

The rate of genetic gain is accelerating

Fast forward with

As part of our 10th birthday celebrations, we take a look at how dairy breeding has developed during the past decade and we ask a leading dairy geneticist ‘what’s next’ in terms of new selection traits and tools.

text **Rachael Porter**

The future of dairy genetics is about to get ‘smarter’, according to DairyCo Breeding+’s Marco Winters. It’s been 10 years since geneticists and breeders seriously started to look at ‘real’ fitness traits, with a particularly emphasis on fertility. “Until then, PLI was very much focused on production – combined with a bit of type,” he says. In 2005 the fertility index was introduced and in 2007 the industry saw a substantial review of PLI, where fitness traits actually accounted for 55% of the total PLI index. “That was a seismic shift really and laid the foundations for the genetic gains that we see today.”

Progress has continued with considerable pace. “Producers want cows with good milk production, but they also want longevity, so the emphasis on fitness traits has continued to increase. We’re now selecting bulls that deliver those traits – such as good fertility and longevity – and this is helping to drive the cost of production down as cows are bred to complete more lactations and replacements rates can fall.”

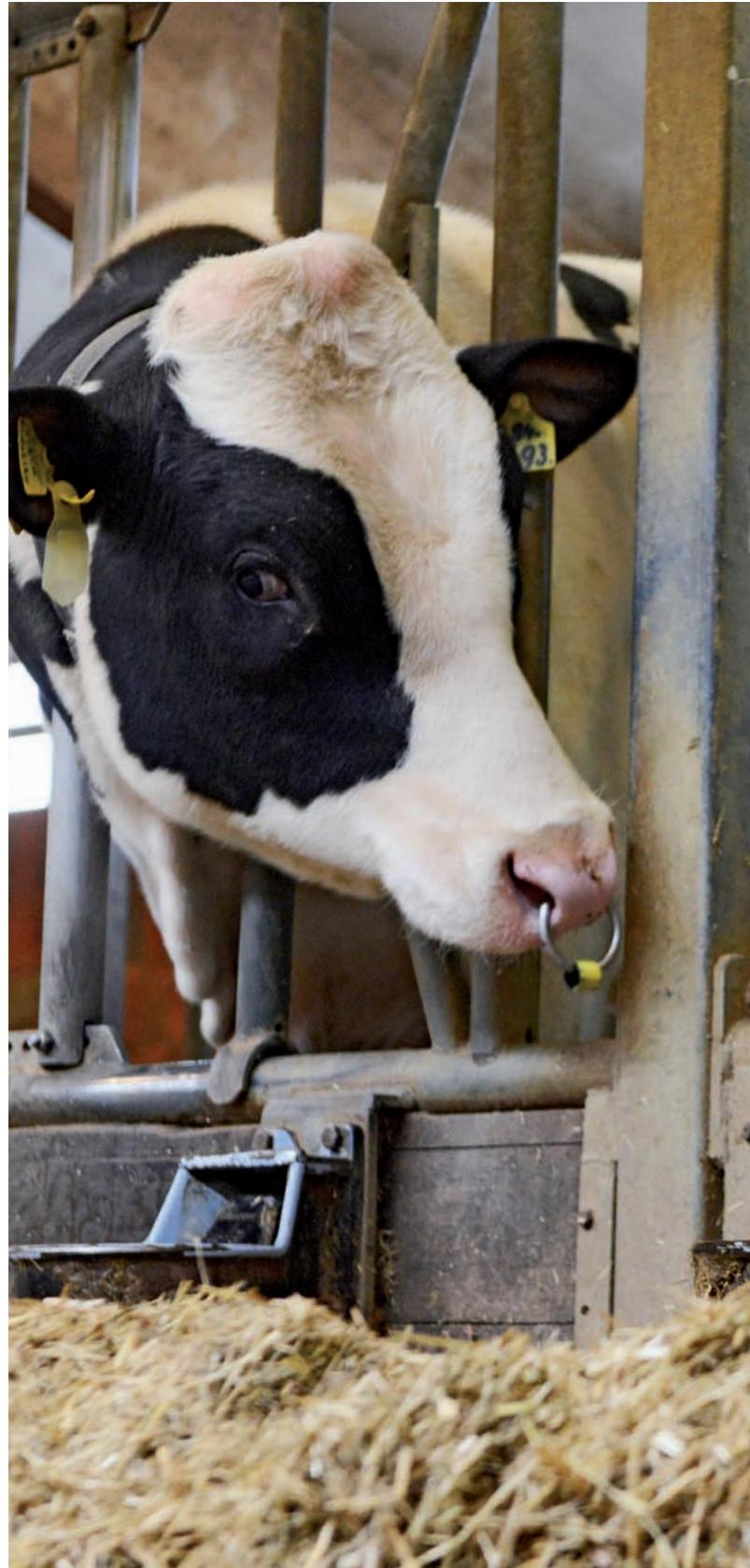
Computing power

With the genetics of fertility much improved already, health is next on the list. “But our focus will remain on the complete cow. So we’re looking at production, fertility, efficiency, health, carcass traits and even her greenhouse gas production.”

This ‘journey’ towards such a ‘complete’ cow will continue into the next decade and, says Mr Winters, at an increasing rate. “Greater computing power allows us to analyse data that was difficult, if not impossible, to decipher before. This can also be done relatively quickly and, most importantly, accurately.”

Genomics are playing a key role here too – particularly in terms of speeding up the process

Select sires: geneticists and breeders are looking for greater emphasis on health and fitness traits



due to refined breeding tools and technology

high-speed breeding



and, therefore, the rate of genetic gain. “This technology has already served to improve the reliability of some of the fitness traits and we’re also able to get these estimates much earlier than before – even before a sire is producing semen or has daughters on the ground.

The ability to change genetic progress has certainly accelerated. “We knew back in 2005 that we had to find and breed from bulls with good fertility. And then it took us four or five years to find that kind of bull from data on daughters. Now, thanks to genomics, we can identify bulls that improve fertility when they’re just a year old.”

Mr Winters says that the speed of change is set to increase further as the genomic technology improves and become more sophisticated and refined. This speed is good news, if breeding takes producers in the right direction – healthier, more fertility and more productive cows.

Fitness traits

“But it also means that we, as breeders and geneticists, have to work with the industry – right along the food chain – to ensure that we’re selecting the right genetics to benefit the cow, the producer, the processor, the consumer and the wider environment.

“Producers still want milk, but not at the expense of other traits. So we’ll continue to step up the emphasis on the fitness traits with a close eye on production. The producer wants the best of both. And that’s what we’re working to give them.”

On the horizon Mr Winters sees, for incorporation into PLI, dry matter intake as an actual trait and other production efficiency measures. “We’ll also be looking at disease resistance, such as Johne’s and bTB, through bull daughter data. Some bulls do sire daughters that are more resistant compared to other bulls.

“Lameness is important too and we’re gathering data from hoof trimmers that should allow us to develop a foot health score.”

As for fertility, longevity and other fitness traits; “We’ll continue to fine tune these, as well as introducing more. Carcass quality, for example, will be invaluable since 50% of beef comes from the dairy herd. So we’re analysing data on that at the moment.”

Mr Winters also believes that, within the next decade, all cows will be genomically tested. “Much will depend on the price of the test, but it’s already dropped considerably during the past three years and will continue to fall.”

Using computer programmes to match sires to cows

Is the cross breeding trend set to continue?

Cross breeding is growing in popularity in the UK, with many breeding companies reporting a significant increase in sales of semen from breeds other than Holsteins for use on black-and-white herds.

But is it a trend that's set to continue, or will improvements in the Holstein's health and fitness traits – and their incorporation and greater emphasis within PLI – see producers crossing back?

Geno UK's Wes Bluhm thinks not. And he believes that cross breeding – which has become increasingly popular during the past few years – will continue to grow.

Commercial success

"While this is easy to say, the practicalities of putting these changes in place are difficult.

"Sire analysts and AI companies are driven by commercial success, just as we all are. Strong pure-bred semen sales are based on bulls that rank well in the indices.

"These sires will be the ones with the best genomic profile. And I believe that this is a very limited group at the moment, so inbreeding could be an issue," he says.

"Many in the industry also believe that genomics will be the answer to the inbreeding problem with Holsteins. But many geneticists also feel that genomics could exacerbate the problem," he adds.

While other countries have facilities to measure health and growth traits and feed-conversion traits in other breeds, they are not available here in the UK. So even if UK breeding programmes want to implement these in their indices, it would be difficult to capture the data.

"The traits that producers want to most improve in many cases are those with low heritability.

"While indices can be changed to reflect increased emphasis it can be difficult to improve these with pure breeding," says Mr Bluhm.

He adds that as more long-term cross-

breeding trials deliver the same good data, the results become more and more incontrovertible.

"And even if pure breeding indices put more emphasis on the traits that those who are cross breeding are looking for, the undeniable benefit of heterosis, or hybrid vigour, is only available via cross breeding."

More durable

Countries, such as the Netherlands, which began the cross-breeding journey before the UK have seen the growth in cross breeding continue as more producers see the results for themselves.

"In the US, a major force in dairy breeding, it is estimated that between 8% and 10% of the national herd is crossbred – that's close to a million cows," says Mr Bluhm.

"In developing countries it has been found that cross-bred cows are more durable and suited to their environment and management system than non-domestic pure-bred animals."



Genomics means that young sires are becoming bull fathers, even before they have a daughter-based proof

will become routine across most herds: "Particularly as selecting sires becomes more complex – due to genomics, but also the speed of progress. It will be even more important to get it right."

He also sees vets getting more involved in sire selection.

"I think they'll take more interest in the genetics being used on their clients' herds, since genetics play an important

role in herd health. We know, for example, that not every cow responds to being vaccinated and some react differently to concentrate feeding compared to others. What we need to do now is find the genomic profiles to identify these animals.

"All areas of herd management will become more integrated and genetics will play a key role here. Breeding will

become more targeted as the science behind it evolves. We'll know exactly how genetics perform in different systems and environments, and what impact they have on the environment."

He stresses that it will all have to be monitored carefully. "We'll be moving ahead so quickly that it really will be vital to keep a check on the direction we're going" |