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Learn to love genetic engineering

BY 2040 there could well be 9 billion people on the planet. The challenge, as oil runs out and climate change kicks in, is not just to grow enough food to feed so many people but to do it without wreaking more havoc on the planet.

It won't be easy. Farming causes more global warming than all the world's cars, trains, ships and planes put together. The worst culprit is a greenhouse gas called nitrous oxide, a breakdown product of nitrogen fertilisers (including organic ones). Next in line is methane from livestock and manure. To meet demand for food and other materials such as biofuels without turning all the remaining wilderness into farmland, and without producing yet more greenhouse gases, we are going to have to exploit every trick we can.

Genetic engineering could make matters far worse. For instance, Craig Venter's Synthetic Genomics and other companies are trying to develop microbes that turn coal, tar shale and oil into methane. This could greatly increase greenhouse emissions by making it possible to exploit hard-to-extract reserves of fossil fuels, such as the extensive oil residues left behind after normal pumping is completed.

Like any technology, however, genetic modification could also be put to positive use. It might be the key to boosting oil yields from algae grown in ponds and to turning plant wastes into fuel, rather than converting valuable food into biofuel, as happens now.

Experimental crop plants that use nitrogen more efficiently provide the same yields as normal crops with less fertiliser. Such crops could reduce both nitrous oxide emissions and the nitrogen run-off that creates dead zones in the oceans. Salt-tolerant crops under development will grow on land contaminated by irrigation or sea-level rise, and drought-tolerant varieties could find even wider use.

In the longer term, even more dramatic changes could be made, such as altering the fundamental biochemistry of plants that carry out C3 photosynthesis – which includes nearly all staple crops – to carry out C4 photosynthesis instead. This would allow them to thrive in hotter, drier conditions.

As pests and diseases evolve and spread, crops genetically modified to resist them could boost production, or at least maintain yields. The ringspot virus had halved papaya production in Hawaii before a resistant GM strain was introduced in 1998.

Last but not least, genetic modification can make existing foods more nutritious. The lack of nutrients such as vitamin A remain a major cause of death and disease in developing countries. GM crops such as the soon-to-be-introduced Golden Rice will help to improve health and reduce child mortality, which will ultimately contribute to a reduction in population growth.

Many people, especially in Europe, oppose crops like Golden Rice simply because they are genetically engineered, but there is no rational basis for drawing an absolute distinction between conventional breeding and genetic modification. Thousands of years of selective breeding have produced extensive genetic changes in the plants and animals we eat, not all of them good. Many "natural" crops like potatoes are poisonous to varying degrees, and conventional breeding can make them more toxic. Transgenic organisms are nothing new either: the swapping of genes between separate species is as old as life itself. As for GM crops making farmers dependent on multinational companies, it was the introduction of non-GM hybrid seed back in 1924 that first persuaded farmers to give up saving seed each year in favour of buying it.

Yes, there are other ways to improve nutrition and boost yields, but combining these methods with GM could make them far more effective. With a third of species facing oblivion, environmentalists need to embrace a technology that could help to save many of them – and many of us. **Michael Le Page**

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Even normal potatoes can be toxic, so why are modified foods so scary?

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