The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Organic Agriculture Is Better Than Industrial Agriculture

Posted by Gail the Actuary on October 16, 2008 - 10:05am
Topic: Environment/Sustainability
Tags: agriculture, carrying capacity, farming, industrial agriculture, organic, original, yield [list all tags]

Today is **World Food Day**. To celebrate the day, we are publishing an excerpt from Aaron Newton's and Sharon Astyk's forthcoming book, *A Nation of Farmers*. We are publishing two sections from this book:

• Industrial Agriculture: Stealing from the Future

• Organic Agriculture Can Feed the World Better

A longer excerpt from the book is available on Hen and Harvest. *A Nation of Farmers* is being published by New Society Publishers, and is expected to appear in the Spring of 2009. The excerpt begins below the fold.

Industrial Agriculture: Stealing from the Future

> *Whenever people say, "We mustn't be sentimental," you can take it they are about to do something cruel. And if they add, "We must be realistic," they mean they are going to make money out of it.* —Brigid Brophy

The price of industrial agriculture is uncalculated quantities of food that future generations will not have to eat. How is this so? Well, for example, though cities grew up in good spots for trade, they also by necessity grew in areas surrounded by fertile, productive agricultural land that could support large populations. The displacement of large populations of agrarian people into cities has meant that all over the world, more and more land is transformed into city and suburb, paved over and no longer producing.

As the ability of soils to hold water decreases because of erosion and climate change, arable land becomes desert. As soils are depleted of nutrients and the price of natural-gas-based nitrogen fertilizers rises, untold people will find the cost of growing their own food in their depleted environment prohibitive. We are seeing this already.

As artificial fertilizers produce nitrous oxide and feedlot meat production warms the planet with methane, millions risk losing the sources of water that allow them to grow food. As we deplete aquifers by growing inappropriate crops in regions that cannot sustain them over the long term, we risk future hunger.

That said, however, we should not underestimate the resilience and power of local, indigenous, sustainable agriculture. For example, in *Bringing the Food Economy Home*, Helena Norberg-Hodge, Todd Merrifield and Steven Gorelick cite several World Bank and FAO papers that indicate that as recently as the mid-1990s, 2 *billion* people—35 percent of the world's population —were being fed by traditional agriculture with minimal or no fossil fuel inputs.[1]

Often these farmers do so on marginal land, because the best agricultural land in the Global South has been turned to non-food or luxury food items. Shrimp farms displace rice farms in coastal India; coffee displaces small polyculture farms or food providing forests in Latin America and Africa; flowers displace food in much of Latin America and Asia; cotton to feed our endless appetite for cheap clothing displaces food in many nations. It will be a non-trivial problem to return this land to sustainable food production, but it is possible.

These statistics, along with the others here should at least raise some significant questions in those who believe we know what the earth's proper carrying capacity is. That does not make the issue of population irrelevant, but it does mean we may have time and choices that we did not know we had. And if 2 billion people can feed themselves on the poorest available land organically and with minimal inputs, how many could do it if sustainable agriculture received the same supports commercial agriculture now does?

Vandana Shiva describes (and we will quote this at some length, because it is very important) what the Green Revolution has done in the third world, but it is important to remember that the loss of calories that occurred there also happened to us. For us, the cost came in the form of our loss of nutrition. That is, though we had more calories than we needed, we replaced nutritious foods with non-nutritious ones, to our detriment. For the poor of the world, it came as a significant loss of food value, as well as nutrition.

> Industrial agriculture has not produced more food. It has destroyed diverse sources of

food, and it has stolen food from other species to bring larger quantities of specific commodities to the market, using huge quantities of fossil fuels and water and toxic chemicals in the process.

It is often said that the so-called miracle varieties of the Green Revolution in modern industrial agriculture prevented famine because they had higher yields. However, these higher yields disappear in the context of total yields of crops on farms.

Green Revolution varieties produced more grain by diverting production away from straw. This "partitioning" was achieved through dwarfing the plants, which also enabled them to withstand high doses of chemical fertilizer. However, less straw means less fodder for cattle and less organic matter for the soil to feed the millions of soil organisms that make and rejuvenate soil.

The higher yields of wheat or maize were thus achieved by stealing food from farm animals and soil organisms. Since cattle and earthworms are our partners in food production, stealing food from them makes it impossible to maintain food production over time, and means that the partial yield increases were not sustainable. The increase of yields in wheat and maize under industrial agriculture were also achieved at the cost of yields of other foods a small farm provides. Beans, legumes, fruits and vegetables all disappeared both from farms and from the calculus of yields. More grain from two or three commodities arrived on national and international markets, but less food was eaten by farm families in the Third World.

The gain in "yields" of industrially produced crops is thus based on a theft of food from other species and the rural poor in the Third World. That is why, as more grain is produced and traded globally, more people go hungry in the Third World. Global Markets record more commodities for trading because food has been stolen from nature and the poor.[2]

This may be the most important point we can make—drawing down future food, and starving our children and grandchildren should not be an option in an agricultural system. High yields for us now and hunger for them later is not a viable choice in a growing world—period.

There is, in truth, no way to be certain what we gained and what we lost in the Green Revolution. What is virtually certain is that its gains were overstated, and that allocation of resources, whether from future generations or from poor to rich were inequitable. When someone makes the statement that grain yields rose by so much, that looks impressive. But the practical realities of that are very different. We have to ask whether those yield increases actually made it from field to the mouths of the hungry, and whether it was possible to duplicate them through any other method.

Organic Agriculture Can Feed the World Better

It's really very simple, Governor. When people are hungry they die. So spare me your politics and tell me what you need and how you're going to get it to these people. —Bob Geldof

To discover whether we can feed the world, first we need to ask whether increased yields have actually meant more available food and nutrition. In fact, this question has been answered—even the World Bank admitted in 1986 that more food does not mean less hunger. Access to food is the primary issue—if it were not, the US would have no hungry people instead of 35 million food-insecure people. Food access is the most important issue in feeding the world, as economist Amartya Sen, among other people, has discussed at length. In Donald Freebairn's analysis of more than 300 research reports on Green Revolution results, he found that 80 percent of them showed that inequity increased with the adoption of Green Revolution techniques.[3]

If the Green Revolution had responded to real material shortages of food worldwide, the environmental costs might be worth it. But it did not. As Freebairn documents, the food supply was sufficient to feed the world's population in 1950, just as it is now. Claims that Norman Borlaug and the Green Revolution saved "a billion lives" are almost certainly wildly overstated—there was sufficient food to go around before the Green Revolution, had equitable distribution been in place, just as there is now. In fact some analysts have suggested, whether rightly or wrongly, that population growth itself is a product of that growth. (That last is a subject we'll return to shortly.)

And, as we've noted, industrial agriculture actually undermines our ability to continue to feed the world, by contaminating soil, increasing global warming, depleting water stocks and promoting erosion.

Dissecting figures about hunger in *World Hunger: 12 Myths*, Lappé, Collins, et al. note that though figures at first seem to suggest that the Green Revolution made real gains in hunger reduction because total food available between 1970 and 1990 rose by 11 percent and the estimated number of hungry people fell from 942 million to 786 million, this is not really true. If you take China out of this discussion, the figures look very different. Removing China from the equation, the number of hungry people in the developing world rose from 536 to 597 million. And,

> In South America, while food supplies rose almost 8 percent, the number of hungry people also went up, by 19 percent.... In South Asia there was 9 percent more food per person by 1990, but there were also 9 percent more hungry people. The remarkable difference in China, where the number of hungry dropped from 406 million to 189 million almost begs the question: which has been more effective at reducing hunger, the Green Revolution or the Chinese Revolution?[4]

This suggests that first of all, though absolute food availability is relevant, it is not as relevant as distribution and economic justice. And because China was a comparatively late adopter of Green Revolution seeds and techniques, it also suggests that the Green Revolution itself may be less important than improved agricultural techniques that apply just as much to organic agriculture as to chemical agriculture.

It is commonplace to assume that organic agriculture yields less than conventional agriculture and that we would have to endure enormous losses in yield were we to give up chemical inputs. The yield increases of the Green Revolution are commonly articulated in isolation, without discussion of comparisons with organic yields. To determine how important the Green Revolution was, then, we need to go through the outputs of the Green Revolution and ask whether increased agricultural yields depend upon Green Revolution techniques. If, for example, agricultural yields

depended on mechanization, we would expect mechanized agriculture to consistently out-yield hand labor. If they depend upon chemical inputs, we would expect organic agriculture to be heavily out-yielded by conventional industrial agriculture. And if they depend on plant breeding, we would expect older varieties to be out-yielded by newer ones.

Are these things true? Well, not in absolute terms. That is, small farms, which generally speaking use much less mechanization, fewer inputs and are more likely to use older plant varieties and save seed than large ones, actually are more productive per acre in total output than large farms. At the extreme ends of this, we can see this disparity in Ecology Action's biointensive gardening methods, which offer yields per acre much, much higher than industrial agriculture can achieve —without fossil fuel inputs, using open-pollinated seeds.

But on a larger scale this is true as well. In *Deep Economy*, Bill McKibben argues that the 2002 Agricultural Census confirms this greater productivity of small farms using more hand labor —small farms produce more food per acre by every measure, whether calories, tons or dollars.[5] What mechanization does do is reduce the amount of human labor required. However, in a world with 6.6 billion humans and growing, human labor is a widely available resource.

It is also true that organic agriculture as a whole can consistently match yields with conventional agriculture, suggesting that we do not depend on artificial fertilizers or pesticides. In a 2007 paper, "Organic Agriculture and the Global Food Supply," the authors demonstrated that organic methods would offer a substantial net increase in yields in the Global South, while continuing comparable yields in the Global North. In a world-wide organic only policy "farms could produce between 2,641 and 4,381 calories per person per day compared to the current world equivalent of 2,786 calories per person per day."

In other studies, agronomist Jules Pretty studied 200 sustainable agricultural projects in 52 countries and observed that, per hectare, sustainable practices led to a 93 percent average increase in food production. Grain yields, as discussed in his volume Agri-Culture, had average yield increase of 73 percent over studies including 4.5 million farmers.[6]

The Rodale Institute has been running test plots of conventionally farmed corn and soybean rotations (the practice of most Midwestern farms) against organically grown plots, where soil is maintained wholly by cover crops, and another where a fodder crop is grown and fed to cows whose manures are returned to the soil. The difference in total yields between the three plots is less than 1 percent. And during drought years, the organic plots dramatically out-yielded conventional ones because of higher organic matter in the soil. The cover-crop-fed plots produced twice as many soybeans as the conventionally farmed ones.[7]

As we go into increasingly difficult times, one of the great strengths of organic agriculture is its resilience in the face of less-than-optimal conditions; when fertilizer prices spike, in drought or flooding years, organics can continue to produce successfully. In times of stress, organic agriculture tends to out-yield conventional—and what is coming is many more stressful years.[8]

Even the much touted problem of lowered yields as fields stripped by conventional agriculture are converted to organics can be overcome, as a German study found. Making the first crop a nitrogen-fixing legume can prevent an initial drop in yield.[9]

Moreover, most of those assuming that industrial agriculture must "feed the world" are assuming that a few grain exporting nations—the US, Canada, Brazil—must feed the poor world. But yields could be doubled in poor nations. Not with commercial fertilizers, already out of the reach of many

poor farmers, but organic cover crops, composting and new techniques could have dramatic results in enabling poorer nations to feed themselves and also in creating an agriculture of richer soil, higher in humus, that can withstand difficult weather. For example, in Benin in the 1990s, the government experimented with subsidizing seed for cover cropping, and found that eroding soils could be repaired with a comparatively small investment in velvet beans, which also reduced weeding. Maize production tripled, without the importation of expensive commercial fertilizers.[10]

So although, seen in isolation, the Green Revolution did increase yield of grain, organic and sustainable agriculture have kept pace and in some cases exceeded the results of Green Revolution techniques. We need not depend on chemical agriculture, mechanization or any other fossil (or eventually renewable) fueled technology to feed ourselves.

Notes

[1]Helena Norberg-Hodge, Steven Merrifield and Todd Gorelick, *Bringing the Food Economy Home*, Zed Books, 2002p. 4.
[2]Vandana Shiva, *Stolen Harvest: The Hijacking of the Global Food Supply*, South End Press, 2000, pp. 12–13.
[3]Donald Freebairn, *Did the Green Revolution Concentrate Incomes? A Quantitative Study of Research Reports*, World Development, 23 No 2, 1995, pp. 164-175.
[4]Frances Moore Lappé, Joseph Collins, Peter Rossett and Luis Esparza, *World Hunger: Twelve Myths*, Grove Press, 1998, p. 61.
[5]McKibben, Bill, *Deep Economy: The Wealth of Communities and the Durable Future*, Henry Holt, 2007, p. 67.
[6]Jules Pretty, *Agri-Culture: Reconnecting People, Land, and Nature*, Earthscan Publications, 2002, pp. 63-66.
[7]Donella Meadows, "Our Food, Our Future," *Organic Gardening*, Vol. 47 No. 5 September/October 2000, p. 54.
[8]Ibid., p. 55.
[9]Ibid., p. 56.
[10]Ibid., p. 54.