

# GE - 10,000 years in the making

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Genetic engineering is the logical next step in 10,000 years of manipulating food genes, says a visiting Californian scientist.

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Pamela Ronald is trying to talk around a mouthful of kiwifruit, yoghurt and muesli. She's eating breakfast at the Intercontinental in Wellington and it's the only spare time she has in a busy round of media interviews and public meetings before flying to Auckland for a conference.

Between bites she talks about food.

"I've just spend a few days with friends in the Bay of Islands. They fed me really well and everything I ate, except the fish, was genetically altered."

No, it wasn't a meal of secretly imported food from a country that allows genetic modification. It was food bought in the local supermarket.

"Everything we eat that is farmed is genetically altered," she explains.

"It is just the result of a long line of 10,000 years of gene manipulation."

She should know. She is professor of plant pathology at University of California's Davis research campus. With husband Raoul Adamchak, she has written Tomorrow's Table on the worlds-colliding idea of integrating genetic engineering with organic farming.

But before she gets on to that she lays the groundwork with the description of a couple of recent meals with her friends.

"For breakfast, the milk was from selectively bred cows, the yoghurt bacillus was selected, and the flour in the scones was from genetically improved wheat. At lunch, the cheese was made from genetically engineered rennet, the chardonnay was from grafted grapevines of two species and the rice in the pumpkin risotto - well, I didn't check it but if it was the organic rice we get in California then it was made by mutation breeding."

Two questions immediately arise: New Zealand has genetically engineered rennet? Yes, she replies, and her breakfast companion, Michael Dunbier, chairman of the government and farmer-funded biotech forage science company Pastoral Genomics, confirms it with a nod.

The active ingredient in rennet is a GE bacteria that has been used since 1990, replacing, at a tenth of the cost, the previous source, the stomach of newly slaughtered calves.

Mutation breeding is also done in New Zealand. In it, seeds are put in a carcinogenic solution or treated with radiation to induce changes in the DNA. After germination, surviving seedlings that have new and useful traits are then adopted by breeders.

Dr Dunbier, a former chief executive of Crop & Food Research, explains this is part of normal New Zealand plant-breeding.

He recalls arguing against a 1990s parliamentary bill with sweeping powers to ban genetic manipulation and making ground with MPs only when he explained it would mean an end to the specially bred hops and barley used to make beer and whisky.

Professor Ronald, a specialist in genetically engineering rice, says it doesn't make sense that mutation breeding is allowed in New Zealand and GE is not. She raises her hand to eye level.

"The National Academy of Sciences [the United States' most respected science body], puts the risk of unintended consequences from mutation breeding up here."

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She lowers her hand to her knees. "And the risks from GE down here. Yet mutation breeding is certified organic and GE is not."

Labelling foods GE and allowing the consumer to decide would not be useful, she says. Carry that argument over to organic produce and it could see labels stating that organic produce treated with rotenone, a "natural" pesticide, "may contain trace amounts of rotenone - chronic exposure can cause damage to liver and kidney", or mutant breeding, "carries a genetic mutation induced by radiation mutagenesis, resulting in the presence of a mutant protein".

All of the breeding techniques are acceptable to her.

"Every process is slightly different and GE is just another tool in the toolbox." And it's time to put that tool to good use, she says.

Some genetically engineered crops include toxins that kill insects. When these are grown, the use of insecticide halves, the biodiversity of beneficial insects increases and yields rise.

In countries with large numbers of people who are poor and malnourished this could be the difference between life and death.

New Zealand faces the same problems as farmers in other countries, she says.

"You've got diseases, insects and greenhouse gases. GE can reduce the insecticide load and the more you're able to do that and have more food grown on less land, then there's more land for the native eco-system - the animals, the plants, the people."

She suggests GE can breed drought- tolerant pastures and Dr Dunbier reels off a list of diseases - clover root weevil, grass grub and clover mosaic virus - that could be tackled.

He says that in New Zealand, laboratory research is looking at GE answers to greenhouse gas problems - plants that deliver the same productivity but on half the nitrogen and pasture that reduces methane and nitrous oxide in the rumen.

This interests Professor Ronald, who comments that plants that need less nitrogen would be a boon for organic growers who add nitrogen in the form of compost, always in short supply.

She says she and her husband, the manager of the Davis campus's organic market garden, are not trying to force GE on organic growers, although she says that for organics in its present form to feed the world we would need another Earth.

"Too many people do not want the organic label to change. But that's just 2 per cent of the world. What about the other 98 per cent? Can we move that to more sustainable agriculture? We want to take the best farming practices, much of it borrowed from organics, and the best science, some of which will be genetic engineering."

In Tomorrow's Table, published in 2008, they wanted to bring the reader into the lives of an organic farmer and a geneticist to "de-mystify" what they do. "The goals of genetic research and of organic farming are much the same, which is to reduce the amount of insecticides and harmful inputs and foster some fertility and really move toward sustainable agriculture."

They had heard no adverse comment on it from the organics movement, but that was because few had read it.

However, policymakers concerned with feeding the growing world population had given it a good reception.

In New Zealand, the GE debate has centred around protecting the country's image in the sophisticated food markets of Britain and Europe.

But Dr Dunbier says these countries have moved to accept GE, while New Zealand's regime has remained the most proscriptive in the world.

He says the GE debate has been dominated by a small number of people and that surveys show the public opinion is not as negative toward GE as many people believe.

Professor Ronald's view is that pollsters have been phrasing their questions wrongly.

"They're asking: 'Should we use GE technology', but that means almost nothing because people are not familiar with breeding and don't realise that everything we eat has genes that have been moved around by humans.

"So, the question really should be, 'How can we keep New Zealand clean and green'.

"New Zealand is a really great place and what we all want is to keep it clean and green, maximise the native ecosystem and feed the people."

Some people don't accept the GE science.

"They think science is an opinion. But science is a moving discovery process, generating knowledge and testing hypotheses, with other scientists confirming or refuting those hypotheses, and as time moves along there are some things that we accept as a scientific community and as a society.

"One of those things is that there hasn't been a single instance of harm to human health or the environment by genetically engineered crops.

"And still you hear people say, 'I don't know if I believe that'.

"But every year, something like 300,000 people are dying from insecticide poisoning - it seems the risks and benefits are out of whack."

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