

Why Biotechnology and High-Tech Agriculture Cannot Feed the World

by Andrew Kimbrell

Kenny Bruno has shown quite clearly why Monsanto's flagship products cannot, by the widest stretch of the imagination, help feed the world. In this article, Andrew Kimbrell shows why neither biotechnology in general, nor indeed high-input agriculture itself can conceivably do so.

“Guess Who's Coming to Dinner? 10 billion by 2030” proclaims the headline on Monsanto's home page. The company warns of the “growing pressures on the Earth's natural resources to feed more people.” The agribusiness giant then cautions that low-technology agriculture “will not produce sufficient crop yield increases and improvements to feed the world's burgeoning population.”

However, there is no need to despair, because, according to Monsanto, “Today's high-yield agriculture is a stunning success . . .” Further, the company asserts that “biotechnology innovations will triple crop yields without requiring any additional farmland, saving valuable rainforests and animal habitats.” Even better, the biotechnology revolution will mean “less chemical use in farming.”² The conclusion is obvious and one that will be trumpeted in an upcoming Monsanto ad campaign “Biotechnology can feed the world . . . let the harvest begin.”³

Monsanto's current commercial propaganda is steeped in numerous dangerous modern agricultural myths about hunger, food production and agriculture. Unfortunately, these myths have been, and are being, repeated so often that they are taken as true. They provide convenient cover for Monsanto and the other agribusiness and biotechnology transnationals which are themselves a major culprit in increasing world hunger. Unmasking these myths needs to be an ongoing task for those advocating sustainable agriculture.

So, let us begin by examining the four primary and interrelated myths used by Monsanto in its current ads and public information campaign.

• World hunger is caused primarily by a shortage of food with which to feed a growing population. There is no myth about hunger. It is estimated that 786 million people go hungry each day. And hunger is increasing. From

1970 to 1990, with the exception of China, the number of hungry people in the world increased by more than 11 per cent.⁴

The myth is not about hunger but rather its primary cause. Monsanto would have us believe that as the world population increases, food production just cannot keep up. The result is that hundreds of millions are hungry. Yet numerous studies and statistics refute this claim. In fact, even as world hunger has increased since 1970, so has the food production per capita. In South America the number of those hungry went up by 19 per cent. Yet per capita food supplies rose almost 8 per cent. In south Asia hunger and food per capita both increased by 9 per cent.⁵

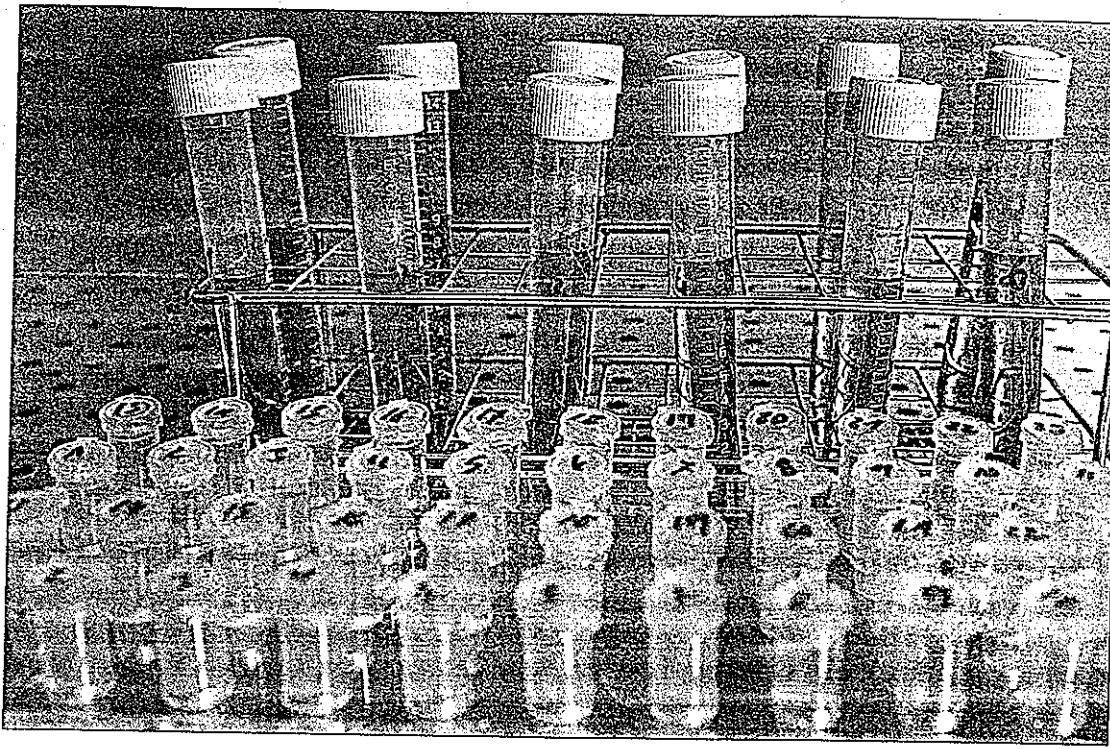
These statistics and numerous others indicate that population growth has not been, at least so far, the primary cause of the increase in hunger since 1970. Total food theoretically available for each person has actually increased significantly. What then is the primary cause of world hunger? The basic cause is food dependence. The industrial system has, over centuries, in virtually every area of the globe, “enclosed” peasants off the land so that the land can be used for export crops. The

profits gained from these exports is the essential “primitive accumulation of capital” required for industrial development in any society. The result of enclosure has been, and continues to be, that untold millions of peasants lose their land, community, traditions and most directly their food independence. Removed from their land, they

then flock to the newly industrialized cities where they quickly become a class of urban poor competing for low-paying jobs in the urban industrial setting. Those that stay on the land generally attempt to survive by low-paying farm work on the large newly industrialised farms. Currently, more than half a billion rural people in the Third World are landless, or do not have sufficient land to grow their own food.⁶

After enclosure, both the urban and rural poor are com-

Monsanto's current commercial propaganda is steeped in numerous dangerous modern agricultural myths about hunger, food production and agriculture. These myths have been repeated so often that they are now taken as true.



THOMAS RAUPACH/GENETIC RESEARCH, GERMANY

After enclosure, both the urban and rural poor are completely food-dependent. Their access to food is solely by purchase and should they lose that purchasing power they starve. Increasing agricultural output has little effect on the hungry because it fails to address the key issues of access to land and purchasing power which are at the root of hunger. As summarized in an upcoming Food First Report, "If you don't have land on which to grow food or the money to buy it, you go hungry no matter how dramatically technology pushes up food production."

• Larger, technology-intensive farms are more efficient for food production.

The myth that bigger, technology-oriented farms are better is a corollary of the myth that food output is the solution to hunger. To address world hunger, we need more output, therefore we need larger farms and more advanced technology.

The most immediate effect of this drive towards larger, more technology-intensive farms is that it accelerates the tragic enclosure trend. In the United States since World War II the size of the average farm has more than doubled. At the same time, the number of farms has dropped by two-thirds and the number of farmers by twice that percentage.⁸ The pattern is familiar, the destruction of rural communities, the exodus to the cities of thousands of uprooted and impoverished farmers and others in the rural communities. The result: increases in unemployment, crime, food-dependency and hunger. As large-scale farms and technologies continue to proliferate in the Third World, even more dire consequences are predicted.

It is not only the size of farms which obliterates farm communities and food-independence, but also the technology applied. New technological advances replace workers in agriculture, and represent economic disaster for all but the largest farms. As one researcher investigating biotechnology notes: "The majority of farmers do not benefit from technological change: the farmer beneficiaries are largely limited to the

early adopters - usually larger operators.' They are able to expend quickly the capital to invest in the new technology. They profit even as the price per unit drops. At the same time, the price drop hampers the efforts of late adopters to remain in the changing market."⁹

Monsanto and others have acknowledged the price that technology and size exact from the farm community but insist it is the price that has to be paid for greater efficiency in food

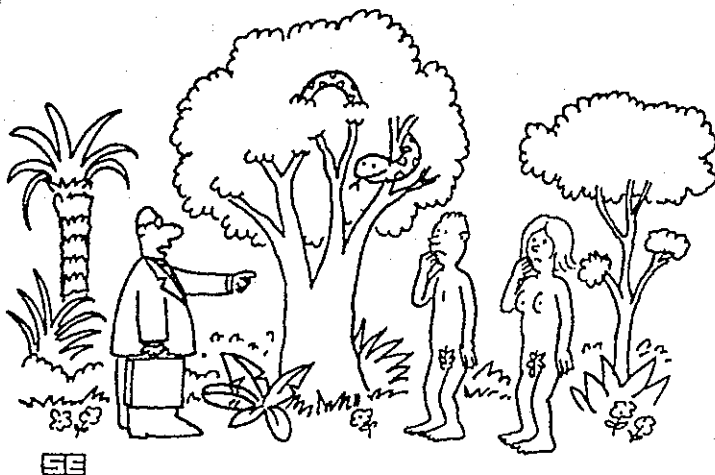
Even by conventional assessments of efficiency which exclude 'externalities' like water and air pollution, top soil and biodiversity loss, medium-sized farms are the most efficient

production. But as writer and activist Marty Strange has detailed, large farms are *not* more efficient. Her research convincingly demonstrates that even by conventional assessments of efficiency medium-sized farms are the most efficient.¹⁰ Moreover, the calculations which support even the more moderate

"economy of size" view that bigger is better are fatally flawed. Conventional efficiency analysis completely ignores the social and environmental cost of large-scale industrial farming. The costs of water and air pollution, topsoil loss, biodiversity loss are not considered. Numerous studies have shown that large farms have far greater environmental impacts than smaller farms, including up to 40 per cent more erosion - whose consequences are at present being masked by increasing application of artificial fertilizers, but which must increasingly affect farm output.

The efficiency analysis also ignores the human health costs of consuming foods contaminated with pesticides, hormones and other poisons. The dislocation, over the decades, of millions of farmers and thousands of farm communities also does not appear in the efficiency calculation. All these costs are viewed as external to farm production and termed "externalities". With these costs excluded the public is never informed of the "real" price of the food produced on large industrialized farms.

What's more, the efficiency analysis does not take into consideration the unique character of small farms. In that it is



"I'm afraid I'm patenting you"

measuring only outputs, the economy of size view ignores significant advantages that small farms have in reducing input. For example, diversification increases efficiency because it allows the more complete use of inputs, such as a variety of crops grown in different seasons. As Strange summarizes, "In agricultural economics, a bias against diversification persists, reflecting the conviction that doing one thing well on a large scale is more important than doing many things well on a small scale. It is a function of our fixation with maximums, and our indifference to optimums."¹¹

In 1989, the United States National Research Council was

asked to assess the true efficiency of large industrial farms versus alternatives. Their conclusion went exactly contrary to the "bigger is better" myth:

"Well managed alternative farming systems nearly always use less synthetic chemical pesticides, fertilizers, and antibiotics per unit of production than conventional farms. Reduced use of these inputs lowers production costs and lessens agriculture's potential for adverse environmental and health effects without decreasing — and in some cases increasing — per acre crop yields and the productivity of livestock management systems."¹²

• "Low-tech" alternatives to high-yield industrial crop production require more land to produce the same output, thus threatening wetlands, forests and other unique ecosystems.

Monsanto and other agribusiness conglomerates are seeing the birth of a powerful new competitor for consumers in the United States and Europe, organic food production. No longer a "niche" market, the organic food market soared to \$4 billion in the United States in the mid-1990s and is increasing 20 per cent each year. Over 2 million American families now buy organic, with more than 14 million searching out "natural" foods. Of even greater concern to Monsanto is the growing resistance to its corporate tactics and message in India and other Third World nations. Public outcry has forced the corporation to back down on numerous enterprises. The bigger is better myth is beginning to lose its power.

Monsanto's response has been to launch media attacks on "low-tech" agricultural alternatives. The company does so

Run-Away Industrial Technologies

Agrochemical genetic engineering (AGE) is the third generation of run-away industrial technologies. The first and second generation technologies were petrochemical and nuclear, emerging in the 1940s and 1950s, respectively. At their inception, these technologies were widely greeted as triumphs of industrial innovation with immense potential benefits for humanity. Needless to say, there was scant consideration for their possible ecological and public health implications, which as everybody knows, have proved extremely serious.

In striking contrast, and as described in this issue of *The Ecologist*, there is, even at this early stage of the era of agrochemical genetic engineering, a wealth of scientific data which more than justifies an international ban on the new technology — a ban which would in any case be justified by social and ethical considerations alone. What makes the argument for a ban even more persuasive is that serious evidence of the value of these technologies for feeding the poor and the hungry has yet to be provided.

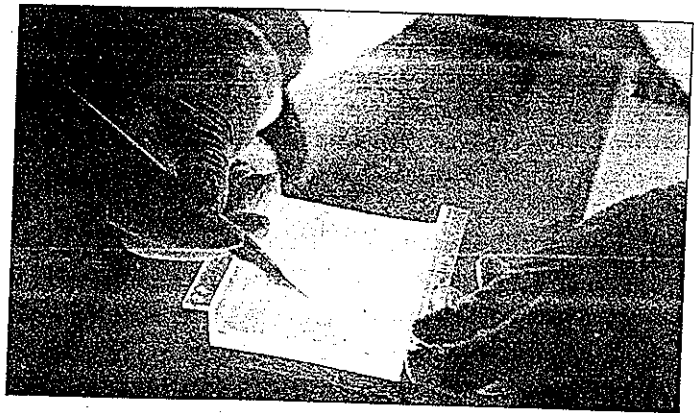
Government authorities simply cannot ignore the numerous studies in peer-reviewed scientific journals which point to the veterinary and public health hazards of rBGH milk. No serious studies have yet appeared to suggest that these hazards have been exaggerated. The biotechnology industry has of course reacted to these studies but only with biased press releases or unpublished critiques, by their indentured academic spokesmen. For this reason the scope of the AGE debate should be widened and extended to the

international public health and independent scientific communities whose contributions to this relatively new issue have, so far, with singular notable exceptions, been minimal.

At the same time, rather than look at this new technology on its own, scientists and regulatory authorities should see it as motivated by the same commercial considerations that led to the development of the nuclear industry with all its empty promises (that it would produce electricity "too cheap to meter" for instance), and which has created large-scale and largely irreversible pollution problems throughout the world. They should note also that the development of the petrochemical industry, which has made possible industrial agriculture and hence the green revolution in the third world — with its equally empty promises, was similarly motivated. As is generally known it has left a legacy of erosion, desertification and pollution, forced countless millions of small farmers off the land and into the slums and has undermined our health with its devitalized, pesticide-contaminated foods, whose consumption has made singular contribution to the growth of a number of chronic diseases, including cancer which now affects nearly one person in two.

Fortunately there is evidence that the public is becoming increasingly aware of these issues, hence the phenomenal growth in the demand for organic food — not only so as to avoid having to consume pesticide-contaminated food, but also food that has been genetically manipulated.

by Dr Samuel Epstein



MIKE SCHROEDER/GENETIC RESEARCH, GERMANY

output as their industrial, chemical-based counterparts.¹³ Additionally, the Monsanto argument fails to account for the declining yields now associated with the technological and chemical-intensive "Green Revolution" foisted on the Third World. In the Philippines, India and Nepal research is indicating significant loss in yields after they peaked in the 1980s.¹⁴ Soil degradation and a proliferation of pests, typical of large-scale monoculture farming are suspected as the culprits in the decline.¹⁵

Researchers at the Henry Wallace Institute also note that, just as industrial agriculture destroys the productivity of farmland, it also compromises other food sources. Chemical contamination and eutrophication (primarily from runoff of nitrogen and phosphorus from cropland) threaten the productivity of the marine and aquatic systems responsible for much of the world's food supplies. Sixty per cent of the world's population receive more than 40 per cent of the yearly protein from fish and seafood.¹⁶ Chemical contamination has also devastated wildlife and the very biodiversity that Monsanto now claims to want to protect.

under the guise of being environmentally conscious. Given the corporation's record on environmental issues, this stance is not credible, yet Monsanto persists. Their primary claim (which they are attempting to transform into a new myth) is that in order to "feed the world" low-tech agriculture (with its purportedly low yields) will need to massively expand the amount of land being used to grow food, which will destroy important wildlife habitat and other vital ecosystems.

Over 2 million American families now buy organic, with more than 14 million searching out "natural" foods.

• **Biotechnology will feed the world, with less chemical use less pollution and fewer resources**
Monsanto's recent ad campaigns have been almost entirely devoted to purveying the myth that biotechnology

As described above, however, numerous studies continue to indicate that alternatives to industrial, high tech agriculture are, when properly calculated, at least as efficient in producing

can feed future generations and can replace chemical agriculture. Though Monsanto built its financial success selling the world's leading herbicide Roundup and other agricultural poisons, it now purports to reject the chemical industrial model. "More Biotechnology Plants Mean Less Industrial Ones," proclaims the headline of one ad. "The world grows its food at great cost to the environment," it continues. The ad then bemoans the environmental impacts of "insecticides, fertilizers and herbicides". It concludes, "At Monsanto, we believe plant biotechnology can limit industrial and chemical impact on the earth. For instance, we have developed crops that are insect-resistant, in some cases eliminating the need to apply insecticides altogether."¹⁷

Agriculture as War
Monocultures and monopolies symbolize a masculinization of agriculture. The war mentality underlying military-industrial agriculture is evident from the names given to herbicides which destroy the economic basis of the survival of the poorest women in the rural areas of the Third World. Monsanto's herbicides are called "Roundup", "Machete", "Lasso". American Home Products which has merged with Monsanto, calls its herbicides "Pentagon", "Prowl", "Scepter", "Squadron", "Cadre", "Lightning", "Assert", "Avenge". This is the language of war, not sustainability. Sustainability is based on peace with the Earth.

Vandana Shiva

In reality of course, much of Monsanto's work in biotechnology will directly or indirectly lead to the use of more chemicals in agriculture. Most of the genetically engineered foods on which Monsanto has over a dozen patents are crops genetically engineered to be resistant to the herbicide Roundup.¹⁸ Now farmers can buy and use ever more Roundup with the resulting contamination of air, water and food. Monsanto as noted in their ad has also engineered a version of the natural pesticide Bt into a variety of food plants hoping to make them pest-resistant. This technology has not yet proven successful,

and will almost certainly have the effect of creating widespread resistance in pest populations to Bt. This would be a near-death blow to many organic farmers for whom Bt is an essential pest control tool. If Bt is lost because of increased pest-resistance, the only alternative for many farmers will be to increase the use of pesticides.

However, Monsanto has been guilty of an even more important sleight of hand in the selling of the biotech myth. Monsanto knows that most of the world's population is familiar with and concerned about chemical pollution from agriculture and industry. This is bad enough, but biological pollution is more fundamental and very much more malignant, as is evident when exotic plants, animals or other organisms are released into the environment. In the United States this type of biological pollution, including the invasion of the US by the Gypsy Moth, the Kudzu vine and the organisms responsible for Chestnut Blight and Dutch Elm Disease, has wreaked environmental havoc. Now Monsanto and others are releasing thousands of new genetically engineered microbes, plants and animals into the environment. Each of these genetically altered organisms is a potential "exotic" which could harm the environment. The long-term impact of thousands upon thousands of genetically modified organisms could well eclipse the damage that has already resulted from the wholesale release of petro-chemical products.

In the case of chemical pollution, the offending chemical

does not reproduce itself, and though it might spread, its concentrations will become increasingly dilute. Thus the damage caused by chemical pollution is most often localized and dissipates with time. With biological pollution, and hence the release of biotechnological organisms, the disturbance to the ecosystem increases and intensifies as the organisms multiply, disseminate and mutate. The problem will not remain localized, but will expand in a potentially irreversible manner. For example, if pest-resistance spreads from crops to weeds, the disease-resistant weeds will multiply and be virtually impossible to isolate and control (even with the massive and indiscriminate use of herbicides). Each release of a genetically modified organism is a form of ecological roulette which Monsanto and others are playing. The ecosystem can only be the loser. Biological pollution may well be the most urgent pollution problem of the 21st century.

Beyond the problems of biological pollution, biotechnology completes the enclosure process in agriculture. Monsanto and other transnationals are now patenting the genes, plants and animals essential for agricultural production. Monsanto has developed the ability to sterilize seeds genetically so they cannot be saved. These companies are enclosing the genetic commons of all agricultural life making all farmers and consumers even more dependent on corporate entities for their very survival.

Andrew Kimbrell is an activist attorney in Washington D.C., Founder and President of the International Centre for Technology Assessment and the Jacques Ellul Society. He is former Programme Director of the Foundation on Economic Trends. Kimbrell is author of *The Human Body Shop* (1993) among other books. He is also a board member on the International Forum of globalization.

References

1. www.monsanto.com
2. Ibid.
3. Louise Jury "Anger at Monsanto's Claim to 'Feed the World,'" *The Independent*, July 25, 1998.
4. Peter Uvin, "The State of World Hunger", in Ellen Messer and Peter Uvin (eds) *The Hunger Report: 1995* (Amsterdam: Gordon and Breach Publishers, 1996), table 1.6. For a more recent and fuller description of world hunger and the myth of the Green Revolution, see Lappé, Collins, Rosset and Esparza, *World Hunger: 12 Myths*, Second Edition, (Grove/Atlantic and Food First Books) 1998.
5. Ibid.
6. Roy L. Prosterman, Mary N. Temple and Timothy M. Hanstead (eds.), *Agrarian Reform and Grassroots Development: Ten Case Studies* (Boulder: Lynne Rienner Publishers, 1990) Introductions p.1.
7. Lappé, et al, "The Latest on the Green Revolution and Proposals for a New Green Revolution," in *World Hunger: 12 Myths*, p.3.
8. Linda M. Labao, *Locality and Inequality: Farm and Industry Structure and Socioeconomic Conditions* (Albany: State University of New York Press, 1990), table 2.1.
9. Jan Woiwoik, *The Arguments of Agriculture*, (West Lafayette, Indiana: 1989) p.88 (citing the work of Fredrick H. Buttel).
10. See Marty Strange, *Family Farming: A New Economic Vision*, (Lincoln: University of Nebraska Press, 1988), pp.78-103.
11. Ibid., p.93.
12. *Alternative Agriculture*, National Research Council, (Washington DC: National Academy Press, 1989), p.9.
13. Hewitt, Tracy Irwin, Smith, Katherin R., "Intensive Agriculture and Environmental Quality: Examining the Newest Agricultural Myth," pp. 7-9.
14. Lappé et al p.17.
15. Ibid.
16. Hewitt and Smith, op.cit. 13, p.4.
17. See www.monsanto.com
18. See, Mendelson, Joseph III, "Roundup rules the World," in this issue.

Monsanto's response has been to launch media attacks on "low-tech" agricultural alternatives. The company does so under the guise of being environmentally conscious, but given the corporation's record on environmental issues this stance is not credible.



Richmond Upon Thames College

Egerton Rd, Twickenham, TW2 7SJ
(near the Rugby roundabout)

Agenda 21

Vocational Holistic Training

(Weekends, day or evenings)

- * Ecological Building * Permaculture
- * Spirituality * Spiritual Healing
- * Sacred Geometry * Herbal Medicine
- * Organic Produce & Health * Nutrition
- * Homeopathy * Exploring Holistic Therapies
- (Health, Arts & Psyche) * Development of Ideas
- * Invention * Project Implementation
- * Franchising & Networking * Grants & Funding
- * Internet * Relationships

The Beacon (Aon) Award 1997-1998
for Adult Lifetime Learning

A gentle revolution in education

Ring 0181 607 8305/8314 for a course booklet

Why Genetically Altered Food Won't Conquer Hunger

By Peter Rosset

In the debate over genetically altered foods, proponents like Senator Richard Lugar, the Indiana Republican, argue that such products will be essential if we are to feed the world.

But this claim rests on two persistent misconceptions about hunger: first, that people are hungry because of high population density, and second, that genetic engineering is the best or only way to meet our future needs.

In fact, there is no relationship between the prevalence of hunger in a given country and its population. For every densely populated and

hungry nation like Bangladesh, there is a sparsely populated and hungry nation like Brazil.

The world today produces more food per inhabitant than ever before. Enough is available to provide 4.3 pounds to every person every day, two and a half pounds of grain, beans and nuts, about a pound of meat, milk and eggs, and another of fruits and vegetables — more than anyone could ever eat.

The real problems are poverty and inequality. Too many people are too poor to buy the food that is available or lack land on which to grow it themselves.

The second misconception is that genetic engineering is the best way to boost food production. There are two principal technologies on the market. Monsanto makes "Roundup Ready" seeds, which are engineered to withstand its herbicide, Roundup. These seeds — usually soybeans, canola or cotton — allow farmers to apply the herbicide widely. Monsanto and several other com-

To solve a problem, first define it properly.

panies also produce "Bt" seeds — usually corn, potatoes and cotton — which are engineered so that each plant produces its own insecticide.

Some researchers have shown that none of the genetically engineered seeds significantly increase the yield of crops. Indeed, in more than 8,200 field trials, the Roundup Ready seeds produced fewer bushels of soybeans than similar natural varieties, according to a study by Dr. Charles Benbrook, the former director of the Board on Agriculture at the National Academy of Sciences.

Far from being a solution to the

world's hunger problem, the rapid introduction of genetically engineered crops may actually threaten agriculture and food security.

First, widespread adoption of herbicide-resistant seeds may lead to greater use of chemicals that kill weeds. Yet, many noncrop plants are used by small farmers in the third world as supplemental food sources and as animal feed. In the United States, the Fish and Wildlife Service has found that Roundup already threatens 74 endangered plant species.

Biological pollution from genetically engineered organisms may be another problem. Monsanto is poised to acquire the rights to a genetic engineering technique that renders a crop's seeds sterile, insuring that farmers are dependent on Monsanto for new seed every year. Farming in the third world could be crippled if these genes contaminate other local crops that the poor depend on. And such genes could unintentionally sterilize other plants, according to a

study by Martha Crouch, an associate professor of biology at Indiana University. Half the world's farmers rely on their own saved seed for each year's harvest.

A true solution to the problem of hunger depends on attacking poverty and inequality among both producers and consumers of food. A food system increasingly dependent on genetically altered seeds takes us in the wrong direction. □

Note to Readers

The Op-Ed page welcomes unsolicited manuscripts. Because of the volume of submissions, however, we regret that we cannot acknowledge an article or return it. If manuscripts are accepted for publication, authors will be notified within two weeks. For further information, call (212) 556-1831.