

Broiler breeders: managing a paradox

By Ron Meijerhof

Introduction

In the world of broiler meat production, developments go quickly. The increase in broiler performance in commercial breeds has been tremendous. This performance is not only established in growth per day, but also in feed conversion, carcass yield, breast meat yield, mortality, leg quality etc. The modern broiler of today is hardly comparable with the bird of 20 or 30 years ago, as a result of a very intense and very sophisticated genetic selection. This is nicely demonstrated in a famous experiment in the USA. A group of researchers compared two lines of broilers, one with the genetic characteristics of the broiler lines of 40 years ago, and on with the characteristics of today. They also developed two different feeds, one with the characteristics of 40 years ago, and a modern broiler feed. When the different lines were given the different feeds, it became very clear that the improvement in performance is largely due to the genetic improvement, as the birds of today did well on the feed of 40 years ago, but the birds with the genetic profile of 40 years ago did hardly benefit from the modern feed.

From an economical standpoint, it is very clear that a breeding company has no choice than to focus in its selection program mainly on broiler traits and to a much lesser extent on breeder traits. As the cost price of a day old chick is only a fraction of the cost price of a full grown broiler, 10% improvement in broiler traits is worth much more money than 10% improvement in breeder traits. After all, we are not in this business to produce hatching eggs or day old chicks, but to produce meat.

The broiler-breeder paradox

Unfortunately, selecting on one trait has often consequences for other traits that are not necessarily directly associated with the trait that we select on. One clear example is the influence of selecting for growth on reproductive performance. It is often assumed that there is a negative correlation between broiler and breeder traits, sometimes called the broiler-breeder paradox. This paradox states that if the broiler characteristics in a line improve, its reproductive capacity will be impaired. Although from a biological standpoint this is true, our modern broiler lines show a different picture. The genetic potential for growth and broiler characteristics has never been as high as on this moment, but at the same time it is for most commercial broiler breeder flocks not uncommon to have 85% peak production or more. There are differences between the different breeds, but reaching 85 or even 90% peak of production is a level where 15 years ago people could only dream off. We must have great respect for the geneticists that work in the different breeding companies, as well as for the research institutes and universities that have contributed to develop the tools that made these progresses possible, because they have been able to overcome the broiler-breeder paradox.

Modern management

However, if we take a closer look to the different commercial lines, we see that the genetic improvements have their impact on the management strategies that we have to apply. As broilers are the end product of different lines with different characteristics, each breeding program has to make a choice in which broiler traits are represented in which line. Although in reality all lines are selected on more or less all traits, one can see that the focus on which traits should be present in which lines is not equal for all breeds.

As a high growth potential in a female breeder has a negative effect on reproduction, some breeds focus for their broiler traits more on the males than on the females. The result is that egg production in these lines goes very well, but the males with a higher growth potential need more strict management in rearing and production to have satisfying results. As they tend to get overweight more easily, it's more difficult to keep them active and in good condition than when the focus for broiler traits is more on the females. If the females are genetically more selected on broiler traits, we see that female management is more difficult but a good fertility is easier to reach, resulting sometimes in flocks with 90% hatch of eggs set for a period of more than 10 weeks. Probably the biggest challenge for geneticists is to keep all the lines in balance with each other, in such a way that in the field the product can cope with all the circumstances that we can apply to them, as the same breed will be used at different places and in different conditions.

Rearing strategies

Although the broiler growth and with that the body weights at for instance 42 days of age have increased dramatically over the last decades, a quick scan of the breeder growth curves especially in rearing shows hardly any change over time. As the requirements for growth and maintenance have not really changed over the years, the amount of feed we have to give to realise the required growth curve has not changed dramatically as well, but the amount of feed the bird could eat if it has the choice did increase tremendously. This means that the level of restriction that we have to apply on our rearing birds, as a percentage of the amount of feed they would consume when fed ad libitum, is gradually increasing. This increasing relative restriction requires more and more precise management, for instance to avoid competition and with it create lack of uniformity.

Growing on air

What we often see is that our rearing flocks require hardly any weekly feed increases in the period from 7-8 to 14-15 weeks of age to stay on body weight. It is as if in this period they grow from air. Of course birds do not grow on air, but because of their high eating capacity in the first weeks of life, we easily overfeed them in this period, and then it takes several weeks of hardly any feed increases to get them back on the correct body weight and growth curve. This bears a risk in itself, as too severe feed restriction can result in negative effects as delayed development at the end of rearing, which requires more feed and (over) stimulation at the beginning of lay.

Overfeeding

Due to the high growth potential of the birds, it is very easy to overfeed them. Especially just before and during the start of production, as well as towards peak production, overfeeding the flock will result in more formation of breast muscle, as that is where modern breeds are selected on. Although the extra breast muscle by itself doesn't necessarily have a negative effect on production, it results in a stimulation of sexual hormones, as the hormones that are associated with muscle growth are stimulating sexual hormones. As a result, some birds (especially the birds that are coming into production somewhat later) will start to produce more follicles than their system can handle, resulting in more double yolks, and if it is too severe in egg peritonitis, internal lay, poor peak and more mortality. To avoid this, care must be taken not to stimulate the flocks too much with feed into production if the flock is not ready. After all, being selected so intensively for growth has resulted in a bird that exactly knows what to do with feed that it can't use for egg production...

Feed reduction after peak

Too much growth after peak leads to overweight birds and lack of persistency in production and fertility. With continuous selection on growth characteristics in the broilers, proper feed management during and after peak becomes more and more important, to avoid excessive weight gains later on. Especially the feed reduction at and just after peak is an important tool to avoid overweight later in life, as at peak the birds need to grow much less than in the period coming towards peak. But with the high peaks that our modern breeds obtain nowadays, it is difficult for a broiler breeder manager to decide to cut the feed when the birds are still at a very high level of production. This often results in a jump in body weight of 200-300 grams 2-3 weeks later, and with that higher body weight the birds have more risk of becoming overweight later in life.

To conclude

Modern broilers breeds have a tremendous growth potential, and with it are still able to have a very good production on the breeder level, which deserves a great compliment for the geneticists of the different breeding companies.

However, with the selection for broiler characteristics we do put pressure on our breeder lines, and this requires a good understanding of what the parent bird needs, and a strict management to fulfill these needs. With this high level of genetic capacity in our lines, we have to accept that no mistakes are permitted to achieve their maximum performance. Continuous adjustment and fine tuning of the management to deal with the continuous improvements in the birds is key.