

How nature's barcode helps to support sustainable food

Using DNA technology, retailers and consumers alike can be certain that the claims they read in the supermarket matches the story behind their food labels.

As more consumers demand higher standards of sustainability, retailers need to be sure that the products match the claims they make about their food's climate impact.

By tracking animals through the food chain back to their farm, retailers can verify their claims – but what information is available to them? Could a retailer prove the species, breed and even identity of an individual animal sold in their store? Could they also show how well that animal was treated?

With the help of a cloud-based analytics platform and “nature's barcode”, there is a way, says Anton Hofland, technical account manager at IdentiGEN, now part of MSD Animal Health.

All animal products contain traces of the animal's DNA. “We use DNA as the fingerprint to trace back to the individual animals that have contributed to the finished product and link it to the farm,” says Hofland. “It's a powerful tool to objectively verify where the meat came from.”

A small sample of meat – about the size of a grain of rice – is collected, analysed, linked to an animal's unique ID (like their ear tag), and then uploaded to the cloud. Millions of DNA sequences are saved on IdentiGEN's cloud-based platform, DNA TraceBack®, each month from beef, pork, poultry and seafood farms. “The cloud makes it available, creating this nice journey of information which means that you can always trace back based on tamper-proof information,” says Matteo Ratti, who leads Data Labs at MSD Animal Health.

In general, meat and seafood supply chains can be quite long and complex. Some products, like further processed meats, go through a lot of change before they reach the consumer, and global sourcing adds more complexity as livestock products are imported from countries with different quality standards.

“But DNA cuts through the complexity,” says Hofland. “The product becomes the label that is carried through the processing plants right back to the exact animal and the farm of origin.”

It takes a small amount of DNA and only part of the genetic code to sequence a meat product. IdentiGEN looks at only the genetic markers on the DNA that are useful to the question being asked. This cuts down on lab time. “All of this can be done with technology that exists today and is scalable and proven,” says Ratti.

Knowing which markers to look for is where IdentiGEN's expertise comes in. As a result, they can process millions of sequences per month.

Then, to verify if a product is being advertised correctly, a second sample can be taken at any stage further along the chain – in the supply chain, supermarket or restaurant – and matched with

the animal of origin. With this link, Hofland says a retailer can prove the species and breed. By adding in data from their unique identifier, even more complex information like how long the beef was aged for can be tracked.

The TraceBack platform also uses artificial intelligence to analyse and verify products like burgers and sausages, which contain DNA from multitudes of animals. There is even workable DNA in cooked meat.

For retailers, having certainty in the claims they make in-store is invaluable. Albert Heijn, with over 1,000 stores, is the Netherlands' largest supermarket chain, and was one of the first retailers worldwide to commit to only sell slow-grow breed lines of chickens for their AH Kip products (who put on less than 50g of mass per day, and have been [found to exhibit higher standards of animal welfare](#)). A claim they could verify by using DNA sampling.

“We see that our customers are increasingly interested in the origins and impact of the products they buy,” says Laura Jungmann, who leads Albert Heijn’s sustainability strategy. “More and more, customers ask questions about things they are hearing in the news or from NGOs. And on the other hand we are seeing in their baskets they are moving towards sustainable products.”

For Albert Heijn, having certainty in the claims they make about the origins of their meat products as well as having traceability along all steps in the supply chain, enables the retailer to know the meat they sell comes from farmers who have committed to sustainable practices, and check that they are delivering on them. Jungmann says they are working with a small number of farmers who work exclusively with Albert Heijn. Those farmers have to meet certain criteria – whether it’s only raising slow-grow breeds of chicken, for example – and with DNA technology, Albert Heijn can verify those claims.

The retailer asks the farmers to take additional steps to improve animal welfare, says Jungmann, in return for [a premium to invest back in their farm](#).

Farmers put a lot of effort into implementing the additional requirements, says Emiel Beekwilder, quality manager for Albert Heijn’s meat products, “but for them verification is a kind of protection so that the benefit of sustainability is only for the farmers that meet the additional requirements.”

Farmer’s involvement in sampling depends on the livestock they produce. In pork production, for example, the farmers have an active role. With each sow’s DNA stored, all of their offspring can be traced back.

For beef production, with far fewer animals in the supply chain, sampling can be conducted in the abattoir. Poultry has to be verified in store, as Albert Heijn requires a large number of broiler chickens per week. In these cases, the farmers might not be directly involved, but with DNA traceability, Albert Heijn can verify that the right breeds are sold in store.

DNA-based traceability should improve sustainability standards across the board, not just in higher-end meat products, says Ratti. By rewarding farmers who undertake extra sustainability commitments with premiums, and checking their produce, farmers who cut corners lose a competitive advantage. “Objectively you can prove the different types of farming with DNA technology, tracing it back to prove that it happens for real,” he says. “This is a big help in the sustainability game. If there is transparency and everyone contributes – you can see my cows are happy – that is a good thing. When you have bad behaviour or less professional farming, you can see it, you reduce the competitive advantage of the poorly-run farm.”

“In the end, sustainability should be considered a pre-competitive thing,” says Jungmann. “The more companies that move towards sustainability, the broader the impact and the easier it becomes to have an impact. It’s important that others follow.”