Where next with duck meat production?

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Duck meat production has risen steadily over the last decade from 1.88 million tonnes to 3.36 million tonnes (FAO). The majority of this growth has been seen in East Asia, where production processes are becoming increasingly more sophisticated with the need for lower cost and better quality products for both domestic and export markets.

This growth is likely to continue with genetic and husbandry advances making duck increasingly competitive to other poultry and meat products. The growth of these markets has also led to more commercial style production with the movement of birds into intensive or semi intensive systems, often within larger integrated operations.

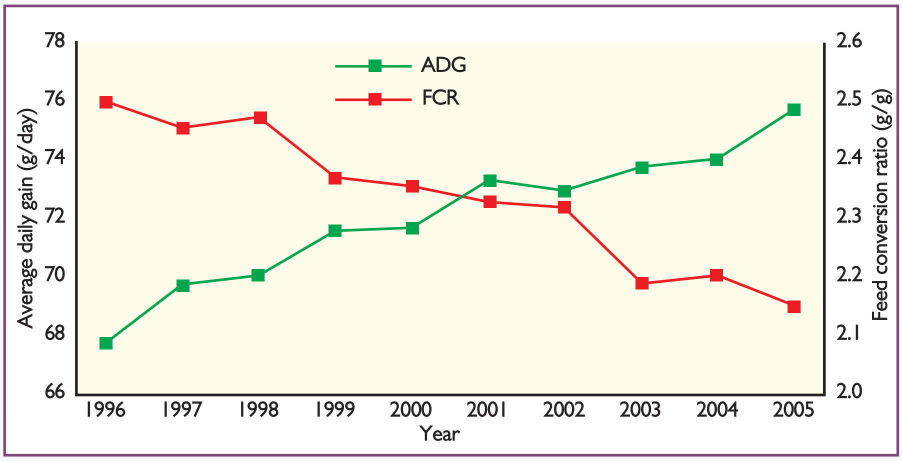


Fig. 1. Feed conversion and average daily gain on Cherry Valley's commercial farms over the last 10 years.

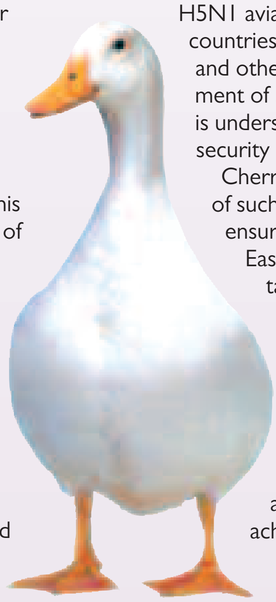
Impact of health status

One of the greatest threats to the continued growth and development of the duck market, as with other poultry species, is that of disease. Poultry disease outbreaks have a number of implications. Most obvious is the effect of increased mortality and lower production performance of diseased stock which lead to significant costs for the producer.

Despite the relative robustness of ducks compared with some other poultry species this depression in performance can result in severe financial implications for large producers who have invested significant time and money in building a successful business.

For certain notifiable diseases this can be catastrophic with the loss of entire flocks and restriction of bird and even fresh meat movements.

Some of the risk of such disease challenges can be mitigated by improved biosecurity. The move to indoor production and even SPF shower in 'clean' sites can reduce the risk of disease being spread by wild birds and rodents or being carried onto sites on boots or equipment.



If such precautions fail there is also an arsenal of vaccines, prophylactic drugs and antibiotics which can prevent or treat certain diseases. However, disease organisms are able to mutate and develop new strains to which these drugs become less effective over time and we end up in an arms race with these organisms. The direct affect on the bird is not, however the only concern. Many of these East Asian duck producers source their genetic stock from European suppliers, however in the light of the recent H5N1 avian influenza outbreaks in these countries and the potential threat of this and other diseases limiting the movement of stock around the world there is understandable concern about the security of supply of breeding birds.

Cherry Valley have long been aware of such dangers and in order to ensure security of supply for vital East Asian markets have maintained pure line, GP and parent stock production in the Asia Pacific region for several years in an effort to ensure availability of high quality stock throughout the world.

These birds are genetically linked to the Elite UK flocks and benefit from genetic gain achieved in the UK. In the longer term it may be necessary to develop independent breeding programmes in certain markets, which would be designed to meet specific local requirements both for supply and selection objectives.

In parallel with changing production and supply structure the demands of an ever expanding global marketplace suggests that breeders must be able to provide breeding stock, which is profitable and robust in a wide variety of environments.

These demands are often conflicting and include such issues as disease resistance, animal welfare and food safety alongside more traditional cost of production concerns.

Although many of these objectives could be achieved by improved management and husbandry practices there is still considerable potential to provide genetic solutions.

Successful selection

Current breeding strategies in Pekin ducks are similar to those in broilers. Selection effort has primarily been driven by the demand for lower cost, higher quality food products typified by traits such as growth, breast meat yield and FCR.

This selection has been very successful and has vastly improved the efficiency of growth and meat production of Pekin ducks whilst maintaining chick cost (see Figs. 1 and 2).

However, there is some evidence that

Continued on page 8

Continued from page 7
intensive, long term selection for such traits in other poultry species can make these populations more susceptible to various pathogens.

There is also some evidence that such selection also results in physiological changes that can increase the incidence of metabolic disorders such as ascites.

However, Rance et al. (2002) found positive correlations between muscle growth rate and that of vital organs such as heart, spleen, liver and gastrointestinal tract.

Several researchers have also reported a deleterious association between growth performance and reproduction in poultry species. Despite this, such deleterious effects are not overtly apparent in Cherry Valley duck populations to date (see Fig. 2).

So, how do we resolve the dilemma of a desire for ever greater growth efficiency with a need to ensure the bird can withstand a wider range of environments?

Several studies have indicated that the relative blood gas contents of oxygen and carbon dioxide are good predictors of ascites susceptibility.

The in vivo measurement of the level of these blood gases using an oximeter provides a continuous trait which is heritable and easy to include in conventional BLUP selection.

Improving resistance

Whilst selection against disorders such as ascites is possible and desirable, direct selection for resistance to a specific disease organism is considerably more complicated and less likely to yield any long term benefit for a number of reasons.

Such selection, whether by conventional BLUP or molecular techniques, would likely only provide resistance to a specific pathogen, perhaps even only a few serotypes.

To develop genetic resistance to several specific diseases in turn would not only be prohibitively expensive but perhaps impossible until we understand a great deal more about the genetics of the avian immune system and the ability of pathogens to evade it.

In this scenario vaccination or drug treatments would be cheaper, faster and more effective means of disease control. Selecting for overall robustness and generalised immunity, via the innate immune response, would seem a more sensible long term approach for improving the overall disease resistance of stock.

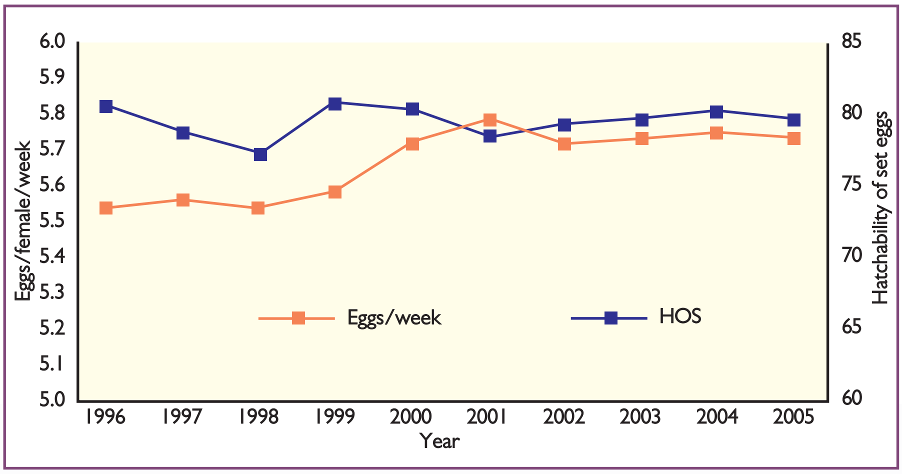


Fig. 2. Change in reproductive performance of Cherry Valley parent stock over the last 10 years.

There are a number of potential genetic technologies being developed, for both biomedical and in some cases agricultural research purposes. These technologies include relatively simple genome mapping and sequencing aimed at providing a greater understanding of the genome and hence biology of a species along with more controversial technologies such as transgenics and cloning, which may offer some unique opportunities.

However, we must also bear in mind that although some technology may exist it is not just a question of what is possible, but what is appropriate. The sequencing of the chicken genome has received a great deal of attention from poultry scientists around the world, by contrast, the duck genome is poorly studied.

Comparative genomic studies suggest that there is a degree of homology between species, however it is not clear if such similarities in DNA sequence will correspond to similar expression of phenotype.

It seems likely that significant differences in gene expression and interaction will exist especially between Galliformes (chickens, turkeys, quails) and Anseres (waterfowl).

Nevertheless, it would still be advantageous to use the chicken knowledge to develop DNA markers in specific genome areas rather than using a whole genome approach.

The most compelling reason for using molecular genetics is to develop selection tools for traits, which are difficult, expensive or impossible to measure in one or either sex. Examples of such traits include disease resistance, meat quality and some reproductive traits.

Quantitative genetic approaches to such selection would require sib or progeny testing which would reduce the accuracy and increase the generation interval. It is unlikely that the latter technologies of cloning and transgenics will be applied to any agricultural livestock systems in the foreseeable future for obvious reasons of both cost and public concerns, which may or may not have a scientific basis, about the welfare of stock and safety of food produced in this way.

Conclusions

Current duck breeding programmes have yielded significant improvements in economically important traits and will continue to do so. There is certainly a great deal we can learn from the broiler breeding industry and academic research into other poultry species, in particular the chicken.

However, we must also appreciate that there are some significant differences not only in the genetic make up and physiology of ducks compared to broilers, but also in the market requirements.

The development of breeding programmes for ducks will need to be continually reviewed and in order to satisfy the markets in the 21st century we must consider all aspects and ensure an appropriate use of technology to improve the performance, health and welfare of stock. ■