'Can We Feed the World Without Damaging It'

By PAUL VOOSEN of Greenwire
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Last in a five-part series about genetically modified crops.

Pamela Ronald and Raoul Adamchak have every reason not to get along.

Ronald, a plant scientist, has spent her past two decades manipulating rice from her lab bench, bending the grain's DNA to her whim. Adamchak, meanwhile, is an organic farmer, teaching college students the best practices of an environmentally gentle agriculture at his California market garden.

As Adamchak confesses, few have been more vociferously opposed to the genetic engineering practiced by Ronald than his organic movement, which has steadily grown in recent years to constitute an influential, if tiny, part of the U.S. farm system. So it can come as some surprise when Ronald and Adamchak let slip that they have been happily married for more than a decade.

Such a union should not be shocking, the couple argues. And a more modest version -- sans marriage -- must be considered by any farmer or consumer hoping for a sustainable future for agriculture.

Industrial farming, with its heavy use of pesticides, synthetic fertilizer and irrigation, is exhausting the environment, and with billions more mouths to feed in the upcoming decades, the problem will only worsen unless the efforts of organic farming and genetic engineering are combined, they say.

"The worst thing for the environment is farming," said Ronald, a geneticist at the University of California, Davis, who is best known for her work developing rice strains that survive two weeks of continuous flooding.

"It doesn't matter if it is organic," Ronald said. "You have to go in and destroy everything. So let's be efficient. Let's conserve. Let's be smart about it."

To spread their message to two communities that rarely speak in measured terms, Ronald and Adamchak have written a book, "Tomorrow's Table: Organic Farming, Genetics, and the Future of Food," which came out in paperback last month.

What Adamchak and Ronald pursue in the book is in essence a unified theory of farming. While critical of Western seed companies that have co-opted genetically modified (GM) crops for questionable business practices, the couple argues that both current and future generations of altered crops will, if responsibly managed, allow much of the world's hungry to be fed from land already degraded by the plow's slice and the tractor's compressing wheel.

"The point of our book is that you really need to look at the goals of sustainability," Ronald said. "What matters is: Are we achieving sustainable agricultures that can feed the world without damaging it?"

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Ronald and Adamchak are not alone in their call for a more nuanced understanding of GM crops. Their work has inspired books by a varied clutch of professionals: an environmentalist, a historian and a journalist. The books -- Stewart Brand's "Whole Earth Discipline," James McWilliams' "Just Food" and Michael Specter's "Denialism" -- take advocates and critics of genetic engineering to task for what has become a polarized and dumbed-down debate.

Brand, who heavily cites Ronald and Adamchak, is perhaps the most incendiary in his work. While he made his name as a leader of the environmental movement decades ago, founding the Whole Earth Catalog, in recent years Brand has sought a third way, supporting "heretical" technologies like nuclear power.

He is full-throated in his defense of GM crops, writing: "I daresay the environmental movement has done more harm with its opposition to genetic engineering than with any other thing we've been wrong about. We've starved people, hindered science, hurt the natural environment, and denied our practitioners a crucial tool."

McWilliams, an agriculture historian at Texas State University and previously a critic of GM crops, said that during his recent research he has come to respect and heed the couple's message.

"I admire them for fighting an immense uphill battle," McWilliams said. "I cannot think of another issue that really sets the organic lobby [so] on edge. ... Their attempt to blend organic agriculture with genetic engineering is really quite visionary."

"They're looking into a tidal wave of opposition," he added. "Just judging them solely on the contents of their book, they do it with a great deal of knowledge and a very powerful argument."

Filling a void?

At its heart, organic farming has never been about opposition to GM crops, said Adamchak, who teaches organic production at Davis. Organic techniques -- use of natural pesticides, no synthetic fertilizer, limited irrigation -- should be seen as limiting farming's effects on the land than as a reaction against agriculture technology.

And there is no doubt that conventional agriculture, while highly productive, puts a huge strain on the environment. Most significantly, synthetic fertilizers derived from fossil fuels, used to load the soil with nitrogen, an essential plant nutrient, leach from fields into water tables, causing massive algae blooms in the oceans and contaminating drinking water.

Such strain pushes the limits of human adaptation and raises questions of how willing communities are to tolerate environmental degradation, Adamchak said. For example, Des Moines, Iowa, has a water system that filters out nitrates left from the region's massive corn and soy fields.

"It's cheaper for that system than changing the farming system," Adamchak said. "But it's kind of crazy."

Organic farms limit external inputs, as they are known, enriching the soil with alternative crops or introducing natural predators for pests. However, such farms are labor intensive and require larger tracts of land to grow yields acceptable to most farmers, meaning widespread acceptance of the movement could destroy more natural land and require a massive return of workers to the heartland. Currently, no more than 3 percent of U.S. farming is organic.

"It's a rare person that will get out and farm," Ronald said. "So, if that's true, and we don't have a massive return to farms," then centralized, highly productive farms will remain, she said. "But how do you retain that productivity without the negative impact?"

This is the void that GM crops can fill, they say. Environmental benefits can be

seen in the developing world with even the current generation of GM crops. For example, farmers in China have quickly adopted cotton engineered to produce a protein called Bt -- a natural insecticide that is also heavily used by organic farmers. Within four years, the farmers' annual chemical use dropped by 156 million pounds, and related illnesses plummeted.

But the true, yet currently unfilled, potential of GM crops in the future will be to allow farmers to maintain or raise their current yields while working with a selection of organic techniques to reduce external inputs and improve soil health. Crops that more efficiently use nitrogen or water will go a long way toward achieving sustainable, industrial models of agriculture, they say.

While such nitrogen-fixing crops may be closer to reality, it should be made clear that they have not yet successfully been developed and have long been promised. It also remains questionable how much genetic engineering could really lower nitrogen use, said Thomas Sinclair, an agronomy professor at the University of Florida.

"Plants have evolved over hundreds of thousands of years to be very conservative with nitrogen," Sinclair said. "Since 75 to 80 percent of the nitrogen accumulated by a grain crop ends up in the harvested grain, I don't see how things can be improved very much."

Turning point seen

Despite the somewhat theoretical thrust of their argument, the couple's position is echoed by a recent report by Britain's Royal Society, which called for a "sustainable intensification" of agriculture using GM crops. The report couples its support with calls for greater public-sector research, responsible use and the need for regulators to limit the risk that GM crops could spread beyond a farm's limits.

Other veterans of the industrial farming models of the "Green Revolution" -- credited with saving millions of lives in the developing world during the 1960s and 1970s -- have seconded Adamchak and Ronald's message, notably Gordon Conway, the former president of the Rockefeller Foundation. Conway, who wrote the introduction to "Tomorrow's Table," has called for a "doubly green" revolution to remedy the green revolution's industrial excesses, counting in part on biotech crops.

Yet despite such institutional support and what Ronald and Adamchak see as their complementary aspects, there has been little openness in the organic community to their message.

"It's almost like the public grasped onto what I see as this very small sliver of sustainable agriculture," Ronald said. "It really was a distraction to the overall goals of what many people in the agricultural community tried to achieve."

Both see the turning point as when the U.S. Department of Agriculture established its national organic certification. The department's initial proposal would have allowed GM crops to be branded organic, a move that drew many thousands of letters of protest. Adamchak witnessed the revolt firsthand as the former president of California Certified Organic Farmers.

"Organic agriculture has been from the start a reaction to the problems generated by conventional agriculture," he said. "As long as [GM] plants are seen as being part of the conventional agriculture system, there is guilt by association."

Ronald tries to closely question people opposed to GM crops, she said.

"I always want people to be really, really specific: what don't you like," she said. "Usually it comes down to, I don't like Monsanto. That's not a forward-looking concept. They should be going to the Department of Justice if they want to stop Monsanto."

McWilliams, the historian, found much the same in his research.

"I have realized that people have deep, deep anger at the companies that own

this technology and that profit from this technology," he said. "That is where the vast bulk of the anger lies. And on the question of the science itself, most of the laypeople I talk to ... really don't understand it.

"I don't mean that to be dismissive. It's just not something consumers have spent a lot of time getting their minds around."

Shifting the debate

Adamchak credits his openness to GM crops quite specifically to his wife.

"It took me a while to figure what her research really was," he said. "It seemed to me what is demonstrated that there are many people in the university looking to solve various problems in agriculture coming from a completely different point of view than organic agriculture."

When the couple encountered various news stories alleging health risks from the crops over the past decade -- notably flawed studies that alleged harm to monarch butterflies from Bt corn -- they had each other's expertise to draw on, Adamchak said.

"What Pam had access to was the scientific papers and research that had been done on this issue -- what the most factual information was," he said. "That really helped me to gain a balanced view of how [GM] crops are functioning in the environment."

Ronald has been disappointed that the larger organic community has not responded like her husband. When the book first came out, she asked Adamchak if they would have a lot of great conversations with his peers, to which he replied, "They won't read it."

"Sadly, he's mostly been right," Ronald said.

"There's no incentive for the organic community to read it," she added. "The marketing is going really well now, and the public has a certain idea. They falsely believe that sustainable means organic and falsely believe GE seed falls outside this."

The couple would like to see a new national sustainable certification established. Such a standard would likely face opposition from both conventional and organic farming, however, they said.

"One of the problems I see with conventional agriculture as a whole is it doesn't really have a vision for sustainability at this point," Adamchak said. "If you can establish one ... that's a vision that a lot of consumers can embrace and say, 'Yes, I'm contributing to a sustainable farming system when I'm buying this food.'"

More than anything, Ronald seems to wish GM crops were placed back into the backwaters of technical, rather than political, debate. One should not get hung up on whether a crop is GM or not and "just use the most appropriate technology," she said. In some cases, like her flood-tolerant rice, it will be advanced breeding; in other cases, genetic engineering.

While they argue for rapprochement, Ronald and Adamchak have left the details for how organic methods can be applied to GM-friendly industrial models to others. Promising research is being done at Iowa State University, Adamchak said, where their chief investigator into sustainable agriculture, Matt Liebman, has experimentally tested organic-style crop rotations that could be competitive with typical industrial models.

Much more research will be need in these areas, Ronald said.

"I think it's important to remind people that most of the arable land has been farmed," Ronald said. "There is fourfold less water available per person on Earth than we had 50 years ago. These problems aren't going away."

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