Food security and global warming: Monsanto versus organic

Organic farming beats genetically engineered corn as response to rising global temperatures

Posted by Meredith Niles (Guest Contributor) at 1:57 PM on 16 Jan 2009

Read more about: agriculture | GMOs | food | organic food | sustainable ag | industrial ag | scientific research | climate change impacts | desertification

This week *Science* published research ($ub. req'd) detailing the vast, global food-security implications of warming temperatures. The colored graphics are nothing short of terrifying when you realize the blotches of red and orange covering the better part of the globe indicate significantly warmer summers in coming decades.

The implications of the article are clear -- we need to be utilizing agricultural methods and crops that can withstand the potential myriad impacts of global climate change, especially warmer temperatures. The article significantly notes, "The probability exceeds 90 percent that by the end of the century, the summer average temperature will exceed the hottest summer on record throughout the tropics and subtropics. Because these regions are home to about half of the world's population, the human consequences of global climate change could be enormous."

Whether you believe global warming is part of a "natural cycle" or a man-made phenomenon is irrelevant. The bottom line is that our earth is rapidly warming, and this is going to drastically affect our food supply. We must undertake both the enormous task of reducing our carbon emissions now to avert the worst, while at the same time adapting our society to the vast and multitudinous effects of unavoidable global climate change. Failing to do either will, as the *Science* article indicates, have dire effects on a large portion of our world's population.

Determining the best course of action for ensuring food security in the face of global climate change remains a challenging task. Recognizing that climate change is slated to affect developing countries and small-scale farmers the most is a crucial point. Such understanding enables people to realize that viable solutions must be accessible, affordable, and relevant to the billions of small-scale farmers in the developing world. Unfortunately, it appears that some of the solutions on the table fail to meet these criteria.

Last week, Monsanto made a big public relations splash by filing documents with the FDA regarding a drought-tolerant GM corn variety it is developing with a German company, BASF. Monsanto claims that in field trials, the corn got 6-10 percent higher yields in drought-prone areas last year, but the release is extremely short on details. Regardless of the reality, Monsanto is presenting the corn as a way to help improve on-farm productivity in other parts of the world, notably Africa.

Yet, absent from the media hype were the many technical and social problems with Monsanto's corn.

A little over a year ago, the Australian Centre for Plant Functional Genomics held a conference specific to drought and drought-tolerant crops. As a follow up, the Australian government's Grains Research and Development Corporation published

a piece detailing the research shared and lessons learned from the conference. One topic addressed was the potential of GM drought-tolerant varieties. In the analysis stated, "The most notable and problematic (effect) is the tendency of drought-tolerant GM lines to not perform as well under favourable conditions. This appears to be the case for CIMMYT's GM wheat and Monsanto's GM corn. The flaw is a profound one. It amounts to shifting the yield losses experienced in dry seasons onto the good years." In essence, farmers might get a small bump in yield during droughts, but will suffer yield losses when conditions are favorable. Considering that climate scientists continually point to increased erratic weather patterns as a symptom of global warming, this reality is clearly disastrous. Surely there must be better solutions that increase production under all weather conditions

One promising solution appeared in an article published in *BioScience* in 2005. The authors outlined the Rodale Institute's Farming Systems Trial, a long-term comparison of organic and conventional farming systems conducted between 1981 and 2002. Significantly, the trials found that organic production yielded equivalently to conventional systems after a transition period. Yet even more importantly, Rodale found that in drought conditions in which rainfall was 30 percent less than normal, organic systems yielded 28 to 34 percent higher than conventional systems. Rodale equates the yield gain to increased water retention as a result of higher soil organic carbon. Water volumes percolating through the various systems were 15-20 percent higher in the organic systems as compared with the conventional systems over the 12 year period.

The *BioScience* article additionally noted that the organic systems used 28 to 32 percent fewer energy inputs, retained soil carbon and soil nitrogen better, and offered a higher profitability over conventional systems. What is so significant about this research is that it demonstrates the ability of organic agriculture to both reduce greenhouse gas emissions with fewer energy inputs and withstand climate change impacts like drought with greater efficacy.

Most importantly, it offers an economical and accessible form of agriculture for billions of small-scale farmers. Scaling up agricultural development in rural areas like Africa can be accomplished with organic methods like manure, compost, and cover crops. Even the United Nations recognized the opportunity presented by organic production in a report late last year. Conventional breeding and improved seeds are also part of the solution. Between 1939 and 2005, conventional breeding contributed significantly to an almost six-fold yield-gain in corn in the U.S.

This point is crucial, since the seeds Monsanto is planning to release will be owned by the company and sold at exorbitant prices. GMO seeds cost from two to over four times as much as conventional seed varieties, and the disparity is increasing. How will small-scale farmers pay for such seeds? How will they pay for the chemicals and synthetic fertilizers necessary for such production? Shouldn't we be looking for solutions that are viable and realistic for those people who are most food insecure? Monsanto does not have the answers here, but organic methods can and should be a big part of the solution.

The future of food security in the face of warming temperatures cannot be based on a system of profits and research that fails to address the needs of food-insecure farmers. We need real solutions that will enable farmers to maintain and increase yields with those materials and techniques already available to them with little extra cost: animal manure, increased irrigation opportunities, cover crops, compost, and integrated pest-management systems. Organic agriculture will reduce, mitigate, and adapt to climate change impacts and still remain accessible and economic to the billions of subsistence farmers around the world. If we really want to fight the food crisis, let's start investing in and promoting organic production today to ensure better climate adaptation in the future.

For story: Food security and global warming: Monsanto versus organic
5 Comments | Post a Comment

Great mitigation from GM crops largely a myth

I've noticed a tendency by people that otherwise would abhor GM (genetically

modified) crops, to tout them as the near solution to future higher temperatures. News flash: you can't genetically modify a crop to withstand future predictably heat events (i.e. over 6C higher than record high temperatures), they can resist it, but unless they are heavily irrigated, they will be scorched.

The major concern I have is that most people are underestimating future heat events. I'm not talking about average summer high temperatures, I'm referring to dramatically higher temperatures for a limited time that predictably occur once in a hundred years now.

For those not familiar with the food situation in the world now, we have only a limited capacity to withstand crop failures. If, as Lovelock predicts, the average summer in Europe will be as hot as the summer of 2003, then there will be world-wide famine. It is foolish to think we can prepare GM strains that will buffer us from that sort of dramatic rise in heat events. It is a simple equation: non-irrigated crops will be damaged, resulting in dramatically lower yields (and the collapse of natural ecosystems that we use for food), and consequencially bring world-wide famine.

Finally, the result of this predictably future famine will be a death spiral of civilization, first within the third world countries, spreading into the second world countries, and finally into the first world countries because of the need to expend significant resources for consequence managment. It is sometimes underestimated what will happen when chaos is introduced into a complex system.

I only am suggesting that scientists start realizing that previously very rare heat events will become MUCH more common before mid-century, and furthermore, policymakers realize the effect of famine on world-wide civilization. Frankly, so far it has been grossly underestimated.

by dobermanmacleod at 4:34 AM on 17 Jan 2009

Get the picture

To understand what people suffer 'when chaos is introduced into a complex system' watch documentary 'No End in Sight' about the US presence in Iraq and decide for yourself if it brought democracy or a complete breakdown of all societal systems.

by Zephaniah at 11:30 AM on 17 Jan 2009

Total organic yields were lower

I hate to burst the bandwagon bubble on organic yielding more than non-organic, but this is an important topic and facts matter.

Here is my published letter from Bioscience in response to the discussed article explaining precisely why the claim that organic farming yields more don't hold up. Also not mentioned in the 2005 article or my letter (space limitations) is the fact that Rodale is comparing organic to old-fashioned chisel-tillage conventional. But modern no-till and low-till farming aided by biotech herbicide-resistant crops achieves almost as much of the soil organic matter/tilth benefits of organic (and more if organic amendments are added as well), and, thus, yields more even in drought years. Why won't Rodale compare organic to no-till? They'll lose every year, including drought years and the system yield deficit of organic would be even more stark.

Letter to Editor, BioScience Oct 2005, pg 820
http://www.bioone.org/perlserv/?request=get-document&...(2005)055%5B0820%3AOACAR%5D2.0.CO%3B2&ct=1

In the recent paper by Pimentel and colleagues, "Environmental, Energetic, and Economic Comparisons of Organic and Conventional Farming Systems" (BioScience 55: 573-582), two claims were made by the authors that warrant

closer examination.

The authors cite data from the Institute's 22-year Farming Systems Trial (FST) showing individual crop yields were "similar to those of conventional systems." However, they presented no data on total system yields.

I was able to glean wheat yield data from another paper on Rodale's FST for the years 1986-1995, during which they averaged just less than 49 bushels per acre (Hanson et al. 1997). At these yields and assuming 60 lbs per bushel, the organic wheat would yield an average of 3,302 kg/ha of grain per crop. Combined with the corn and soy yields, this gives an average of 11,906 kg/ha of total grain produced per 3-year rotation. After fifteen years, the organic legume rotation would provide 59,530 kg of grain, whereas the conventional rotation would yield 74,253 kg over the same period. Thus, the conventional system yields 25% more grain than the organic system over time. Even with organic wheat yields of 65 bushels per acre, the organic system would produce 20% less grain than the conventional system.

Most disturbing, however, were statements that the "environmental benefits of . . . less soil erosion . . . were consistently greater in the organic systems than in the conventional systems" and "crop rotations and cover cropping typical of organic agriculture reduce soil erosion . . ." Nowhere in the paper were any data provided from the FST or any other source to substantiate these claims. In fact, ongoing work by USDA-ARS researchers has demonstrated the opposite: that soil erosion potential (as measured by soil properties) is essentially equal between organic and traditional non-organic farming systems, but that both were significantly more susceptible to erosion than a non-organic no-till farming system (Green et al., 2005). That these inaccurate and completely unsubstantiated claims were allowed to be included in this paper demonstrates a critical lack of rigor in the peer review process.

References cited

Green V, Cavigelli M, Dao T, Flanagan D. 2005. Soil Physical Properties and Aggregate Associated C, N, and P in Organic and Conventional Cropping Systems. Soil Science, in press. (http://www.ars.usda.gov/research/publications/publication ...)

Hanson JC, Lichtenberg E, Peters SE. 1997. Organic versus conventional grain production in the mid-Atlantic: An economic and farming system overview. Am. J. of Alternative Agriculture 12(1): 2-9.

by Alex280 at 7:22 AM on 19 Jan 2009

USDA already compared organic and no-till

Hi Alex280, thanks for your comments and interesting additions. The link you sent did not work so I was not able to see the letter published online. With regards to comparing no-till and organic, the USDA did a study on this over a 9 year time period. It can be found at http://www.ars.usda.gov/is/pr/2007/070710.htm. It showed that organic beat conventional no-till in being able to build soil organic matter, which is crucial for retaining water and allowing plants to withstand droughts.

Meredith Niles Cool Foods Campaign Coordinator The Center for Food Safety www.coolfoodscampaign.org www.centerforfoodsafety.org

by Meredith Niles at 9:22 AM on 21 Jan 2009
[Parent]

Talking past one another

Yes, but the organic system in question is still eroding the soil, organic matter, and nutrients out of the fields and into waterways and other places. That's a problem. The Pimentel study also found that runoff was equivalent between conventional (not no-till) and organic systems.

I would like to point out that the dichotomy between Organic and Genetic Engineering is an arbitrary and false one. Read Tomorrow's Table. Who says that there can't be a GE drought-resistant variety of corn grown in an organic system? If organic growing systems are going to feed the world, there needs to be an ideological change.

by Inoculated Mind at 12:38 PM on 21 Jan 2009

You are not logged in. Thus, you cannot post a comment. If you have an account, log in. If you don't have an account, well, by all means go make one! Meet you back here in five.