



AN ORGANIC FARMER AND A GENETICIST WALK INTO A FIELD

For Pamela Ronald and Raoul Adamchak, genetic engineering and organic farming are both legitimate tools for pursuing sustainable agriculture.



Photo by Pico Van Houtryve

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August 26, 2013 — The debate around genetically engineered crops and organic farming usually begins well beyond a point of no return. Heels dug in, opposing sides accuse one another of being anti-environment or anti-science, evil or ignorant. From there, what takes place is something closer to a schoolyard shouting match than adult discourse.

This is not usually a good — or very successful — place to start honest discussions looking to move conversations forward.

And it's not the starting point for Pamela Ronald, a University of California, Davis, plant geneticist, and Raoul Adamchak, a farmer who runs the student organic farm on campus. The two are co-authors of

[*Tomorrow's Table: Organic Farming, Genetics, and the Future of Food*](#). They are also married — a truly odd couple in a world divided by preconceived notions and decisions before discussions.

Debates pitting genetic engineering against organic agriculture, focus on, among other things, what each camp feels is necessary to feed a growing population. Both claim to have science on their side when it comes to producing the amount of food needed in a way that will do the least harm to the environment. But, where others see opposition, Ronald and Adamchak contend the two practices should be used in tandem toward the goal of sustainable agriculture.

“The common ground was obvious to us. It isn’t very difficult if you look at the overall goal of sustainable agriculture ... and say, ‘What’s the best way to get there?’” —Raoul Adamchak

“We both came into our respective fields because we’re interested in ecologically based farming,” says Ronald, who has successfully genetically engineered rice to tolerate prolonged periods of flooding, a problem in many parts of the world where rice is a dietary staple. “We believe that it’s really a distraction to think about how the seed was developed. ... The issue is really whether a particular seed or farming practice can advance the goals of sustainable agriculture.”

“The common ground was obvious to us,” Adamchak says. “It isn’t very difficult if you look at the overall goal of sustainable agriculture ... and say, ‘What’s the best way to get there?’ It was relatively easy for us to say, ‘We should use the best technology and the best farming practices possible.’ That seems to us a perfectly reasonable way of achieving the most sustainable agriculture possible.”

Ronald and Adamchak met through mutual friends; both had already been active in their fields for many years. Ronald had worked on organic farms when she was younger, and Adamchak had studied entomology and agricultural development in graduate school — overlapping experiences that Ronald says allowed them to connect. In *Tomorrow's Table*, the two argue that any technology or farming practice is appropriate as long as it produces abundant, safe and nutritious food; reduces harmful environmental inputs; provides healthful conditions for farm workers; protects the genetic make-up of native species; enhances crop genetic diversity; fosters soil fertility; improves the lives of the poor and malnourished; and maintains the economic viability of farmers and rural communities.

“You can’t generalize about genetic engineering, whether it’s good or bad. It’s really the issue of the trait, the environment, the crop, the farmer.” —Pamela Ronald


Trouble begins, Adamchak says, when people abuse any one tool at the disposal of growers. “If you use an herbicide-tolerant plant and you spray Roundup year after year after year, it’s not going to end well.

You are going to get weeds resistant to Roundup.” Instead, he says, such a genetically engineered plant is just one tool that can be used, but it “needs to be part of an overall, integrated weed management system.” However, current guidelines defining organic farming do not allow organic farmers to use genetically engineered plants in their systems, so Adamchak is not able to use them on the UC Davis farm.

The discussion around genetically engineered crops has been hurt by oversimplification and generalization, according to Ronald. “People hear ‘GMO’ and they think, ‘I don’t want anything genetically modified,’ but of course everything we eat is genetically altered in some way through crop domestication,” she says. “You can’t generalize about genetic engineering, whether it’s good or bad. It’s really the issue of the trait, the environment, the crop, the farmer.”

Adamchak says the couples’ differing expertise allows them to fill gaps in one another’s knowledge. “We can give each other a reality check,” he says. “If she starts talking about farming or [says] something that doesn’t jibe with how I think farming happens, I can say, ‘But, Pam, growers don’t do that.’ And if I’m talking about genetically engineered crops and I don’t understand something or I misquote something, she can say, ‘That’s not done this way; it’s done this way.’”

So, what *would* the future of food look like in a world in which genetic engineering and organic farming are both seen as legitimate tools for achieving sustainable agriculture?

“I think we’d have an all-of-the-above strategy,” Ronald says. “You would develop [crop] varieties based on sustainable agriculture criteria rather than marketing criteria or an agenda pushed by somebody who has a conflict of interest.” Adamchak, for his part, sees good in extending the core value of sustainable agriculture beyond organic agriculture, which makes up only about 1 or 2 percent of the cropland worldwide. “[We] need to get the vast majority of conventional farmers focused on the goals of sustainability,” he says. “The ideal vision is for more ecologically based farming practices, [with] tools like genetic engineering to be used to impact those issues of sustainable agriculture, like soil erosion, pesticide use and fertilizer runoff.” 

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Connie Kuramoto
Aug. 30th, 2013

Genetic engineering is not compatible with organic farming since Roundup kills the microbes necessary for optimum microbial action. Genetic engineering also implies that a crop will have all the same genetics. This is not compatible with the resilience of an organic system that comes from diversity. Comparing crop domestication with genetic engineering is just silly. One occurs in nature and the other does not.

Erin

Aug. 31st, 2013

Connie, "genetic engineering" doesn't necessarily have anything to do with using Roundup. We "genetically engineer" plants when we choose which plants' seeds to use again next season. I think that was their point--that GMO for the sake of pesticide resistance is bad, but "GMO" is more nuanced in reality than what people think it's about.

Lois Braun

Aug. 31st, 2013

Connie Kuramoto's comments display a deep lack of understanding of some concepts: 1) Roundup Ready GMOs are only one type of GMO. There might be good reasons to reject the Roundup Ready concept, without tossing out all GMO's. 2) Hybrid corn, which is organically acceptable, is also genetically uniform. 3) Crop domestication might have been brought about by humans who had no clue what they were doing, but that doesn't mean it was "natural". What does "natural" really mean anyway? Figuring that out is a discussion that needs to occur. I suggest that Ms. Kuramoto read Ronald and Adamchak's book!

Marilyn

Oct. 12th, 2013

Love the broad view taken here. Though I still would like more nuances - here and elsewhere - in terms connected with genetic modification.

Yes we 'modify' all the time, and have done for thousands of years - not only plants but also animals. However there are two characteristics of modern 'GMO Monsanto-style' that I find disturbing. One is the modification to withstand certain toxic commercial products, eg Round-Up. The other is the introduction of genes from very different species, eg mouse genes in tomatoes. In my opinion these are totally different processes - and indeed should rightly be named differently.

These are the processes that we (at least I) would like to see named and labelled. Or forbidden.

John

Nov. 15th, 2013

There is a massive growing movement pretty much being totally ignored by Governments & Media called Permaculture that is an holistic practice in all areas of earth care/use and life style. Check out Masanobu Fukuoka, Bill Mollison, David Holmgren & Geoff Lawton(his youtube videos on Greening the Desert & Designing a Food Forest are great) just as a starting point. I am in connection with thousands of people worldwide who are practicing this, both in cities, towns and rural areas.

I like many others am being the change I wish to see rather than pointing fingers around to find blames, excuses & reasons.

Dr Abhay Shendye

Nov. 27th, 2013

I was thrilled to see the title and was thoroughly disappointed to see the contents. A 'geneticist' is a biologist that studies genetics. It means heredity, genes, and more importantly variations. It means so much more at cellular level. If a person studying these aspects teams up with an 'organic farmer' for common cause they would do wonders. I expected something related to this aspect in the article.

In no way a 'genetic engineer' be termed as 'geneticist'.

Connie Kuramoto

Dec. 3rd, 2013

One of the biggest problems with genetic engineering is that it reduces bio diversity, not increase it, which is counter evolutionary. Fine for those who believe in creationism I guess.

Lois Braun

Dec. 4th, 2013

"Genetic engineering is one tool of plant breeding and does not itself cause a reduction in bio-diversity. Plant breeding programs, by definition, select a few high performing varieties for agricultural production and can lead to a narrowing of the gene base if an effort is not made to keep and introduce diversity in the background selection populations. In 1969-1970, before the use of genetic engineering, the U.S. came close to a total corn crop epidemic of southern corn leaf blight because most of the commercial hybrids were based on one cytoplasm source that was susceptible to a race of that fungus. Subsequently, a major effort went into diversifying the source germplasm and cytoplasm sources in corn breeding programs. It is the design of the overall plant breeding program that determines the genetic diversity among varieties, not one mechanism of gene transfer. Policy and economics determine the diversity of crop species grown across an agricultural landscape."

Feb. 6th, 2014 [Pingback](#),

An Organic Farmer and a Geneticist Walk Into a Field: Both Come Out Alive | AgFunderNews / Ag Investment, Tech and Startup News

Rob Kilbury
Sep. 2nd, 2014

Excellent piece. The thing that I scratch my head about, is the trait approval process. Both domestically and internationally, approval seems to focus on risk of consumption by animals and humans. To my knowledge there has never been a single documented scientific case where consumption of GMO grains by people or animals caused a problem. So much like the conventional wisdom on climate change, political orthodoxy trumps good science.

Connie Kuramoto
Sep. 3rd, 2014

Genetic engineering is just not needed, and it's adaption limits the gene pool, enslaves farmers into buying expensive seed each year, tends to encourage the sale and use of Round up and the only purpose for them is to make money for bio tech. Of course, if you have shares in bio tech and just want to make a lot of money you will definitely want to promote this technology. Every modern agricultural problem can be solved with good cultural methods.

Connie Kuramoto
Jan. 18th, 2015

Louis Braun, I do not have the deep misunderstanding of concepts that you insist that I do. I know that not all gmos are round up ready but I really do not think that incorporating Bt in the plant is a great idea, and at the very best the accomplishments of any gmos, including golden rice, is overrated. I am quite aware that hybrid corn is genetically uniform. That is what hybridization is. I prefer, in most cases to grow open pollinated for that reason, and have good results, and can save seeds from open pollinated plants. We have lost many varieties of many types of plants through hybridization and centralization of our seed sources. I do not think that losing genetic diversity is ever a good thing. You are right, natural has become a meaningless word. But occuring in the field in a way that would happen in a field is less natural than it occuring in a laboratory. Lets face it, the only reason gmos exist is to make money for the companies who manufacture them. While I am not opposed to someone making money on a good product I dont think that the propaganda around saving the world with gmo seeds is warranted.

Lois Braun
Jan. 20th, 2015

Connie, I happen to agree with you that Bt engineered into plants is not a good idea because of the likelihood of harm to non-target insects and because of the likelihood of development of resistance to Bt in the target insects. Both Bt and Round-up Ready crops enable farmers to abandon crop rotations, which had been effective methods of controlling some of the problems Bt and Round-up purport to control, leading to severe loss of crop diversity on our landscape.

I also have reservations about golden rice. It's not that I think its consumption may be harmful, but just that I doubt it is truly needed. I reason that Vitamin A deficiency cannot have been a long term problem in those places where it is now, or else those societies would not have survived. So what has changed in their eating habits to make it a problem now? Could it be cultural attitudes that favor refined rice over brown rice? Could it be that people are not eating vegetables, many of which are high in Vitamin A, the way they used to? Wouldn't it be simpler to promote vegetable gardening? But I don't live in those parts of the world, so who am I to say? I do know that the developers of golden rice made it available for free, so I believe their intentions were good.

And there have been other applications of genetic engineering for which there probably were no other good alternatives. For example, saving papayas from a disease that threatened to wipe out all papayas.

I also share your final concern, about the control of crop genetics by the multinational companies that increasingly control both the chemicals and the seeds that were designed to go with them. Too much power concentrated in too few hands is never a good thing.

But I think it is a mistake to reject the technology just because of who promotes it. As Jonathan Foley wrote in an Ensia editorial a year or so back, GMOs have failed to deliver what they promised in terms of soil conservation and reduction in pesticide use. But that doesn't mean that they have not been useful. There are no panaceas.

Marilyn Mehlmann
Jan. 22nd, 2015

Thank you, Connie, your entries are a breath of fresh air. Over-optimism about science and (particularly) new technology have brought humankind to the brink of the abyss. To imagine that more of the same will reverse the process is... shall we say, naive?

Lois, to say that GMOs may have been 'useful' sounds to me like saying that the space program was useful because it gave rise to teflon-coated kitchenware. Yes, sure. But compared with the potential usefulness of other investments? And discounting the side effects not yet discovered (there are bound to be more, even statistically)?

Lois Braun

Jan. 22nd, 2015

Marilyn and Connie, I was going to try not to respond, because I really don't have the time, but I can't help myself.

My fundamental point is that genetic engineering is a tool, one tool of many. It is not the tool itself that is the problem, but some of its applications. The gravity of the problems that the world faces now, namely, how do we feed, clothe, house and warm 7 billion plus humans in the face of climate change, soil loss, water pollution, crop diseases desertification, etc, are too great for us to reject a tool that is potentially as useful as GMOs just because it may be risky.

I am not saying that GMOs are a panacea. There are no panaceas, which is why we need to have many tools in our tool chest.

Although we must be cautious, and reject supposed solutions for which the proven risk is too great, I am not convinced that is the case for all applications of GMOs, though it might be the case for Bt crops. I have enough confidence in our ability to discover the real risks--and in our system of scientific review to reject phony science--to trust that the risks of GMOs are low. (By contrast, we have now have definitive enough evidence that neonicotinoid pesticides harm pollinators, that I believe we ought to ban them.)

I used to share your skepticism of the space program. The development of teflon in my opinion does not rise to the level of usefulness to justify the enormous cost of the space program, either financially or environmentally. I cringe when I hear of space tourism for it seems to me that the carbon released into the atmosphere by even a single blast off is extravagant.

But would we have developed satellites without the space program? Modern communications would not be possible without satellites, much less modern weather forecasting, which has saved innumerable lives. Satellites are now being used to monitor and manage a whole host of environmental problems. Yes, it could be said that modern communications have eroded community because people have forgotten how to talk face to face, or that before weather forecasting people were better at reading the sky for signs of a storm. This may be true-- though I'm not sure, given the way that cell phone technology is revolutionizing health care in Africa.

My point is that we cannot put the genie back in the box, either on the space program or GMOs, especially not with 7 billion people on the planet. (We really need to stop adding more people.) All we can do is move forward--cautiously, knowing the risks better than our predecessors thanks to the information age. We can only pray for wisdom.

Connie Kuramoto

Jan. 23rd, 2015

I agree about praying for wisdom. If we are really concerned about 7 billion people being on the planet perhaps we should look at the uneven distribution of wealth, or just as importantly the amount of food that is wasted on this planet. Part of the problem with wasted food is due to our centralized food system, a food system that grows large quantities of food in one place, then transports them long distances to another place, leaving many foods less than fresh by the time they get to their destination. We also need to get rid of a lot of excess lawn. We need to grow more veggies locally and support local farmers. We need to stop growing corn for fuel, and look at alternative sources of energy. We need to stop planting thousands of acres of corn just to manufacture high fructose corn syrup. Corn that is used for these last two uses is mostly gmo corn. Gmos have made it possible to go in the wrong direction very quickly. That is part of the problem with them.

The whole feeding of 7 billion people line is one of the best public relations line in history. I can't believe that so many have fallen for it. Of course I dont want to see anyone starve, but there are easier and safer solutions to the problem. One of them is to eliminate growing crops that do not produce nutritious foods. The other is to decentralize our food systems. The third is to push for more equal distribution of wealth and power by diluting the clout of large multi national companies. Another is to promote, not reduce genetic diversity. I wonder why we as humans do not learn from our past. A crop that is genetically identical falls prey to a problem at a 100% rate. A genetically diverse crop will have some individual plants that survive. Do we remember the Irish potatoe famine at all?

Please read "Wake up before it is too late"

Lois Braun

Jan. 31st, 2015

Connie,

There's nothing in your latest comment with which I disagree. It's nice to find common ground. I especially agree with your statement that one of the problems with GMOs is that they have made it possible to grow vast monocultures of corn and soybeans. Although I do not think that GMO technology itself is a problem, I certainly do agree that over-reliance on just a few crops is a huge problem.

BTW. If you Google my name you'll find out that I work on the development of one of several possible new crops that might diversify the agricultural landscape of the Upper Midwest.

Joseph E Fasciani

May. 4th, 2015

Ms Connie Kuramoto and others make excellent, insightful comments. I'm 72 and spent 52 of

those years in horticulture, some devoted to plant breeding, w/'Wintergold', a Canadian Ornamental Plant Foundation registered cultivar to my credit, so I know something about genetics and breeding, in both the animal & plant worlds.

A good part of the problem here is the less than perfect reasoning used, most especially in the confusion of ends and means.

Pamela & Raoul have the best of intentions: more & better food for an apparently never-ceasing human population. But HOW we achieve these goals is another matter. As I come from a conservative approach, I know full well that good intentions too often pave the way to Hell. We have seen this over and over in human history, so we don't really need to verify it by yet one more study.

The fact is that there have not been enough large-scale studies OVER TIME on GMOs, so we have only short-term studies on lab rats for the most part, NOT human subjects.

There was a larger scale study over more than 12 months by an Italian medical scientist in which he found multiple reproductive defects in his rats, and we must pay attention to these, unless of course we are not parents, so we're only concerned for our cancers, tumours, etc.

When I was a pre-teen I read some of Dr George Gamow, the UK-based astrophysicist's writing, and it was there that I learned to start thinking in 100,000 year blocks, else get my findings skewed by human bias. I suggest we need to take much longer range studies for our standards, certainly not less than three generations of lab animals [No, I'm not a vivisectionist!].

Even then, we need to be cautious about letting the GMO genie out of the lamp, as once released I doubt that either Monsanto or Pandora will be able to capture it, as then we are done, and deservedly so.

After all, it is likely that a disregarded Nature's payback will be far more than we mere humans can deal with in the short-term.

Marilyn Mehlmann
May. 5th, 2015

Conny and Joseph, I appreciate your points and your experience.

Lois, I absolutely do not share your faith in the reliability of the peer review process. Without calling into question the ethics of reviewers, there are multitudinous examples over the past 100 years that it works only up to a certain point.

When we are talking about science that could threaten the future of humankind as a whole (as well as possibly contributing to its survival) we are looking at an extraordinary situation that calls for extraordinary caution, care, and transparency.

Surveying recent literature on actual food production innovations (non GMO) I find convincing arguments for redirecting investments from tweaking current systems (I include GMO in that category) to systematic rethinking and reintegration of different aspects of food production; first and foremost to investments that will secure a healthy future for the world's soils. It's no coincidence that this is the UN Year of the Soil.

Lois Braun
May. 6th, 2015

Marilyn, You are right that the peer review process is not perfect. But I can't think of a better alternative.

I too am heartened by new developments in plant breeding, such as use of molecular markers and gene editing, that may make gene transfer (GMO's) seem like a crude and un-needed technology.

I work in Agronomy at the U of Minnesota, and think that most of my colleagues share a holistic perspective of agriculture and appreciate the need to design agricultural systems modeled after natural ecosystems. It may not have been that way a generation ago. It just seems that the public still hasn't gotten the message that the university is more enlightened than it used to be. The existence of ENSIA is evidence that we have changed.

Nov. 19th, 2016 [Pingback](#),

[*Tales of a Recovering Pollanite – Food and Farm Discussion Lab*](#)

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