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# Why Biotechnology May Not Represent the Future in World Agriculture

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- U.S. environmental groups are suing to end the use of *Bacillus thuringiensis* (Bt) to provide pest resistance in genetically modified crops.
- European public opposition to genetically modified crops increased from 35 percent in 1997 to 51 percent in 1998.
- The Swiss nearly voted to ban biotechnology in food production last year (Gottfried 1998). Important members of the anti-biotechnology coalition were the national organizations representing both Lutheran and Catholic women. Modern agriculture cannot even count on what should be its core audience of homemakers.
- Virtually the only messages that reach today's urban First World<sup>1</sup> public about high-yield agriculture (biotechnology or otherwise) come from such organizations as Greenpeace and the Sierra Club. Agriculture tries to send its messages through journalists who behave as though committed to the environmentalist cause — and thus reject modern farming.

There are two major reasons why biotechnology should be the future in world agriculture: First, the world will need three times as much farm output in the middle of the 21<sup>st</sup> century as it harvests today. Agriculture has no choice but to provide fully adequate diets for the larger, more affluent human population projected for the year 2050. Parents will not let their children starve. In the 21<sup>st</sup> century, they will not even allow them to go without high-quality protein (meat, milk, and eggs). Nor will tomorrow's pet-owners accept low-quality diets for perhaps two billion additional cats, dogs, and other companion animals.

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<sup>1</sup> First World here means the developed countries of the world.

Second, humanity wants to preserve the planet's wild lands and wild species — and we cannot do that without achieving still-higher yields from our crops and livestock. We are already using 37 percent of the earth's surface for farming. We cannot preserve wild lands with a peak population of 8.5 billion affluent people unless we produce much higher yields.

Biotechnology is the largest piece of unexploited knowledge available to agriculture as we enter the 21<sup>st</sup> century. Moreover, biotechnology is already proving that it's likely to become the most powerful tool for advancing the productivity and sustainability of agriculture in all history.

Unfortunately, there is one major reason why biotechnology may not be the future in agriculture: the shortsightedness — or arrogance — of modern agriculture and agribusiness.

### IS SELF-RIGHTEOUSNESS AGRICULTURE'S FATAL MISTAKE?

Farmers and agriculturists have a deep and steadfast belief in their own righteousness because they produce food. When the public still suffered periodically from food shortages, they always seemed to concede the importance and virtue of farmers. Today, when the public has real food security for the first time, it no longer reveres farmers. Urbanites have no more sense of gratitude for food than they have for radial tires (which also save lives). They know their food comes from the supermarket. It's available 24 hours per day, seven days per week, and it can be bought for a small and declining share of income.

Farmers are unlikely to ever again get political credit for producing food anywhere this side of Russia. It's too plentiful, too cheap, and too reliable. Hence, it is taken for granted.

Farm subsidies have proven another key public affairs mistake for agriculture. First World farmers asked for subsidies, because there was "too much food," though the world never had a food surplus. Rather, it had a lot of potential customers with no money. Today, another two billion consumers are getting the money to buy — but pervasive trade barriers still prevent export farmers from supplying them. Thus, much of the First World public is still looking at piles of surplus grain and meat. (The import barriers won't be lifted as long as Europe uses export subsidies.)

Farming's final mistake was not talking to city folks. Farmers always felt a little embarrassed about being "country." And when the mass exodus to the cities began about 1946, farmers started talking to their legislators instead. The agricultural committees always listened, and then cut interesting deals with the non-farm legislators.

That worked until the environmental movement emerged — and trumped the farmers' legislative strategy by talking directly to the urban public. What they said was that modern farming was bad for the environment.

## THE ENVIRONMENTAL CAMPAIGN AGAINST MODERN FARMING

Agriculture was initially shocked at the environmental attacks. Farmers and researchers have spent decades attempting to refute what they thought were serious charges about cancer and wildlife losses. However, as the eco-activists have continued to assail modern farming, it has become clear that their charges are not based on science. (Rachel Carson was wrong about even early pesticides causing cancer [Ames and Gold 1992; Ritter 1997], and even about the famous robin deaths being caused by DDT [Klaus and Bolander 1977].) It is clear now that the eco-activists will claim anything that city folks are willing to fear.

- The eco-activists began telling city folks that pesticides cause cancer. Never mind that after 50 years of widespread pesticide use and billions of research dollars, science is still looking for the first case of cancer caused by pesticide residues.
- Wildlife groups have universally claimed that modern farming was poisoning massive amounts of wildlife with chemicals. Never mind that there is never much wildlife in the fields, nor much biodiversity on the good quality land that is generally used for farming. Nor have they given credit for the massive amounts of wildlife, which have not had to be plowed down for low-yield crops. Noble laureate Norman Borlaug has estimated that if American farmers hadn't raised their yields in recent decades, we would have had to clear all of the forest east of the Mississippi to get today's food supply. (Borlaug 1997) How many billions of birds would that have destroyed?
- Eco-activists claim that more food would simply mean more people. Never mind that births per woman in the Third World are down from 6.5 in 1960 to 2.9 today. We are clearly in the first era of human history when more food has not meant more population. Instead, more food security has encouraged smaller families because parents can feel secure that their first two children will live to support them in their old age.
- The activists claim that modern farming is destroying the soil with rampant erosion (Pimental, et al. 1999). Never mind that tripling yields on the best land cuts soil erosion per ton of food by two-thirds. Or that conservation tillage allows us to build topsoil even as we grow high-yielding crops.
- The eco-activists claim that modern seeds are destroying the world's biodiversity — displacing thousands of land race crop varieties with a few dozen modern hybrids that would eventually expose us all to crop epidemics (Tuxill 1999). Never mind that we would have long since starved or destroyed all our wild lands without the higher yields produced by modern seeds. Never mind that much of the biodiversity is already in the world's gene banks and more of it would be if we modestly increased gene bank funding. Never mind that biotechnology can use wild genes to create more biodiversity.

We can document a long list of charges made against modern agriculture by people who claim to be plaintiffs for the environment — but all their charges have proven false or misleading.

Agriculturists must now realize that they are being targeted, not because they are bad for the environment, but because modern farming 1) represents the pinnacle of success for technological abundance; and 2) the environmental movement wants the farmers' land and water. They think they would rather see more bison and prairie dogs and fewer corn plants. They think they'd prefer a farm that looks like a Currier and Ives print than the grain bins and tractors of a modern high-yield farm.

## THE NEW GLOBAL CAMPAIGN AGAINST PLANT NUTRIENTS

The latest big eco-effort is a campaign against plant nutrients keyed to water quality. A crisis is being created to renewing the Clean Water Act of 1972 with sweeping new powers. In the public mind, vital plant nutrients, such as nitrogen and phosphorus, are being turned into threats.

Hypoxia — A White House task force has been appointed to resolve the hypoxia problem in the Gulf of Mexico. The hypoxic, or low-oxygen zone, doubled after 1990 from 3,500 square miles to 7,000 square miles. Agriculture, again, is being blamed. The presumed solution is to make Midwest farmers radically cut their use of fertilizer, and to “crack down” on big livestock and poultry farms. Never mind that hypoxic zones are characteristic of rivers that drain fertile regions. Never mind that the size of the hypoxic zone in the Gulf of Mexico shrank back to 4,800 square miles in 1998, linking the size of the hypoxic zone to the Mississippi water volume, not the nitrate levels. Never mind that cutting fertilizer use in the corn belt will mean clearing tropical forest for low-yield crops somewhere else in the world.

Manure as toxic waste — For 50 years, the critics of modern farming have held up organic crops fertilized with animal manure as the global ideal. Now the same critics are saying “organic fertilizer” is “toxic waste”— if the animals are being raised in a big confinement facility. Never mind that the big confinement feeders protect the environment by collecting their wastes and using them to more-sustainably raise the yields of feed crops. Never mind that the little outdoor producers let the wastes wash into the streams. As the world triples the number of hogs in its inventory from one billion to three billion we better hope, for the sake of the environment, that the additional hogs will be raised in confinement.

Volatilized nitrogen — Recently, the activist magazines (and even main-stream *Science*) carried articles about the dangers of “too much fixed nitrogen.” They're concerned that too many crops are being fertilized, and too many meat and milk animals are producing too much manure. They say that too much fixed nitrogen might even change the global climate and our ecosystems. Certainly, some of the fixed nitrogen from agriculture is volatilized into the

atmosphere, but so far no one has found that to be much of a problem. One researcher complained that the extra nitrogen “aggravates acid rain” (Vitousek 1997). Never mind that a \$600 million federal study found that acid rain was a minor problem, confined to a few tree species, such as red spruce, in a few mountain areas lacking limestone or other buffering from the natural acidity of our rainfall. Never mind that nitrogen, from perhaps four million square miles of high-yield crops and intensive livestock, is being spread over 197 million square miles of land, water, mountain and forest around the world — where its major impact is to slightly enrich the food chain. The biggest negative impact is likely to be a slight disadvantage for wild legume plants.

Complaints about wonder wheat — When the International Maize and Wheat Improvement Center (CIMMYT) recently announced a major re-breeding of the wheat plant to raise yields by 50 percent, the initial reaction cited in *Science* was distress that this would encourage high levels of fertilizer use. CIMMYT says its new wheat varieties have yielded up to 18 tons of grain per hectare, far more than any other wheat. An Indian scientist was quoted as being dismayed that this would mean using up to 400 kilograms of fertilizer per hectare of wheat. Never mind that it takes a fixed amount of about 25 kilograms of fertilizer to grow a ton of wheat. So, it takes 400 kilograms of fertilizer to grow 18 tons of wheat why not use it on one optimal, erosion-resistant hectare of farmland rather than clear another 17 hectares of wildlife habitat. The difference is that the high-yield wheat leaves far more room for nature.

## WHY MODERN AGRICULTURE DESERVES TO WIN

High-yield farming is mankind's greatest humanitarian achievement. The whole world is getting true food security for the first time in history. People are no longer pitted against people during food shortages. Parents are no longer forced to choose between feeding themselves and feeding their children, or choosing whether girl babies will starve while boy babies live.

High-yield farming is humanity's greatest conservation achievement. Crops have saved the most — probably about 15 million square miles. Confinement livestock and poultry have saved an additional several million square miles. Food processing allows us to grow the food where the yields are highest, and transport the production to wherever the people choose to live without post-harvest losses. The total wild lands saved by the modern food system is probably close to 20 million square miles — or the total land area of the U.S., Europe, South America, and some major parts of Asia or Africa.

## BUT AGRICULTURE HASN'T TOLD ANYONE

Biotechnology in Food is Important — to Wildlife

The world is in the early phases of exploring biotechnology's potential — the “biplane stage” to draw the analogy with airplanes. But already we see enough to know that biotechnology will be enormously important to conservation.

## SAVING WILD SPECIES WITH ALUMINUM-TOLERANT CROPS

Two researchers from Mexico discovered a way to overcome the aluminum toxicity that cuts crops yields by up to 80 percent on the acid soils characteristic of the tropics (Barinaga 1997). Noting that some of the few plants that succeed on the world's acid savannas secrete citric acid from their roots, they took a gene for citric acid secretion from a bacterium and put it into tobacco and papaya plants. Presto, they had aluminum-tolerant plants. The secreted acid ties up the aluminum ions, and allows the plants to grow virtually unhindered. The Mexican researchers have since gotten the citric acid gene to work in rice plants, and hope that it can be used widely in crop species for the tropics.

Acid-soil crops have enormous potential for wildlife conservation. Acid soils make up 30 to 40 percent of the world's arable land, and about 43 percent of the arable land in the tropics. Thus far, they have been one of the major barriers to providing adequate food in the very regions that are critical to wild lands conservation — the Third World tropics. The very area where the populations are growing most rapidly, where incomes are growing most rapidly, where the food gaps are growing most rapidly — and where most of the world's biodiversity is located.

The world's good cropland typically had large wildlife populations — but only a few wild species. (Argentina's famed Pampas, for example, had virtually nothing but Pampas grass.) Most of the world's biodiversity is found in the tropical forests, the wetlands, the mountain microclimates, and other places where we shouldn't even try to farm. If the world has 30 million species (a reasonable biologist's guesstimate) then 25 to 27 million of them are probably in tropical forests. Researchers have now found more wild species in about five square miles of the Amazon rain forest than we have ever found in all of North America.

In the name of conservation, we must farm the world's good land for all it can produce — so we can leave the tropical forests and fragile lands for the wild species.

## RAISING YIELDS WITH WILD-RELATIVE GENES

Two researchers from Cornell University reasoned that more than a century of inbreeding the world's crop plants had significantly narrowed the genetic base of our crops. They also reasoned that the world's gene banks contained a large number of genes from wild relatives of our crop plants. They selected a number of genes from wild relatives of the tomato family, a crop where yields have been rising by about one percent per year. The wild-relative genes produced a 50 percent gain in yields and a 23 percent gain in solids. The same researchers selected two promising genes from wild relatives of the rice plant — a crop where no yield gains had been achieved since the Chinese pioneered hybrids

some 15 years ago. Each of the two genes produced a 17 percent gain in the highest-yielding Chinese hybrids; the genes are thought to be complementary, and capable of raising rice yield potential by 20 to 40 percent (Tanksley and McCouch 1997).

### SPEEDING PROGRESS IN PROTECTING CROP YIELDS

Recently, a research consortium announced it had succeeded in creating a genetic barrier against a new race of barley stem rust that had been advancing northward in recent years from Colombia. The new barrier was created in less than a decade. With traditional plant-breeding techniques, it might have taken several decades. With farmer-saved land race seeds, overcoming the rust might have taken centuries.

### SAVING LAND FOR NATURE WITH BIOTECHNOLOGY TREES

The world will not only demand three times as much food in the year 2040, it will demand ten times today's harvest of forest products. We could provide the increased tree production if we planted just five percent of today's wild forests in high-yield tree plantations. Such plantations are good-but-not-great wildlife habitat because they are not "fully natural" — but they could apparently take all of the logging pressures off 95 percent of the natural forests.

Trees have always been difficult to improve through crossbreeding because the time frames are so long. Biotechnology is already helping to provide the higher-yielding trees through cloning and tissue culture — which permit us to rapidly copy the fastest-growing, most pest-resistant trees in a species. When we master the tools of biotechnology more fully, we should be able to increase growth rates, drought tolerance, pest resistance and other important traits more directly, and even more effectively.

Biotechnology is also likely to permit the creation of new crops producing new products that we've never had before. I am ambivalent about new biotechnology crops, however, as I have long been ambivalent about "energy crops." I know that we can produce them, but they take land. Unless we can raise yields even more than three-fold, diverting cropland to non-food products may simply take more land from nature.

### WHY DID SWITZERLAND TRY TO OUTLAW BIOTECHNOLOGY?

This summer, Swiss activists collected more than 100,000 signatures to ban biotechnology in food production. The signatures put the question on a national referendum ballot.

The good news for agriculture is that the initiative failed, and the ban was defeated. The bad news is that the Swiss ballot initiative is probably a warning of further troubles with public acceptance of high-yield modern farming, and specifically with biotechnology in food production. The worst news is that

outspoken female scientists led the opponents of biotechnology food in Switzerland, and the coalition included both the country's largest Protestant women's group and its largest Catholic women's group. In other words, the opponents of biotechnology food in Switzerland included most of modern agriculture's core customers, the people who should be its strongest supporters.

Why did so many Swiss sign the petition? First, the Swiss signed the petition because they already have plenty of low-cost food. That describes a billion people in the world today, but it will describe three billion people in the next decade and five billion people in the decade after that. Agriculture can no longer count on consumers to feel "grateful" for their food. Second, they signed the petition because Europeans see more food as simply leading to global overpopulation. There are only seven million Swiss, but they're crowded into mountain valleys with the same traffic jams and exhaust fumes as New York and London. Third, they signed the petition to protect laboratory animals. The animal rights activists were a key element in the anti-biotechnology coalition. The fact that the Catholic and Lutheran women's groups joined the coalition probably means that First World religious groups no longer feel comfortable with the Judeo-Christian assertion that God gave man "dominion" over the other species on the planet. The Swiss petition defined laboratory animals to mean not only monkeys and lab rats, but also fruit flies and earthworms. Fourth, the Swiss signed the anti-biotechnology petition because they are genuinely nervous about the power of biotechnology. They understand that the power to manipulate genes directly goes well beyond any power scientists have ever had before. They are willing to accept the use of biotechnology in human medicine because they clearly see the benefits.

Unfortunately, agriculture has never given European consumers what they consider a valid reason for putting the power of biotechnology into the hands of big companies and big laboratories whose work they cannot even understand, let alone supervise closely.

From the public's point of view, we started the biotechnology revolution in food with bovine growth hormone for a dairy industry that already produced milk surpluses throughout the First World. Then we moved on to herbicide-resistant soybeans, and the activists said this was just to foist more chemicals onto family farmers to enrich big corporations. To this day, agriculture has never given the urban public that controls its regulatory structure an emotionally valid reason to support it.

Why did the Swiss ultimately vote for biotechnology? The two big reasons were 1) people do want biotechnology for human medical problems; and 2) the Swiss pharmaceutical industry said they'd have to move their research jobs out of the country if the ban passed. In no other country of the world would an appeal for biotechnology jobs carry the day in a public referendum. If the Swiss referendum had been a straight-up vote on whether to allow biotechnology in agriculture, agriculture would have lost big-time.

As a signpost for the future, a top manager for one of the Swiss biotechnology companies says they got a strong positive response to the argument that biotechnology can help us save more room for nature.

## WHY DO THE ACTIVISTS PUSH THE WORLD INTO MORE RISK?

The activists of the world are always unhappy, and always pushing for something different. It is the nature of activists.

In Peru, the activists demanded an end to the chlorination of drinking water because the U.S. Environmental Protection Agency (EPA) found those high levels of chlorine could cause cancer in laboratory rats. Peruvian officials took the chlorine out of the water, and the cities promptly suffered a cholera epidemic that killed 7,000 people.

I don't blame the activists. I blame the people who trusted the activists, and the people who should have represented the other side of the question. I also blame the press, which should have sought out reality.

But the world is on a trend to have more activists, in more countries. Democracy and affluence encourage activists and the free, open debate of public questions. If modern agriculture is to succeed, it must learn to succeed in an activist-rich environment.

## THE ACHILLES HEEL OF MODERN AGRICULTURE — REGULATION

The desire to preserve nature is so urgent among the world's affluent city-dwellers that the Greens haven't needed to win elections. Environmental concern is so widespread that politicians race each other to embrace key points of environmental strategy. In recent years, Wirthlin Group surveys have found that 75 percent of the public agrees with the statement: "We cannot set our environmental standards too high — regardless of cost." Even motherhood no longer gets ratings that high.

Because of the high public approval for the environment, we have an EPA with virtually no congressional oversight. The bureaucrats who work for the EPA read the newspapers, and they can interpret polling results. They assume that they can regulate "environmentally offending" industries, such as agriculture, in virtually any way they choose.

The draconian new regulations covering animal wastes in this country are a case in point. There is no evidence of a water quality problem in the country, and strong evidence that modern meat and milk production has reduced any water quality problems that may have existed in the past. There is no good reason to expect that the proposed regulations will improve our water quality or our safety in any meaningful way, though they will add billions of dollars per year to farmers' costs without helping public health. There is probably no way to stop the proposals short of suing in the federal courts. The regulators have the bit in their teeth.

## THE BETRAYAL OF MODERN JOURNALISM

It grieves me to criticize the media. I had dual majors in my undergraduate college years: agricultural economics and journalism. No one believes more fervently than I do in the importance of a free press.

Unfortunately, today's mainstream media are not living up to their professional obligations for objectivity and research. Somewhere during the Vietnam era journalists got the idea that refereeing the game of life was not as satisfying as playing on the winning team. Among the causes they adopted as their own in recent decades is the environment. They have decided to side with the Greens. (The *New York Times* is perhaps the most dramatic example of this, but the phenomenon is widespread.) Of necessity, adopting the Greens meant that journalists have disowned modern agriculture.

I have been on a first-name basis with *New York Times* Science Editor, Bill Stevens, for a decade. He cheerfully quotes me on world hunger questions — and just as cheerfully ignores the environmental benefits that I tell him are being delivered by high-yield farming.

In May 1999, we put out a press release noting that data from North Carolina showed the nitrate loading in the Black River had declined during a period when its hog population had quintupled to one of the highest levels in the U.S. A reporter called and asked whether the hog industry had sponsored the study. No, we told her, the data was from a state agency. "But that's not what my readers want to hear," she lamented. That's how far behind the public affairs curve modern agriculture currently finds itself. This is not a problem that can be dealt with by writing press releases, or by hosting community tours of farms and processing plants.

There is virtually no possibility of getting favorable messages about farming into the news and commentary columns of big-city newspapers and even less opportunity on network TV news.

## A PUBLIC AFFAIRS STRATEGY FOR MODERN AGRICULTURE — AND BIOTECHNOLOGY

On the basis of my experience over the past two decades in speaking to the environmental community, the organic community, and the urban public at-large, I would like to propose a public affairs strategy for modern agriculture. It is a long-term strategy because there are no short-term strategies with any visible success potential.

The key element of the strategy is to tell the urban public about the environmental benefits of high-yield modern farming. We can talk about reducing malnutrition for children, but we cannot leave ourselves open to Paul Ehrlich's charge that more food simply means world overpopulation.

"Saving nature" is the one public policy priority universally accepted throughout the First World today. We must talk about saving wild lands and

wild species with better seeds. We must talk about conquering soil erosion with high yields and conservation tillage. We must talk about preventing forest losses to slash-and-burn farming (which has destroyed two-thirds of the tropical forest). We must analyze every eco-activist proposal in terms of its land requirements. If they propose organic farming, we must point out the additional five million square miles of wildlife refuges that will have to be planted to clover and other green manure crops to provide adequate nitrogen sources for crops. If they want free-range chickens, we must point out that it would take wild lands equal to the State of New Jersey for the chicken pasture. If they want to reduce fertilizer usage in the Corn Belt, we must ask how many additional acres of poorer-quality land will have to be cleared in some distant country to make up for the lost yield. If they oppose free trade in farm products and farm inputs, we must ask how much tropical forest will be cleared for food self-sufficiency in Asia.

The environmental movements own organic food is also vulnerable on the grounds of consumer safety. The Centers for Disease Control has been afraid to publicize it, but their own data seem to show that people who eat organic and “natural” foods are eight times as likely to be attacked by the virulent bacteria, *E. coli* O157:H7. *Consumer Reports* wrote that free-range chickens carried three times as much salmonella contamination. The fact is that organic food is fertilized with animal manure — a major reservoir of bacterial contamination — and composting is neither careful enough nor hot enough to kill all of the dangerous organisms.

## PRESENTING AGRICULTURE’S CASE WITH ADVERTISING

How can we present our case if the journalists will not write it, and if U.S. politicians fail to support it?

My model is the advertising of the Weyerhaeuser Company, which has been telling me for decades that it’s the tree-growing company. Not the tree-cutting company, not the tree-using company, but the tree-growing company.

The American Plastics Council has largely defused the opposition to plastics with a series of radio and TV ads that simply talk about the ways plastics help us and protect us. (They even have one on food that shows a mother and son walking from the filth of medieval farmers’ market into a modern food store.) Now, David Brinkley, the most respected journalist in America today, is presenting the case for modern agriculture on U.S. network TV. Archer Daniels Midland, the big corn and soybean processor, sponsors the Brinkley ads. They are doing a fabulous job.

- Brinkley notes that farmers are still the most indispensable people.
- He shows a cute little girl in Taiwan, and points out that her mother wants her to have meat and milk in her diet so she will grow strong and vigorous. Who could oppose that?

- ADM notes that “the higher yields achieved by modern farmers are providing food — and in some cases even shelter — for families around the world.” (As they show families of deer and pheasant.)

Many of the firms with billions of dollars invested in modern agriculture are already talking to urban America. DuPont and Dow have whole rosters of consumer products and millions of dollars worth of consumer advertising. Why not wrap the whole corporate product line in the golden glow of wild land conservation? Cooperatives like Land-O-Lakes and Countrymark have consumer ad budgets too. Wild land conservation would be a winner with both their customers and their farmer members. Pioneer Hi-bred has used Merlin Olson as a corporate spokesman. Merlin played Grizzly Adams on TV. What a terrific conservation advocate he could make!

If the eco-activists want to argue with the ads, they'll have to deal with substance. And agriculture will win on substance. Plastics are winning on substance.

I know that agriculture has never in the past had to spend money on its consumer image. But agriculture in the past was winning. If they were winning today, I wouldn't be suggesting a new strategy.

Mainstream agriculture has so far been content to feel neglected, abused and sorry for itself. But this attitude is unworthy of a major, vital industry. I have high hopes that agriculture will soon realize the stakes, and its potential for success.

Alternatively, we could wait until the citizens of the world's affluent cities are finally convinced of the need for high-yield farming by their own hunger. By that time, the momentum of agricultural research would have been lost, the wild lands would have been destroyed forever, and this generation of farmers and agribusiness firms would have gone bankrupt.

It is up to agriculture.

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