

Genomic testing pays its way as a management tool in commercial dairy herds

Test adds value and fast tracks progress

Genomic testing is likely to become commonplace in many UK dairy herds. But do the potential herd-efficiency and profitability benefits stack up? We ask NMR's GeneTracker team about the commercial and practical advantages of this DNA report and how it can be integrated into dairy herd management systems

text **Karen Wright**

'Know your cows, know your business'. Frequently used in advocating individual cow data in the management of dairy units, this adage can be taken a step further with the introduction of genomic testing for dairy

heifers. From four weeks old, producers can build an accurate CV for individual heifers and their likely contribution to herd profitability.

Consultant vet Ian Cumming, who is working with vets on the value of

genomic testing and the application of GeneTracker as a key management tool, sees a very clear picture.

"Genomics uses the DNA from individual animals," he explains. "It provides a prediction for each of 35 traits and these are used, in varying proportions, in the genomic PLI. It's far more reliable than the parent average – a gPLI carries a reliability of 65% to 70%, and a parent average has a reliability of 25% to 30%, so producers can use genomic indices with confidence."

Highly accurate

"A tissue sample from a young dairy calf can tell us what the DNA is saying, and this can never change," adds Dr Cumming. "It's highly accurate – the

Genomic information can improve herd efficiency beyond levels that have been seen in the past



Working with GeneTracker

Provided through NMR, GeneTracker is the UK's leading genomic testing service available to all producers.

Turnaround is between four and six weeks and results go back to producers as an iReport on NMR's Herd Companion with copies to the vet or adviser as requested. "Producers can use the iReport to compare gPLIs of the latest heifer calves with the herd profile and

make rearing and breeding decisions," says GeneTracker's Rebecca Gage.

"The genomic reports become part of the farm's business plan," she adds. "It depends on the herd's breeding and management goals, but genomic rankings give producers the opportunity to match potential with targets at an early stage."

Rebecca Gage



DNA sample from an animal is identified with fluorescent markers and compared with millions of others on the database for each trait and related back to the particular cow. These markers read what the DNA is saying. It's 'big data'."

Table 1: NMR pilot 460-cow herd: top and bottom cows ranked on gPLI s

cow number	gPLI	fertility	
		index	life span
top 10 gPLI			
3901	533	13.4	0.6
4249	491	4	0.5
3924	490	3.5	0.4
3787	486	3.1	0.5
3526	484	2.1	0.3
4252	484	8.4	0.5
3945	480	11.1	0.4
3937	472	6.7	0.4
4238	470	5.6	0.4
3588	469	2.2	0.3
average	486	6.01	0.43
bottom 10 gPLI			
4233	78	1	0
2775	75	0.2	0.3
2779	71	1.3	0.2
2766	68	2.7	0.2
2992	56	1.3	0.1
2746	50	4	0
3703	48	2.2	0
2776	44	-1.9	-0.1
2971	14	-1.4	0
3234	-27	4.3	0.1
average	48	1.37	0.08

Fertility index Each unit of fertility index equates to a reduction of ½ day of calving interval and an increase of ½% conception rate and is worth £12 profit. Difference in FI top 10 versus bottom 10 is 6.01 - 1.37 = 4.64 = 2.32 fewer days open and 2.32% improvement in conception rate per animal. Total value for the group difference = 2.32 x 10 = 23.2 x £12 = £278.40 increased profit.

Life span Each 0.1 life span equates to 1 month extra herd life which in financial terms, is worth £18 profit. Difference in LS top 10 versus bottom 10 is 0.43 - 0.08 = 0.35 = 3.5 extra months herd life per animal. Total value for the group difference = 3.5 x 10 = 35 extra months herd life = 35 x £18 = £630 increased profit. Total extra profit by breeding for improved fertility and life span from the top 10 animals = £278.40 + £630 = 908.40 or £90.84 per animal.

Highlighting the accuracy of genomic tests, NMR has compared genomic test results of cows with milk records and found very little difference.

"The genomic figures are very close to the cow records," he says. "It shows just how reliable the genomic test is. Producers can be confident when it comes to using the information in herd management."

Cost benefit

The real benefit comes when all cows in the herd have a genomic test and a baseline is established. "Cows can then be ranked - you see the good from the poorer animals for gPLI and for each trait. It's then straightforward to establish the cost-benefit ratio."

He illustrates this by comparing the gPLI average of the top 10 cows with the bottom 10 cows in a 460-cow herd (see Table 1).

"The average gPLI for the top 10 cows is 486, compared with 48 for the bottom 10 cows. It's then interesting to look at fertility and lifespan - two major criteria used in PLI and that affect herd efficiency, and see the financial impacts."

Additional profit

In the pilot herd, the difference in the fertility index between the top and bottom 10 cows was 4.64. "We consider that each unit of fertility index equates to a reduction of half a day of calving interval and an increase of half a percent in conception rate and is worth £12 of additional profit per cow. The top 10 cows are then generating 2.32 times £12, or £27.84 a cow more than the bottom 10 cows.

"Add to this the financial difference in life span between the top and bottom 10 cows, and we can see that the extra profit generated by the top 10 cows is £908.40. That's an extra £91 a cow."

Dr Cumming believes this herd is

representative of many commercial Holstein units. "The cost benefit soon becomes highly significant and the cost of genomically testing dairy heifer calves, which becomes currently around £30 a head, is easy to justify."

Rearing potential

Dr Cumming also highlights other benefits, starting with making decisions about which heifers to rear.

"It costs at least £1,000 to rear a dairy heifer to calve at two years old and many estimate the cost to be more. If you identify just three heifers that, within a herd, are not up to the herd's target, the saving in rearing costs will pay for at least 100 genomic tests."

And there are advantages in breeding planning. "Producers, their vets and advisers can be 'trait-led' in management and breeding decisions," explains Dr Cumming. "We can use them to select for specific traits, including those with lower heritability without compromising other traits; a first in the history of breeding. We've seen years of selecting for production and compromising health and fertility traits through relying on population genetics - parent averages and daughter proofs. This can change now, and our breeding decisions can be far more accurate with much better progress."

He encourages vets to get more involved in using genomic data on traits for breeding decisions. "No one knows more about cow health, fertility, longevity and production issues than the vet. They also know the herd's management system and environment.

"Add genomic information for these key traits, that are typically used in breeding decisions, and they are well placed to advise on breeding that will improve cow efficiency beyond levels that we have seen in the past, and promote a more uniform herd." |