

Genetically Modified Food Seeds: Health, Socio-economic, Environmental and Religious Aspects, An Israeli Perspective

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Abstract: Although concerns about genetically modified (GM) food seeds are serious and well-founded, the problems which these seeds raise are usually not unique to GM seeds alone. GM organisms are only one example of problematic new varieties or breeds. Large soybean and other monocultural plantations have serious environmental effects which GM seeds exacerbate. Although GM seeds may benefit large scale commercial agricultural, these, and especially “terminator” and “traitor” genes, are a threat to small farmers. People have a right to know what they are eating, so labeling should be mandatory. Bioethics, like great philosophy, must grapple with the interface between science and religion. Spiritual and religious aspects of the GMO issue cannot be ignored. The question why corporations are investing in GMO technology will be discussed briefly because there is not much to say on the subject. There are viable alternatives to GM food seeds, especially organic methods such as the Kitchen Garden Scheme.

Keywords: Agriculture, Genetically Engineered Food, GMO, Judaism, Maimonides, Science and Religion, Spiritual.

Introduction

Although concerns about genetically-modified (GM) food seeds are serious and well-founded, the problems which these seeds raise are for the most part and with some exceptions, not unique to GM seeds alone. In Section II, we shall see that genetically modified organisms are only one example of the problematic new varieties or breeds of flora and fauna. We shall then (Section III) discuss environmental effects of large

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soybean and other monocultural plantations. This will lead us to comment, in Section IV, on “terminator” and “traitor” genes. In Section V, recognizing the right of people to know what they are eating, leads to a discussion on labeling. Some of the reasons which people have for wanting to know what they eat are spiritual reasons. Indeed, just as the great philosophers, with almost no exceptions, grappled with the interface between science and religion, so bioethics cannot ignore this challenge. So, spiritual and religious considerations will be discussed in Section VI. Section VII examines why corporations are investing in GMO technology. This will be the shortest section in the paper, because there is not much to say on the subject. Section VIII will consider alternatives to GM food seeds, especially organic methods with an emphasis being laid on the *Kitchen Garden Scheme*.

Unfortunately, there is not enough space to allow an in-depth discussion of the horrible impact of huge soybean plantations. These are displacing small farmers and Native Americans in Latin America, just as small farmers, tribal people, forest dwellers and others are being displaced for the sake of ‘development’ elsewhere in the world. Although non-GM soybeans can create the same problems, GM varieties have exacerbated the tragedy. As I have learned from Mr Edward F. Thiery, whose daughter Marcela has had first hand experience in Greenpeace demonstrations, those who are working for the rights of the Native Americans are threatened with violence by soybean interests. One nun has already been murdered. I have supplied references for the reader who would like to investigate this matter.¹

Nor will there be adequate space to discuss risks to human health. These should not be ignored. The reader is referred to a WHO report expressing concern about *allergenicity*, *gene transfer* and *outcrossing*.² For a balanced discussion of other risks, the reader is referred to a paper by Watanabe and colleagues.³

Genetically-Modified Organisms as only One Example of Problematic New Varieties

Let us begin by putting the GMO controversy into context. Ethical problems concerning genetically-modified organisms are not entirely unique. They are special cases of general problems of new varieties or breeds of food crops and other organisms. These new varieties may

have been the result of traditional methods of selective breeding or interbreeding in order to bring about flora or fauna which will be tastier or more aesthetically attractive or more useful for some purpose (such as a faster racehorse, or a bee which can pollinate more efficiently) than were previously existing breeds. Or they may have been the result of genetic engineering. Or varieties may be 'new' in the sense that although they have existed for a long time, they were only recently introduced into a specific eco-system. In order to see that some main issues in the controversy over genetically modified organisms may also arise over traditionally bred organisms, let us consider two examples: the question of the nutritional value of modern foods, and the question of introducing foreign species into an ecosystem.

The Nutritional Value of Modern Foods

Just before giving a lecture on the GMO controversy, I happened to notice in a supermarket an onion the size of a muskmelon. I bought it together with the smallest onion I could find, about the size of a cherry. I showed them to the students and presented the following thought experiment. Suppose that you plant 100 onion seeds of one variety, and 100 onion seeds of another variety, in the same garden plot. We shall assume that each of the 200 seeds has available to it the same amount of water, and the same amount of the same fertilizers (it is irrelevant to the thought experiment whether the fertilizer is organic or not). All other conditions: type of soil, temperature, etc, are also equal. The only difference is that the first group of seeds produce muskmelon sized onions, and the second group produce cherry sized onions.

Assuming that at the end of the growing season (the same length of time for both groups of seeds, of course) we get 100 muskmelon-sized onions and 100 cherry sized onions, I asked the students - almost all of them microbiologists - which onions would be the most nutritious per a given weight of onion. All seemed to agree that the cherry-sized onions would be the most nutritious.

The point seems to be obvious, If you breed plants (whether through genetic modification or through traditional breeding methods) for more yield per unit of input, you can expect puffed-up plants with less nutritional value. I do not know if this can be absolutely proven scientifically. But it is not surprising that recent research has shown that modern foods are less nutritious.

A 2004 study compared: "USDA nutrient content data published in 1950 and 1999 for 13 nutrients and water in 43 garden crops, mostly vegetables". The 43 foods showed: "apparent, statistically reliable declines ($R < 1$) for 6 nutrients (protein, Ca, P, Fe, riboflavin and ascorbic acid), but no statistically reliable changes for 7 other nutrients. Declines in the medians range from 6 per cent for protein to 38 per cent for riboflavin". The authors "suggest that any real declines are generally most easily explained by changes in cultivated varieties between 1950 and 1999, in which there may be trade-offs between yield and nutrient content".⁴ A newspaper interview reports that Davis, the principal investigator in the study, 'who discussed his findings at a recent meeting of the American Association for the Advancement of Science in St. Louis, suspects the trend in agriculture toward encouraging crops that grow the fastest and biggest is a reason for the decline'. 'The tradeoff is that the faster-growing plants aren't able to acquire the nutrients that their slower-growing cousins can, either by synthesis or from the soil...'.⁵

It is perhaps debatable whether the reduced nutritional value is due to modern varieties of plants, or to chemical as opposed to organic methods of fertilization. Davis' data should really be compared to data on vegetables fertilized with compost rather than with commercial fertilizer. Although organic growers have often claimed that plants grown on compost are more nutritious than those grown on commercial fertilizer, this has not to my knowledge been proved. Davis' data should provide a good start towards designing a study for testing this claim. Until the claim is tested, however, it seems most reasonable to assume that the varieties of plants, rather than the methods of fertilization, are to blame for the reduced nutrition.

The trade-off between yield and nutrition in new varieties doesn't seem to depend upon whether the higher yield is achieved by genetic manipulation or by older methods of breeding. It would be a good idea, however, to do a similar study comparing nutritional content of GM foods with non-GM foods.

Ecological Impact of Foreign Species

Without yet touching on the question of genetically-modified organisms, we shall consider a further example of a problematic new variety. A variety can be 'new' in the sense that it never existed before.

It can also be 'new' in the sense that although it has existed in the past, it never before existed in a given ecosystem. An example is the bumblebee, *B. terrestris*, of which more than 40,000 colonies are imported into Japan from Europe each year. These bees are much more efficient pollinators than are native Japanese varieties. However, an article by Goka and colleagues points out that the introduction of *B. terrestris* into Japan may have undesirable ecological impacts of three kinds.

The first of the impacts listed by Goka and colleagues is competition for an ecological niche between introduced commercial species and native species. The second is the genetic disturbance caused by mating between introduced and native species. And the third and most serious impact is in carrying parasite invaders.⁶

I have intentionally refrained from touching on GMOs in order to bring out the point that reasons for concern about genetically-modified foods are only special cases of general concern about new varieties of organisms. If seeds, which have been bred by traditional means to produce greater yields, can also produce a loss in nutritional content, then so can seeds which have been genetically modified for greater yields. If there is reason for concern about the impact of introducing new traditionally bred foreign varieties into an ecosystem, there may also be reason for concern about the impact of introducing genetically-modified varieties into an ecosystem. The three forms of environmental impact mentioned with respect to the bumblebees are mirrored by similar causes for concern with respect to genetically-modified food seeds. This is obvious with respect to competition for ecological niches and with respect to the genetic disturbance caused by cross-pollination. And although there seems no reason to worry that GM seeds might introduce parasites, as did the foreign bumblebees, GM seeds carry other potential dangers.

Environmental Effects of Large Soybean and Other Monocultural Plantations

By 'monoculture' is meant the opposite of biodiversity in agriculture: the growing of one species of crop in a plantation, usually a large plantation. Monocultural plantations are much more susceptible to insect attack than are biodiversified plantations because there is no mixture of species to confuse the smell for predator insects. Insects that

prey on a specific species will be attracted in large numbers to feast and breed.

Monoculture, therefore, requires more pesticides than do diversified plantations. Selling the pesticides brings further profit for the corporations. Pesticides are often serious environmental pollutants. Organic farmers, on the other hand, like indigenous small farmers who learned organic methods from tradition and trial-and-error, use “companion planting” - the judicious mixture of species in the same field - to produce a situation in which one plant repels the insects which threaten its neighbour. This is one of the organic alternatives to pesticides. Companion planting can also increase production: one example is growing legumes, which increase nitrogen in the soil through a symbiotic process involving nitrogen-producing bacteria, alongside plants like maize corn which have high nitrogen needs.

Conversion of forests, savannas and jungles to large plantations results in ‘habitat loss’, which has been described as the dominant cause of the loss of biodiversity. But the biodiversity of fauna is important to human health. One way in which fauna biodiversity reduces human disease is what is called the ‘dilution effect’. Insect vectors that transmit pathogens, “only take a limited number of bites in their lifetime; when some of these bites are taken from hosts that are not competent to amplify the pathogen, these bites are wasted. This reduces the rate at which the pathogen is transmitted”.⁷

Again, we are not discussing a problem which is unique to GMOs, but a problem which GMOs have the potential to exacerbate, due to their programmed suitability to large, monocultural plantations to which biodiverse forests, jungles and savannas are sacrificed.

On the other hand, one article argues that GMOs can contribute to biodiversity. “The possibility of adapting GM crops to conditions currently marginal for farming”, the authors say, “could also be highly advantageous for biodiversity conservation”.⁸

I do not understand, however, why GMOs should be needed to grow crops in “conditions currently marginal for farming”. June and I had five years of experience in converting a multiple growth forest to

rich soil for organic vegetable gardening in New England and upstate New York. By multiple-growth, I mean forest land which was cut for timber, used for farming or pasture, allowed to return to forest, cut again for timber, and so on through many repetitions. Not much soil is left after such a history. Yet, we used such methods as composting (making fertilizer by aerobically rotting organic matter) and green and brown manuring (planting crops not for the purpose of harvest but to be plowed back into the soil, either when they are still green or after they are dry and brown, in order to add organic matter, nitrogen, and other essentials of organic gardening). Our New England garden was for personal use, while the upstate New York garden provided food to a summer camp and nature education centre. Both gardens were very successful with no GMOs.

When Jews began to return to Israel in large numbers over the past hundred or so years, they found that the Biblical Land of Milk and Honey had been turned into a desert by two thousand years of unrestrained sheep and goat grazing by nomadic tribes. The Israeli miracle of making the desert green is known all over the world. When we were in the Sinai Desert, from after the 1967 war until we gave it to Egypt in the late 1970s and early 1980s, we turned vast areas of sterile sand dunes – conditions worse than “marginal for farming” – into rich agricultural land. I participated in this for two years as a member of Kibbutz-Moshav Atzmona. Under difficult conditions we were so successful as to have the earliest melons on the European market each spring.⁹ If we had the chance, we could turn other deserts into rich, biodiverse agricultural land, with no need for GMOs.

“Terminator” and “Traitor” Genes

The problems discussed in this section are unique to GMOs.

Imagine a farmer who is not very sophisticated about biotechnology. He buys some grain which he has heard produces very high yields. Indeed, the crop is unusually successful. Like a good farmer, he and his family eat some, sell some, and save some for seed for next year. The next year, he works hard plowing, planting and fertilizing. But there is no harvest. Nothing comes up because these seeds have a ‘terminator gene’. This is a gene which ensures that although a seed

will produce a plant, and that plant will have seeds, this second generation of seeds will be sterile. The 'terminator' gene further ensures that the farmer will not be able to save seeds successfully for the next year, as farmers have done for thousands of generations, but will have to continue to buy seeds from the company.

In 2001, India banned the sale of seeds containing 'terminator' technology, and the ban was reconfirmed in 2005.¹⁰

'Traitor' genes seem worse than 'terminators', according to website reports. For example: '...Novartis explicitly claims the introduction of 'traitor' traits by the deactivation of essential, natural resistance functions of plants. By linking this deactivation to inducible promoters, patented plants can be sold that will not exhibit natural positive traits like germination and pest resistance unless exposed to a chemical. Novartis blandly calls it 'inactivation of endogenous regulation.' According to the company, the technique results in plants in which 'genes which are natively regulated can be regulated exclusively by the application to the plant of a chemical regulator.' In other words, the plants are effectively drug addicted....'¹¹

However, although these reports about 'traitor' genes seem reliable, I have not succeeded in finding information about them in peer reviewed, scientific sources. So I cannot endorse the reports. With respect, however, to 'Terminator' genes, which as we have seen are banned in India, I have been to a large number of conferences in which these genes were discussed from many scientific and ethical angles, so that the information which I have quoted seems incontestable.

Labeling

People may have various reasons for objecting to eating certain kinds of foods. The reasons may have to do with health, the environment, socio-economic issues, cruelty to animals, and spirituality.

Religious Jews refuse to eat a number of foods for spiritual reasons. These include, among others, meat or milk from animals which do not chew the cud and have a cloven foot. Hindus, for spiritual reasons, will not eat beef. Indian Ayurvedic medicine claims that beef has a bad effect on personality traits. Many Hindus abstain not only from beef

but from all animal, poultry and fish flesh. Jains are not only vegetarian, but they abstain also from roots, like potato, onion and radish. We may or may not agree with these various kinds of abstention. But surely people have a right to make their own decisions about what they don't want to eat. And for the decision to be a free one, they have a right to know what they are being offered or sold.

It seems clear that GMOs exacerbate socio-economic and environmental problems. We do not know enough yet to draw a clear conclusion as to whether they are dangerous to human health. Nor can we say for sure that they present a problem for spirituality. But surely people have a right to make their own decisions about these matters. So GM foods and seeds ought to be labeled as such.

Several years ago, I attended a seminar in Jerusalem on GM foods, conducted by Mrs Ofra Strauss, the owner of the Strauss Company, (now called Strauss-Elite) which produces cheeses, ice cream and other dairy products, as well as humus (ground chickpeas). Humus, as well as falafel (also made from chickpeas) are the Israeli national food. Mrs Strauss told us that her company will not buy milk from genetically engineered cows, or from cows which have been eating genetically engineered feed.

When I prepared a lecture last spring on GM food seeds, I decided to find out how well the Strauss Company has been able to maintain Mrs Strauss' ideals. I learned by telephone that their humus was not genetically engineered. Later, on 17th April 2006, I received an email from their representative, Yossi Kozay, saying: "Raw materials [which Strauss uses] from genetically engineered plants are usually varieties of maize corn and soy which are principally grown in North America. Most of the genetically engineered crops withstand disease better, and produce a larger harvest. We buy from the United States. So it is impossible to know if the raw material is genetically engineered or not, because there is no law about this, and no requirement of labeling.

Spiritual Considerations

It may seem incongruous to see a discussion of philosophical, religious and spiritual matters in the course of what is mainly a review of scientific and semi-scientific literature. Bioethics, however, faces to a large extent

the same kind of challenges which philosophy faced in its great days: challenges of apparent or real contradictions or tensions between science and religion.

The great philosophers, from ancient times until up to at least the beginning of the twentieth century, were almost all learned both in the science of their times and the religion of their peoples. I think this is equally true in Western and in Asian philosophy. I do not think that one can understand Ayurveda in isolation from Hinduism. Nor can one understand Plato and Aristotle without knowing something of Greek science and religion. Descartes was a mathematician, physiologist and physicist with a sound knowledge of Catholicism through his Jesuit education. Hume, although an atheist or close to being one, had a strong education in Presbyterian theology. And he knew enough Newton to attempt to base his psychology on a similar experimental method, while he grappled as well with paradoxes of infinitesimals. Bertrand Russell, mathematician, shows a serious interest in religion in his *History of Western Philosophy*. And his: *Why I am not a Christian* was not written from ignorance. This tradition of working in the interface of science and religion continued up into the first half of the twentieth century, until a new breed of philosopher, ignorant both of religion and of science and proud of it, began to take over: at least in English speaking countries. Gilbert Ryle, a deep philosopher in spite of it all, was able to decide that a study of the brain could teach nothing about the mind, without his having studied the brain.

Bioethics, which is not philosophy because it is broader than philosophy and includes philosophy as only one of its sources, includes a return to the great philosophical tradition of grappling with science and religion together.

This is appropriate especially with respect to GMOs. Where science has not yet answered our questions about whether they are good for us and the earth, and while it may never answer them, we must step outside of science and look at philosophical, social, religious and spiritual sources.

Prince Charles' critical statements on GMOs are well known (HRH, the Prince of Wales 1999). Many of his statements are quite consistent

with material which I have found in a literature search seven years after they appeared, and to which I have referred in this paper. He says, for example: “The benefits, such as there are, seem to be limited to the people who own the technology and the people who farm on an industrialised scale”. Later in the document, he says: “Before drugs are released into the marketplace they have to undergo the most rigorous testing.... But GM food is also designed in a laboratory for human consumption.... Surely it is equally important that we are confident that they will do us no harm?”

But I would like to emphasize some more philosophical remarks of his: “Are we going to allow the industrialisation of Life itself, redesigning the natural world for the sake of convenience and embarking on an Orwellian future? And, if we do, will there eventually be a price to pay? Or should we be adopting a gentler, more considered approach, seeking always to work with the grain of Nature in making better, more sustainable use of what we have, for the long-term benefit of mankind as a whole?” In spite of the rhetoric, Charles’ questions are very important. Is nature created for the benefit of humans, so that we may do with it as we please? Or shouldn’t we recognize the right of Nature itself to exist? Perhaps a cooperative, sustainable relationship with nature will be not only for the good of nature but for the good of humanity as well.

Charles was educated in the British, Christian tradition. But let us see what Judaism has to say about these issues. The Bible says that God blessed the first humans and said: “Be fruitful and multiply and fill the Earth, and conquer it, and have dominion over the fish of the sea, and the birds of the heavens, and of every creature which moves upon the Earth. (*Genesis I, 28*) But the phrase, “conquer it and have dominion”, can be interpreted in different ways.

Some would interpret “dominion” in a quite despotic sense. The *Mishna*, in *Tractate Kidushin*, IV, 14, quotes Rabbi Shimon ben Elazar as saying that the animals and the birds “were created only to serve me, and I was created to serve my Creator (my translation). Rabbi Moshe ben Nachman (“Nachmanides”, “Ramban” 1194-1270), commenting on *Genesis I, 28*) understood this verse as saying that God gave humans “power and dominion to do as they will with the animals and the

lower creatures, and all which creep on the Earth, to build and to tear up what has been planted, and from the mountains to mine copper and similar thing.” (My translation) These opinions are the basis for those who today are saying that there is nothing wrong with our interfering in creation and “playing God”, because we humans are partners with God in creation.

On the other hand, Rabbi Moshe ben Maimon (“Maimonides”, “Rambam” 1138-1204), who was Israel’s greatest rabbi, philosopher, physician and bioethicist, says that the verse which we have quoted from *Genesis* “does not mean that man was created for the sake of this, but merely gives information about man’s nature.... (Ben Maimon 1953, III, 13). As Maimonides goes on to explain, God – with few exceptions – does not create one thing for the sake of another. God creates each thing because God wants that particular thing.

An intermediate view is expressed in the Midrash, *Kohelet Raba* VII, I, 13. The Midrash is a rich ancient collection of stories, anecdotes, advice and Jewish Law: “When God created the first man, He took him for a tour of all the trees in the Garden of Eden. ‘Look at my works,’ He said, ‘how pleasant and excellent they are. Every thing which I created, I created for you. Pay attention not to ruin and destroy my world. For if you cause ruin, there is no one who will repair your damages’ (my translation). This story is beautiful but dangerous, because it can give us the prideful attitude that everything (with the lone exception of God) is for us. If we couple this attitude with the prideful attitude that technology can solve all of our problems, we are easily on our way to taking more environmental risks. Haven’t we polluted our air, soil and water enough?

Lynn White Jr’s famous 1967 article, which blamed Jewish and Christian theology for “the historical roots of our ecological crisis” was partially right.¹² As we have seen in Nachmanides and in the *Midrash*, there are Jewish sources which can lead to a domineering attitude towards nature. But Judaism is a vast sea of sources which very often don’t agree with one another. This is because Judaism is an open-minded, non-dogmatic religion which encourages freedom of thought and opinion. We don’t have one prophet. We have many prophets, and new prophets can arise in each generation. We don’t have a Church

hierarchy. We have rabbis, who are regular humans who often (although not always) have learned more than those who are not rabbis. We are all encouraged to learn, think and discuss, using the intellect which God gave us. The Jewish sources, which suggest that nature is created for us, and that we can do with it as we please, are not the only Jewish sources. Nor are they the most important of the Jewish sources on our relationship to nature.

Maimonides, who as we have seen did not believe that nature is created for us, had a very animistic, almost pagan attitude to nature. For me, however, 'pagan' is not a pejorative term.

At one time I compared Maimonides' philosophy of nature to Aristotle.¹³ Today, I would rather compare his philosophy of nature to ideas of the divinity of nature in Shinto. I see Judaism as more similar to Asian national and tribal religions than to Western thought.

Maimonides refers to nature as: "...wise, having governance, caring for the bringing into existence of animals by means of an art similar to that of a craftsman, and also caring for their preservation (Ben Maimon III, 13, p. 455) In his *Guide to Health* he says that nature is: wise and crafty, it will do what is necessary and has no need for others [to help it] to cure the sick (Ben Maimon 1957a, I, 44). In his treatise, *On Asthma*, he says in the Hippocratic tradition that nature is educated in good ethics, for it is from nature that we learn ethics (Ben Maimon 1957b). In his *Medical Aphorisms*, he accepts Galen's doctrine that whenever there is a doubt about how to cure a patient one should leave him or her to nature, for nature knows the proper balance of the organs, provides each organ what it needs for health, and keeps living creatures healthy and cures them of their sickness (Ben Maimon 1957c).

Maimonides didn't know about GMOs. So we cannot say what he would have thought about them. If, however, we combine Maimonides' respectful, animistic view of nature, together with his denial of the doctrine that nature was created for man, a strong conservatism about tampering with nature is suggested. Of course, Maimonides never said that we are never to tamper with nature. With respect to treating patients, it was only when in doubt that he recommended letting nature take its usually – but not always — healthy

course. When nature alone is inadequate to curing a patient, he recommended a change of diet and other habits or, in more extreme cases, medicine. But GM food seeds are a matter of doubt. There are clear social, economic and environmental threats. It is still doubtful whether these threats can be overcome. And freedom from direct threats to human health is still a matter of doubt. So I would think in the spirit of Maimonides, that we should take an extremely conservative position towards GM food seeds, and probably even forbid them. The situation may be different with respect to genetically engineered drugs *if* they are proved to be safe and effective. Human gene therapy *may* also sometime be proved to be safe. But genetically modified food seeds, about which there are so many doubts, are a different matter.

The fact that even one of the very greatest of the rabbis said something, does not make it true. Is Maimonides right about our relationship to nature? He says that God did not create one thing for the sake of another. But how does Maimonides know what God has in mind? How can we know whether Maimonides' interpretation of the Bible is any truer than the interpretations of rabbis who thought that God created nature for the sake of man? All rabbis have the same holy sources available to them. Any issue on which two of them can contradict one another cannot be unequivocally decided on the basis of holy sources. This is especially true when it comes to knowing anything about God. "And He said, Thou canst not see my face: for there shall no man see me, and live" (*Exodus XXXIII, 20*). "The secret things belong unto the Lord our God: but those things which are revealed belong unto us and to our children for ever, that we may do all the words of this Law." (*Deuteronomy XXIX, 28*, King James translations with my minor revisions). My humble opinion is that when it comes to issues like what God has in mind, nobody can know the answer.

Our recognition that we have no way of knowing the deepest meaning of life, or God's purpose in creating the world and its creatures, should lead us to humility. Being small creatures ourselves, totally ignorant of the deeper things, how can we dare be so prideful as to take it into our hands to make radical changes in something so fundamental to nature as the genomes of flora and fauna, especially when such changes have no scientifically proven human benefit? This is especially pertinent after our record of global environmental failure.

Why are Corporations Investing in GMO Technology?

A few years ago I attended a bioethics seminar in Japan. Novartis-Japan was invited to send a representative. During the discussion of GMOs, someone asked the representative why Novartis is investing in GMO technology. She answered: "Because we think that it will be profitable."

Alternatives to GM Food

Let us begin with another quotation from Prince Charles: "How much more could we achieve if all the research funds currently devoted to fashionable GM techniques - which run into billions of dollars a year - were applied to improving methods of agriculture which have stood the test of time?"¹⁴

I would like to add: "And methods of agriculture which would serve the majority of the needy people in the world".

It does not serve the needs of people to force or entice them out of their small farms, their forests and their jungles to make space for 'development', and then - if they survive at all - to put them in a situation of having to choose between being starving urban homeless or working at unhealthy, undignified jobs in order to buy the products of the same 'development' which destroyed their traditional lives.

People in rich, highly technological and materialistic countries find it difficult to distinguish between simplicity and poverty. Unhappy, sick people living on the streets in big cities are poverty. Happy, healthy families living in houses with dirt floors, mud and straw walls and straw roofs, making their living from hard work with their own animals and their own tiny farms, are simplicity. I have never seen such happy people and gracious hosts as a family of this sort with whom I stayed a night in Velhe Block, Pune District, Maharashtra. They were so isolated that even our Jeep could not reach them. So we walked through the monsoon mud for the last bit of the journey. In the evening we all sat in a circle on the mud floor. The women sat by the fire and passed us hot, freshly cooked food and freshly fried chapatti. They did not lack in spiritual life, being active in the local Hindu temple. The grandfather was renowned in the area for successfully growing plants which no one before had been able to grow in that area. Their daughter is a Prabhodika, a 'Spreader of Light', working in a project of the Jnana

Prabhodini organization in Pune, teaching village mothers about improving nutrition, hygiene and midwifery, and helping them set up home crafts businesses. Later, each took a blanket, found a place on the floor and went to sleep. In the morning I went to the rain drain to wash. A child came out and proudly presented me with a small sliver of soap. People in rich countries who think that there is something wrong with you if you don't get a new car every few years, are incapable of understanding that this is not poverty.

I have already quoted Prince Charles, who suggested investing those "billions of dollars a year...[into] improving methods of agriculture which have stood the test of time." For me this would mean helping millions of people to achieve what that family has achieved, and helping them to improve what they are doing even more.

One example of an alternative to GMOs, a plan for improvement, is the Kitchen Garden Scheme: an integrated system involving anaerobically composting human and animal waste, to produce biogas for cooking. When the anaerobic compost is finished, more organic matter is added and the pile is composted aerobically to produce rich fertilizer for the home garden.¹⁵ Composting human and animal waste radically improves sanitation and hygiene. It also prevents the rains from carrying these wastes off to pollute water supplies. The compost privy, replacing free defecation, prevents parasite infections to children going barefoot among the "night soil". And parasites are a major cause of underweight. Cooking with biogas rather than solid fuels on indoor fires prevents smoke inhalation. A higher vegetable content in the diet fights iron deficiency among other problems. Indeed both allopathic and Ayurvedic doctors whom we interviewed in a health survey in Maharashtra in 2000 indicated a lack of vegetables in the diet as a major cause of disease.¹⁶

Yet, underweight, unsafe water, sanitation and hygiene, iron deficiency, and interior smoke caused by the burning of solid fuels are five of the eleven most important risks to health today, which were listed by Gro Harlem Brundtland, Director General of the World Health Organization, in her Message included in the 2002 World Health Report.¹⁷ Can anyone seriously say that GM foods have such a potential for improving human health?

The Kitchen Garden Scheme is only one of the many potential ways to improve traditional agriculture as alternatives to GMOs. But this paper can not provide more details of this, except to mention that perhaps the first priority has to go to returning the mountains, the jungles, the deserts and the forests to their traditional inhabitants.

Endnotes

- ¹ Altieri (2006); Greenpeace (2006a, 2006b).
- ² World Health Organization (2006).
- ³ For more details see, Watanabe, Sassa, Suda, Chen, Inaba, Kikuchi (2005).
- ⁴ Davis (2004).
- ⁵ Gay (2006).
- ⁶ Goka (2001).
- ⁷ Dobson (2006), Keesing (2006).
- ⁸ Connor (2003).
- ⁹ Leavitt (1993).
- ¹⁰ Anon (2005).
- ¹¹ Guidetti (2000).
- ¹² White (1967).
- ¹³ Leavitt (1998-1999).
- ¹⁴ HRH The Prince of Wales (1999).
- ¹⁵ Leavitt (2005).
- ¹⁶ Tanabe (2001).
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