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Perspective, part of Special Feature on Genetically Modified Organisms

Genetically Modified Crops: Risks and Promise

Gordon Conway

The Rockefeller Foundation

ABSTRACT

GM foods have the potential to provide significant benefits for developing countries. Over 800 million people are chronically undernourished, and 180 million children are severely underweight for their age. By 2020, there will be an extra two billion mouths to feed. Ecological approaches that underpin sustainable agriculture (e.g., integrated pest management) and participatory approaches that strengthen farmers' own experimentation and decision making are key. Biotechnology will be an essential partner, if yield ceilings are to be raised, if crops are to be grown without excessive reliance on pesticides, and if farmers on less favored lands are to be provided with crops that are resistant to drought and salinity, and that can use nitrogen and other nutrients more efficiently.

Over the past 10 years, in addition supporting ecological approaches, the Rockefeller Foundation has funded the training of some 400 developing-country scientists in the techniques of biotechnology. Most of the new crop varieties are the result of tissue culture and marker-aided selection. The Foundation also supports the production of genetically engineered rices, including a new rice engineered for beta carotene (the precursor of Vitamin A) in the grain.

Some specific steps can be taken by Monsanto that would improve acceptance of plant biotechnology in both the developing and the industrialized worlds: label; disavow gene protection (terminator) systems; phase out the use of antibiotic resistance markers; agree (with big seed companies) to use the plant variety protection system, rather than patents, in developing countries; establish an independently administered fellowship program to train developing-country scientists in crop biotechnology, biosafety, and intellectual property; donate useful technologies to developing countries; agree to share financial rewards from intellectual property rights on varieties such as basmati or jasmine rice with the countries of origin; and finally, develop a global public dialogue that treats developing-country participants as equal partners.

KEY WORDS: *Bacillus thuringiensis (B.t.)*, food security, genetically modified rice, GM foods, intellectual property rights, marker-aided selection, Monsanto, participatory approaches, plant biotechnology, plant variety protection, terminator technology, Vitamin A deficiency.

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STATEMENT ON PLANT BIOTECHNOLOGY

(Based on spoken remarks to the Monsanto Board of Directors)

24 June 1999, Washington, D.C.

Contact: George Soule, The Rockefeller Foundation (212) 852-8456

Thank you very much for inviting me. I am here tonight to talk about biotechnology and global food security. But first I would like to spend a moment providing some background on the Rockefeller Foundation and my own work.

The Rockefeller Foundation is a global foundation with a mandate and commitment to enrich and sustain the lives of the poor and excluded throughout the world. We want to be sure that the rapid changes in the world do not leave the most vulnerable even more disadvantaged. As part of this broader mission, over the past 15 years, we have supported advances we believe will be particularly important to the poor and excluded. For example, the Rockefeller Foundation has funded over U.S. $100 million of plant biotechnology research and has trained over 400 scientists from Asia, Africa, and Latin America. While this may not sound like much by Monsanto standards, our grantees have made significant progress. At several locations in Asia, there is now a critical mass of talent applying the new tools of biotechnology to rice improvement.

Most of the new varieties that our grantees are developing are the result of tissue culture and marker-aided selection techniques, and do not result in transgenic plants. For example, a new variety resulting from anther culture has been designated La Fen Rockefeller by one of our grantees in China; it is providing farmers with 15 – 25% yield increases in much of the area surrounding Shanghai. Scientists at the West Africa Rice Development Association have also used anther culture to facilitate the crossing of high-yielding Asian rices with the traditional African rices, which require fewer inputs. The result is a new plant type that looks like African rice during its early stages of growth (in particular, it is able to shade out weeds), but becomes more like Asian rice as it reaches maturity, resulting in higher yields.

Marker-aided selection has been used in several locations to pyramid two or more genes for resistance to the same pathogen, thereby increasing the durability of resistance. Molecular markers are also being used by a small network of our grantees in an effort to accumulate in a single variety several component traits that, in aggregate,

should result in rice plants that are highly drought tolerant.

We are also investing in the production of transgenic rice. This includes research adding new genes for insect resistance and disease resistance. Several of our grantees are now field-testing rices under containment conditions.

Much of this research on transgenics is focused on adding genes for traits that have little commercial value. In developing countries, and in Asia particularly, 180 million children suffer from Vitamin A deficiency. Each year, two million die from diseases linked to persistent Vitamin A deficiency. This is a particularly serious problem for many poor children in Asia who are weaned on rice gruel and little else. One of our grantees is modifying rice to produce beta-carotene in the grain that is converted to Vitamin A in humans. The rice grain has a light golden-yellow color and contains sufficient beta-carotene to meet Vitamin A requirements in the average Asian diet, from rice alone. The new golden rice offers an exciting opportunity to complement Vitamin A supplementation programs, particularly in rural areas that are difficult to reach. This same grantee has also added genes to rice that increase its bio-available iron content over threefold. This could help a significant portion of nearly two billion people worldwide, again mostly poor women and children who suffer from iron-deficiency anemia.

Another of our grantees, this one in Mexico, has added genes to rice, as well as maize, that help plants tolerate high concentrations of aluminum, a soil toxicity problem that constrains cereal production over vast areas of the tropics. At the University of Delhi, Indian scientists have added two genes to rice that, together, appear to help the plant tolerate prolonged submergence, a common problem in parts of Asia.

We believe these achievements hold real promise of considerable benefits for the people of the developing countries. However, use of this research, particularly by the poor and excluded, is being threatened by the mounting controversies in Europe and, to some extent, in the United States. There is a real danger that the research may be set back, particularly if field trials are banned. It is, of course, only through field trials that we can truly assess both the benefits and the risks. Field trials are also essential to adapting the innovations to local circumstances.

The potential damage resulting from the political controversies cannot be overstated. In Europe and the developing world, the contention over the use of plant biotechnology is intensifying, but science is not at the center of it. On Monday, President Clinton addressed only two issues at the end of the E.U.-U.S. summit: the war in Kosovo and the Franco-German initiative for an international panel on genetically modified (GM) foods. The lead editorial in last week's *Economist* was on the same issue. Much of the strength of the Green parties in the recent European elections was attributed to the growing opposition to GM food. There is now a real danger that research will be delayed, field trials will be stopped, and irrational restrictions will be imposed on the use of foods produced by new technology.

Much of what is being said in Europe is driven by passion. Some of it is motivated by simple anti-corporate or anti-American sentiment. But underlying some of this rhetoric are genuine concerns about the ethical consequences of biotechnology, about fear for the environment, and about the potential impact on human health.

Tonight, I would like to address four points about biotechnology in a global context and to suggest some ways to move this important dialogue forward.

1. The rush to get products to market has led to mistakes, misunderstanding, and a backlash against plant technology. Biotechnology could be one key to food security in the next century. But unless there is a conscious effort to proceed at a pace that is gradual enough to observe unforeseen effects − before they do harm, that is,− this rush may remove the opportunity to benefit from biotechnology.

2. Crop variety development systems in developing countries are poorly equipped to deal with the rapid changes that are occurring. They have depended extensively on international free exchange of germplasm, a process that has proved vital to developing countries' ability to innovate. As plant research in the industrialized world has come to be dominated by private companies that closely guard their proprietary technologies, the process of innovation in the developing countries has slowed. Public-sector plant breeders do not know how to respond, and when they try, they are handicapped by the huge disparity in resources and negotiating power between themselves and the companies.

3. The idea of using "terminator" technologies designed to prevent germination of grain as seed, thereby blocking farmers in developing countries from saving their own seed, has engendered strong opposition in most quarters. The possible consequences if farmers who are unaware of the characteristics of such seed purchase it and attempt to reuse it are certainly negative and may outweigh any social benefits in protecting innovation. In any case, there is widespread negative public reaction to encouraging poor farmers to use such technology.

4. There is a great deal of talking going on, much of it very emotional and acrimonious. Yet, there is very little accountability or transparency in these discussions. The dialogue needs to be better informed, better structured, and more inclusive. There may be an opportunity to help create a public space for conversation, to turn down the decibel level and increase the amount of real information and exchange that could lead to a more positive outcome.

Based on these four points, I will suggest some things that could be done immediately to improve the situation. Before I address any of these issues, let me talk briefly about the very broad global context.

FOOD SECURITY IN A GLOBALIZED WORLD

We − Monsanto, others in the biotechnology industry, the Rockefeller Foundation, the poor and excluded − are all part of an evolving global system that has not yet adopted what Nobel Laureate Amartya Sen called a "balanced set of ground rules" to ensure that everyone in the world can have the possibility of improving their lives and livelihoods.

At The Rockefeller Foundation, we know that globalization cannot be turned back. But we also know that if we cannot figure out a way for this worldwide system to work for everyone, over the long run it will not work for any of us. In the words of former President Jimmy Carter, "There can be no peace until people have enough to eat ... Hungry people are not peaceful people." There cannot be a stable future in which at least a third of the world's population lives on the knife edge of starvation while the rest of us become more and more prosperous. It simply will not work.

Peace and morality aside, our inextricably intertwined global economy needs the poorest to become active participants in the marketplace. They are the drivers of growth for the future.

Against this background of starkly contrasted poverty and privilege comes the promise of new technology that may help to assure food security. Last month, my book *The Doubly Green Revolution* was published in the United States. Its subtitle is *Food for All in the 21st Century.* I begin the book by laying out the current state of affairs. Despite the success of the Green Revolution in keeping food production abreast of population growth, there are over 800 million people in the world today who are chronically undernourished, and 180 million children who are severely underweight for their age. 400 million women of childbearing age suffer from iron deficiency, and the anemia that it causes results in infant and maternal mortality.

In addition to this challenge, we will have an extra 2 billion mouths to feed by the year 2020. Various econometric models predict that market supply will meet market demand by 2020. Yet, there could still be nearly a billion people who lie outside the market and are chronically undernourished. The models also assume continuation of past production trends. This assumption is open to question. In those regions that have benefited from the Green Revolution, the yield growth of cereals is slowing. There are multiple causes, but the most significant are the achievement of yield ceilings in the most favored lands, and widespread and growing environmental degradation.

I believe the answer lies in what I have termed a Doubly Green Revolution, one that is as successful, in productivity terms, as the old Green Revolution, yet is environmentally friendly and equitable. This is a daunting challenge that is commonly underestimated. However, I contend that it can be met. Part of the answer lies in using ecological approaches, such as integrated pest management, that underpin sustainable agriculture. Another key ingredient is the development of participatory approaches that strengthen farmers' own experimentation and

decision making. But these alone will not be enough. Biotechnology is going to be an essential partner, if yield ceilings are to be raised, if crops are to be grown without excessive reliance on pesticides and herbicides, and if farmers on less favored lands are to be provided with crops that are resistant to drought and salinity, and that can make more efficient use of nitrogen and other nutrients.

Technology can help, but it cannot provide all of the answers. Ending hunger and vulnerability requires a set of political decisions. Amartya Sen points out that famines occur despite a surplus of food in the world as a whole, and often despite spare food in the countries that are worst afflicted. His research shows that, in times of famine, the hungriest areas are sometimes still exporting food. Technology will provide some of the solutions, but political decisions will also affect how technology is used and who will benefit from its use.

Trying to ensure a future that includes the poor and excluded is not only a huge job, it is, you may say, not Monsanto′s job. Monsanto′s job is to provide a decent return to your shareholders by running a sustainable, innovative, and responsible enterprise. But the future of the poor and excluded is an important part of the context in which you do your job. We all need to take it on as a shared goal, a shared problem. It is a problem requiring collective action and decision making, without a clear process, without clearly defined interests, without a model of how to do it, and without any one entity in charge. We must all play our part.

AMPLIFYING THE RISKS: THE RUSH TO MARKET

The real risk-benefit analysis about plant biotechnology will take place throughout the developing world among the poorest people, often living on these less favored lands, because it is in these circumstances that the need is urgent and the options are few. This risk-benefit analysis inevitably takes place against a generalized mistrust of the privileged and a much more specific mistrust of Monsanto and other large multinationals. Had there been a slower introduction of this technology, with more commitment to the Precautionary Principle, which suggests a pace moderate enough to measure unforeseen effects and to measure carefully enough to detect those effects before they do harm, there would have been far better public acceptance.

Tonight, I would like to divide the perceived dangers from plant biotechnology into three different areas: risks to the environment, risks to human health and individual farmers, and threats to the viability and sustainability of the food system. When thinking about these three areas, we should be guided by the gradual pace suggested by the Precautionary Principle.

Let me look first at the environment. "Why all the furor?" ask many in the biotechnology industry. Those in favor of the genetic modification of plants often argue that the GM technology differs little from traditional plant-breeding techniques. Humans have been "engineering" crops for thousands of years by breeding plants to develop hybrids with desired traits, so the argument goes. Most of today′s food crops, GM or not, are quite different from their ancestors. Some proponents of genetic modification argue that the new technology simply speeds up this process, and that it is only slightly different from traditional plant-breeding techniques.

Others point out that the new genes added to GM crops might escape via pollen to nearby weeds or other plants, and that the sudden changes would significantly disrupt the environment. This is a legitimate concern. For example, a group of scientists advising the Rockefeller Foundation's rice biotechnology program concluded in 1993 that the likelihood of gene transfer from cultivated rice to weedy relatives that exist in Asia is of sufficient magnitude that, over the long term, some gene transfer probably will occur among closely related species. They recommended that field-test facilities be designed with an extra degree of caution, and be located at considerable distances from any wild relatives.

Of equal importance, these scientists agree that the potential of each gene construct added to rice to disrupt the environment, if transferred to a wild relative, must be assessed on a case-by-case basis. Special attention should be given to gene constructs that could increase the weediness of wild relatives by conferring a competitive advantage through enhanced fitness or greater reproductive capacity. For a gene conferring herbicide resistance, the consequences of gene escape are relatively obvious, i.e., loss of an effective herbicide. Even with something as obviously beneficial as adding genes that confer beta-carotene production in rice grain, we need to seriously examine what the consequences will be, if any, when those genes are transferred via pollen to a wild relative. The

risks may be much higher in developing countries, where cultivated land is often far more mixed with uncultivated land. Here again, the Precautionary Principle: when any GM crop is grown in its region of origin, or where related plants occur, gene transfer to wild relatives via pollen is possible, caution is needed, and the consequences of gene escape need to be considered in the benefit-risk assessment.

A further area of concern has to do with plants that are modified to contain genes from viral pathogens of crops that might exchange these genes with other viral pathogens, creating entirely new viral strains with unknown properties. An epidemic of African Cassava Mosaic Virus currently devastating the cassava crop in East Africa has been shown to be the result of natural recombination. Researchers need to make sure that viral genes added to a plant to confer resistance do not also lead to the creation of new viruses. Researchers are designing strategies for reducing such risk. Until the mechanisms involved are better understood, this type of transgenic crop needs to be used cautiously and monitored closely.

Use of genes from the bacterium *Bacillus thuringiensis* (*B.t.*) to produce a natural insecticide in plants is another example of the need for careful monitoring. Crops containing *B.t.* toxin genes were among the first transgenics to be commercialized, and have already demonstrated their effectiveness in controlling insect pests and reducing pesticide use. However, insects are notorious for evolving the ability to overcome such genes. A strategy is needed to prolong the usefulness of this valuable biological resource, which is also used by organic farmers in its natural form.

I was pleased to see that the major corporations deploying *B.t.*-corn in the United States have responsibly acknowledged, and begun to mitigate, risks by joining forces with the National Corn Growers Association to develop a uniform plan designed to keep insects from evolving tolerance to *B.t.* toxin. The strategy employs refuges of non-*B.t.* corn and is based on the assumption that insect tolerance of *B.t.* toxin would be a recessive trait. In theory, susceptible insects from the non-*B.t.* refuges would mate with any tolerant mutant that might arise, producing only susceptible progeny.

Researchers working with rice are recommending a second strategy in addition to refuges. It would employ two or more toxin genes, each with a different molecular target in the insect. In theory, if the insect evolves tolerance to one toxin, it should still be killed by the other. All of these strategies are designed to prolong the usefulness of *B.t.* genes, but experience indicates the continued need to be prepared for their eventual breakdown, which means continued monitoring of insect populations. Also needed is closer monitoring of the impact of *B.t.* crops on nontarget insects, particularly beneficial insects such as those that keep other pests in check and contribute to integrated pest management.

I use these examples because they highlight the danger of simple answers. To deal with concerns like these, we must be seen to be placing prevention now ahead of possible cure later.

Let me now turn to the effects on human health. Some worry that GM crops may render some common antibiotics useless. These fears focus on the risk of transplanted genes that could produce antibiotic resistance because they add no value to the end product, but simply facilitate the process of genetic engineering by enabling an antibiotic to be used to kill all plant cells that have not been genetically transformed. Some European countries have already denied commercialization of GM crops containing antibiotic resistance genes. A E.U. Committee has recommended doing the same across the Union. Persevering with use of antibiotics as triggers creates a set of concerns that easily could be avoided.

The question of allergic reactions to new proteins is more theoretical. It comes, of course, from transplanted genes producing proteins in the plants, which may cause allergic reactions in people eating the food. There is a lot of rhetoric about allergies, but there appears to be a real rise in the number of allergic reactions in industrialized countries. The extent and the etiology are the subject of heated debate amongst specialists. Is it possible that new plant varieties could create new allergies or exacerbate existing ones? Of course.

There are more far-fetched fears that have less scientific basis. There does not seem to be evidence of damage to the immune system, or of cancer caused by GM foods, but you will not be able to cope with these fears by saying you see no evidence of harm. Remember, this is what the British government said about eating meat from BSE-infected cows, and what the Belgian government said, until a few weeks ago, about animal feedstuffs containing petrochemicals.

There must be a new culture, with appropriate systems and ongoing institutional support, that provides careful monitoring, open reporting and transparency, and a place for public participation about the impact of plant biotechnology on human health. Only if you are seen to be careful, concerned, interested, and open-minded will you convince the reasonable majority that you are a partner to be trusted in looking for new ways to feed people without creating health problems that are worse than hunger.

It is true that the risk-benefit equations may be different in developing countries. Those faced with malnutrition or starvation may be less worried about the ill-defined health risks cited by American and European pressure groups. But the poor have a right to decide for themselves, and need the information and tools with which to do so. Their decisions must be based on their own analysis of their own needs and priorities. They cannot be bribed into becoming guinea pigs for the North.

GENETIC MODIFICATION AND THE SUSTAINABILITY OF THE FOOD SYSTEM

The last − and perhaps the most important − of the risks that I want to examine is the effect of GM foods on sustainability. The single biggest concern in the developing world may be that millions of poor farmers will become dependent on a dozen or so multinationals for their future livelihoods. Developing countries need to participate in the food system not only as consumers, but also as producers and innovators who can reap some of the benefits of that innovation and production to sustain their economic growth.

The most obvious cause for concern is the use of terminator technology to cause seed sterility. I do not need to explain these concerns to you. There is a temptation to think that these concerns are just a new expression of old anti-trade, anti-corporate sentiments. They are, in fact, shared by most governments of the developing world.

It is now possible for a company to take an existing variety, insert a few genes, take out a patent, and try to sell the seeds wherever they are adapted. Of course, the value of any variety is determined by the combinations of genes that determine height, leaf density, drought tolerance, disease resistance, grain type, maturation period, and so forth. The addition of one or two traits adds value, but clearly there was value in the preexisting line or variety. Without intellectual property rights on that preexisting line, any compensation to plant breeders or institutions who developed the previous variety is unlikely. All varieties are built on preexisting varieties, and as recently as 50-100 years ago, all seeds were selections by farmers of the most attractive plants in their fields. These so-called landraces underlie all plant breeding. The value of the additions is limited, but captured by the holder of the patent. Many believe this is not just.

In developing countries, most subsistence farmers save seed year after year, so the market for commercial seed is limited. Plant variety protection of the International Union for the Protection of New Varieties of Plants (UPOV) type provides adequate protection against commercial pirating of varieties in many European countries. It qualifies as an acceptable crop intellectual property system under the Trade-Related Aspects of Intellectual Property Rights (TRIPS) provision of the World Trade Organization (WTO). As a further advantage, it encourages researchers to build improvements directly on protected varieties. It should be the standard throughout the world, in the United States as well in developing countries.

Crop seeds have only recently been subject to intellectual property protection, and there is much misunderstanding of the matter in most developing countries. The aggressive pursuit of patents on varieties containing traits of special national importance, like basmati or jasmine rice, generates fear and animosity, and is seen to threaten foreign exchange earnings by Thailand and Pakistan. This is not the way to gain friends or markets.

One of the most basic issues, assumed away by the Patent and Trademark Office, is how short a sequence of DNA shall be deemed patentable. Although the Chakarbarty Supreme Court decision settled the patentability of life forms, since then, genes, promoters, terminal sequences, and even single nucleotide polymorphisms (SNPs) are being patented in ever greater numbers.

Is it in the interest of society or, indeed, of individual companies, to grant intellectual property on extremely short DNA sequences or polymorphisms? Concentrated ownership of crop-seed production capacity is beginning to generate public apprehension about what may follow from the market power inherent in such concentration.

Research on the economic impact of genetically modified crops should parallel research into the science: there must be credible, accessible work on the social and economic impact on the lives of poor farmers. We should try to apply the research that has been done on the politics of food distribution in attempting to predict the impact of GM foods on the poorest. Where changing patterns of demand and trade are caused by new technology, you should promise to use your discoveries to help those who find that their source of income has disappeared. This is a part of what I meant earlier when I said that you should commit to being an active part of the global struggle for the welfare of the poor and excluded.

SOME POSITIVE ACTIONS TO IMPROVE RESEARCH, INNOVATION, AND ACCEPTANCE IN DEVELOPING COUNTRIES

As well as committing to a broad concern for the well-being of the poorest, I think there are some specific steps that you could take today that would improve acceptance of plant biotechnology in the developing and the industrialized world. These are things that would remove many of the suspicions about abuse of intellectual property to create market domination. They would cost you very little and could allow many poor farmers and others to see your technology as much less of a threat.

Food and environmental safety (labeling)

Consumers have a right to choose whether to eat GM foods or not. There are certainly logistic problems in separating crops all the way from field to retail sale, but this technology will not be accepted unless consumers feel that they have a choice. If consumers wish to be informed whether they are eating GM foods, they have a right to know. Monsanto should come out immediately and strongly in favor of labeling.

Gene protection systems (terminator)

The agricultural seed industry must disavow use of the terminator technology to produce seed sterility. Astra Zeneca has apparently already promised to do so (in a letter to Action Aid, the British charity). You have said that you will not exploit these patents until there has been a full, independent review of the impact of the technology, but I believe you should now follow Astra Zeneca's example. The possible consequences, if farmers who are unaware of the characteristics of terminator seed purchase it and attempt to reuse it, are certainly negative and may outweigh any social benefits of protecting innovation. In any case, there is widespread negative public reaction to encouraging poor farmers to use such technology.

Antibiotic resistance

Phase out the use of antibiotic resistance markers. Alternatives exist and should be used.

Patents and plant variety protection

With little competitive loss, the big seed companies could agree to use the plant variety protection (PVP) system in developing countries in cooperation with public breeding agencies, rather than using patents to protect crops. The PVP allows farmers to save seed for their own reuse, and allows plant breeders to use them in research designed to produce further varietal improvement. Both of these provisions are prohibited by patents, but are seen to have significant public welfare advantages, certainly for developing country agriculture. Regardless of what happens in the current case before the U.S. District Court, the use of the PVP system, which prevails in most of Europe, is preferable for developing countries.

Biotechnology and intellectual property rights capacity in developing countries

To meet the overwhelming need in the developing countries for training to build national capacity in the science and management of biotechnology, intellectual property rights, biosafety, and international negotiations, companies should establish a fellowship program for training developing-country scientists in crop biotechnology, intellectual property, and international negotiations. Participating companies should contribute to a fellowship fund administered by a neutral fellowship agency, something like the Fullbright program. The capacity of governments or the science sectors of many developing countries to understand, deploy, and negotiate regarding biotechnology is quite limited. They simply have very few people with the education and experience required to understand these matters.

All transgenic plants will require extensive greenhouse and field testing before they are released to farmers. The Rockefeller Foundation has invested significant sums in helping developing countries put in place the biosafety regulations and facilities necessary for such testing, but much more needs to be done. I cannot help but think that governments and the public in developing countries will be more receptive to this technology if they know that their own scientists thoroughly understand it, have the ability to use it, and have in place biosafety protocols designed to minimize risks. If Monsanto and others in the industry would also help to finance establishment of effective national biosafety protocols and facilities, I think it would go a long way toward truly reducing risks and encouraging acceptance of the technology.

Biotechnology tools and techniques

To speed the development of biotechnology capacity in developing countries, companies that have intellectual property rights over certain techniques or materials might agree to license these for use in developing countries at no cost. The agrobactrium transformation system is one possible candidate for such treatment. Another candidate might be all of the privately held genomic data about a key crop species in which mamy genomic data are already in the public domain, say rice. Making these key tools available, not just for research, but for commercial applications in developing countries, might give a boost to scientists in developing countries.

Intellectual property and developing world resources

Another set of actions would relieve apprehension in developing countries over what they perceive as unreasonable intellectual property rights claims on crop varieties or crop traits of distinct national origin, such as South Asian basmati rice or Thailand's jasmine rice. The U.S. patent on "Basmati rice lines and grains" specifically claims the invention of "novel rice lines with plants that are semi-dwarf in stature, substantially photoperiod insensitive and high yielding, and that produce rice grains having characteristics similar or superior to those of good quality basmati rice grains produced in India and Pakistan." An agreement to share financial rewards from such inventions, or to grant free licenses to use such lines in breeding programs in the country of origin of the trait, might gain the appreciation of developing-country researchers. One might also foresee the possibility of legal actions in the United States and Europe against companies that claim intellectual property rights on such traditional crop traits.

A NEW WAY OF TALKING AND REACHING DECISIONS

These three areas of concern that I outlined earlier are legitimate, and you will not overcome them in Africa, Asia, and Latin America by issuing statements reassuring poor people that you are committed to feeding them and caring for their environments. It would be better to treat them as equal partners in a dialogue. Acknowledge that you are concerned about returns on investment, market penetration, continued growth, and other commercial issues. Admit that you do not have all the answers, but set out those that you do have and commit to prompt, full, and honest sharing of data as you get them. This is not the time for a new issues management program or a new offensive by a PR agency. It is time for a new relationship based on honesty, full disclosure, and a very uncertain shared future.

I believe that we urgently need to generate a global public dialogue that will involve everyone on an equal footing: the seed companies, consumer groups, environmental groups, independent scientists, and representatives of

governments, particularly from the developing nations. Its purpose will be to put science back at the center of a discussion of risks and benefits.

The road back will be slow. The public feels excluded from this discussion and from this process. The nature of debate is that views that have been ignored or even suppressed will be expressed forcefully. Many of those opposing plant biotechnology have their own agendas and will not be convinced, whatever the proof. But it is worth trying to convince the reasonable majority. The benefits are important and are most important to those who often have trouble in being heard: the ordinary people of the developing world.

I would not wish to propose the form of this discussion: it should evolve as the various potential partners come together. But, it seems to me, it should have the following elements:

1. A list of all the possible areas of risk and of benefit, and an attempt to prioritize them.
2. The creation of a range of fora for discussion, including the use of the Internet.
3. A truly impartial public education effort, based on the global list of risks and benefits.
4. Concessions on the part of Monsanto.
5. Full disclosure and transparency.
6. Respect for the process.

The starting point is a new kind of honest discussion involving all kinds of stakeholders, especially those in low-resource countries.

CONCLUSION

Thank you for hearing me out. If I may steal some marketing language, the clients of the Rockefeller Foundation are the poor and excluded, those who remain untouched by the benefits of globalization. I believe that much of what you have found could be important to these clients of ours. But, if I may be blunt, Monsanto needs to speak and to act differently if this technology is to be a part of the solution to the problems faced by the most disadvantaged and the most vulnerable of our fellow human beings. My presence here is evidence of your willingness to listen.

RESPONSES TO THIS ARTICLE

Responses to this article are invited. If accepted for publication, your response will be hyperlinked to the article. To submit a comment, follow this link. To read comments already accepted, follow this link.

Address of Correspondent:
Gordon Conway
420 Fifth Avenue
New York, NY 10018 USA
Phone: 212-852-8400
president@rockfound.org
