

Selection criteria in turkey breeding to meet the needs of the consumer

The turkey industry supply chain flows from the breeders through a number of multiplication phases which culminate in commercial birds being grown and processed and finally sold to the consumer. Primary breeders are at the start of this process.

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Delivery of genetic progress from the breeding programme to the end-consumer typically takes around four years. This means the challenges of the industry today had to be anticipated by the primary breeders at least four years ago and the challenges for the future consumers need to be anticipated now.

Turkey primary breeders provide breeding stock free of a number of major diseases. The mainstream market requirement for breed types is principally divided into two segments: the heavy sector where males are typically grown to 19.5-22kg and the medium sector where birds are grown up to 18.5kg. Typical breeds used in Europe include the BUT6 and Nicholas Select for the Heavy sector and the BUT Premium in the Medium sector.

There are a number of smaller, speciality segments across Europe supplying high value birds to meet specific consumer needs. Standard, coloured and slow growing breeds from the mainstream breeders as well as speciality breeders such as Hockenhull Turkeys satisfy the diverse needs of these market segments.

Determinants of criteria

Turkey breeders receive direction from many sources directly and indirectly through a complex web of communication. The job of breeders is to disentangle these messages to distil them into practical selection criteria. The consumer, as the end

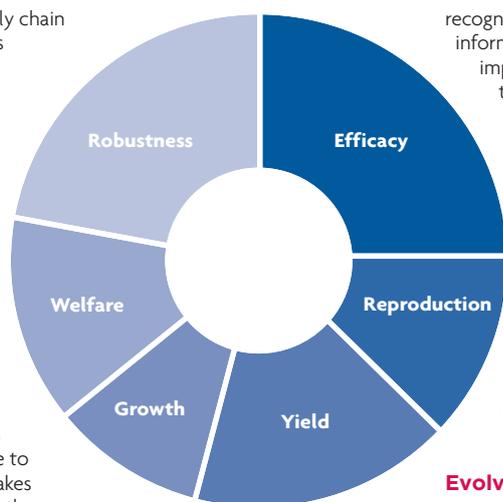


Fig. 1. Example of the balance of selection pressure in different trait criteria in a pedigree turkey line.

purchaser, is the core driver, forming their opinions from a range of sources and these are typically reflected in their purchasing habits which in turn affect the retailers, producer and ultimately the breeders.

Consumer preference research indicates that, alongside the traditional drivers such as price, there is an increasing emphasis on evolving drivers such as health and wellness, safety and social impact. Transparency is increasing in importance as consumers want to know more about their food and how it is produced.

Within the primary breeding operations, many of the consumer preferences have been incorporated as selection criteria for their genetic lines, as breeding companies have moved from a focus on productivity related traits towards multi-dimensional breeding goals. Whilst economic efficiency remains hugely important, there is increasing emphasis on traits related to welfare, sustainability and robustness (Fig. 1).

Historically, primary breeders were cautious about releasing details of their breeding criteria as this is their source of competitive advantage. However, this is changing as breeders

recognise the role they have in informing society of the improvements being made through selective breeding.

Examples of activities now undertaken by the primary breeders include open days for industry stakeholders, publication of results of breeding research, sharing information at conferences and participation in a range of research programmes and working groups developing policies on turkey production.

Evolving needs

Integrating expanding consumer needs into the breeding programme requires the primary breeders to continuously search for more accurate ways to collect data, and analyse data for different purposes and for new traits. Some selected examples of these challenges are: progress in sustainability, improving gut health and robustness and application of genomics.

Sustainability is an evolving need of increasing importance to the consumer. Sustainable resource utilisation is a by-product of growth, FCR, poul production and liveability traits, which have been incorporated into the breeding programme for many years and whose selection has evolved with the adaptation of new technology and analysis techniques.

As an example, the turkey of today compared to the bird of 1993 is 3.9kg heavier at 20 weeks and 48 points more efficient in FCR to 21kg (BUT6 performance objectives).

These improvements have direct effects on sustainability as less feed is required to produce the world's annual requirement of 5.4 million tonnes of turkey meat. The reduction in feed means fewer road trips to collect raw materials and deliver feed and the valuable land resource requirement to grow cereal crops is reduced.

Furthermore, the use of life cycle analysis modelling highlighted the importance of feed efficiency in reducing the environmental impact

of turkey production. Use of animal medicines in agriculture have come under increased scrutiny due to concerns about antimicrobial resistance and the lack of new antibiotics being approved for human use. Turkey producers are being required by government intervention to dramatically reduce their usage of these treatments, much of which can be done through improved management.

As an example, antibiotic use in the German turkey industry has declined by 40% since an antibiotic use and improvement system was introduced in 2014 by the Federal Office of Consumer Protection and Food Safety. This has largely been through improvements in bird management but breeders also contribute to reduced antibiotic use through the selection of birds which are generally more robust i.e. birds which have good overall fitness and vitality across a wide range of production environments. Gut health, skeletal strength and immune function are key components.

Water consumption

Water consumption is an indicator of gut health and functionality and has the benefit of improving litter conditions and footpad health. Birds are responsible for most of the moisture found in the barn.

Whilst most birds consume on average around 1.65 litres/kg liveweight at market age, some birds consume considerably more. Around 20% of water consumed is assimilated; the rest is exhaled or excreted.

Selection against excessive water consuming birds has resulted in around a five litre per bird reduction in consumption since we began the work in 2012. This reduces the amount of water consumed by an average 8,000 bird flock by around 41 tonnes with consequential benefits on footpad health and litter use.

Leg health is assessed through a combination of traits such as gait scoring, x-raying with the lixoscope to identify clinical and subclinical tibial dyschondroplasia, scoring of

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angular leg deformities and footpad health.

Multi-environment selection is used to overcome the breeder's dilemma of needing to ensure biosecurity of pedigree birds whilst addressing the need to identify birds which underperform in more challenging environments.

This is done by placing pedigree siblings in a separate farming system where they are grown in conditions seen in commercial farming environments.

Measurements are made in both environments and the data is used in the genetic evaluation and selection. This allows the identification of birds with the capability to do well, regardless of environment.

The development of genomic selection in turkeys has progressed rapidly since the publication of the turkey genome in 2010.

Lessons from the commercial application of genomic selection in broiler breeding have paved the way for rapid implementation in turkey breeding. In 2016-17, the era of genomic selection in commercial turkey breeding began.

With genomic selection, phenotypic measurements are combined with information at the DNA level to improve the accuracy of predicting the birds with the best genetic potential.

In a proof of concept, genomics results in a 40% improvement in accuracy for feed efficiency through a better prediction for non-phenotyped individuals.

Future selection criteria

In many ways, future challenges will likely be an extension of what we have seen in recent years. An increasing global population will put further pressure on natural resources and so efficient production will remain key.

The drive for reduced medicine use will continue, as will the preference for improved animal welfare.

Particularly challenging areas may emerge for novel traits required to overcome alterations to production systems as a result of legislative changes, for example the banning of infra-red beak treatment.

Novel traits and recording technologies present new breeding opportunities. One example is the use of 3D imaging technology to predict breast meat yield and product quality. This technology has been implemented for broiler breeding and its feasibility in turkeys is being evaluated.

Novel behavioural traits are under evaluation. For example, a by-product of individual feed and water intake evaluations has been the collection of associated behaviour measurements. Whilst these behavioural traits have shown useful heritabilities, their utility needs further exploration.

Breed development

Volatility and uncertainty in the marketplace is becoming the new norm. Climate change, feed price volatility, health challenges and political unpredictability etc have knock-on effects in trade and investment and also on consumer confidence and attitudes.

As breeders, altering breeding direction to meet changed needs takes a long time due to the lag between the breeding operations impacting the commercial birds. Breeders therefore need to be geared to deal with the uncertain times the future market holds. This is handled through development of existing breeds and new breed crosses (Fig. 2).

The current breeds offered by breeding companies cater not only for the existing markets but also new markets. These breeds are improved using broad breeding goals to cover many traits simultaneously and with a strong emphasis on building robustness to deal with a range of current and also emerging production systems or markets.

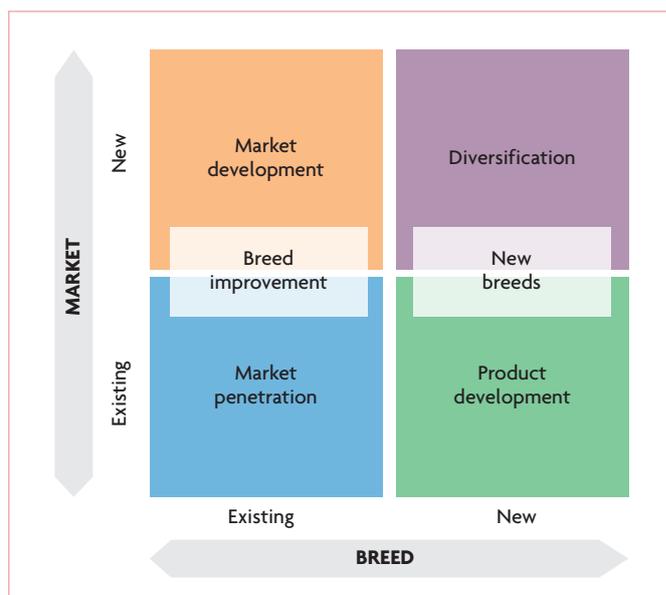


Fig. 2. Breed development strategies.

Testing new breed crosses is performed on a continual basis to see if these are a better fit for existing market needs or suitable for new market segments. To do this, breeders hold additional lines in the breeding programme which are their security to meet future market needs.

Testing of new breed crosses takes many years, starting with predictions based on pedigree line performance followed by small scale testing. If this is successful, larger scale field testing is conducted to fully understand the breed characteristics and develop accurate performance objectives. If all this meets customer needs with sufficient demand from the market then the new breed is launched.

Conclusion

Turkey meat is in direct competition with other protein sources. The future success of turkey meat will rely upon adapting the breeding goals and developing current or new

breeds to meet the developing needs of the consumer.

Through increased transparency and factual communication, the breeder also has a role in shaping consumer preferences.

The future will likely be driven by an expansion of the general challenge to deliver more progress in more traits. These will principally be economic drivers and evolving demands such as sustainability, welfare and robustness.

Some of the future challenges will require investment in innovative breeding solutions. Breeders will also need to adopt breeding strategies to cater for rapid changes in market needs.

To meet the future challenges for a successful turkey industry, there will be an ongoing need to increase investment in turkey breeding and a requirement to recoup part of the additional value generated from the supply chain. ■

References are available from the author on request