

Duck Production Systems in Europe and North America

Winston Churchill Travelling Fellowship 2006/7.

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Outline

The purpose of this project was to visit duck producers and animal welfare researchers with an interest in duck production to compare production systems in a number of countries, evaluate the reasons for any difference in systems and where possible share knowledge which may help improve ducks quality of life.

The two main destinations visited were the mid-west USA in summer 2006, hosted by University of Purdue and USDA (with a short (opportunistic) visit to California to view mule duck production systems), and The Netherlands in winter 2007, hosted by University of Wageningen. Throughout the project I also maintained contact with duck producers in UK, as well as researchers engaged in duck welfare research to ensure that I investigated those issues of most relevance to comparison with UK systems.

My primary objective was to investigate the provision of water to ducks, as it appeared that North American Farms only provided nipple drinkers, whereas in UK and elsewhere in Europe ducks tended to have access to open water. I was, however, also interested in provision of litter, access to pasture, incidence of aggression or other injurious behaviour and surgical interventions such as bill trimming.

The project was conducted against the background of world-wide concerns regarding avian flu and heightened bio-security measures at duck farms (the majority of ducks are reared in enclosed barns to minimise infection from external sources), which led to restrictions on access to farms. Nevertheless it was possible to ratify husbandry systems through direct first hand evidence, and evaluate the reasons for any differences between economic areas.

In general, North American producers rear ducks in enclosed barns, with limited access to litter (e.g. conventionally housed on slats or concrete with little straw), whilst most UK producers would provide access to a straw litter (topped up daily) and as required by law access to open water via bell drinkers or small troughs. Producers on continental Europe, are generally similar to UK producers (they are governed by same EU legislation), however tend to use less litter, and have limited access to open water drinkers, preferring to use mostly nipple drinkers.

Access to open water in the form of ponds, or small pools, sufficiently deep to allow ducklings to swim is virtually non-existent in indoor reared flocks, and only really seen in small-scale outdoor rearing systems (for example organic systems). The reasons for these differences, can be divided into 4 areas; culture/legislation; concerns for bio-security and disease; concerns regarding water pollution; and local availability of litter.

In addition to developing contacts with duck producers and researchers and enhancing my knowledge of duck production systems, the project has realised 3 significant outputs.

1. Colleagues at USDA Purdue have been awarded funding to investigate pain following bill trimming in ducks and alternative means of reducing feather pulling behaviour. This research was facilitated by a meeting between duck producers and researchers arranged as part of the US visit in Summer 2006.
2. Cherry Valley ducks (largest UK producer) are funding a post-graduate project investigating means of providing greater access to water with myself as academic supervisor.
3. RSPCA have invited me to join their review committee considering "Freedom Foods" accreditation of duckling production systems in the UK.

Introduction.

Duck production for meat products (table birds and prepared meals) is a growing food industry both in UK and on a worldwide scale. Traditionally, ducks were reared outdoors in small flocks with access to ponds and/or rivers, however, modern production systems involve large (1000s of ducklings) reared indoors in large barns or sheds. The development of duckling production systems has mirrored that of the more substantial chicken meat production, with selection for high growth rate and high feed conversion rates, resulting in accelerated growth. Nowadays most ducklings reach slaughter weight at 6 to 8 weeks of age, well short of adulthood. Whilst still dwarfed by the massive chicken meat industry, ducks have nevertheless become the second most common species in agricultural production in the UK, a development that is likely to be seen in other countries as they change from traditional outdoor rearing to more intensive indoor rearing of fast growing lines.

Three types of duck are commonly used in modern production systems. These are the domestic duck, the Muscovy duck and the mule duck. The domestic duck is derived from the mallard duck (*Anas platyrhynchos*) and includes breeds such as the Aylesbury, Khaki Campbell and Pekin. Modern meat producing strains are largely derived from the Pekin duck, and this is the most common type of duck found in UK, US, most of continental Europe and south east Asia. The Muscovy duck and the mule duck (a hybrid of Muscovy and domestic ducks) are less common (except in a few countries e.g. France), and are reared for both meat and foie gras (fatty liver pate) production, which has production bases in France and California.

Research and development into ducks has been primarily focussed on genetics, nutrition and disease prevention, and conducted by duck production companies, or national agricultural bodies with the aim of improving and realising growth potential under commercial systems. Very little independent research has been conducted on duck welfare, in terms of satisfying behavioural needs and the birds' ability to cope with the challenges of intensive production systems. The purpose therefore of this fellowship was; firstly to gather information on production systems in Europe and North America, secondly to evaluate systems in terms of what is currently known regarding duck welfare (or can be derived from other species), and finally to assess the importance producers place on welfare issues, as well their reasons for having differences in welfare standards.

North America and Europe were chosen as both areas had mature, modern production systems in the sense that the majority of ducks were reared in indoor systems, and that there had been sufficient time for relatively standardised production systems to have arisen. As a consequence practices would be likely to be consistent between farms, and I would only need to visit a small number of farms to have a good representation of how the industry in each area operated. This was important, as it was anticipated that it may be difficult to arrange a large number of successive visits, if for no other reason than bio-security precautions, as most modern producers would try to limit unnecessary visits by outsiders, to minimise risks of introducing disease causing organisms, and consequently would have concerns regarding visits between production units. During the lifetime of the fellowship, these concerns regarding bio-security were further heightened by the world-wide fears over avian flu.

The other advantage of focussing on these two areas was that it would be possible to make more direct comparison with standard rearing conditions in the UK. I had initially considered a broader remit, for example, including areas where the duck industry is emerging such as for example China and elsewhere in south east Asia. These are the world's largest market for duck meat, but there is a mix of traditional systems and recently introduced "westernised" indoor rearing systems. However, apart from the logistics of arranging visits to a third continent, I felt that what little access could be arranged had the great potential to misrepresent the industry which is both diverse and changing.

Comparison with UK production systems was useful, partly as this is a relatively mature industry with the main producers (Cherry Valley, Green Label and Gressingham) all using similar systems. Furthermore there are clear minimum standards in animal welfare as laid out in both UK and EU codes of practice. Finally, I had some experience of duck welfare issues as a result of working with duck producers and welfare charities on duck welfare problems, specifically the provision of water and the degree to which ducklings aquatic needs are addressed in commercial husbandry systems, so there was good potential for passing knowledge gained during the fellowship to interested industrial and welfare bodies.

The starting point for my application was simply a photo shown to me by a representative of Cherry Valley Farms Ltd., whilst discussing the value ducklings place on alternative types of drinker. This research had investigated if ducks placed value on open water drinkers over nipple drinkers, and had found they both preferred and would actually work hard to use open water providers such as troughs over nipple drinkers. The research had also found (at least in ducklings up to 12 weeks of age) little further value placed on open water that allowed activities such as wading or even swimming. Our overall conclusion, therefore, was that it appeared that the ability to dip their heads and sift (side to side movement of bill, whilst filtering) were highly valued in young ducklings. As a consequence of this research the advice to producers including Cherry valley was to provide a mixed economy of drinkers, including more open water trough to satisfy all the water related needs of ducks at that age. During this discussion a photo of a "typical" US system was produced and as well as showing ducks drinking from a long line of nipple drinkers, it was also clear that ducks were housed on wire slats. (Sheets of 1 inch square plastic coated wire), and there appeared to be evidence of beak trimming and poor eye condition.

This prompted three immediate questions. Firstly was the photo really typical, i.e., did they only use nipple drinkers or was there access to bell or trough drinkers elsewhere? Secondly, did they mainly house ducks on wire and consequently, did ducks have little or no access to litter as bedding or for manipulation/foraging behaviour. Thirdly was bill trimming common practise in USA and if so, why?

These questions cut to the heart of approaches to animal welfare, in particular do you attempt to control/manipulate every aspect of the animals husbandry, limiting its freedom of choice but minimising risks such as disease or injury, or do you attempt to satisfy both the psychological and the physical welfare of the animals, by providing choices and control over its environment? Specifically with ducks, with respect to water, it is known that ducks prefer to drink from open water sources, and deprivation of such sources restricts opportunities to preen, forage, paddle and swim, but providing access to open water is thought to increase risks to health and hygiene from water contamination and ducks reared with nipple drinkers alone show high rates of growth.

With respect to access to litter, most ducks in UK systems are housed in straw bedded barns, where fresh straw is frequently added (typically every day). Only small areas may be straw free, typically around drains and (if provided) access to open water such as pools, to allow free drainage. As well as providing comfortable and potentially dry bedding, fresh straw is used by ducks as a foraging substrate, with ducks spending considerable time sifting through the litter particularly following addition of fresh straw.

Finally with respect to bill trimming, Muscovy ducks are known to engage in injurious aggressive interactions under commercial conditions and consequently bill trimming to remove the sharp point of their bill is allowed and conventionally practised in UK and EU. In contrast, Pekin ducks are highly gregarious, and there is little evidence of them engaging in injurious pecking in UK husbandry system. As a consequence, bill trimming, whilst legal is practically never practised, as risks of injury are known to be low and (apart from the potential suffering of as a consequence of the surgery) feeding efficiency can be impeded with a painful or blunted bill. Rather than a response to increased aggression, it was plausible that bill trimming was practised as there was an increased risk of feather pulling as a consequence of inappropriate redirected foraging in the absence of straw litter or other potential foraging substrates.

This situation may be similar to the situation in laying hens where beak trimming is practised not only to reduce the potential damage from aggressive pecking as a consequence of social interaction in confined spaces, but also to reduce the damage of feather pecking and feather pulling which is an expression of redirected foraging in wire cages, where the only available foraging substrate may be the feathers of other hens.

As this behaviour was not commonly reported in UK flocks of ducks it was important to investigate further if there was a causal link between low litter levels, increased risk of feather pulling (which whilst not very harmful in itself, can lead to bare patches, bleeding and eventually cannibalism) and its resolution by surgical intervention.

Timescale and Itinerary.

My original application was to travel to USA and Netherlands in Summer 2005, however due to family circumstances it was not possible to follow my original planned itinerary and with kind permission from WCMT I was able to delay visiting USA until summer 2006 and followed this with a visit to Netherlands in Winter 2007. The delay brought with it some timely advantages. Firstly, a longer period of preparation helped to develop links with the host academics that were to help me access their local industry contacts. Secondly, during this time there was both a review of husbandry practises and their implication for duck welfare conducted within the EU and DEFRA initiated funding of a major research project into UK duck welfare at University of Oxford. I was therefore able to work closely both with those engaged in the review and the researchers at Oxford in establishing what we did and did not know regarding duck welfare and consequently helped refine the information I sought to collect abroad.

In the USA, I was hosted by academics at United States Department of Agriculture (Drs Jeremy Marchant (an ex WCMT Fellow) and Dr Ruth Forde) at West Lafayette, Indiana, who work primarily on animal welfare in US production systems. With help from colleagues in the Agriculture Faculty at Purdue University, (in particular Prof Todd Hamilton and Dr Hang Wei Cheng) who had been working with Maple Leaf Farms Ltd on traditional animal science issues such as genetics and nutrition. Maple Leaf are the largest Pekin duck producers in US, based mainly in northern Indiana, though with bases elsewhere in mid-west, and I was able to discuss and see exactly how their production systems operated with help of Dan Harper one of their managing directors, and Janelle Deatsman who had responsibility for public relations.

During summer 2006, I was also able to meet Prof Joy Mench from University of California at Davis who had been working with Muscovy/mule ducks, a much smaller industry based mainly in California involved in foie gras production. Whilst not part of the initial aims of the project, this was a valuable side enquiry, to gain insight into a similar different form of production and the degree to which US legislation and public pressure differs from state to state. In Indiana, a state with a largely agricultural economy, there was very little pressure for animal welfare regulations beyond those nationally adopted. In California, the higher profile, (though considerably smaller) foie gras industry had received much scrutiny including the interest of State Governor (a Mr Arnold Schwarzenegger), and experienced more proscribed regulation supported by regular inspection.

In the Netherlands, with help from Dr Marco Ruis and Dr Bas Rodenburg from University of Wageningen's Agricultural Field station at Lelystad, I was able to visit modern rearing facilities, make comparisons with UK and US systems and also help feedback my findings as they had instigated the EU review of practises. I was also able to visit the vet school at University of Utrecht, where with help of Prof Berry Spruijt and colleagues I was able to get an overview of the continental approach to EU welfare initiatives.

Overview of findings.

In both US and Europe the duck meat industry was arranged along very similar lines. Namely rather than owning all the means to production, the duck meat companies such as Maple Leaf in US, and Cherry Valley in UK and Netherlands, provide franchised farmers with ducklings (usually at day old), buildings and their fittings, feed and support/expertise as required. Franchised farms, owned by independent farmers are distributed around processing plants, where live birds are slaughtered and processed. In Europe, all farms were normally within 4 hours drive of the processing plant such that birds could be “lifted” or harvested, transported and slaughtered within a day. This is also consistent with EU legislation regarding transport of live animals, where special dispensation is required for journeys over 8 hours duration. In US, driving times could be longer (up to 24 hours), but given larger land areas involved industries could still be best described as localised (as opposed to widely distributed over a country) and consequently dependent on locally available resources. For example in the UK, Cherry Valley ducks are mainly grown in north to central Lincolnshire and south Yorkshire, and dependent on a transport infrastructure that could access processing facilities in Caistor, North Lincolnshire. Similarly, Dutch production was mainly centred on the reclaimed Polderland, whereas Maple Leaf were centred on processing facilities in north central Indiana, Michigan and Wisconsin, albeit with a larger catchment areas due to less rigorous transport regulations regarding time in transit.

Whilst rearing birds is mainly conducted by franchised independent farmers, the breeding stock are still wholly owned and maintained by the central producing company, who use these to provide their farmers with day-old ducklings and also allow R&D in selection and performance. Whilst producers are competitors, in particular in their local markets, there is actually considerable collaboration between producers across borders, with Cherry Valley providing much of the breeding stock used throughout the world, including the parent stock from which Maple Leaf have selected for their local needs.

In USA, duck meat is a minor industry, and is largely considered a speciality or even luxury food item, focused on the Chinese restaurant trade, high class restaurants and special occasion meals at home. In contrast in UK, and increasingly also in rest of Europe, duck meat has moved from a speciality food (though Chinese restaurants is still a mainstay) to a common product available in a variety of forms in butchers and supermarkets. Producers in US have tended to take their lead from developments in Europe, and anticipate growth in their market as well as stricter welfare codes in the future. As a consequence, I found US producers surprisingly open with respect to their current practises and potential improvements, so meetings regarding husbandry practises and the constraints of their market were highly productive and site visits (subject to heightened bio-security restrictions) were fruitful.

Site visits and discussions with producers confirmed that in the US

1. Nipple drinkers were usually the only form of water available to Pekin ducks
2. Production systems were normally minimal or no litter, with slatted floors around drinker areas and a concrete lying areas having little or no litter

3. Bill trimming was commonly practised.

US producers did allow farmers some leeway to provide alternative drinkers, and additional litter, however, few farmers did so. As a consequence there was little deviation from standard husbandry practises, though one slight variation of note was that many of the farmers in Indiana were of Amish extraction, and in order to adhere to their beliefs used gas and oil fired heating and lighting (as opposed to electricity) with no overt husbandry problems.

Nipple drinkers were used for a number of reasons. These included the expectation that there is greater disease risk with more open water provision, and consequently risks of lower growth and higher mortality. This is a common perception throughout duck industry, and whilst there is some evidence of slower growth, it is not clear if high disease incidence is a universal consequence of open water access. A further contributing factor are environmental pollution regulations, as open waters normally lead to greater water wastage (sewage) and greater costs in terms of treatment/storage compared with low water systems such as nipple drinkers. Finally, there is not legal requirement to provide access to open water (unlike UK and EU) so producers do not have to provide alternative waterers.

The use of slatted floors and minimal litter is again related to perceived disease risk and water management, as well as local supply of litter. Systems with litter tend to have more lying water or soaked litter, which is considered a disease risk compared with more rapid drainage through slats or from bare concrete floors. This minimal use of litter is consistent with disease management. In addition local supply, at least in Indiana, is limited as local crops (e.g. maize) do not provide suitable litter, and more suitable litter material (wheat straw or shavings from timber industry) would entail high transport costs.

The use of beak-trimming was to minimise risk of injurious pecking in particular feather pulling activities, which in young birds can lead to harmful injuries and slower growth. It was not possible to test a causal relationship between lack of litter and increased risk of feather pulling as result of redirected foraging, as this would have entailed a long term developmental study. Nevertheless incidents of apparent feather pulling were seen, and feather condition subjectively appeared poorer than in birds with access to straw bedding. Whether this was solely related to lack of litter, or whether the means of water provision was a further contributing factor could not be determined. However, it is known that ducks use water not only to drink but also to engage in other activities including preening and feather maintenance. In my own work I had found ducklings with access only to nipple drinkers spent less time engaged in preening behaviour, whose function is to maintain feather condition.

Eye condition (again without being able to make long term direct comparisons) also appeared to be worse in ducklings with nipple drinkers alone, and it is believed that part of the function of head dipping activities (where ducks dip most of their heads in open water, then tip their heads back) is to maintain eye and nasal cavities. This does not in itself mean that nipple drinkers are inadequate for this activity as in principle ducks could allow water to run over their heads by manipulating the nipple drinkers, and this issue may be worthy of further investigation.

In Holland, most farmers provided a mixture of nipple drinkers and open water drinkers and litter was used over most or all floor areas. EU law recommends ducks have access to water that they can dip their heads into, and the producers compromise is to provide mainly nipple drinkers because this is better for hygiene, perceived risk of disease and management of waste water, but in order to satisfy legislation (and welfare concerns) a small number of open water drinkers are also available. In the duck producing region of Netherlands suitable little (e.g. wheat or barley straw) is widely available, inexpensive and often grown on the same farms as the duck barns, so there seems to be no major financial barrier to providing litter. As bill trimming of Pekin ducks is illegal (and unnecessary when litter is provided) unless there is evidence of feather damage/aggression the procedure is not normally practised on EU farms.

Conclusions and On going Work

In summary, I was able to meet duck producers and visit (a limited number) of duck farms, and able to confirm the US producers tend to limit access to open water and litter, and practise bill trimming. The reasons are that in the absence of legislation requiring access to open water, US producers use nipple drinkers for disease and waste management. Similarly litter such as straw is not generally provided for disease and waste management as well as the cost of provision. Bill trimming appears to be a surgical intervention designed to reduce risk of injurious feather pulling in the US. In European production systems, bill trimming is not necessary in Pekin ducks as provision of litter appears to minimise risk of injurious pecking. Where producers are required to provide access to open water drinkers, then nipple drinkers may also be used in locations where waste management is a major environmental issue.

As a consequence of contacts made during my fellowship there have been some interesting developments in duck research particularly in the US. Drs Cheng and Marchant Forde are now undertaking a research programme investigating long term consequences of the current bill trimming approach (hot-knife on day-old chicks) on pain perception, feed intake and growth. They will be comparing this approach with techniques recently introduced into layer hen husbandry involving laser technology. It is believed that such technology is less likely to leave large scale tissue damage and painful neuromas, and may be a more acceptable form of surgery should bill trimming still be deemed necessary. In the longer term they are hoping to investigate means of reducing need to bill trim at all.

Back in UK, I have become involved in industry (Cherry Valley) and charity (RSPCA) initiatives in duck welfare. I am working with Cherry Valley ducks on a Knowledge Transfer Partnership (joint funded by Cherry Valley and DEFRA) investigated behaviour and welfare of breeder stock. These are the pedigree lines of breeding animals whose progeny are the breeder flocks who in turn give rise to the ducklings reared for meat. Their current housing conditions make provision of open water impractical and we shall be investigating means of altering husbandry systems to make it possible to introduce open water drinkers.

Finally, I have been invited to join the RSPCA's steering committee responsible for assessment and promotion of Freedom Foods as applied to duck production. Freedom

Foods is an initiative by the RSPCA whereby they promote welfare friendly production systems under the Freedom Foods brand. For example Freedom Foods promotes outdoor production of pig meat, and free range egg production. RSPCA are reviewing the Freedom Foods brand and revising their grading system, with duck production being one of the areas they plan to enhance their standards.

In summary, I believe the Travelling Fellowship to have been a success both in terms of my own development and hopefully for duck welfare. I have been able to gather evidence of differences in systems and understand the basis for these differences. I have also gained strong contacts amongst both the academic and the industrial communities. I have been able to share my findings with other researchers interested in duck welfare and I am in a better position to conduct research and offer advice in these areas. My very greatest thanks for providing the opportunity to do so.