

# Soaring Food Demand, Biofuels, Organic Farming and the New Vision for Agriculture

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## ■ Introduction

Over the next 50 years, the world's farmers will face their greatest conservation challenge in history - supporting a peak population of perhaps 8 billion mostly affluent humans, and their pets, without clearing the rest of the planet's forests for low-yield crops and pasture. In addition, farmers are expected to free the world from its "addiction to fossil fuels" by producing billions of gallons of biofuels on their "spare" land. Finally, the farmers are told they should produce this abundance organically, with half the yields per acre of conventional farming. Together, these are impossible demands based on a touching faith in the past successes of farm science and technology.

## ■ Hard Choices Must Now Be Made

In the 1960s, science overcame the challenge of 1 billion starving Asians. In the process, high-tech farming saved 16 million square miles of global forests from being plowed down for low-yield crops, and earned a Nobel Peace Prize for Dr. Norman Borlaug.

Today, however, the world is at risk of losing those millions of square miles of forest and may even lose the agricultural research momentum that made that revolution possible.

- The Center for Global Food Issues estimates that the world will more than double its demand for food and feed in the next 50 years. That will put a premium on national agricultural comparative advantages: the ability of the Corn Belt to grow lots of corn per acre; of Brazil to

grow highly efficient sugarcane; and of Canada and France to grow high yields of wheat.

- Energy spent to move food and feed around the globe after harvest will turn out to be a good investment. The energy requirements for transport will be smaller than the energy required to grow low-yield crops and livestock.
- Unfortunately, due to fears of man-made global warming, world governments are now mandating that virtually unlimited amounts of biofuels be made from farm crops. This will prove to be a costly waste of the world's scarce land and water, and a trap for many farmers.
- Simultaneously, due to a backlash against science, the consumers of the First World are demanding that the world's farmers give up the high-yield farming that has saved the 16 million square miles of forest—so far—and go back to organic and “natural” (primitive) farming systems. The low yields from these farming systems will ultimately mean failure for the strategy, either due to hunger for huge numbers of people or the destruction of most of the world's remaining forest to get more cropland.

## ■ **Losing the Gains from the Green Revolution?**

World demand for food, feed, and pet food will more than double by 2050. Total human numbers will likely stabilize at less than 9 billion, but we'll have perhaps 7 billion affluent consumers. If China reaches America's pet ownership density, that will mean 500 million additional cats and dogs, none of them vegetarian. The resulting surging demand for meat and milk—which require roughly 3 times the farming resources per calorie—will hugely amplify the demand for farming resources.

The Green Revolution of the 1960s achieved a near-miraculous tripling of crop yields on much of the world's high-quality land, with its plant breeders leading the effort. Thanks to the momentum from the world's past investments in education and agricultural research, farm productivity has continued to increase significantly in the years since 1970. U.S. corn yields, for example, have increased from about 5 tons per hectare in the early 1970s to about 9 tons per hectare today. U.S. meat and milk production per hectare has doubled since 1970, thanks not only to higher crop yields but to such advances as more complete feed rations and veterinary medications. Canada's productivity has certainly followed a similar upward path.

In addition to saving a billion people from starvation, the Green Revolution produced a startling side effect: the end of the population explosion. Peasant farmers historically had large families as their only available “social security.” The Green Revolution not only allowed vastly more food to be produced on less land, but it released many rural workers to take ultimately higher-paying urban jobs. In cities, where large families are an expensive ego investment, birth rates voluntarily fall below replacement. In 1960, Third World women averaged 6.2 births. Today, their birth rate is probably about 2.8, and stability is 2.1. Worldwide, human numbers are expected to decline after 2100 (UN Population Division, 2006).

Back in 1995, the Hudson Institute invited an ecologist named Michael Huston, of the Oak Ridge National Laboratory, to address its farm policy conference. Dr. Huston had written a book titled *Biological Diversity: the Coexistence of Species on Changing Landscapes* (Huston, 1994). He summed up his advice on conservation and biodiversity very succinctly: All over the world the best farmland had little biodiversity. Instead, the good land had big populations of just a few species, such as the bison on the American Great Plains and the kangaroo on Australia’s grasslands. Meanwhile, the poorer-quality lands had most of the wild species. He told us that the object of the world’s farm policies should be to encourage the production of as much food and feed as sustainably possible on the good land, so that we could save the lands rich in biodiversity from human impact (Huston, 1995). This remains the only visible strategy to save wildlands and wild species.

## ■ The Biofuels Wild Card

The Green movement has encouraged public fears that burning fossil fuels will “overheat the planet”. Public policy in the Western countries is now gearing itself to radically reduce the production of so-called “greenhouse gases.” At the same time, the Greens are maintaining their opposition to nuclear power. No country has yet shifted heavily to the costly and erratic solar panels and windmills.

This leaves the world’s governments in the odd position of demanding that their farmers create billions of gallons of biofuels. President Bush has mandated 35 billion gallons of alternative fuels by 2017. Corn ethanol is currently the only U.S. source of such fuels. Unfortunately, when we factor in the fuel required to produce the corn, and ferment the ethanol, and the 35 percent fewer Btus in a gallon of ethanol compared to gasoline, the corn produces a net yield of only 50 gallons worth of gasoline per acre per year - against an annual gasoline demand of 134 billion gallons (Avery, D., 2006a).

Biofuels are truly a strange policy outcome for an environmental movement that was founded on protecting forests and wildlife. How many million acres of trees are we willing to clear for corn ethanol? What will happen to the soils in the Ozarks and the ecological services of the drained wetlands if we press them into crop production?

## ■ Can We Feed the World Organically?

Including pastures, about 38 percent of the earth's land area is being used for agriculture. We are farming perhaps half of the earth's land surface not covered with ice or desert. More than two-thirds of human water use is also for farming (FAO, *The State of Food and Agriculture 2003-2004*).

- We are using very little additional land to supply more than twice the world population of 1950 with much higher-quality diets - and the population gorilla has now been tamed through voluntary means.
- The much-touted downstream problems associated with nitrogen fertilizer are relatively trivial; seabed sediments show the Gulf of Mexico had a "dead zone" associated with Mississippi floods before Europeans settled the Mississippi Valley.
- Conservation tillage, using herbicides instead of plows to control the weeds, cuts soil erosion up to 95% on millions of hectares all over the planet—even as it doubles soil moisture to increase crop yields still further. Canada has made massively effective use of conservation tillage.
- Confinement feeding is protecting the world's consumers against new livestock and poultry disease mutations that historically have emerged when people, livestock and poultry lived closely together. The WHO is urging Asia's poultry indoors to prevent new global outbreaks of influenza, which could attack millions of birds (both domestic and wild) and millions of people.

Today, as the newspapers never tire of telling us, organic and "natural" foods are the fastest-growing segment of the food industry. They're fashionable, and we can afford to be silly.

There is danger in this, however - especially for the environment. The total crop yields from organic fields are little more than half as high as the yields from comparable high-yield farms. The measured yields per acre are typically 15 to 40 percent lower than from conventional farms. Organic farmers also suffer bigger losses to weeds, fungi, crop disease, and insects. The big penalty comes, however, because organic farmers refuse to use nitrogen

fertilizer. They force themselves to get their N from cattle manure or green manure crops. Both strategies require land, lots of it (Avery, A., 2006).

The high-level Bichel Committee in Denmark reported in 1999 that an all-organic farming mandate for that country would cut human food production by roughly half (Danish Environmental Protection Agency, 1998). Most Danish land would have to be put into forage crops, for feedlot cattle, so the manure could be spread thickly over the countryside to maintain soil fertility.

Vaclav Smil, author of *Enriching the Earth*, estimates that giving up industrial nitrogen taken from the air would require the manure from 5 - 7 billion additional cattle worldwide. The world simply doesn't have the extra land for organic, unless we starve billions of people, or clear the rest of the world's forests for low-yielding crops.

There has been a "smokescreen" of press coverage this summer for claims by the Catherine Badgley et al. study (2007) from the University of Michigan that the world could *increase* its farm output per acre by going organic. This ignores the fact that the world has no more than half enough animal manure needed to support current farm output if it were grown organically.

As an example of research misrepresentation, the Michigan study claimed that organic methods increased Argentine corn yields by 37 percent. The source was an Argentine farmer named Roberto Pieretti. Roberto is a friend of mine, and also the past president of the Latin American No-till Farmers Association. He and his fellow no-tillers use herbicides to kill their weeds, while planting 98 percent genetically-modified soybeans and 25 percent GM insect-resistant corn seed. Labeling these yield gains as "organic" is to make the term meaningless - or absurd.

The University of Michigan study also picked abnormally low conventional yields to make their low organic yields look better. The Badgley paper reported one study with Peruvian organic potato yields "340 percent higher than non-organic." Yet the "higher" organic potato yields reported (8,000-14,000 kg/ha) are no higher than the FAO's year-2000 average for that country (11,221 kg/ha).

The University of Michigan paper cites four separate favorable yield ratios for wheat from a long-term California research project - but failed to say that conventional yields for the corn rotation in the study averaged 52 percent higher than the organic for eight straight years!

This same California study (McGuire et al., 1998) also calls into question the Badgley et al., conclusion that organic grain producers could supply ample nitrogen without chemical fertilizers, from the lavish use of green manure

crops. In this case, growing the off-season legume cost half the ensuing corn crop.

My son, Alex Avery, has recently published a remarkable deconstruction of the organic industry titled *The Truth about Organic Foods* (Avery, A., 2006). Alex notes correctly that there is no evidence that organic food provides any consumer benefits in terms of nutrition, health, or food safety to offset its lower yields. He quotes organic believers own words, bemoaning their inability to *prove* any of the good things they *believe* about organic.

The U.S. Organic Trade Association and the British Soil Association admit that they can find no provable organic benefits. They just keep repeating the baseless claim they've been making for 80 years that the evidence is just now coming in. And an amazing number of First World people want to believe this.

## ■ Can Humanity Afford to Reject High-Tech?

The Green Revolution was led by plant science, and supported by industrial fertilizer, pesticides, and irrigation. It has been carried forward by conservation tillage, confinement feeding, veterinary medications and computer-managed feed rations. The eco-movement has opposed all of these strategies.

In America no-till farming, which cuts soil erosion by up to 95 percent, has expanded by more than 25 million hectares since biotech crops were introduced in 1996 - with all of the expansion using the genetically engineered seeds that make no-till weed control more effective. The Conservation Tillage Information Center reports that the no-till fields gain 590 pounds per acre of soil carbon, increase their earthworm numbers by 3 - 6 fold, and provide improved habitat for birds (Towery, 2002). But that's not enough to placate the eco-movement.

Sadly, the anti-biotech campaign has, thus far, been successful in blocking high yield systems in Africa, where low crop yields are a major and immediate threat to both the people and the wildlife. Only South Africa is permitting the planting of biotech crops. This in spite of the fact one of the intriguing new developments is genetically researched corn for African farmers that contains a natural tolerance for the herbicide imazapyr. This development can help suppress the endemic, parasitic witchweed that lurks in some 40 million hectares of African farmland, threatening to take half, or all, of the small farmers' crop (African Ag. Tech. Foundation, 2006).

The new corn has produced a four-fold yield gain in field trials—and an even bigger gain in African farm families' food security. Without the pressure and

misinformation from Greenpeace, African farmers could have begun suppressing the witchweed with Roundup-ready corn seed 10 years ago.

## ■ Science Backlash and the Third World as its Victims

I have a neighbor who thinks we have too much throw-away technology, eat too much food, burn too much gasoline, spray too much pesticide and otherwise conduct ourselves like resource gluttons. She may be right, but if the affluent West is denied energy and high-yield farming, so, too, will be the poor of Asia and Africa. Already the West is proposing energy taxes on imports from China and India, because they have no obligation under the Kyoto Protocol.

Everybody can think of clever ways to reduce our food and fuel consumption by 15 percent - but the Green solutions would reduce energy supplies by perhaps 75 percent and food production by more than 50 percent as we renounce nitrogen fertilizer. Those cuts in resource availability could not be overcome with today's technologies.

Green Anti-Science is already responsible for the 30 million Africans and Asians who have died of malaria in the years since Rachel Carson lied about DDT causing cancer and thinning the eggshells of birds. The First World countries used DDT to eliminate malaria from our shores, and then denied it to the Third World. Malaria by itself may be enough to explain the lack of economic growth for billions of poor people around the planet's tropic regions.

The anti-biotech propaganda doesn't cause Americans much inconvenience, but what about the tens of millions of children suffering blindness from severe Vitamin A shortages in Third World rice cultures? It could be prevented by biotech "Golden Rice," if and when it ever completes its long and uncertain approval process.

In the energy field, it's not just buying a hybrid car. It's about the energy for the lights in the hospital, and the "clean room" that produces the computers. It's about powering the fertilizer factories without which we could not retain the forests in the face of global famines.

Massive changes must be made in the world's farm policies, or humanity will soon be undergoing the agricultural equivalent of California's "rolling blackouts."

- Food price inflation will begin robbing the world's poor of their claim on food supplies as organic mandates are forced onto production farmers around the world.

- Biofuels will begin forcing the clearing of more forests, from Indonesia's islands to the American Corn Belt. Along with the lost forests will go their ecosystems and wildlife species—to produce trivial amounts of low-grade auto fuel at ultra-high costs—without making a dent in “energy independence” for any country except Brazil.
- Soil erosion will again threaten the productivity of the fields, not just in primitive African countries but in the Ozarks and on marginal croplands throughout the planet.

## ■ Ethanol and Global Warming

A new analysis of peer-reviewed literature reveals that more than 500 scientists have published evidence refuting at least one element of current man-made global warming scares. More than 300 of the scientists found evidence that:

- a natural moderate 1,500-year climate cycle has produced nine global warmings similar to ours since the last Ice Age and/or that
- our Modern Warming is linked strongly to variations in the sun's irradiance. This data and the list of scientists make a mockery of recent claims that a scientific consensus blames humans as the primary cause of global temperature increases since 1850.

Other researchers found evidence that:

- sea levels are failing to rise importantly;
- that our storms and droughts are becoming fewer and milder with this warming as they did during previous global warmings;
- that human deaths will be reduced with warming because cold kills twice as many people as heat; and
- that corals, trees, birds, mammals, and butterflies are adapting well to the routine reality of changing climate.

Despite being published in such journals such as *Science*, *Nature* and *Geophysical Review Letters*, these scientists have gotten little media attention. Not all of these researchers would describe themselves as global warming skeptics, but the evidence in their studies is there for all to see.

We compiled the names primarily from the authors cited in the new book, *Unstoppable Global Warming: Every 1,500 Years* (Avery & Singer, 2006). The researchers represent such specialties as tree rings, sea levels, stalagmites,

lichens, fossil pollen, fossil plankton, insects, public health, Chinese history and astrophysics.

We have compelling evidence of a real-world climate cycle averaging 1470 years (plus or minus 500) running through the last million years of history. The climate cycle has above all been moderate, and the trees, bears, birds, and humans have quietly adapted.

Two thousand years of published human histories say that the warm periods were good for people, with long, stable growing seasons, fewer storms and floods, and fewer diseases. It was the harsh, unstable Dark Ages and Little Ice Age that brought bigger storms, untimely frost, widespread famine and bubonic plague. The historic evidence of the natural cycle includes the 3000-year record of Nile floods and 1st-century Roman wine production in Britain.

The physical evidence comes from oxygen isotopes, beryllium ions, tiny sea and pollen fossils, and ancient tree rings. The evidence recovered from ice cores, sea and lake sediments, cave stalagmites and glaciers has been analyzed by electron microscopes, satellites, and computers.

Based on seven species of relict trees that grew above today's tree line, Constance Millar of the U.S. Forest Service says that during the Medieval Warming temperatures on California's Whitewing Mountain must have been 3.2 degrees warmer than today.

Humans have known since the invention of the telescope that the earth's climate variations were linked to the sunspot cycle, but we had not understood how. Recent experiments have demonstrated that more or fewer cosmic rays hitting the earth create more or fewer of the low, cooling clouds that deflect solar heat back into space-amplifying small variations in the intensity of the sun.

About 70 percent of the earth's post-1850 warming came before 1940, and thus was probably not caused by human-emitted greenhouse gases. The net post-1940 warming totals only a tiny 0.2 degrees C - and there has been no warming at all during the past eight years. That's a very moderate climate crisis.

There is no evidence that human-emitted CO<sub>2</sub> has added significantly to the Modern Warming, nor that ending the use of fossil fuels will reduce our temperatures. Nevertheless, public policy in much of the world is being targeted at replacing most of our energy with either nuclear power or something we're not sure of that will be at least less erratic than solar and wind, and hopefully cheaper too.

My prediction is that the OECD countries are headed for rolling blackouts on a massive scale. I believe it will take these massive blackouts and real economic deprivation to awaken the sleeping middle classes and end the love affair our intellectual elites have been conducting with “living lean” and “the precautionary principle.”

If we are lucky, we will limit or end the flirtation with biofuels before they wreck the economy, drive food costs beyond the reach of the poor, and deforest the rest of the planet. I am not very hopeful that such limits will appear in time to prevent corn from reaching \$5 per bushel.

The Modern Warming is likely to last another 200 - 300 years. It seems unlikely to bring more than another 2 degree of warming. There are likely to be some drought impacts near the equator, but there are always drought problems near the equator; it's just that the locations change. California had two century-long droughts during the Medieval Warming, and this could happen again. The whole southern tier of U.S. States could be more drought-prone.

The crop losses involved will be offset by higher temperatures and more rainfall in Canada and Siberia. Canadian farmland will become more valuable, both because it will become more successful in competition with other cropping regions, and because of the biofuels experiment - until biofuels are shut down due to public disgust with high food prices, deforestation, and their trivial reduction in gasoline prices.

Fortunately, it is now a simple matter to ship bumper crops from Canada to San Diego, by either rail or truck. San Diego can desalinate its drinking water from the sea, and recycle its wastewater on a vast scale - if we have energy to power the processes. The adaptation will be primarily in adding roads, rails and storage facilities where they don't currently exist.

The real likelihood is for further, moderate, erratic warming, totaling perhaps another 1 degree C. There will be droughts and floods, and poor crops and good ones. People's hunger for high-quality protein will continue to flourish and their demands for farm products will more than double by 2050. People are quickly coming to realize that having the critically needed food supplies at reasonable costs is more important than adding another 1 percent to our gasoline supply at radically higher costs.

The new vision for agriculture, then, is surprisingly like the old vision for agriculture. Farmers will need to redouble their yields over the next 40 years, to preserve the planet's wildlands while feeding a peak human population of perhaps 8 billion. Farm costs will continue to be a major focus, as they always have been. We will need to work even harder to assure our increasingly

distant customers of the sustainability of our farming, and the kindness shown to our farm animals and poultry.

Farm land values will slump back to pre-biofuel levels as the governments become increasingly disillusioned about corn ethanol. Farmers will need to sell quickly, or hold for the long term. Profit from grain-based biofuels while you can, but be careful not to get caught in their collapse.

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