfarlane of Macfarlane Pheasants Inc, and his team, to attend the 81st North American Game Association (NAGA) Conference in Kansas City. I was most grateful to Bill for inviting me to attend such an important event in the game bird calendar giving me a vital platform from which to continue my travels whilst in America. We enjoyed some excellent speeches ranging from disease control, where Steve Shaw discussed an 'Update on Aivlosin used to treat Myco-plasma', to habitat management and systems where Dr Tom Warner discussed 'KSU Wildlife and Outdoor Enterprise Management Program'. It was a fantastic experience where I learnt a great deal about new techniques which I had not previously considered. The speech by Dr Tom Warner really emphasised the importance of having cover within the run. He discussed how different types of cover can be utilised to give the birds a more natural habitat, thus decreasing the mortality rates when birds are transferred to outdoor runs.

Currently in the UK most game farmers are using very simple and outdated equipment which is listed below along with a plan illustration and photo of a typical set up.

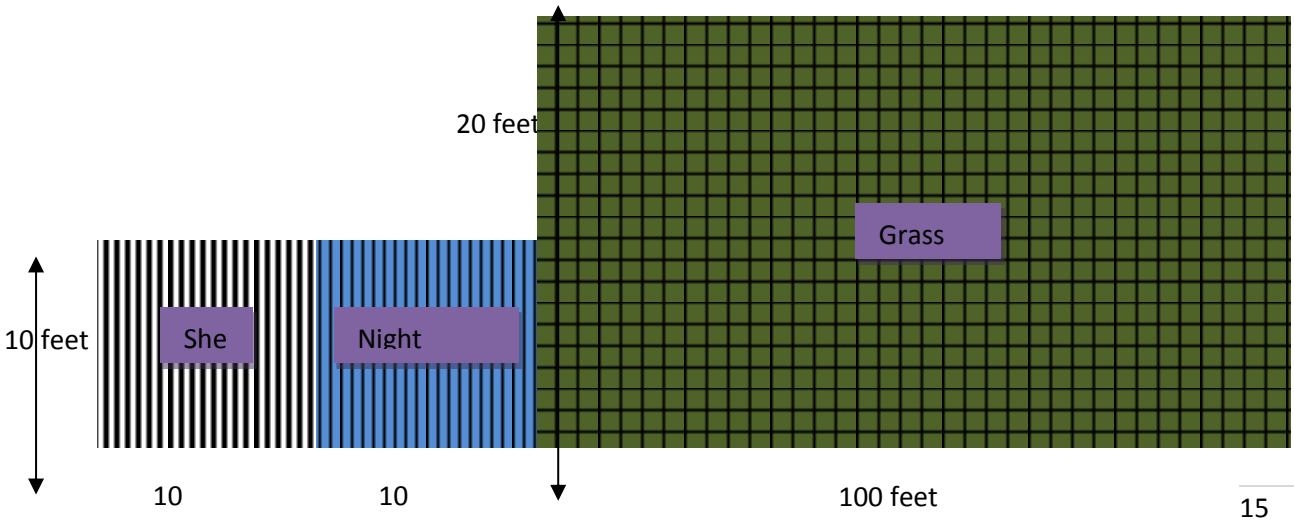
Shed: Non-insulated wooden 10 x 10 feet with ventilated tin roof

Night shelter: 10 x 10 feet plastic sheet walled structure with tin roof.

Grass run: 100 x 20 feet grass run with netted top.

Temperature control: Infrared gas fired heater with thermoregulatory probe.

Below is a plan view showing shed, night shelter and run layout of a typical UK current installation



A typical wooden rearing unit used within the UK

This type of equipment is no longer, in my opinion, fit for purpose. In my first few seasons when I was producing only up to 50,000 birds this equipment was my only option. Whilst not the most efficient equipment it served a purpose as it is easy to manufacture and relatively cheap to buy. However, as the scale of rearing increases these sheds become highly inefficient in a number of ways:

- Uninsulated, resulting in vast heat loss, fluctuation in temperature and increased gas usage.
- Under extreme weather conditions they fail to keep the elements out.
- Their life span is only a maximum of 4-5 years and their durability is questionable, resulting in constant maintenance.
- Due to planning requirements to dismantle the shed after the rearing season has finished it must be restricted to a size that is easy to physically handle and move. This restricts the number of birds able to be reared per shed.
- The size also creates a difficult and inefficient working environment.

The current feeding and drinking systems are also an area where significant improvements can be made.

Drinking system: Nipple bucket and open water drinkers gravity-fed directly from 250 litre header tanks.

Feeding system: For birds between the age of 0-2 weeks trays are placed evenly on the shed floor to ensure maximum opportunity to feed. These need to be hand filled. For birds from

2-7 weeks hopper style containers holding approximately 25kgs of feed are used. These again need refilling by hand daily.

Chicks at J S Game Ltd

By modernising the feeding and drinking systems efficiencies will undoubtedly be made. These include:

- A huge reduction in labour costs.
- Medication would be easier to control and administer.
- Volumes of water and feed intake could be accurately monitored, giving a first indication of disease if the volumes were to drop.
- Competition for feeders and drinkers could be reduced.

In order to better understand and learn about game rearing systems and technologies I went on to spend some valuable time working at Macfarlane Pheasants Inc. Although it was very cold I worked within every part of the business from catching poults ready for release to hatching day old chicks.

At Macfarlanes, birds were reared in large scale broiler style barns which were split into two sections. The first section covered 25% of the shed the other covered 75%. For the first two weeks they are reared in the first section then moved onto the second section. After 5 weeks they are moved into a permanent grass enclosure for the remaining weeks before delivery.

All laying stock were kept in large scale barns set up similarly to a broiler breeder shed. This enabled them to control the feeding and drinking systems much more efficiently. The drinkers used were open water bell drinkers. It was clear to see that the number of feeders and drinkers per shed was ample for the stocking density. The feeders used were automatic hopper feeders at ground level. This really showed how automating the feeding system increased efficiency.

Whilst in Pennsylvania visiting Richard Smith at Royal United Game Birds it was interesting to note that the holding pens were netted 20ft high allowing trees and cover to grow. This definitely helped the birds to exercise and to roost. He also believed that this resulted in a better quality of flying pheasant. Enriching the pheasant's life is important and visiting this farm gave an example of how this can be done.

Sullivan Pheasant Farm in Illinois was a very modest set up which rather reminded me of my own establishment. Whilst not full of expensive technology and equipment they did strive to produce quality game. A new building had just been erected which could hold 5,000 birds. It was of timber construction and split into three brooding areas. It was refreshing to see such a small farm using techniques that I have only ever seen on much larger scale game farms.

20ft Netted runs at Royal United Game Birds, Pennsylvania

Similarly to Red Oak Wild Bird Farm, birds were pushed into new areas each week but by 6 weeks of age they reached an outdoor raised wire floored veranda *(as shown in the picture above).* This enabled the birds to be weathered but reduced the risk of disease by limiting contact with droppings.

Mahantongo Game Farm, Pennsylvania, which was much larger than Sullivan Pheasant Farm, also used wire verandas; however they were on a much larger scale. The difference between the two was that Mahantongo was using wire for both the veranda and the brooder house. Using the wire flooring in the brooder house was a completely new concept for game rearing and it was great to see the benefits first hand.

See photos on next two pages

Sullivan Pheasant Farm, Illinois, embracing new wire floor rearing

Brooder house with complete wire floor, automated feeders and ventilation
at Mahantongo Game Farm, Pennsylvania

Over four acres of wire runs at Mahantongo Game Farm, Pennsylvania

I have taken a great deal from the visits to America as rearing on wire in the early stages of the chick's life was not something I had previously thought was viable. This really is a step forward from the more conventional techniques currently used in the UK.

In France birds were reared in redundant farm buildings using the traditional litter floor system. After six weeks of age hens that were destined not to be sold were placed in single tier metal laying cages for overwintering - instead of the barns used in America - and cocks were graded and the best were kept in permanent grass runs. Rather than the open water system the French used nipple drinkers. This served to enable the birds to drink from crystal clear water and reduce the amount of cleaning needed. The feeding system used was hopper style, and not automated.

Having had the opportunity to visit these farms has enabled me to see the varying methods and equipment used for the rearing of game birds across the globe. I have taken away some brilliant ideas which are certain to influence my way of thinking.

9. Integrating the poultry industry

Before undertaking my Nuffield study I was well aware that the poultry industry was many years in advance of the game industry. However, having completed my study, it is now apparent that the gap is much larger than I had first anticipated. I believe there is a huge amount that game farmers can learn from the poultry industry and, by closing this gap, game rearing can become as efficient as its poultry counterpart.

I visited the EuroTier exhibition in Hannover, Germany, on 13th-16th November 2012, a fantastic opportunity with all the major poultry housing suppliers and manufacturers under one roof. To mention a few: Valli, Big Dutchman, Hatchtech, Facco and Zucami Poultry Equipment were there.

I had detailed conversations with many about trying to breed game within an indoor multi-tiered chicken system. The first most obvious problem that quickly arose was that the dimensions would have to be altered to suit game birds. Having discussed this with the leading manufacturers it was apparent that this would not be a major problem; however the cost may be a more pressing issue. I acknowledged that it was going to take huge financial investment to set up the cages but a quote of £57.00 per game bird compared to only £20 per chicken was a bit of a shock. The cages would only be in use for 20 weeks of the year to rear pheasants. To combat this I think by utilising the cages after the pheasants have departed, possibly for other types of poultry, would make the investment more viable and hopefully a reality.

On my return to the UK I decided that the best step forward would be to see some systems in use. I planned visits to:

- One of the top broiler breeders in the country, **McKenzie Brothers**
- The largest UK multi-tiered indoor caged egg producer, **Oakland Farm Eggs Ltd**
- **Hy-Line**, the largest commercial hybrid chick producer

McKenzie Bothers Chicken Farm, Berkshire:

I met with Andrew McKenzie of McKenzie Brothers on the 26th November 2012. I arrived in my wife's car rather than my work vehicle as I was already aware of Andrew's strict bio-security regulations. Decked out in white overalls I changed my boots no less than three times before actually seeing a bird. This had never happened to me before on any UK game farm I had ever visited. I was firstly shown a shed of eleven-week-old broiler hens not yet in lay and, because broilers are naturally hungry birds, the feed was spun off the roof so that there was an even distribution of food per bird. Nipple drinkers were automated. There was a calm and relaxed atmosphere in the shed. Dead birds were bagged and put into freezers before being collected by a disposal company every week. For bio-security reasons the lorry was not allowed to enter the farm and any bags would be taken out to the farm gate.

Stripped down, scrubbed up and donning new white overalls and masks, we then went off to see another age group. The same procedures ensued as the tour progressed. The next age group was just coming into lay and now had the pleasure of the company of cocks.

Entering the shed the first noticeable difference was that the shed was strategically lit up to create no shadow. This discouraged

floor laying and nest boxes were on two sides of the house with a back-to-back line down the middle.

Back at the office we talked further and Andrew showed me the extent of record keeping used to monitor flock performance and food and water consumption. This again was not commonplace in the game industry. The McKenzie Brothers' use of barns was highly efficient in terms of temperature control and was extremely bio-secure.

Oaklands Farm Eggs Ltd, Shropshire:

The one man whom I was most looking forward to meeting with was Aled Griffiths of Oaklands Farm Eggs Ltd, and this took place on 6th December 2012. His company has come from humble beginnings to become the largest egg producer in the UK.

We first visited a rearing farm. Again bio-security was paramount. I walked into the longest shed I have ever seen, full of fully automated four-tier rearing units containing week old Hy-Line layer chicks. The first thing apparent was, again, how quiet and calm the environment was. I also noticed that only the middle two of the four tiers was occupied. This was because the middle tiers maintain a more constant temperature and, once the birds reached four weeks old, they were thinned into the top and bottom tiers, so giving all birds more room to grow on to fourteen weeks when they are transferred into their colony cages ready for lay. Food was delivered by way of a conveyor system and water by auto-nipple drinkers. Losses were as little as 0.5% and all birds were uniform and active.

The main laying complex was next on the agenda. We entered a house of newly occupied fifteen week old birds in fully automated colony cages. Knowing the reputation of battery cages I was surprised at just how much room the birds did have and how contented they looked. They were spread evenly, either eating, drinking or perching.

I was then shown the packing centre. A sea of eggs was pouring in to one end, being checked for cracks and blood spots and graded faster than my eyes could keep up with, and then packed and ultimately distributed all over the country. The robots were fascinating.

The use of Techno cages at Oaklands Farm Eggs Ltd enabled optimum hygiene conditions, higher stocking density, more even growth and energy saving capabilities. They were at the forefront of rearing technology and showed that, with investment, cost of production and mortality rates can be significantly lowered.

Hy-Line UK Ltd, Warwickshire:

It was an absolute honour to gain access to Hy-Line's Millennium Hatchery on 19th March 2012. I arrived and met Nigel Butcher and filled in various bio-security forms. We then entered the first part of the hatchery for which there was a shower-in system with a full change of clothes supplied by Hy-Line.

I was shown the grandparent chick sorting and sexing rooms which were immaculately clean, and then followed into the egg store where over a million eggs were trayed and labelled. Every trolley was fully traceable to its original source.

We then moved on to the hatchers, with row upon row of highly modern Chick Masters. All incubators were single stage and meticulously cleaned with swabs taken and cultures grown for every cycle without fail. We continued to the chick take-off room were chicks were taken from their hatchery baskets and placed onto the line where they were then sexed and

split into two. Female chicks were then transported to another room where they were beak trimmed by infra-red and vaccinated according to the customer's requirements. All male chicks were destroyed. Each room had huge extractor fans removing the chick dust from the air. It was not necessary for staff to wear masks and without doubt the fans created a much cleaner environment.

Looking at the three separate disciplines within the poultry industry is proof that the embracement of automated systems enables the highest levels of efficiency, production and disease control. I truly believe that the two industries (poultry and game) can be integrated and that game bird rearing can become a profitable and stable business.

Shown below are recipes courtesy of the Country Alliance.
See next chapter : Game meat – a wasted resource

Christmas Pheasant

Roast Partridge

Pheasant Casserole

Game Pate

10. Game meat – a wasted resource

Are pheasant and partridge a wasted by-product of a leisure industry and tarnished by the content of lead?

Following my meeting with The League Against Cruel Sports I was determined to establish whether their claim of mass dead pits held any truth.

I arranged a meeting in January 2013 with a local game dealer who has asked, I am afraid, to remain anonymous. It was most unsurprising to learn that in fact shot game does not go unused but is actually distributed both nationally and internationally with 80% going to countries such as France and Belgium for consumption. I was shown around the company's small processing facility where game birds were firstly dry plucked and the initial stage of grading was taking place. A visual check for bruising, gangrene and general condition of the carcass preceded the second grading which established the end use of the bird i.e. breast, diced, table bird. All meat was checked with a shot locator to determine lead content levels and these were subsequently removed. The meat was then packaged either in polystyrene trays or via vacuum packing. The game dealer stated that, recently, game meat has without doubt become a much more popular choice within the UK market as today it is generally hung for less time giving a more subtle flavour.

At this point I felt that I needed some facts and was most interested to discover the Countryside Alliance's efforts to promote game on the menu.

Game-to-Eat is the campaign driven by the Countryside Alliance, dedicated to increasing the eating and enjoyment of British wild game. The campaign was founded in the year 2000 and since then game has grown tremendously in popularity. The campaign reaches out to butchers, chefs, journalists in print, radio and TV media, and of course to members of the public.

Results from research commissioned by the Game-to-Eat campaign (*Auther, 2006*), *shown in the table on the next page*, suggest that there are real health benefits attached to eating game. Pheasant and partridge contain a high level of iron, protein, vitamin B(6) and selenium, which helps to protect cells from damage caused by free radicals.

Further to the high nutritional value of wild game, is the knowledge that no substances have been added to the meat.

This however moves us swiftly on to the secondary debate against the use of game as a table bird.

It has been claimed that eating shot game can result in lead poisoning. However, many types of everyday food also contain lead. It was found by the European Food Safety Agency (EFSA) that the highest content of lead was in fact in such outwardly harmless foods as potatoes, bread, water and tea. Game meat was found to make up a very small contribution to lead content in the diet, comparable to that of fish.

See table on next page.

	Partridge	Pheasant	Venison	Lamb	Beef	Turkey	Chicken
Energy (kcal/100g)	112	119	104	172	191	111	105
Energy (kJ/100g)	476	505	442	720	800	469	443
Protein (g/100g)	25.8	27.1	23.4	20.8	23.1	25.2	20.1
Fat (g/100g)	1.0	1.2	1.0	9.9	11.0	1.1	1.5
Cholesterol (mg/100g)	85	66	85	90	99	65	90
Saturated fatty acids (g/100g)	0.00	0.39	0.00	4.75	4.39	0.00	0.50
MUFA (g/100g)	0.00	0.54	0.00	3.76	5.31	0.00	0.58
PUFA (g/100g)	0.00	0.21	0.00	0.96	0.81	0.00	0.35
Vit B1 (mg/100g)	0.030	0.023	0.021	0.052	0.039	0.073	0.150
Vit B2 (mg/100g)	0.015	0.019	0.011	0.022	0.033	0.013	0.012
Vit B3 (mg/100g)	2.67	3.77	1.64	7.62	9.34	5.75	6.3
Vit B6 (mg/100g)	0.130	0.061	0.061	0.053	0.074	0.110	0.110
Vit B12 (ug/100g)			0.94	0.57	0.34		
Vit D3 (ug/100g)						0.12	
Iron (mg/100g)	0.7	1.0	2.4	1.6	1.4	0.2	0.2
Sodium (mg/100g)	37	40	44	43	49	64	37
Zinc (mg/100g)	0.7	0.8	1.8	2.5	3.5	1.2	0.5
Selenium (mg/kg)	0.43	0.37	0.04	0.08	0.04	0.10	0.10
Ash (g/100g)	1.1	1.2	1.2	1.1	1.0	1.2	1.2
Total solids (g/100g)	27.1	28.8	26	31.5	34.7	26.6	25.5

** Leatherhead Food International Research 2006*

11. Discussion

11a. Disease control – open to the elements

Of all the issues I have considered during this paper, disease control is possibly the most difficult to address. It is by far the biggest threat when rearing pheasant and partridge and just a small decrease in occurrence would have a huge impact on the number of birds surviving post infection. It is clear to see that bio-security amongst the game industry is far from adequate and in most cases non-existent. My travels have enabled me to see how this issue is being tackled by both the game and the chicken industries and how some of the techniques employed can be transferred.

Whilst the two industries are very different in a number of ways I believe the game industry can learn a great deal from intensive poultry farming. One area in particular, egg production, has the potential to be transferred to the game world with relative ease.

> I believe the game industry can learn a great deal from intensive poultry farming.

This became apparent following my experience at Oaklands Farm Eggs Ltd where I saw how a large scale egg farm handled the rigours of bio-security. Without doubt this was one of the most impressive farms I visited whilst on my travels, as their attention to detail and meticulous bio-security was of the highest calibre. It showed me that with the right investment and attitude to bio-security even a farm of such a large scale can remain completely bio-secure while ever expanding.

The possibility of housing breeding pheasants in a caged environment would not only control disease, as wire flooring keeps the birds dry and out of their own faeces, but indoor sheds would also eliminate any external challenges. It would also enable the exact monitoring of egg production, egg quality and fertility, thus increasing the efficiency and profitability of production.

One of the biggest challenges is to adopt and maintain bio-secure practices when not rearing in a modernised shed. Large modern sheds require significant investment and may not always be feasible for rearing wild game birds. This is a problem that is not easily solved and, in fact, rearing except in a controlled environment really is extremely difficult re bio-security and it is clearly impossible to remain totally clean and bio-secure.

Whilst carrying out my research no game farm stood out as leading in bio-secure method. This was not a surprise as most UK game farms were using old style rearing techniques where, in the past, bio-security had never been considered a major factor. At present it is becoming more widespread to use antibiotics such as oxytetracyclines in a low dose within daily feed to keep disease to a minimum. This use has now also become a more economical option to the alternative liquid administration. With such high usage it is now imperative to address this issue before diseases become resistant.

MacFarlane Pheasants Inc. reared their pheasants indoors up until the age of 4 weeks.

Although they reared in a controlled environment they were still unable to combat disease as the flooring was not wired, thereby not keeping the birds out of their faeces. This has therefore proven the importance of the wired floor, whether this is in a cage or an open style barn.

> Perhaps the short term answer would be to vaccinate as day old chicks to reduce losses and improve the quality of time the bird spends in captivity.

The critical issue surrounding this whole problem is of mass stocking density. As soon as the birds are released totally into the wild, disease no longer remains a concern. Perhaps the short term answer would be to vaccinate as day old chicks to reduce losses and improve the quality of time the bird spends in captivity.

11b. Game bird rearing – systems and techniques

This area of the game industry is clearly in need of improvement, with current techniques not fit for larger scale game rearing. I would say, however, that the current equipment and techniques do have a place for smaller game farms and shoots. It is clear though that once numbers reach, perhaps 50,000, this no longer becomes a viable option.

The chicken industry has proved that with large and sustained investment massive strides can be taken. The investment witnessed on my travels on farms such as Oaklands and Hy-Line was staggering and inspirational. It showed how investment of this kind can not only drastically improve the financial margins of a business but also that the conditions in which the birds are kept can be greatly enhanced. The EuroTier Exhibition certainly highlighted the scale of the chicken industry. The number of suppliers offering solutions to the day to day problems faced by chicken farmers was something that greatly interested me. The investment has clearly stimulated the supplier market to look at new and innovative ways of addressing hard-to-solve problems and this has benefited the

> If we could get even 10% of this (equipment) supplier base to look at the game industry this would be a huge step forward.

industry massively. If we could get even 10% of this supplier base to look at the game industry this would be a huge step forward. After all, they are the experts in the field of new technologies and, with rearing and behavioural expertise from someone in my position, I think it would be possible to modify the technologies used to rear chickens to suit game birds.

I think another important point to mention is that, if this technology is to be the way forward, then it needs to be adaptable to suit both pheasants and other types of poultry. I say this because a pheasant rearing season is only 20 weeks long, therefore leaving the investment redundant for the remainder of the year. Ensuring the equipment is adaptable will make it possible for the investment to be utilised all year round, thus making it more economically viable. Whilst rearing poultry in cages provides a controlled and bio-secure environment it does not

unfortunately give the enriched surroundings a wild game bird requires.

Whilst completing my study I did not observe any real attempt in the game rearing industry to provide any sort of considered enrichment. Farms in America, France and the UK made little effort to enrich the bird's life during their time in laying cages or in rearing systems. However, broiler and egg producing farms in the UK that use cage systems are now by law required to provide a certain level of enrichment which meets European standards. I believe that with careful thought we in the game industry can by far exceed these requirements.

However, I am not convinced that game farmers will be willing to make such large monetary investment when current equipment has been long since paid for. Indoor cage systems for both breeding and rearing are at present only a theory and have not yet been proven successful. I also have one niggling doubt – at the beginning of my study I considered rearing in cages to be the way forward and I suggested this to the founder of Gib-ocean Game Farm in France, an elderly gentleman who was only too happy to discuss my ideas. His response was "We tried that years ago and it does not work". That put a spanner in the works! Although Gib'ocean had attempted this a long time ago, in a much more modest way, I am still convinced that there is a need and a place for it in the current market.

One key issue to also consider is how disease spreads, and to address this by creating systems which, although may not prevent it, will in the least restrict it.

So here is my suggestion: chicks should be reared in cages for their first four to five weeks. This would reduce 'starve out' rates and occurrence of disease producing a much stronger chick. Ventilation and lighting can be controlled and automated feeders and drinkers would be in place, maintaining minimal disturbance. Birds will be fitted with a more ethical intrusive device during this time and will then be moved to permanent high-netted outdoor grass runs full of trees and natural cover giving them the opportunity to exercise, weather and 'oil up' in preparation for release.

I do however maintain that the cage system for breeding pheasant and partridge is by far the most effective. Not only can disease be kept to a minimum and labour time decreased but it is possible to monitor fertility rates and competition for food and water is greatly reduced.

I believe that I can take the idea of enrichment and design a cage that both meets the fundamental requirements of a game bird but also has the necessary enrichment within the cage to make captivity a more positive experience.

11c. Integrating the poultry industry

Integration between the chicken and game industries is extremely important to the growth and advancement of the game industry as a whole. The knowledge and expertise that potentially can be gained from the more advanced chicken world is pivotal to

Integration between the chicken and game industries is extremely important to the growth and advancement of the game industry as a whole.

enhance rearing techniques, tighten bio-security and modernise equipment.

At present the two industries are not integrated as there is too much disparity between the two in terms of scale and investment. This needs to change if we are to successfully implement some of the transferable chicken rearing techniques. However, I have discovered that it would not be possible to fully rear either pheasant or partridge in a complete chicken system. The finished bird would not be prepared for release and survival in the wild.

It is going to require greater thought to overcome game birds' natural behaviours.

It is going to require greater thought to overcome game birds' natural behaviours. Feather and vent pecking still remains a huge welfare concern, not to mention their natural instinct to 'pile' on top of each other in mass numbers when spooked or feeling unwell. It has also been suggested over the years that if game birds are to be continually bred in flightless cages then soon a bird which could not fly would be produced.

The Nuffield Farming Scholarship has helped immensely in the first stages of this integration. I am now part of the Nuffield Poultry Group that meets periodically throughout the year to visit farms both nationally and internationally. The invaluable experience I have gained so far has undoubtedly changed my thinking and given me the confidence to plan and implement changes to the way in which I rear my own pheasant and partridge. I am the first game farmer to be part of the group and there have been some insightful and sometimes heated conversations about the two industries.

11d. Game meat – a wasted resource

I am glad to say that the claims made which suggested that game meat was being wasted are, as expected, unfounded. I completely understand the concerns of individuals and campaign groups who were led to believe that game is simply disposed of after it is shot. Such a waste of a natural free range meat would be totally unjust and quite frankly uneconomical. I am a true advocate of utilising shot game and, from my extensive experience within the shooting world and research during my Scholarship, I have found that all game is unquestionably ustilised in one way or another.

I believe the real issue that needs to be addressed in order to keep shooting sustainable is the cost and demand of the game birds. There is definitely a stigma which comes with eating shot game and this unfortunately causes the selling price to be significantly lower than for other poultry meats. The average price per bird is £0.50 when bought directly from a shoot. This does not seem a fair price to pay when pheasants are being sold in London for a minimum of £8.00 per bird, plucked and prepared.

The stigma of eating shot game needs to be removed.

In order for this to change, the stigma of eating shot game needs to be removed. This could be done in a number of ways:

- Celebrity endorsement
- Buy in from restaurant chains
- More advertisement

There is unfortunately no 'overnight' solution and any changes will take time and effort. However, investing in and working with the people concerned can only be beneficial to

the shooting industry. It will not only increase the demand for game meat which will in turn be beneficial to the industry as a whole, but it will safeguard the use of game meat after it has been shot.

At present game farms expect losses of up to 10% on average per season whilst the chicken industry enjoys no more than 0.5%.

To address the concern of lead content in game meat as a foodstuff there are possible alternatives to lead shot such as steel, tungsten and bismuth but these do not yet meet all the requirements necessary, as their impact on human health and the environment have not yet been explored.

11e. Summary of discussion

At present game farms expect losses of up to 10% on average per season whilst the chicken industry enjoys no more than 0.5%. There is a sequence of contributory factors resulting in these loses – current rearing systems and techniques lead to mass disease due to high stocking densities where intrusive devices must be used as wild birds are being farmed in an unnatural environment.

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12. Conclusions

1. **Bio-security** – limited attempts are made to safeguard stock as antibiotic intervention is so readily available.

2. **Inadequate temporary housing** – small outdated labour intensive hut rearing systems are both inefficient and volatile.

3. **Enrichment** – efforts to enrich the environment are minimal with overcrowding and boredom the main contributory factors to injurious behaviour.

4. **Weather dependent** – the UK's unpredictable weather breeds disease.

5. **Shoot management** – not always good practice and consideration not always given to flora and fauna.

13. Recommendations

1. **Bio-security** – as a minimum, increase number of hand sanitisation and foot dips. Limit access to foreign bodies that may have been in contact with other farms. It would be beneficial to spread age specific groups around different sites.

2. **Permanent housing**, use of cage systems and enclosures with established cover of increased area – would both enrich and enable the birds to display more natural behaviour whilst reducing labour time and cost by as much as a third.

3. **Embracing new technology** - automated systems would make it is possible to minimise losses and disturbance by stabilising the environment.

4. **Enrichment** – provide the most natural environment possible.

5. **Research** - disease control including the introduction of vaccinations.

6. **Legislation** - against bad practice and unnecessary suffering.

7. **Traceability** – back to their origin.

14. The future of game farming

Supported by evidence and findings from practices and research from around the world, I am now in a position to introduce new thinking to the future UK game market, which I hope will also influence the wider sporting community.

From particularly my experiences in America and that of the UK poultry industry I have now merged together different ideas from various visits to create a bright new vision for the future of JS Game Ltd – 'Enriched Rearing!'

As I write this we are still searching for that elusive, dry, flat, isolated pocket of land on which to establish the business firmly. However, this is the way forward for us; we will over-winter all stock in one building with a complete wire floor with suitable perching, air flow and lighting. This building will then be converted into the birds' permanent laying quarters in the spring. All eggs will be laid in roll-away nest boxes to maximise cleanliness of eggs.

The rearing process will also radically change - we will use brooding techniques taken from America where chicks are placed straight onto a wire floor for the first 4 weeks and will then be transferred to permanent enclosures full of established crop drilled specifically for game birds and including plenty of roosting and natural shelter. Manola feeders will be phased out and a covered chain feeder will be introduced stretching the length of the run to maximise availability and minimise competition. Similarly, a slatted drinking area will also be introduced still utilising nipple drinkers, yet making it possible to massively reduce the ratio of nipples to birds by 5:1.

Bio-security will naturally improve and develop once these new systems are in place, reducing exposure to disease.

Following the initial modifications made to the Bit-fitter gun with Brian Eadie of Roxan Developments I hope to further develop anti-pecking devices making them easier to remove by creating a snap-off system in a more forgiving material.

The changes I will be making will undoubtedly enhance the birds' short time in captivity and so I can only hope that organisations such as The League Against Cruel Sports will recognise these improvements as a positive step to addressing their concerns.

I was greatly influenced by Paul Kelly of Kelly's Turkeys and hope to establish a secondary use for both my facilities and equipment once the rearing season is over, thus creating a wrap-around business all year round.

For now, we continue 'flat out game farming' and brace ourselves for a fight with the local planning authority.

Longer term, and if and when my ideas have been proven, I am hoping to work with appropriate colleges to optimise the content of educational courses relating to game.

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15. Acknowledgments

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Tim Zindl - Oakridge Pheasant Ranch Inc

North American Gamebird Association

16. Study tour overview

By travelling to my chosen countries it was possible to identify the fact that climate is a huge determining factor in rearing techniques around the world. There are different challenges to overcome within each country which dramatically broaden how game is produced and harvested. However, game farms in general are still massively labour intensive and I believe that this is detrimental to the wellbeing of the birds, spreading disease with constant disturbance to a wild species which is naturally shy and becomes easily stressed.

The ever increasing pressure from animal rights groups and rumour of new government legislation is making UK game farmers too nervous to financially invest heavily in more modern automated systems and equipment which could be integrated from the poultry industry. At present only 5% of game farms are utilising cage systems. This is maintaining the opening for the French to monopolise the market with 90% of all Red Legged partridges released in the UK being imported from where controversially welfare standards are by far inferior. If only half of the birds imported from France were, instead, hatched and reared within the UK, it would not only be a huge benefit to our already struggling rural economy but create substantial rural employment.

Due to the UK sporting ethos of a limited shooting season, plus current legislation, year round trade is prevented, restricting market growth. Export is minimal, with only a small amount to Ireland whilst France enjoys little restrictions with export all year around to Spain, Italy, Germany, and the whole of Europe. America has an open hunting season enabling small businesses to have a constant income whilst here in the UK we need to seek alternative revenue in the down time.

The UK has maintained the heritage and tradition of game shooting which has remained unchanged over centuries. Other countries have forgotten the history of the sport and just hunting in luminous jackets and hard hats remains. At this point I am humbly proud to call myself British and look forward to sporting my tweeds in the forthcoming season.

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17. Executive Summary

The shooting industry is worth £1.6 billion to the UK economy providing nearly 70,000 jobs.

Game birds have been traditionally bred and reared using simple systems of husbandry; however, increasingly, more intensive methods are being used to meet demand. Mortality rates are significant.

There is huge scope and potential to develop the game industry and its image, raising the profile of the sport and improving public perception.

The introduction of DEFRA's Code of Practice for the Welfare of Game birds 2010 following on from the Animal Welfare Act 2006 highlights the critical issues faced in modern day game farming.

Management devices have more recently become the hottest topic within the relevant animal rights groups, creating a new stigma against rearing practices within the UK. Whilst every effort is made by most to promote the welfare of their stock it is impossible to balance protection against injurious behaviours - due to the semi-wild species of the bird - when conditions for breeding are far from optimal. Nevertheless, attempts to enrich the environment in intensive units are minimal. Through better design, specific to game birds, it could be possible to overcome some of these challenges, enhancing the birds' time in captivity and allowing them the opportunity to express more natural behaviour.

It is in the interest of producers to have the highest standards of bio-security. However, stocking at unnaturally high densities means the use of antibiotics to combat mass infection is unavoidable with diseases such as coccidiosis and hexamita a constant threat. This regular need for medication raises a huge question as to whether these birds are being raised in the correct system to support health and wellbeing. With antibiotic resistance an increasing issue it is feasible with some research to introduce the use of more natural, alternative therapies. In addition, approximately 37% of game birds released in the UK are shot and a vast number of these enter the food chain. Should the preventative measures used to sustain health in the industry become more regulated?

From experience it seems that the education available to the next generation is in desperate need of modernisation with some practices having remained unchanged for over a century. In an ever increasing industry there should be greater emphasis put on trying to streamline management techniques, modernise the equipment used and provide an enriching environment for the birds to develop. Addressing these issues will, without doubt, decrease the dependence on antibiotic medication and will perhaps promote an ethos of 'prevention is better than cure'.