



Science *for*
Sustainable
Agriculture

No such thing as natural farming

Maarten J. Chrispeels

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Science for Sustainable Agriculture

Maarten Chrispeels, Distinguished Professor Emeritus of Molecular Biology at the University of California San Diego, reflects on a historic stand-off between organic wine producers and GM crop farmers in Mendocino County, California, the first US country to vote for a ban on growing GM crops in 2004. He warns that rejecting modern technologies would be a disastrous development if we are to feed the 9 billion people who soon will inhabit our planet. The organic farmers of Mendocino hoodwinked the public into believing their practices were more "natural." But there is nothing natural about farming, he says. We should instead be worrying about sustainability, and embracing farming technologies and systems which can help us produce more food with less impact on the environment.

Back in 2004, Mendocino County in California hit the headlines after becoming the [first county](#) in the United States to vote for a ban on growing genetically engineered crops, following a demonstration led by local organic wine producers claiming that GMOs could contaminate their crops and damage their 'natural' image.

The Mendocino vote to ban genetically engineered crops might suggest to the casual observer that we would all be better off by avoiding the application of new agricultural technologies, while embracing more "natural' farming techniques.

But it got me thinking what, exactly, do we mean by natural? And what would be the costs to society of abandoning new technology in agriculture?

Right now, the food available in our stores is cheaper, more plentiful and more nutritious than ever before in our history. Yet we worry about the way food is produced on farms and about the genetic makeup of the plants used by our farmers. "Are they using natural plants and farming the natural way?" we ask ourselves.

Perhaps it is time to kill off a few myths about farming. There is nothing natural about farming. An agricultural landscape may look attractive – a vineyard in the San Diego backcountry for example, or a sunflower field in full bloom in the Provence in France – but its creation required the complete destruction of the natural ecosystem and its

replacement by an agricultural ecosystem.

Further, to grow so many of the same plants in one field while at the same time suppressing the growth of other plants – in this case, weeds – is not natural. This is true even if farmers practise crop rotation, or "inter-cropping," the practice of growing two or three crops at the same time. Such an ecosystem is not what nature intended, and as a result we must continuously supply fertilisers, and apply weed control, disease control and insect control measures to keep that artificial ecosystem going. The most important question is not whether it is natural, but whether it is sustainable in the long run. Do our practices destroy the resource base, or do they maintain it for future generations?

And what about the plants? Are they natural? Well, our crop plants were domesticated 5,000 to 10,000 years ago, and in the process their genetic makeup was changed considerably and irreversibly. Changed so much in fact that crop plants generally cannot survive in nature. Although all the plants in our canyons and mountains are not native – there are many invaders – there are no runaway crop plants to be found. They simply can't survive there.

Further, the genetic makeup of our crops keeps on changing. This is true whether a San Diego tomato farmer buys the latest hybrid seeds from a crop breeding company or whether a corn seed selector in Chiapas, Mexico, selects seeds from this year's harvest for planting the next season.

In subsistence farming communities all over the world, seed selectors – usually women – carefully select seeds from the best plants and keep them for planting. This does not maintain the genetic "purity" of these land races but rather produces constant genetic change so that the crop remains adapted to its ever-changing environment.

In our society, ever since the 1900s, plant breeders have been making new gene combinations to produce the best planting materials. The so-called genetically manipulated or "GM crops," sometimes referred to as "GMOs," are simply the latest expression of plant breeders' desires to produce the best crops for the farmers. In such GM crops, new genes are introduced by a combination of molecular techniques and traditional plant breeding.

Because molecular techniques are used at the start, the genes can come from any organism: another plant species, a microbe or even an animal. Animal genes will not be used to create new food plants but may be introduced to create plants that manufacture pharmaceuticals. The productivity of our agriculture, whether conventional or organic, can only be maintained by constant genetic improvement because the disease organisms and crop pests keep on evolving. Which brings me to the vote in Mendocino County to reject the growing of genetically manipulated crops. This was another battle pitting organic farmers against biotech companies. We love these David and Goliath stories.

The campaign and the vote were discussed in the local media under the headline "For Mendocino County, natural's the only way to grow." Without being explicit, the headline reinforced the popular belief – not based on scientific evidence – that some types of agriculture – in this case, organic – are somehow more natural than conventional methods.

The use of manure, that symbol of virtuous farming, does not make those practices any more natural. Instead of worrying about what is natural, which is impossible to define, we should worry about sustainability.

If certain farming practices are unsustainable – irrigation with groundwater that is not replenished, for example – they should be taxed rather than subsidised to make them less attractive to farmers. If certain new pesticides are less toxic to people and the environment than the traditional ones used by organic farmers, their use should not be stigmatised by those seeking economic advantage for their own farming practices. If certain GM crops make agriculture more sustainable because they permit less pesticides to be used or conserve water they should certainly not be banned but embraced by society.

Rejecting modern technologies would be a disastrous development if we are to help feed the 9 billion people who soon will inhabit our planet. To achieve that goal, we must seek out the best agricultural practices and combine them with the best genetic crop varieties – whether produced by molecular and/or traditional means – so as to achieve food security for all, including the 800 million who are now without a secure food supply.

The organic farmers of Mendocino County and elsewhere are shrewd business people. By sticking to manure and certain older chemical fertilisers and pesticides, by banning newer ones and by banning GM crops, they have hoodwinked the public into believing they are "natural" farmers. The public is willing to pay a premium for their organic wines, and they are happy for anyone to spread their groundless message that they are farming in nature's way and others are not.

Maarten J. Chrispeels is Distinguished Professor Emeritus at the Department of Cell and Developmental Biology at the University of California San Diego (UCSD). His active research career at UCSD spanned 42 years. For 10 years he served as the Director of the San Diego Center for Molecular Agriculture (SDCMA) on the UCSD campus. Professor Chrispeels was elected to membership in the US National Academy of Sciences in 1996.

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