BDGP
Beef Data & Genomics Programme

ICBF.com

Department of **Agriculture, Food and the Marine**
An Roinn **Talmhaíochta, Bia agus Mara**

Genomics update

In week five of the BDGP information page series, we outlined the benefits of genomics to beef farmers. Genomics works by using an animal's DNA to help to predict how it will perform in the future. It will increase the reliability percentages on animals €uro-Star Indexes before they are ever used for breeding.

Therefore, it is essentially removing some of the risk for farmers. There are a few steps involved in establishing genomic indexes.

1. Reference population

You firstly have to establish a reference population. To do this, you take DNA from animals with high reliabilities on their genetic indexes (proven animals). A reference population will primarily be made up of well-proven AI bulls as well as older, well-proven stock bulls and cows. DNA is usually taken via hair, skin, blood or semen. Samples taken as part of the 2014 Beef Genomics Scheme were used to establish a reference population.

2. Identifying traits

Once the reference population has been set up, you then need to identify sub groups of animals within the overall reference population according to their performance on different traits. As these are proven animals, we know exactly what their strengths and weaknesses are. Take the milk trait as an example. You look at the DNA profiles for all of the reference animals that are strong on milk and look for common genetic markers. Once identified, these markers are then associated with good milk production. The same applies to animals that are very poor for milk as it is equally important to identify these genes so that they can be avoided in future.

3. Applying to young animals

Once genetic markers for the various traits have been identified in the reference population, you can then apply genomics to young animals. If a young animal has similar markers in its DNA profile to those associated with milk in the reference population, then it is highly likely that this young animal will be strong for milk also. The same principle applies to all other traits, eg carcase, docility, fertility, etc.

Removing risk

Traditionally, replacement females would have been selected on breed, visual appearance and the performance of their dam. In more recent times, the €uro-Star index would have been taken into account also. This may work well, but by adding genomic information into the criteria, the selection process will be much more accurate.

Having a prediction on the future performance of an animal from a young age will be a big improvement on the current situation whereby you have to wait two to three years before you find out how the animal will perform.

Initial genomic results

Initial work carried out by ICBF and Teagasc on beef genomics has quantified the potential effect on the €uro-Star Indexes of young animals. Table 1 details a number of key profit traits for beef and the impact of genomics on the reliability figures, as well as the equivalent number of progeny which the genomic information will represent. Traits which traditionally were very difficult to quantify, such as calving interval, will receive the biggest boost from genomic data in terms of equivalent progeny records.

Ramona Farrelly

Jerome pictured with some of his dairy cows. Over 90% of Jerome's milking herd is genotyped. Genomics has given him an extra tool when selecting both AI bulls and replacement heifers.

Table 1: The effect of genomic data on the reliabilities of traits and the equivalent numbers of progeny records which genomic data will provide

Trait	Reliability		Equivalent progeny records
	Pre-Genomic	Genomic	
Age first calving	21%	46%	6
Calving interval	16%	44%	96
Survival	14%	43%	140
Carcase weight	25%	48%	5
Carcase fat	22%	46%	5
Carcase conformation	21%	46%	6
Feed intake	12%	42%	4

Q&A

Q. Will a genomic index be a 100% guarantee of an animal's future breeding performance?

No, unfortunately you cannot be 100% sure as to how any animal will perform in the future. What genomics will do is give more certainty to farmers when selecting potential breeding stock through increased reliabilities. There is also the added bonus of parentage verification.

Q. Will all traits benefit equally from genomic data?

No, certain traits will benefit more than others. The traits that will benefit most are those that traditionally required a much higher number of records to get to a high reliability. Fertility traits such as calving interval and survival are two examples.

December Beef Evaluations

December proofs are now available for beef AI sires in the genetic evaluation section of the ICBF website at www.icbf.com. The bull search, Active Bull List and herd profiles will be updated on 21 December.

FARMER FOCUS: JEROME DESMOND

"Moving to genomics was a natural progression"

Name: Jerome Desmond, Ovens, Co. Cork
Farming System: Dairy
Genomics: Over 90% of cows are genotyped.

This week we decided to change the farmer focus to look at how genomics has benefited a dairy herd. Genomic indexes have been available for dairy farmers since 2009 and it has dramatically increased the rate of genetic gain experienced in dairy breeding. Jerome Desmond is a dairy farmer based in Ovens, Co. Cork. He is a member of the Crookstown discussion group and in 2013 the group members took the decision to genotype all of their cows. We asked Jerome for his thoughts on genomics.

Jerome Desmond

When and why did you start genotyping your females? I started genotyping my heifers in 2012 and I did all cows in 2013 if my memory serves me right. Following the success of our discussion group in the 2009 EBI competition and considering that we had been very focused on EBI, we felt that it was a natural progression for us to move to genotyping and explore the potential benefits of the science. Parent average EBI's are a good predictor, but genomics goes the extra mile by giving a direct insight into what genes each animal has inherited from their sire and dam.

How has genomics benefitted your herd? The improved reliabilities from genomics give me a lot more certainty when picking my replacement heifers. I also sell surplus heifers to other dairy farmers and it is a good selling point to have heifers for sale with genomic indexes. Being able to guarantee that the parentage of all animals is correct is a big bonus. Calving takes place in a loose straw bedded shed and there could be anything up to 20 cows together at a given time. I have never mixed up calves, but genomics gives me that extra peace of mind. I would also have a number of bull calves genotyped each year by AI companies with a view to purchasing them as future AI bulls.

Do you plan to continue genotyping into the future? Yes, that's the plan anyway. I will more than likely do my heifer calves each year from now on. I suppose, like any farmer, I'm running a business and I try to reduce costs where at all possible and genomics would be even more attractive if the price reduced further in the future.

NEXT WEEK GENETICS V ENVIRONMENT