Food Security and Transgenetic Engineering in the Global Food System

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As Dr. John Fagan has explained that led by genetic engineering, we are entering a new era. This

> is reminiscent of the birth of the nuclear era when humankind stood at the threshold of a new technology. Then, few people understood that nuclear power would fill our planet with highly toxic radioactive waste. The general public was so impressed by the power of a new discovery that it leaped ahead blindly, and without caution. Today the situation with genetic engineering, particularly as it involves the food that we eat, is perhaps even more grave because this technology acts upon the very blueprint of life itself.

I. Introduction

The world faces the acute problem of feeding a growing population with declining resources in arable land and fresh water. How will humanity feed itself in the years ahead as populations continue to grow to perhaps 8 billion people or more? No question is more important. The human future depends on finding the right answer. Food, just as water, is a common global good. In reflecting on these matters it is important to remember that food is essential to life and is sacred culturally to all peoples.

Today, the primary proposal for increasing food supply today is the development of genetically modified food crops. This proposal is highly controversial and deserves close examination. Currently it is being implemented on a massive scale without the reflection that is so badly needed. This paper aims to provide Christians the needed information to enter into this discussion. As explained in an earlier position paper (Cobb, ed., Chapter 15) the need is not simply a global increase of production. The need is for global food security that is environmentally restorative. Will the wide use of GMOs increase or diminish food security? To answer that question requires much more

complex reflection. We need to consider such matters as food safety, environmental stability, international trade, organic food production, international agricultural development strategies, intellectual property rights, and the maintenance of the integrities of global seed depositories.

Our first step in evaluating GMO agriculture will be to compare it with the currently dominant form of agriculture, which grew out of the Green Revolution. This agriculture is based on petrochemicals.. Will the new agriculture, based on a manipulative biological technology, contribute more to food security than the preceding form? Our conclusion is that, although the new technology has some advantages, it introduces far greater risks. Even now we can see ominous signs of its effects.

Consider, for example, what is happening to the monarch butterfly.

> The Mexican government said that 75% fewer monarch butterflies had appeared at the wintering grounds in the country. The Mexican government blamed the decline on a number of factors, including an unusually cold summer in the U.S. and a high mortality rate for the butterflies in Mexico in 2003 because of cold, wet conditions.
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> The report also attributed the decline, although without any supporting evidence, to intensive farming practices in the U.S., including the use of genetically modified crops." (*Los Angeles Times*, February 19, 2005)

Despite the diffidence with which GMOs are mentioned as responsible, we suspect that monarch butterflies are indeed threatened by this new technology and that in fact they are only one of many life species that are endangered. We also suspect that the shift to the extensive use of biotechnology is likely to damage our food security for the future in ways we cannot now predict. We should resist this change. But this does not mean that the petrochemical based agriculture of the Green Revolution, the form that has dominated recent decades, provides the needed security. If it fails, obviously there must be change, and bio-technology is the current candidate for that change. We cannot oppose it without proposing an alternative.

Our second step in this paper is to point toward the way in which food security *can* be attained. This requires envisioning a very different agriculture as part of other cultural changes. Within that context petrochemical and transgenetic biotechnology will have, at most, a subordinate, and carefully delimited, role.

II. Transgenetic Bioengineering in Agriculture

"Agricultural biotechnology" in a broad sense is quite ancient, having begun with human selection of certain plants and other species for improved food and fiber production. Today, however, the term usually refers to the process of isolating a gene in one life source, removing it, and inserting it in another organism. This "transgenetic engineering" is a relatively new technology that dramatically increases the capacity of human beings to alter the natural world and the foundations of life by crossing the natural barriers between plants, animals and microorganisms. For example, it includes transferring genes between unrelated species such as fungi, bacteria and viruses.

Transgenetically modified agricultural crops are increasingly becoming a dominant feature of agricultural landscapes in the USA, China, Argentina, Mexico, and Canada. Worldwide, the area planted during the past 8-10 years is between 600 and 800 million acres. This is a 20 fold increase from 1996. In these nations, over half of the major crops, such as soybean, corn and canola, are planted in transgenetic varieties. Herbicide-resistant plantings include about 60 crops and 15% of the total area of all transgenetic crops in the year 2000 (Altieri, "Ecological Impacts")

Transgenetic engineering involves the manipulation of patterns of proteins in an organism (See Department for Studies, 2001). A "transgenetically modified organism" is one, usually a plant, produced by inserting a sequence of DNA into the nucleus of a recipient organism. DNA (deoxyribonucleic acid) is a large molecule that encodes genetic information that cells need to replicate and produce proteins. Thus, the new DNA becomes a part of the recipient's genome (the entire set of genes in any living creature), and the now modified recipient produces a totally new protein in the host.

Transgenetically engineered crops are new forms of life introduced into ecosystems that have no history in these systems. The process is extremely complex. It is like pasting a string of letters from one document into another. Thus, a new document is produced with instructions for producing within a cell what was previously a foreign protein. If the engineered organism is a plant seed, the new protein becomes a feature of the plant as it grows, since the new DNA sequence is duplicated every time

the engineered cell duplicates. Some forms of engineering insert genetic material into plants from organisms as distantly related as bacteria, viruses, insects, fish or animals. The DNA sequences introduced during this process are referred to as “transgenetically derived,” “transgenetic sequence,” or “recombinant DNA.” The purpose of this process is to create a plant exhibiting a desired trait, such as tolerance to herbicides and defense against insect or pathogenic pests. Transgenetically modified food crops are those developed for human and animal consumption. They constitute a subcategory of genetically modified crops. GMO technology also includes research and development of pharmaceuticals and industrial crops. However, food crops are the focus of this paper.

Corn and potatoes have been implanted with a gene extracted from the soil bacteria, Bacillus thuringiensis (B_t). This bacterium produces a protein that is toxic when ingested by the European corn borer. When this insect ingests tissues from any part of the B_t corn plant, it dies. The concentration of toxicity is estimated to be 20 times greater than what is naturally found in the soil. This toxicity, to some degree, enters the human body, or that of animals, in the food we eat or the food used in domestic livestock production. We do not yet know the degree of transfer, or toxicity, by means of cross pollination to other plants.

In order to control weed infestations in fields of soybean, canola and cotton, these crops have been engineered to tolerate glyphosate, a herbicide effective on many species of grasses, broadleaf weeds and sedges. The herbicide is marketed under the common name, “Roundup Ready.” When applied in the field, weed pests are controlled while the genetically modified crop remains unaffected.

Transgenetic modification of the crops tolerant of this herbicide thus frees the farmer, if needed, to use larger quantities of “Roundup”. This sometimes increases crop yields, but three major questions remain with respect to all herbicide use. First, what might be the impact upon non-targeted plants? Second, can the targeted weeds develop resistances and become “super weeds? Third, to what level do these chemicals contribute to toxic runoff?

More broadly there are two major concerns about the switch from conventional crops to transgenetically modified food crops. One is the safety of the food for the consumer. The second is the overall environmental impact.

Because of these concerns, there has been widespread opposition to the rapid expansion of transgenetically modified crops. Since 1998 the European Union has had a moratorium on planting them; with Spain and the Netherlands being the exceptions. However, in 2006, the WTO overturned the European Union moratorium, enabling GMO crops to enter Europe when, and if, buyers can organize markets. Thousands of protestors across India campaigned for "Monsanto to quit India," as Monsanto had joined with the largest Indian seed company, Maharashtra, to introduce GMO crops. In 2001, at Porto Alegre, Brazil, protestors demonstrated against the introduction of GMO soybeans into Brazil and the attempt of the WTO to circumvent certain trade restrictions in order to allow for global trading with GMO crops. Zimbabwe requires that all B_t corn be milled before its importation for food-aid purposes. Zambia prohibits the importation of B_t corn. In the U.S., Mendocino County California, in 2004, passed legislation prohibiting the planting of GMO crops. There are efforts underway across the state of North Dakota to develop similar restrictions

III. <u>Promises and Perils</u>

Proponents of the new biological technologies involved in the engineering of GMOs for 21st century agriculture are numerous and often provide seemingly impressive arguments for their claims that their work is an important contribution to the human future. The claims for this new science are two fold: it increases food production to meet growing populations of hungry people, and it conserves the most essential of agricultural resources, the soil. Controlling weeds by conventional tillage increases the loss of soil due to snow melt, rainfall and wind. GMO crops need less tillage. Also, reduced tillage lowers fuel consumption. If crops are protected by this new science from the infestation of insect and pathogenic pests, then greater productivity can be realized. Biotechnology claims these benefits for farmers everywhere, and particularly for those in the so-called "developing nations."

Proponents of GMOs also claim they will contribute to biological diversity conservation and will not threaten indigenous people. They insist that GMO technology is ecologically safe and will launch an era of chemically free sustainable agriculture; and that biotechnology will enhance the use of molecular biology for the benefit of all sectors of society. They also claim that there are no known large-scale impacts on animal or human health. To date, according to proponents, this new era of GM crops will decrease the application of insecticides, herbicides, and even fertilizers, thereby reducing environmental damage from the overuse of these materials. Perhaps it may even improve the nutritional value of crops. Most important, GMO technology for the development of new crops, by increasing the availability of food will help to alleviate hunger and thereby reduce social turmoil.

We share the critics' skepticism about these claims. No doubt some GMOs will save tillage and thereby reduce soil loss and the use of oil. But overall the huge monoculture plantations they encourage will continue to erode the soil, and this form of agriculture remains oil-dependent. It will continue the process of reducing the number of agricultural workers needed, but there are forms of labor intensive agriculture that produce more per acre. Since hunger is not so much a function of absolute shortages as of poverty and poor distribution systems, the net effect is as likely to be increased hunger as reduction.

The fact that widespread damage from GMOs has not yet been demonstrated points more to the length of time over which major damage is likely to occur than to any reasons to judge that the consequences will be benign. As a plant geneticist and founder of The Land Institute, Salina, Kansas, and a recipient of the John D. MacArthur "genius" award, Wes Jackson mentioned during an informal conversation, "The major threat to life forms affected by GMO technology will not visit us in one year or five, but in 20 to 50 years. We don't know how genes express themselves in different organisms." Unfortunately, by then it will be too late to undo the damage. If contamination of other crops by GMOs becomes widespread, it will be too late to stop the damage. One needs to be suspicious that widespread contamination might be a corporate business strategy ("Why Should We Be Novartis's Guinea Pigs" 2004, 2). If this becomes the case, or if it already is the case, then regulations and controls involving such international bodies as

the North American Free Trade Agreement (NAFTA), the World Trade Organization (WTO), and others will be largely irrelevant. (SeeTokar 2004)

Another element in this debate is about food safety. Because this era of transgenetic engineering in food crops is new, no long-term studies have been conducted on laboratory animals or human beings to determine whether GMO foods are safe. No one knows for sure whether our immune systems are being harmed. We are now consuming DNA and proteins from viruses, bacteria and fungi that have never been eaten by humans in all the millennia that we have existed on the planet. (Tsimese 2004, 69) We do not know what new allergies may develop to the GMO food.

Among the possible environmental consequences are the emergence of super weeds, spreading toxicity through the global food chain, the disruption of nature's natural systems of pest control, the impact of the inevitable pollen drift on organic production methods, the threat to the maintenance of purity of worldwide seed depositories (See Mellon and Rissler 2004), genetic contamination of indigenous plants and wild relatives, the impact on non-targeted insect populations such as pollinators and insect predators. Other concerns are the results of patenting new GMO's and intellectual property rights, corporate control of farmers, the vulnerability of farmers and their communities to shifting global market conditions, and the threat to biodiversity as a consequence of encouraging the continual expansion of annual monocultures.

There are three concerns that stand above all others. First is that little is known about the long-term persistence of crop genes in wild populations or about the impact of related crop genes on the population dynamics of weedy relatives (Altieri, "Some Ethical Questions") Second, GMOs contribute to ecosystem simplification and the genetic erosion of species diversity. Transgenetically homogenous fields and forests are more vulnerable to disease and insect pests. Third, beyond these overarching biological and environmental concerns is the issue of GMO protection with patents. Patents enable their holders to recover their investments in research and development and provide an anticipated return from product sales; but corporate control of intellectual property rights threatens poor farmers. The production and saving of seeds by poor farmers world wide could become a thing of the past if a global monopoly is developed by GMO seed producers. Farmers would become totally dependent on costly inputs. Further

worsening the situation for farmers is the advent of so-called terminator crops. Seed treatment (genetic use-restrictive technology "gert") makes crops produce sterile seed. This could destroy traditional farming methods.

IV. Questions Frequently Overlooked

Decisions about what we do in the present reflect our basic moral and religious values. Should we alter the genetic structure of the living world in the name of utility and profit? Is there something sacred about life, or should life forms be viewed simply as commodities in the new biotechnical marketplace? What about human beings? Is the genetic makeup of all living forms the heritage of everyone, or can it be appropriated by corporations and thus become private property for a few. Miguel Altieri, professor of agroecology at the University of California, Berkeley asks, "Who gave individual companies the right to the monopoly over entire groups of organisms and do biotechnologists feel themselves masters of Nature? Are these scientists blind to the complexity of ecological process and relationships?" (Altieri, "Some Ethical Questions") These are historically unprecedented questions because the technologies related to transgenetic engineering are so new.

Sometimes solutions to problems are found by asking good questions. The following, more specific, questions cluster around two major concerns: the environmental and the socio-economic impacts. Referring to environmental concerns, the following questions are being raised by groups such as the Ecumenical Network, North Dakota Council of Churches 2005, Evangelical Lutheran Church in America 2003, National Catholic Rural Life Conference 2003:

(1) How far ought transgenetic engineering intervene with natural processes? In other words, to what extent ought we to tamper with nature?

(2) Does GMO technology foster research and development methods that increase the production of plant species in their full diversity and habitat?

(3) At this early moment in the history of GMO's, is research adequate for estimating short term and long term impacts on environmental health and stability?

(4) Will the autonomy of indigenous crops be impacted by GMO's in agriculture,

pharmaceutical and industrial crops due to genetic contamination of multiple aggressive pollinators?

(5) Is it inevitable that super pests (insects, pathogens, weeds) will evolve?

(6) What might be the impact of GMO's on non-targeted organisms, from soil microorganisms to such pollinators as honeybees?

(7) Will the prevalence of biotechnology in the hands of a few private interests tend to compromise biodiversity rather than improve upon it?

(8) Is there an "exit strategy" in the event that things go wrong? Can there even be such a strategy now that these crops have become so widespread?

With reference to social and economic analysis of possible benefits and risks, one can reasonably ask:

(1) Who benefits from the GMO technologies? Who loses? In other words, will GMO technology in agriculture result in a more egalitarian distribution of food? Will it empower the poor and marginalized?

(2) Do global trade agreements involving patents for seed and other plant materials undermine people's ability to meet their basic needs and access to common resources?

(3) To whose needs is bioengineering in agriculture responding?

(4) How satisfied should we be with our current knowledge of GMOs in the food that we eat?

(5) To what degree ought we to trust current regulatory practices?

(6) Should bio-agricultural corporations be regulated or restrained more closely than other kinds of agricultural enterprises?

(7) What is the level of community participation in decision-making processes about the incorporation of genetically engineered crops into our global food system?

Progressive Christians Uniting judge these questions to be relevant. We need to be reminded that we are free to raise questions others dare not to ask and to suggest answers that some would consider absurd.

The guidelines proposed by the Ecumenical Consultative Working Group on Genetic Engineering in Agriculture for any use of GMOs are helpful. This Group was organized by the National Catholic Rural Conference; the American Institute of

Biological Sciences; the Evangelical Lutheran Church in America, the Department for Studies of the Division of Church and Society; and the Africa Trade Policy Working Group sponsored by the Africa Faith and Justice Network, Washington DC.

- Respect and support the dignity of the human person, and the integrity of creation, and our common humanity
- Advance the common good
- Be transparent, involve the participation of all stakeholders and empower the most vulnerable
- Respect the legitimate role of government in collaboration with civil society, to set policies regarding the development and welfare of its people
- Safeguard the global commons and respect the rights of local communities to protect and sustainably develop their natural resources
- Be subject to extensive testing over long periods of time
- Be guided by the concept of the sacredness of life and respect the wisdom and integrity of natural processes by which the world is maintained

In the short run GMOs may possibly increase the production of needed crops, and in the long-run there may be a place for them in a well-integrated system of agriculture. However, since no one can confidently predict long-term impacts that will result from such massive developments of agricultural crops, we need to proceed with humility and great caution. We did not do this during the advent of the nuclear age. It is important to recognize, at the beginning of this new biotechnological era, that no exit strategy exists if things go wrong! We must remember the advice of Aldo Leopold: "A thing is right if it contributes to the beauty, integrity and harmony of the biotic community. It is wrong if it goes the other way." (Leopold 1949)

In view of these questions, the need for a citizenry well-informed about these matters is apparent. Only well-informed people can participate helpfully in the debate about the benefits and risks of the GMO strategy. It is our judgment that when we ask these questions and answer them knowledgably, we will look for other ways of responding to the global agricultural crisis. That means that we will do what we can to stop the spread of GMOs over the earth. We should not play dice with the future of the biosphere for the sake of corporate profit or promises of illusory benefits.

IV. An Alternative Approach to Global Food Security

Thus far we have considered the promises and risks of bio-technology in comparison with the now dominant agricultural system. For many reasons, that system is not sustainable. The most obvious reason is that it is based on petroleum which is rapidly becoming scarce in relation to demand. If biotechnology pointed the way forward in a post-petroleum world, we might be forced to consider it a necessary evil. But it does not. It is hardly less dependent on oil that the system it seeks to replace. It endangers the future more radically. Its advantages are overwhelmed by the dangers it brings with it.

The basic problem with industrialized biotechnology in agriculture is that it is based on the same assumptions as was the Green Revolution, which underlies the current system. This is a reductionist science, which, in turn, is based on a materialist philosophical premise that is fundamentally flawed. This science is backed by a multinational industry that treats nature as a commodity. The new form taken in bio-technology was developed by departments of biological sciences in major universities and by large corporate research bodies such as Monsanto, DuPont (owner of the world's largest seed company, Pioneer Hi-Bred), Bayer, Syngenta (herbicides), and Novartis.

Recognizing that present agricultural environmental, technical, and social problems are themselves outcomes of earlier rounds of technological attempts, biotechnology is another technological attempt, or a "magic bullet," aimed at circumventing the environmental problems of agriculture. Biotechnical developments work toward single-gene solutions for problems that derive from ecologically unstable monocropping systems designed on the industrial model. Before pursuing this line of development further, its basic assumptions should be challenged.

We join with others in holding that this whole approach to the solution of agricultural problems is moving in the wrong direction. An ecological approach, examining the web of interdependent relationships in agriculture, is superior. It rejects both the current agricultural science dominated by petroleum based chemistry and the new agriculture dominated by transgenetic organisms. Being informed by the dynamics

of natural phenomena, practitioners of agroecology understand nature in a different way. From this perspective the move to GMOs only makes clearer the extreme risks to the global future that result from basing food production on fundamentally flawed assumptions that already control agribusiness.

Within this whole debate, the question is repeatedly raised: Who will feed the growing world population? Do we require technological advance for this purpose? If, such advance would produce the needed food, and if that food cannot be produced without this advance, then humanity has no choice but to move ahead with this kind of technology.

However, this is not the case. As noted above, whereas petrochemical and transgenetic biological technology can reduce the need for human labor in agriculture, they are not required in order to increase yield per acre. Labor intensive organic methods can do this better. Further whereas both chemical and biological technology lead to farming methods that erode and impoverish the soil, threaten water quality and lead to the evolution of new pests, organic methods can lead to an agriculture that is not only sustainable but even regenerative.

Accordingly, we agree with those who say that instead of corporate monoculture agribusiness, it will be the farmers who live across the surface of the world that will feed humanity! From this point of view, the greatest problem with the growing emphasis on GMOs is that it encourages the continual expansion of already entrenched annual mono-cropping farming systems, and in so doing it *impedes* research into an alternative farming system and *distracts* from its implementation. The new era of GMOs undermines global efforts to develop a more regenerative, and therefore sustainable, food system that is based on the concept of domestic regenerative self-reliance. This alternative is free of dependence on outside inputs such as agricultural chemicals and patent-seed resources. A resource-regenerative food system is based on green manures, cover crops of legumes, livestock integration, tree crops (or agroforestry), farmer and community learning centers and improvements in roads, bridges, storage and marketing facilities. This approach is far more complex than the promotion of annual monocrops planted with transgenetic and patented seeds. (See Mellon and Rissler 2004 and Jackson and Jackson, 2002)

To achieve sustainable food production in the 21st century will require a radical departure from the approaches of the inorganic chemical dependent Green and transgenetic approach of the GMO revolutions. The needed strategies focus on the development of regenerative and therefore sustainable systems across a multitude of diverse environments. The "Sustainable Agricultural Revolution" is focused at the moment on an agricultural system situated within areas poor in natural resources and among people who are still on the margins of society, that is, most of the world's people. The rural unemployed and landless must be brought into the global food system if there is ever to be a secure and dependable food system. The experience and wisdom of indigenous people needs to be incorporated into the design of sustainable domestic-food systems. Reversing the neglect and exploitation of rural communities is now widely recognized as a fundamental strategy for overcoming food deficits.

To accomplish this complex goal, the strategies of the "agroecological revolution," or what has been called the "Doubly Green Revolution," (see Conway, 1998) will involve the recruitment of leadership from across a wide array of disciplines that will include not only plant breeders, molecular biologists, and agronomists; but also those representing the social sciences. An interdisciplinary approach to agroecosystem development is required, along with the development of integrated crop- and livestock-production methods appropriate to the global diversity of rangelands, croplands and forests. The emphasis should be on the rehabilitation of stressed ecosystems within which an agroecology can evolve. This strategy moves far beyond the domain of the physical and biological sciences. If the vision and goal of global food security, with its underlying commitment to the evolution of a sustainable, or regenerative, self-reliant food system is to become a reality, the first priority in research and development will be reaching the marginalized sector of national populations, but not with patented seed (Bread for the World Institute Board of Directors, 2002).

Obviously, the next agricultural revolution designed to be regionally specific and focused on marginal landscape resources must address issues that were not taken into consideration during the first Green Revolution and today's GMO Revolution. The needs are many: self-reliant and regenerative soil nutritional management; water management, including surface and underground resources; mangrove and coral reef

protection; reducing pollution from farms; regional biodiversity maintenance; alternatives to slash-and-burn agriculture; the development and maintenance of alpine agriculture; changes in land-tenure traditions; innovative market accessibility; careful farming designs for the irrigation of crops and the raising of livestock, including the maintenance of wildlife habitat. Also required are national and international policies that give priority to developing essential rural infrastructures, including public health and educational services, as well as roads, bridges, railways, and storage and processing facilities for agricultural products. The only viable path toward sustaining the natural resource base lies in enhancing the potential of regenerative domestic self-reliant agriculture. This requires *location-specific* technologies and production packages that meet the aspirations of the majority of farmers who own fewer than four acres of land. (Sharma 2001, 99)

This agenda is demanding. The needed agroecological revolution, if it is to reach or approximate the goal of adequate supplies of food globally, must focus on food production with justice, be ecologically benign (even enhancing), and be economically viable. The challenge is to understand production-efficiencies of a food system in ways that measure all social and environmental costs. If there is to be food for tomorrow, it is imperative to move beyond the present paralysis in production-research, our dependency on fossil fuel, and the mindset that some must produce more in order to feed others. (Freudenberger, 1984) We must give priority to the challenge of strengthening the ability of communities of people to feed themselves sustainably and justly. (See Cobb 2003, 276-78) If in some cases, the questions about the risks of GMOs can be answered positively, they can be used as one more tool in the development of an agroecology. This is very different from allowing them to shape the nature of agriculture: And if the questions cannot be answered positively even in limited instances, then the precautionary principle should be applied.

Accordingly, we agree with Munsayac and Zamora. (2004)

> Genetic engineering is a concrete example of a technology that needs to undergo rigid examination. It is acceptable only if all risks are minimized. Otherwise, one may easily succumb to temptations of productivity with profit at the expense of people and the environment. As long as foreseeable dangers are not fully identified, studied, and avoided, alternative approaches should be

employed and the development of GMO technologies should be delayed altogether.

Those pursuing the vision of a “Doubly Green Revolution” (organic farming technologies) are observing promising benefits. Replacing a petrochemical based agriculture with integrated livestock systems, green manures, fallow periods and more labor intensive management, replacing large scale capital and petrochemical technology at ever increasing costs, generally result in equivalent or even greater yields per unit of land once toxicities are diminished during the course of three to five years. These findings are variable according soil deposits, rainfall patterns and crops under cultivation. But as has been described above, a highly productive organic farming system is dependent on a strong rural infrastructure of viable commodity markets, public health and education systems, roads, bridges, storage and processing facilities and agricultural research and educational outreach services.

VI. A Christian Perspective

In a previous position paper on “Global Food Security,” Progressive Christians Uniting expressed its conviction that the integrated approach outlined in the preceding section is of utmost importance and that progressive Christians have every reason to support it. We commented on the dominant mind-set in our culture that leads to neglect of this complex approach and the preference for the technological quick-fix. In these further reflections, we will pursue this question.

In our materialistic culture, driven as it is by economic and technological considerations, the question is often simply: “Can it be done?” We take great pride in our increasing ability to manipulate nature, and once we find that we can take another step, we rush into the new exercise of our prowess with great enthusiasm. If we ask whether we *should* take this step, we are more likely to rationalize doing so than to place the new actions in a broad context to examine their real merits and dangers.

This expresses an extreme secularization to which, we need to recognize, Christianity has contributed by its rejection of the distinction between the sacred and the profane. Yet the distinctive Christian position is as different from this secular one as it is from the traditional religious worldview.

The traditional religious orientation to life has always been characterized by a sense of limits. The choruses in Greek tragedies express this sensibility. The tragedy often lies in a heroic breaching of these limits followed by the inevitable downfall of the hero.

The creation stories in the Christian Old Testament can be read in a similar way. Adam and Eve were free to enjoy all the fruits of the garden except one. Eating this one would make them like gods, knowing good and evil. They crossed this line and were expelled from the garden. In this story, the act of crossing was an expression of weakness rather than strength. They yielded to temptation.

However, Jews in general did not regret the attainment of the knowledge of good and evil. They understood the law given them by God as spelling out that knowledge, and the study of that law together with obedience to it was the heart of their religious life. The good and evil they studied were not simply questions of ethics; they were questions of purity as well. As in most religious traditions, there was a strong sense of the unclean or impure that must be avoided. This is closely tied to the sense of the sacred. To be a faithful Jew is to channel one's activities in prescribed ways and to observe the limits built into the human condition.

Although Christians judged that they were no longer bound to the Jewish law as a whole, and rejected in particular the requirement of male circumcision, the great majority of Christian communities respected some of the Jewish laws and especially the Decalogue. In addition, most of them have developed their own rules of behavior. These, too, have included both ethical rules and others shaped by the sense of the unclean or sacrilegious. To be a faithful Christian has meant for many to channel one's activities in prescribed ways and to observe the limits built into the human condition.

Religious people, whether Jewish, Christian, or other, tend to be conservative in the sense of seeking to continue established ideals, norms, and patterns of life. When the religious community is a minority, these norms and patterns are likely to be in tension with the dominant society and therefore counter cultural. When the religious community is a majority, its members are likely to seek to conserve the ideals and patterns that have been accepted in that society, and, therefore, to resist change.

When human beings take matters into their own hands over which they have not previously had control, many Christians complain that people are “playing God.” Today we hear this most often with respect to end-of-life issues, but sometimes also with respect to employing technical means to conceive and bring an embryo to term. The sense of the violation of limits has thus far blocked efforts to clone human beings. For many Christians, as for religious people generally, there is thought to be a profane sphere in which human beings are free to act, but also of a sacred sphere, which they should not violate.

Progressive Christians do not follow this widespread religious pattern. We find our inspiration in another, distinctively biblical, tradition. In the Hebrew scriptures this is found especially in the prophets. They place ethical questions such as justice first and criticize religious attitudes and actions when they distract attention from the ethical. God is on the side of justice and is not impressed by sacred ceremonies.

Jesus and Paul belong to this tradition. Jesus repeatedly subordinates obedience to traditional dietary and Sabbath laws to the needs of human beings. Paul criticizes the effort to achieve righteousness through obedience to law. He goes further and denies the distinction between the clean and the unclean. *All* things are clean.

The “secular” mind can be viewed as one freed from any sense of the sacred. All things are profane, so that the only limits to human actions are ignorance and weakness. As human beings learn more and gain more technical abilities, the sphere of their action expands. Progressive Christians join secularists of this kind in affirming that science and technology are precious resources. The prophetic tradition, culminating in Paul, can be read as paving the way for this later secularism. If all things are clean, then nothing is sacred in contrast to profane. Some conclude that all things are permitted. Indeed, even in his own time, Paul was accused of antinomianism of this sort.

Paul, of course, vigorously opposed antinomianism. He called for a wholly different way of faithfulness to God. The passage in which he explicitly declared that nothing is unclean is worth quoting here. “I know and am persuaded in the Lord Jesus that nothing is unclean in itself, but it is unclean for anyone who thinks it is unclean. If your brother or sister is being injured by what you eat, you are no longer walking in love.

Do not let what you eat cause the ruin of one for whom Christ died." (Romans 14: 14-15 NRSV).

Paul's teaching is clear. Our concern should be the effects of our actions on others. It should not be remaining pure ourselves or avoiding sacrilege. We are free to act as love directs us. In doing so we are not bound by laws. This means that we are free to use science and technology, including the manipulation of nature involved in GMOs. But, even more important, it means equally that we will do this only to promote an enduring, regenerative and therefore sustainable pattern of development for all. We will refuse to allow science and the technology it makes possible to determine our way of dealing with the problems we face. Our policies will be designed, instead, to be in conformity with our most inclusive understanding of the world's needs. If there is a place for GMOs in the development of responsible programs formulated in this largest context, progressive Christians will support their use.

Some secularists recognize the need for moral principles. There is likely to be some agreement between progressive Christians and ethically concerned secularists. On many issues, no doubt, we will agree. But the two positions are not identical. Both do away with the distinction between the sacred and the profane. But for the secularist, this means that all things are profane. For those who follow Paul, it would be equally correct to say that all things are sacred. More accurate is to say that all things are creatures beloved of God. Our broadest reflection will consider the intrinsic value of all the creatures involved. In a world of creatures loved by God, what does our faithfulness call us to do? What relation to God's creation as a whole gives the fullest expression to love?

Judeo-Christian perspectives, rooted in the Hebrew and Christian biblical texts declare that land, or the biosphere, belongs to God. In Leviticus it is declared that the land is not ours, to be treated as a possession. It is true that in Genesis 1:26, we have been taught that God has given humanity "dominion" over the other creatures, and not only the first chapter of Genesis, but the Bible as a whole sees human beings as related to God in a distinctive way. However, recent biblical scholarship shows that the biblical idea is that God establishes humankind as representative of God. Humans are authorized to act as responsible stewards in governing life's resources for the benefit of

all life and for the purpose of keeping the creative processes alive and moving forward. This is in sharp contrast to any idea of “dominion” as the right to exploit for one’s own advantage. Humanity has responsibility for the liberation of life from human exploitation. We are to care for the Earth, to till it and keep it (Genesis 2:15). Tilling and keeping in ancient Hebrew thought means to watch over it, and to keep it as one keeps (tends) a garden.

Further, the relation to the land cannot be separated from the relation of human beings to one another and especially to the poor. The Judeo-Christian tradition requires that central to the solution of any problem, such as producing adequate food, is addressing underlying social problems of injustice and maldistribution of resources rather than being dazzled by the promise of the latest expressions of technological innovations. (Scoville 2000) Humans are called to work for the establishment of a full justice that reflects the purposes of God.

To actualize a full justice in light of our growing awareness of the deterioration of the health of the planet requires a radical shift in Christian thought. Full justice involves the welfare of until generations yet to be born. If our generation continues to live beyond the regenerative capacities of the earth’s resources and contaminated the earth with toxic wastes, genetically manipulated life forms and species extinction, then future generations will be without the means for survival. Christian thought is challenged, as are all of the great world religions, to be centered on transgenerational justice that is dependent upon the health of the planet. By this, we mean the stability of all ecological processes. L Unless we take a radical shift in thought from human preoccupations to a thorough going biocentrism, or creation centeredness, and understand human salvation within these contexts, a just future simply is not foreseeable. Dominion (Genesis 1:26) means responsibility for the maintenance of justice and righteousness (stewarding healthy ecological process) within the sphere of one’s influence. In ancient Hebrew thought, if a king, queen, governor or general fails in the stewardship of his or her domain, they forfeit the right to rule. Or, referencing specific Hebrew texts, “Obey my ordinances and live” (Leviticus 25:18), or disobey and the land will vomit you out (Leviticus 20:22).

Obviously, the responsibilities and challenges facing Christian communities are many. First and foremost is the task of educating for a greater awareness of the reality of biospheric deterioration. In view of this historically unprecedented challenge, Christians should be sensing a call to study the Scriptures from a "green" perspective (Habel), 2000) and to critique those theological orientations that are still so human centered. This is a challenge for individual Christians, their congregations, seminaries and ecclesiastical structures. The challenge is to participate aggressively in the promotion and implementation of public policies and programs that address such issues as considered in this essay. Today, for example, there are more than 40,000 registered organic farmers in the United States who are demonstrating ways to resist technological and economic forces that are destructive of land and rural community. These farmers are supporting innovators who are experimenting with land management practices and marketing programs that show promise for the regeneration of their basic resources of land, water, plants, and livestock. These activities are designed to achieve a more sustainable and therefore just future for everyone. Contour terraces are being rebuilt. Wetlands are being restored. The mentoring of new farmers is underway by neighboring farmers. Rotational grazing has proven its worth. Niche markets are developing nationwide along with the ever increasing demand for organically produced food. These activities and many more function as models for a renewed agriculture that addresses the challenge of global food security.

VII. What Christians Should Do

For most Christians, the claim that genetic engineering of food crops is potentially more risky than nuclear energy may seem to be just another way of getting our attention. Few will have sufficient knowledge to hazard a judgment about the accuracy of this claim. Nor are we likely to understand fully, as the paper argues, why neither the Green Revolution nor biotechnology is ecologically sustainable. And what about the "Doubly Green Revolution:" Is it really feasible, and if so would its implementation really feed the world? Christians need to learn more about these assertions if we are going to be effective agents of accountability and reconciliation in society.

So what can we do?

- We can **recognize we are part of the problem.** We know so little about these issues that we are unable to enter into serious discussions about their

consequences for ecological sustainability, food safety, or human organization. We invest our money in firms that despoil the land and monopolize life forms. We buy foodstuffs with little regard for the processes that produce them or for the effects of those processes on the poor farmers displaced from these lands. We must be more deliberate in applying our values to these and other actions we take every day.

- We can **do something about our ignorance.** Read this paper a second time to be sure you understand its main points. Sample the questions for discussion at its end to test your understanding. The bibliography is a rich trove of additional information.
- Better still, we should **encourage our congregations to study the issues** of biotechnology, the Green Revolution, and the Doubly Green Revolution, perhaps in a series of adult education classes making use of this paper and other materials. The series should be structured to include study of the Scriptures from a "green" rather than human perspective.
- We can **harness new understandings to effective action** by helping to shape better public policies. Encourage our congregations to hold the higher judicatories of our denominations responsible for making an effective social policy witness on the issues discussed in this paper. Urge your congregation to commit itself to the implementation of the church's policy decisions in effective action.
- We can **support organic farmers** who are demonstrating ways to resist technological and economic forces that are destructive of land and rural community. They experiment with land management practices and marketing programs that show promise for the regeneration of land, water, plants and livestock. These activities are models for a renewed agriculture that addresses the challenge of global food security.
- We **can resist advances in unsustainable technologies** by holding our elected representatives accountable for the consequences of existing public policies. Direct citizen contact with members of the executive and legislative branches of national and state governments, either in person or by letter, is a more effective way to influence policy than simply waiting for the next election. This paper identifies a variety of initiatives that could culminate in new public policies.

Questions for Discussion

1. Each day our world witnesses 800 million people go hungry and 170 million children under 5 years of age suffer from malnourishment. This situation is a human tragedy on a vast scale, made even worse because it is avoidable. Do you agree that implementing the "Double Green Revolution" proposed in this paper would help alleviate hunger as we know it? Why or why not?

2. Biotechnology and genetic engineering present risks both to the economy and the environment because we know too little about the organisms being released and the environments into which they will be released. In our materialistic

culture, risks tend to be discounted. Is this also true of traditional religious beliefs?

3. From a Christian point of view, how far ought transgenetic engineering be allowed to intervene with natural processes? In other words, to what extent ought we to tamper with nature?

4. How much better or worse than transgenetic engineering is the Green Revolution?

5. Christians are called to work for the establishment of a full justice that reflects the purposes of God. In what ways are existing methods of producing food failing to establish "full justice?"

6. What should Christians do to move towards a fuller justice? As individuals? As church members? As citizens?

7. What can be done to achieve sustainable food security for all by, say, 2030? Be specific about your priorities and responsibilities.

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