Science, Faith & New Technologies:

Transforming Life

Volume II

Genetics, Agriculture and Human Life

Discussion-Document
by the Working Group on Genetic Engineering of the
Justice, Peace and Creation Team

World Council of Churches
&
World Association for Christian Communication

This document deals first with the implications of genetic engineering applied to human life and then turns to the implications for agriculture. For those who are interested in some basic clarifications concerning biotechnology and genetic engineering, the text of a paper that was written by Tewolde Berhan G. Egziabher and Vandana Shiva already in 1997/1998 as a background document for a new phase of discussion on the ethical challenges of genetic engineering is included in this booklet. We want take the opportunity to express our sincere gratitude to both of them and to members of the working group who contributed in different ways and at different stages to the process: Victoria Tauli-Corpuz, Eunice Kamaara, Elisabeth Sherril, Christine von Weizsäcker, Heinrich Bedford-Strohm, Donald Bruce, Steve de Gruchy, Jaydee Hanson, Douglas Hunt, Brewster Kneen, and Vadim Repin for their involvement and support.

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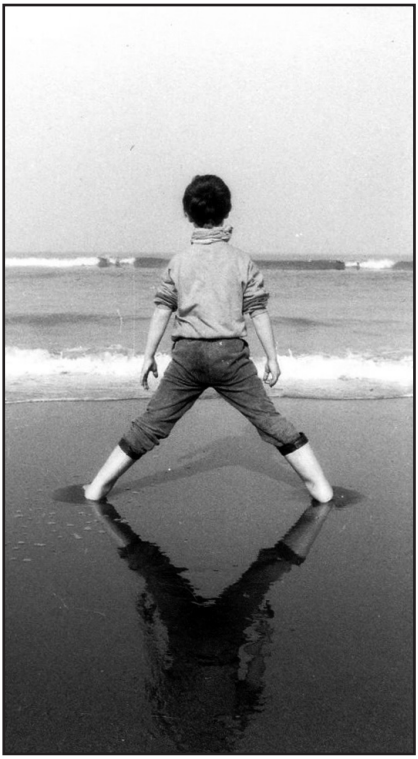
Contents



Introduction

What does it mean to be human and to be part of God's creation? Responses that seemed to be clear and unshakeable for centuries are severely challenged by new scientific and technological developments. The ecumenical movement addressed some of these concerns very early as part of a study process that culminated in the 1979 Conference on Faith, Science and the Future in the Massachusetts Institute of Technology (Boston, USA) and later in a study document on biotechnology in 1989.

In the meantime, churches have wrestled with the often difficult and divisive ethical questions concerning the beginning and ending of human life and have engaged with the newly evolving challenges of rapidly developing technologies. The 1989 study document and other documents and resources concerning biotechnology (including a provisional list of church statements) can be found at:

http://wcc-coe.org/wcc/what/jpc/earthdocs.html#biotech.

The Advisory Group of the World Council of Churches' (WCC) Justice, Peace, Creation Team (JPC) took up some of these challenges and suggested work on agriculture and genetically modified foods as an entry point for a study process on genetic engineering that concentrates on underlying ethical concerns and the vision for life. A small working group on genetic engineering discussed the proposal and developed background documents to stimulate further discussion by members of the Policy Reference Committee II of the WCC's Central Committee (CC). This document grew out of this work.

Context matters for both faith and science. In assessing research agendas and technologies, it is both reasonable

and necessary to start again and again from the very simple question: Why are we doing this? Given the pragmatic, result oriented and often utilitarian ethics of the dominant technological culture, the question can be rephrased in these terms: What is the problem this technology (or science) is supposed to address? Who defined the problem and constructed the solution, and to what end? Is the 'problem' simply being defined according to the (commercial) 'solutions' that are available or that would be most profitable to those offering them? If context matters, we need to ask again and again not only Who will benefit? but also Who is most likely to lose out?

The WCC working group on genetic engineering started to build a database of the many documents, brochures and books produced by churches and church related organisations. Although by far not complete, the list shows that the issues are widely discussed and are no longer seen as predominantly "Northern" concerns. Churches in the "South" have studied the impact on people and are fully aware of the leading role of trans-national corporations in pushing for the introduction of genetically modified seeds and genetically engineered pharmaceuticals that, in general, do not address the most pressing needs of people.

The affirmation that "context matters" is, however, also relevant for another reason. With increasing knowledge of the human genome, many scientists have become more critical of the initial drive towards genetic determinism, the assumption of a direct one to one relationship between cause and effect, the individual gene and expression of a certain characteristic or effect. At one time it was thought that humans had more than 100,000 genes, now researchers believe human have only about 20,000-25,000 genes. The relatively small number of genes mapped by the Human Genome Project point to much more complex processes, in which the inter-action between different genes, various parameters of the process and the whole context indeed matter. This should lead to much more careful assessments of the future prospects of the technology with a much stronger emphasis on the precautionary principle.

This discussion document concentrates on questions arising if we take seriously the socio-political, economic and cultural context as it shapes research agendas and the development trajectory of the technology and its applications. The group working on the document decided to adhere to a double focus on genetic engineering concerning agriculture on the one hand and human beings on the other. Depending upon the context, genetic engineering with animals could fall into either focus. The border between these two areas is fluid anyhow and it is difficult to draw a clear line since all the different applications are based on the same insights of molecular biology and the technology of genetic manipulation. More important, however, is the reason that in all of these areas, we encounter almost the same actors and much the same dynamics.

The document argues its case not from a supposedly neutral and objective position, but rather starts from the stories and voices of small farm holders, of Indigenous Peoples, of women and of persons with disabilities. Small scale farmers and Indigenous Peoples do not share the assumptions made by protagonists of the benefits of genetically modified seeds and crops. They challenge the broader public to very carefully examine the statements and promises made and to be vigilant regarding issues of power, profit and control. Indigenous Peoples are also struggling in many parts of the world to defend their genetic data, which have become a highly valued resource in the development of new pharmaceuticals and therapies. Persons with disabilities raise pertinent questions concerning the ideal of the medically managed person that is the shared ground for much of the discussion on human genetics. Many women warn that even their bodies are turned into an economic resource. These and other groups urge the wider public to take nothing for granted, but to re-examine the arguments brought forward in favour of genetic engineering, which usually reflect the context of societies highly integrated into the global economy and influenced by the modern development paradigm. It is precisely for this reason, that their experiences and voices are often marginalised and excluded from the discourse.

The group working on the document included representatives of Indigenous Peoples and persons with disabilities together with researchers, ethicists and staff of churches working on the issues at stake. In making their choice transparent, they have also responded to the mandate of the JPC Team, which takes responsibility of this document. This choice of perspective also implies that the document does not pretend to be representative of positions taken by WCC member churches coming from different theological traditions and different contexts. It seeks to foster the debate within and among the churches and to challenge them in their prophetic witness. It is meant for those in the churches who have an interest in the ethical challenges concerning genetic engineering and are ready to engage in an ecumenical discussion concerning their own assumptions and perceptions. This in turn applies also to this document – it is a discussion document in the real sense of the word.

Human Genetics

1. A rapidly developing agenda

Genetic engineering added a new dimension to the capabilities of human beings to modify and change the development of human and other species. It is at the origins of a new generation of pharmaceuticals, new diagnostics such as pre-natal genetic diagnostics that can be used for pre-implantation selection, new somatic therapies, and embryo cloning. These technologies and future genetic research developments such as some more recent developments in stem-cell research[1], and the legal frameworks around them, e.g. regarding intellectual property rights, patenting of life forms, prior informed consent and privacy, status of the embryo are rapidly developing. There are significant gaps in which there is no legal or regulatory framework and only little public debate in most of the countries. Of grave concern are the racist and dehumanising aspects of a new eugenics.

2. Overarching issues

Human genetic technologies deeply touch theological issues. Far beyond the immediate ethical questions that arise with the use of any new technologies, they touch the fundamental ethical fabric of our societies:

·Human genetic technologies touch our fundamental attitude toward life.

This is emphasised not only by defenders but also by critics of a theological view.

The American Nobel Prize Winner James Watson explicitly addresses those who believe that all human life is a mirror of God and who attribute therefore sanctity to human life that excludes any human attempt to use it for ends such as medical research. Watson himself affirms that life is not created by God but is the product of an evolutionary process that follows Darwin's principles of natural selection. Religiously motivated laws, which, for example, enforce the birth of genetically disabled children, says Watson, create unnecessary suffering for their parents. In the long run – thus the Nobel Prize Winner – these religious voices will be isolated and their views will be ignored.[2]

Watson's line of argument shows that in the current debate on the new possibilities of modern biotechnology there is more at stake than just the pros and contras of a certain method. It mirrors a possible change in ethical culture. It questions the validity of fundamental ethical values that come embedded in a broad societal consensus. Human genetic technologies touch our deepest convictions about the value of human life.

· Human genetic technologies force us to clarify our understanding of human beings as creatures of God, especially when in issues of human genetic technology religious language is invoked in public.

When U.S. President Bill Clinton announced the completion of the Human Genome Project in a globally broadcast press conference on June 26, 2000, he used theological language: "Today we are learning the language in which God created life".[3]

What is the meaning of such theological assertions in this context? How do churches respond to this claim?

· Human genetic technologies involve an assessment of the weight of different goods such as the possibility of healing sicknesses and the integrity of early human life. Sometimes ethical dilemmas cannot be avoided. Then, it is all the more important to carefully analyse and assess the ethical aspects of the problem and thus come to a responsible decision.

· Human genetic technologies are based on a distribution of resources for health that has to be questioned. Human

genetic technologies depend on resources that are extremely unequally distributed in the different parts of the world. The use of significant financial resources to help some parents have healthy children through expensive genetic technologies must be balanced against the need of other children to have their basic health needs met.

· Human genetic technologies that allow parents to choose or enhance the traits of their children may have an impact on the ecology of values in a society and will redefine concepts of sickness and disability.

3. Human genetics and persons with disabilities

We approach the issues of human genetics from the perspective of persons with disabilities. Some underlying concepts have to be clarified.

There are three main models of health and disease each having different consequences for the research and development of science and technology in the arena of genetics.

a) Within the *medical model* of health and disease, health is characterised as the normative functioning of biological systems and disease as the sub-normative functioning of these. Medical intervention at the level of the individual is seen as the remedy of choice. According to the medical model, disability is a defect in a person or a 'person-to-be' (a foetus, an embryo), caused by disease, a genetic condition, trauma, other health problems or a deviation from „normal" health.

b) The *social model* of health and disease recognises that a disabled person functions sub-normatively but differs from the medical model by questioning the exclusive focus on medical remedies for individuals. In the social model, a person's "disability" is affected most of all by their social situation, not solely by their genetic make-up or other traits.

c) New advances in biotechnology, nanotechnology, information and cognitive sciences have prompted some

persons to envision a third, *transhumanist model* of health and disease. These persons believe that new technologies will make it possible to integrate biological and mechanical systems in a ways that 'improve' the human. In this model it will become increasingly difficult to distinguish between disabled and non-disabled persons. All are in need of improvement. For the transhumanist distinctions between "enhancements" and "therapies" are irrelevant. According to this model, everyone is disabled; everyone has defects in need of 'fixing'.

Genetic and other technologies are promoted, as a tool for fixing disabilities - whereby disability is often a synonym for impairments, diseases, defects, and 'subnormal' abilities. They are seen as tools for diminishing suffering and as having the potential to free "us" from the "confinement of our genes, body structure, abilities and limited functioning. " Most genetic and other technology applications focus on the individual and his or her perceived shortcomings, thus perpetuating a medical, intrinsic, individualistic, defect view of disability. They follow a medical or transhumanist, not a social evaluation of a characteristic, and therefore offer only medical or transhumanist solutions but not social solutions (acceptance and societal cures of equal rights and respect).

Today the main targets for eugenic practices and for the non--genetic modification of the human body and its abilities are the characteristics labelled as being disabilities, defects and diseases that are viewed as a medical problem in need of a medical technological solution. The report "A Church of All and for All", produced by the Ecumenical Disabilities Advocates Network (EDAN) has a direct bearing on the ethical challenges arising in the field of bio and other technologies because it questions the obsession of seeing disabled people as a medical problem in need of a medical fix.[4]

The medical model of genetic diseases leads many to think that all genetic abnormalities need to be "corrected" through intervention. There are many genetic interventions being proposed. To date the most common is genetic testing. More than 1000 genetic conditions can be tested for at present. More and more of these genetic tests are available for pre-natal use. While these tests predict a likelihood of having a

particular genetic condition, not a certainty, many doctors and prospective parents interpret the tests as definitive. Moreover, most genetic conditions have a wide range of expression in the individual. Nonetheless, in countries where abortion is widely accepted, most parents choose to terminate pregnancies when they are told that the mother is carrying a child with a genetic disease. Couples that use in vitro fertilization to have a child are now being offered an array of diseases that their embryos can be tested for and can choose which embryos to implant in a womb based on genetic tests.

The individual decisions which have to be made in such cases and the decisions which govern the legal and institutional setup in which these problems are dealt with have profound ethical implications. Therefore we ask: How can theology help orient our work?

4. How theology can give orientation

The sanctity of all life

God's salvation in Jesus Christ not only means fullness of life for the human community, but the restoration of all creation to its goodness and wholeness. God's Holy Spirit comes to renew the whole creation. As the early church confessed: God, the Creator, the Son and the Holy Spirit are one in the Holy Trinity. According to the creation stories of the Bible, the earth was meant to be home for all living creatures, which live in different spaces, but linked to each other in a web of relationships. The human community is placed within the wider community of the earth, which is embedded in God's household of life. It is this vision of a truly ecumenical earth, which emphasises the sanctity and inter-relatedness of all life.

Jesus Christ as the basis

Christians understand what it means to be human in the light of Jesus Christ as the one human being in whom God's creative will for human beings has shown on earth. Biblical notions and the stories about the life, death and resurrection

of Jesus do not provide a blueprint for contemporary ethical decision-making. But if we live in a certain tradition and make the story of this tradition into our own story, our perspectives on the world are shaped by this story. As Christians we believe that the life, death and resurrection of Jesus is a powerful resource for a meaningful life. We believe that it can give us life-fostering guidance in the ethical questions of our times.

Relationality from below

The understanding of human beings as relational beings is fundamental. It does, however, not suffice just to speak of some general humanity with some general relationality. Such humanity and such relationality are qualified. Jesus is the vulnerable human being, the tortured human being, the powerless abused human being. Relationality, theologically understood, is therefore, relationality from below. To look at human relations as Christians, requires looking at them from the perspective of the poor and vulnerable.

Understanding this qualification of relationality has clear consequences for the assessment of modern human genetic technologies. Not only does it show the dubiousness of all technical efforts to improve human beings, but it also deeply ingrains the perspective of the disabled and physically "imperfect". Discussions about the selection of human beings, genetically worthy or unworthy to live, are seen differently, if this perspective becomes one's own perspective. Human life is given by God. Its beauty does not depend on human assessment. Honouring the indisposibility of human life is expressed in rejecting all efforts to apply the cloning technique to human beings.

Human beings have worth in themselves

Since every human being is created by God, humans are not at the disposal of other humans. No human being may be used as a pure instrument for any other purpose. Human beings are always ends in themselves and never only means to another end. Therefore, every human being is irreplaceable. This is

what the notion of the "dignity of the human person", which lay the groundwork of the modern human rights' tradition, means. If the Tongan people have resisted the economic exploitation of their blood in rejecting a research project by an Australian company that acted on behalf of a pharmaceutical TNC, they have shown a clear intuition for this dignity.[5] When human dignity is upheld, all forms of the use of human genetic technologies, which subject human beings to pure economic interests become unjustifiable.

Dignity instead of commodity

Human lives are more and more shaped by an economic paradigm that is dependent on the trade of commodities in the market place. The danger is obvious that this paradigm even shapes human attitudes toward life instead of nurturing this attitude toward life with the paradigm of dignity.

The emphasis on the dignity of the human person is irreconcilable with any commodification of human life. Human life is commodified when its value is weighed against another value. This is what happens when human life is patented. Such patenting gives power over human life to specific human beings that cannot be justified. Life ultimately belongs to God. The patenting of human life is in opposition to this conviction.

Unconditional affirmation of human life

Every human being is part of God's creation of which God said: 'It is very good'. Therefore God's love extends to every human being, regardless of whether other human beings consider it worthy or not. Current societal tendencies to judge others according to their degree of perfection, be it aesthetical, moral or physical, fail to witness God's will for God's creation. New genetic selection techniques such as Pre-natal Genetic Diagnostics open the door for efforts to judge the worth of human life and therefore to new forms of eugenics. A new culture of affirming life that includes human beings seen as disabled by others is imperative.

Questioning the notions of health and sickness

There are no objective criteria for the notions of sickness and health. What is called healthy differs in various contexts. While some can see deafness as a serious deficiency, others have learned to live with it and can affirm it. Vice versa many who seem healthy from one perspective can be seen as sick, for example in their social attitudes, from another.

Alleviating suffering is a high human goal. Jesus himself healed the sick and alleviated their suffering. But Jesus acted in relationship. He healed the whole person, not just their physical malady. He changed the person's body and soul and their status in society. He responded to a call for help. His healing was an affirmation of life. Medical treatments today have to be sensitive to the needs of the patients. Medical efforts fail to meet what they are called to do if they make patients into objects of a self-running medical or scientific enterprise that serves more the glory of the researchers than the needs of patients.

The moral status of the human embryo

If only by using others, including developing early human life, can we heal illnesses, then the price is too high. The churches do not completely agree upon the moral status of the embryo. Some affirm that the dignity of the human person applies to human life from the time of conception on. Others believe that the embryo only gradually develops into a full human being with the full protection of human dignity.

Nevertheless, there is the common conviction that no human being has to earn basic respect and dignity by moral, spiritual or physical worthiness. Such respect and dignity can also not be based on reaching a certain stage of biological development. Dignity is not earned by human beings but attributed by God the creator. Therefore, there is agreement that the embryo, from the very beginning at conception represents the beginning of human life and cannot be treated arbitrarily. Even those few denominations that do not exclude research with human embryos in the first fourteen days after

conception advocate strong restrictions on ethical grounds. Since therapeutic cloning ("research cloning") implies that human life is created for the simple reason to be destroyed again for research, it is not compatible with the respect for life which churches advocate.

Health justice

Modern human genetic technologies call to everyone's attention the grave injustices that characterise the global distribution of health resources. Human lives cannot be weighed against each other in an accounting mode. Every human life with its own biography is precious and deserves to be cared for. This is why it is a moral scandal that in many parts of the world the very basic requirements of human health care are not met. Nevertheless the main share of intellectual and financial resources for health care in the world is still directed to the wealthy. Whereas in some parts of the world health problems are caused by poverty, in other parts lack of health is caused by an affluent life style.

Christians believe that there is only one human family created by God. As long as some in this human family are gravely disadvantaged Christians are called to be their advocates. Those responsible in politics and health care must direct their attention to effective strategies for overcoming global health injustice. A more balanced global distribution of health goods is necessary. An ethics of self-limitation in the health care systems of the affluent countries and a common effort to develop basic health care systems globally are called for. If human genetic technologies cannot help in this effort, they should not be given any priority.

Accepting our finiteness

Especially in the affluent countries, people try to do everything to escape human finiteness. Large amounts of money are being used to expand life as long as possible. According to the Bible, however, good life includes finiteness. It is no coincidence that the creation story in Genesis sees the wish

of the human being for eternal life as the one temptation that would be like a second fall. God places the Cherubim at the door of paradise to prevent Adam and Eve from eating the fruits of the second forbidden tree - the tree of life - so they would not "*take also from the tree of life, and eat, and live forever.*" (Gen 3,22f). It is an act of God's love that God places the Cherubim at the door of paradise. Striving for eternal life on earth is failing to be human. Striving for human-made eternal life is striving for a fake paradise and it runs the danger of actually ending up in human-made hell. People of faith live with a different promise. They can accept their finiteness because they trust in an eternal life opened up by God.

5. Policy recommendations

Promising fields of genetic research

We support research that uses genetic technologies in ways that assist persons to life full and productive lives. We specifically look forward to continued developments in the basic understanding of how the more than 20000 genes in the human genome work to make the human function. Understanding the complex design of human genetics more and more, we are in awe at the wonder that God has created in humans. At the same time, we reject the efforts of those who would reduce the science of genetics to a form of genetic determinism wherein every aspect of human existence is reduced to genetic prediction.

We specifically support those kinds of genetic research that help persons live life more fully. We look forward to new advances from genetic research that help drugs work better and to research using adult stem cells and cord blood cells to find therapies that help repair our bodies. We look forward to new understandings of how our minds and bodies interact with our genes. We hope that this new genetic information will be used to help treat each person as a unique individual.

Embryonic research

The desire of couples to have children of their own is attested to throughout Scripture. We applaud research that will help couples overcome problems of infertility through better understanding the conditions in which the embryo comes into being and develops.

We recommend that no embryonic research that intentionally destroys human embryos or creates human embryos for destruction be undertaken. This means that we oppose the creation of human embryos for the production of embryonic stem cells and we oppose the development of cloned human embryos for any purpose.

Designer babies

We oppose techniques to allow parents to select the genetic make up of their children. While new techniques will be developed, at this time it means that we oppose the use of pre-natal tests for selection of which children to carry to term. We do however support the use of pre-natal testing to help parents know how to best care for their children and urge that all pre-natal testing be available only with pre-natal genetic counselling by qualified genetic counsellors.

We oppose the use of pre-implantation genetic diagnosis wherein cells are removed from a developing embryo to test them for genetic conditions or to determine the sex of the embryo. We also oppose the use of tests to select sperm that are used to fertilize eggs.

We oppose any techniques that would enhance human genetic traits. At this time we are opposed to any permanent changes in the human genome.

We are opposed to any efforts that would create a new market-driven eugenics. We condemn the old state run eugenics that epitomized the eugenics of the last generation. We do not want it to be replaced by a new eugenics wherein parents are encouraged to become eugenicists and design their children instead of welcoming them all as gifts of God.

Buying and selling human body parts

We are opposed to the buying and selling of human body parts. This includes the patenting of human genes and human embryos as well as the sale of human eggs, sperm and embryos. We are opposed to paying surrogates to incubate human embryos. However, we do support the adoption of embryos left over from in-vitro fertilization procedures.

Mixing of human and animal genomes for research

While many research animals contain human genes for research purposes, some limits must be placed on the mixing of human and animal genomes. We oppose the addition of animal genomes into human embryos for any purpose. We oppose the insertion of human nuclei into animal eggs. We are opposed to the development of human brains in any animal.

Need for further debate

policy recommendations are neither comprehensive nor final. They are intended to invite a more thorough debate on the ethical implications of new biotechnologies for the design of our medical care system. As churches we are called to be a clear and audible voice in the public debate on these ethically controversial issues.

Biotechnology and Agriculture

1. Genetic engineering and its application to agriculture

Whilst farmers have for thousands of years practiced selective breeding to develop the gene pool of plants and animals, genetic engineering presents the world with a dramatic increase in the power and possibilities for changing and adapting plant and animal life. The cells of living organisms contain genetic material known as DNA (deoxyribonucleic acid), or in some cases, RNA (ribonucleic acid), and this material forms genes. Genetic engineering is the manipulation of these genes within species and between species and even between plants and animals. It was made possible by the discovery of the structure of DNA in 1953, and then in the 1970's of a family of enzymes which made it possible for DNA to be isolated, cut and then pasted onto another fragment of DNA from another organism. This creates recombinant DNA, which can be infinitely multiplied (known as cloning) and then introduced back into a living organism, which becomes a genetically modified organism (GMO). The past three decades have seen the accelerated development of the tools and techniques for such genetic engineering.[6]

There are a range of steps that are undertaken in the process of the genetic modification of plants. The desired gene is identified and isolated from a donor organisms, and is then used to create the new gene or recombinant genetic sequence, with a marker gene added (for later identification). This gene

is then multiplied and inserted into the host organism using either a particle gun or what is known as a bacterial 'vector'. Because of the imprecision of this process, only a small percentage of the treated cells will respond to the inserted DNA in the desired manner, and so a process of selection of these cells takes place using the marker gene that was added earlier. Under optimum conditions, each selected plant cell can then grow to become a transgenic plant with every cell in the plant having the newly inherited DNA. This means that any daughter plant that develops through cuttings or pollination is also transgenic, and that all future pollen and seed will carry the foreign genes.

There are two basic types of transgenic plants, namely, those in which the properties of the food are modified through the gene change, and those in which the food is not itself modified but now carries a gene that enhances resistance to disease, drought or herbicide. Tobacco was the first plant to be genetically engineered in 1983, and this was followed by tomato, soy beans, oilseed rape, chicory, maize, and cotton.

In summary there are currently six potential applications of genetic engineering to agriculture and food production. These are:

1. To increase the yields of crops - which has had little success thus far;

2. To produce crops that can withstand environmental pressures such as drought, salinity or frost – this has had little success;

3. To increase the nutritional value of the plant, so that staple legumes and cereals would carry vital amino acids, which they currently lack, thus reducing the required quantity of food intake – this process is still in its infancy;

4. To enhance resistance to disease, weeds and pests, or (as in most cases) to enhance tolerance to designer herbicides, which kill off the disease, weeds or pests but leave the plant healthy – this is the most well developed aspect of GMOs thus far;

5. To minimize the need for fertilizers and agrochemicals, although this seems rather unlikely as the companies which

produce the GMOs also produce the fertilizers and the chemicals; and

6. To enhance the texture, flavour or shelf-life of the plant – because this could aid global trade. Quite a bit of work has been done in this area.

With these applications, GMOs are presented as a wonderful solution to world concerns about food security, suggesting that, with the correct application of certain techniques, hunger could be thing of the past. Given that 15 million children below five years die each year from hunger-related causes and another 840 million people experience food shortages, the sponsors of GMOs and biotechnology naturally promote themselves as a group which cares for life and for people's livelihoods. Witness this statement which Monsanto, the giant chemical company turned life-sciences corporation, attempted to have endorsed by African leaders in 1998:

As we stand on the edge of a new millennium, we dream of a tomorrow without hunger. To achieve that dream, we must welcome the science that promises hope. We know advances in biotechnology must be tested and safe, but they should not be unduly delayed. Biotechnology is one of tomorrow's tools in our hands today. Slowing its acceptance is a luxury our hungry world cannot afford.[7]

This is a significant claim, and one that deserves the close attention of the ecumenical church which is committed to 'caring for life'. It is a claim that is made on the assumption that industrial agriculture is necessary and good. By the term 'industrial agriculture' we mean turning farms into factories through the extensive use of fossil fuels, chemicals, synthetic fertilizer, and extreme mechanization. It is sometimes referred to as 'production agriculture' in which the sole aim is the mass production of commodities. As we shall see, however, from a Christian perspective, this assumption is not true. Therefore the burden of proof as to why we should move to genetic engineering in agriculture more properly lies with its proponents than with its critics. We need now to locate GE within the wider context of the provision of food in the global context.

2. The wider context in which GE is located

At the heart of the claim of the proponents of GE is the creative potential of science and technology in the service of human need, a claim that is foundational to the growth of 'western', industrialized or 'modern' society. The attempt by well-meaning or religious people to raise ethical questions about this is seen as 'superstition standing in the way of progress. Because of this, western societies hold tenaciously to the idea that technology is neutral and therefore not subject to ethical debate. However we are justified in asking if this is really about the progress of human life and community, or is just a scientific adventure which could lead us into more problems we have not even begun to anticipate.

We should remember that in its infancy western science was indeed a clear protest against power and on the cutting edge of human freedom. Science became a powerful vehicle for those who sought 'truth' over and against the established institutions of the day, among them the churches. There are many ways in which science continues to function in this way. However, it is crucial to recognise that in the context of the modern neo-liberal economic paradigm the relationship between science and power has changed significantly, so that technology is not a neutral tool, but reflects power distribution in this world and the choices made in the past by different cultures, communities and societies.

As noted in the introduction to this document, it is here that the WCC has chosen to understand these matters from the perspective of the deprived and powerless, and to ask:

· What is the problem this technology (or science) is supposed to address?

· Who defined the problem and constructed the solution, and to what end?

· Is the 'problem' simply being defined according to the (commercial) 'solutions' that are available or that would be most profitable to those offering them?

· If context matters, we need to ask again and again not only Who will benefit? but also Who is most likely to lose out?

2.1. The major actors in food and agriculture

To help us answer these questions, and to locate GE in the wider food economy we turn now to a consideration of the major actors in the field and how they have responded to GE, from the perspective 'from below'.

Scientists

In the past decade science, especially molecular biology and biochemistry, had to adapt to major structural changes. From publicly funded, basic science with its own ethos of intellectual honesty and transparency, it went to industry funded, narrowly specialised, so called pre-competitive research oriented towards the fast development of marketable products. Independent expertise and expertise with an appropriate level of discourse between the relevant variables, factors and fields of biological and other knowledge is not easily available in the scientific world. Some essential fields like soil ecology and structure are lagging behind. In this context, courageous, largely unprotected whistle-blowers who are willing to risk their scientific careers are the ones who lift the curtain, providing the public with essential data.

Transnational corporations and financial markets

Not only new biochemical methods of analysing and manipulating DNA, i.e. the basis of the genetic code, but also new structures of research, development, financing and promotion are dominated by transnational corporations and financial markets. Genetic engineering technology is very expensive and consequently strives to translate general insights about the biochemical nature of heredity into speedy general application in the globalised market. It has become the driving force for the agricultural market for commodities and cash crops for export to the affluent world. This process, which undermines local farming communities and markets, has been supported by World Bank policies, and the biotech and chemical company Monsanto has become the archetype for this. Transnational corporations have the financial and

political clout to use the WTO and to persuade countries to have industry-friendly regulation, and to introduce new laws protecting the investments, property and profits of corporations, especially through patenting laws. Many faith communities and churches have naturally protested against the patenting of life forms.

Governments and politicians

Politicians are called to control and limit the power of players in the political arena. There are, however, enough examples for the heavy influence of major corporations and investors on the governments of the USA and other industrialised countries. Dependence on the performance of economic actors is often combined with a strong belief in the neo-liberal economic doctrine and the rhetoric of liberalisation, deregulation and privatisation, which further limits the space for political interference and action. The accelerated process of economic globalisation has made this a common concern around the globe, affecting individual countries as well as the UN System and other international bodies. Nevertheless, the UN Convention on Biodiversity (CBD) and the Biosafety Protocol under CBD or the International Treaty on Plant Genetic Resources under the Food and Agriculture Organization (FAO) are important instruments to respond to the new challenges. They are, however, threatened to be overruled by WTO agreements. This was also criticised by the UN Sub-Commission on Human Rights.[8] The reconstruction of the political dimension of societies and appropriate legal frameworks that can be reinforced by a functioning judicial system have become major concerns everywhere.

Consumers

Consumers are torn between consumerism or learning to be active agents for sustainable and responsible consumption patterns. Consumers in industrialised countries usually do make not appropriate use of their purchasing power. Nevertheless consumers can play a role by insisting on GMO

free food, both for their own health reasons, but also for the well-being of other communities and other generations. The fight for labelling is to be understood in this context of solidarity. In order to mobilise consumer action, the public need access to information and participation and access to jurisdiction.

Farmers and social movements

Farmers grow food for us all. The return they get for their production on the world-market is minimal compared to the benefits that trade and food processing make to their shareholders. More and more farmers around the world realise that genetically engineering their grains, tubers, nuts, fruit-trees, vegetables, salads and spices will impact on their lives. Promises of benefits at the farm-level proved only to materialise in some cases, depending on climate and socio-economic conditions, for a short period of time. Family farmers in many countries had a closer look at the situation and came up with positions of severe criticism or outright resistance. Traditional and organic farmers see their way of running their farms in a holistic, low-input manner threatened.[9] Even industrialised farmers have come to resist decisions to grant permits for new genetically modified varieties of crops, like wheat, that will make it difficult if not impossible for them to meet consumer demands for GMO-free food.

Indigenous Peoples

As soon as a culture, market, financial system, agricultural and other practices become invasive and do not allow for peaceful coexistence with other cultures and their practices, Indigenous Peoples speak up and defend their sovereignty, their land and their rights. Indigenous Peoples have clearly voiced their concerns about genetic engineering and the release of its constructs into the environment. Contamination of their traditional crops and harm to the high biodiversity Indigenous People rely on and are safeguarding would cause an irretrievable loss to their cultures.[10]

The consideration of these six groups and their varied and diverse responses to the use of genetic engineering in agriculture illustrates clearly how the response is rooted in different assumptions about and experiences of industrial agriculture. The dominant actors argue that industrial agriculture is the only way to solve world hunger, and that biotechnology and genetic engineering is a natural advance on the 'green revolution'. This position can be summed up in the following seven claims:

1. Industrial agriculture will feed the world.

2. Industrial food is safe, healthy and nutritious

3. Industrial food is cheap

4. Industrial agriculture is efficient

5. Industrial food offers more choices

6. Industrial agriculture benefits the environment and wildlife

7. Biotechnology will solve the problems of industrial agriculture

A great deal of research into food security and hunger, and the experience of farmers throughout the world, has shown that these claims are myths.[11] This growing body of international opinion is a reminder that in the area of food security, science and technology are not neutral, but are in fact rooted in the power dynamics of the global neo-liberal economic paradigm.

2.2. *Understanding 'from below'*

It is here that we are guided by the WCC's prior commitment to understand the questions of life from the perspective 'from below', from the insights of the marginalized and those who stand in continuity with those with whom Jesus spent his life. As we do this, we take seriously the stories and voices of small-scale farmers, landless peasants and of Indigenous Peoples who do not share the assumptions made by proponents of genetically modified seeds and crops.

From this perspective, it is clear that biotechnology – life (*bios*) treated as, and reduced to, a matter of technology – is an

expression or product of a very particular culture and time. It is not a universal project, nor is it based in universally held assumptions about what it means to be alive and to die. The very development of this technology is calling into question key constants of human life and civilisation over thousands of years. Both reproduction and production are facing changes to their very essence. Human life is itself now often thought of and used as a commodity. Food sovereignty, once the very backbone of community, is now able to be removed from the community and located in the hands of technologists and large corporations.

In many cultures, particularly of Indigenous Peoples, the idea of genetic engineering is outrageous and its practice condemned as a violent attack on life, on Mother Earth, on the Great Spirit. Genetic engineering is certainly not based on respect for the miracle of life and the integrity of the organism, whether that is a microorganism, a plant, an animal, a human being or an entire bio-habitat. Critics of this technology describe it as an expression of a monoculture that assumes nature to be alien, stingy, deficient and in need of control. Nature must be forced to surrender its 'resources', which are then transformed and improved to suit human purposes – or the purposes of some humans who control the means.

Coupled with modern capitalism, which views everything as a potential commodity, this exploitative approach to life is reinforced and determines direction and priorities of scientific research. Geared towards production of marketable and profitable commodities, science is in grave danger of being reduced to a production technique, including research and development. It becomes at the same time a political tool in the hands of commercial interests. Development of genetic research is financed as long as it continues to come up with new and potentially profitable products, from seeds to drugs to genetic 'therapies' that are protected and excluded from competition by Intellectual Property Rights. Product development is removed from critical public policy discussions with the rationalisation that we cannot stand in the way of progress and the need for companies to protect their investments in research.

Small-scale farmers in many parts of the world, Indigenous Peoples and those who care for diversity in their local habitats are vitally concerned that global agribusiness supported by the Agreement of Trade Related Intellectual Property Rights of the World Trade Organisation (WTO) and related WTO rules and regulations takes over control of seeds and indeed the whole food cycle, while exploiting their traditional knowledge and the genetic information of their own bodies.[12] They would entirely depend on the money led market economy without having the purchasing power even to buy the seeds they need to continue and to survive. Growing indebtedness and despair of farming communities is a common feature around the world.[13]

A recent example of these concerns comes from a meeting of MOCASE (Via Campesina Argentina) and Grupo de Reflexion Rural.

We resolve:

· To struggle and mobilize, jointly with other movements and organisations against the present model of development, agro exports and the proliferation of transgenic crops, which tragically affect the peoples of South America and which attack the environment and peasant societies through monocultures;

· To denounce the false concept of sustainable soya mono crops officially promoted at the First Round Table Conference on Sustainable Soy, held at Foz do Iguaz in the interests of the North and of the agribusinesses, with the scandalous support of some large national and international NGOs;

· To assert that sustainability and monoculture are fundamentally irreconcilable, as are the interests of peasant societies and agribusiness;

· To denounce the relationship between agro businesses and hydro businesses, that entrenches the privatization of water supplies and destroying the aquifers of Latin America;

· To defend water as a universal right and a common good, in opposition to the logic of transnational corporations, who view it as a mere commodity;

· To hold the agribusinesses responsible for the mercantilisation of life and land;

· To denounce governments for a failure to pursue policies of agrarian reform;

· To defend the cultures, territories and traditional economies of indigenous peoples and peasants, while building unity with urban movements;

· Encourage and disseminate the agro ecological experience of peasant societies, not merely as alternative modes of cultivation, production and consumption, but as a radical alternative vision of life and the world, transforming the relationship between nature and human beings.[14]

2.3. *Food aid*

Special attention needs to be given to Food Aid, and the place of genetically engineered foods being offered to regions experiencing severe food shortages. Unfortunately, food aid is not in actuality the noble expression of solidarity and compassion as it is usually presented, but is regularly used to further political and economic interests. For example, PL480 in the USA was used immediately after World War Two to create markets for US agricultural commodities such as skimmed milk powder and white flour. Research has clearly shown how such food aid (regardless of whether it is genetically modified or not) impacts upon local food production and distribution in the long run, affects local diets, and often undermines local livelihoods.

At the same time, food aid has to be critically examined as an integral aspect of support for industrial agriculture and a support for the contamination of global agriculture with GMOs. For example, the US Agency for International Development (USAID) has been the principal US agency for providing economic and humanitarian assistance to developing and 'transitional' countries since 1961. US foreign assistance has always had the furthering of America's foreign policy interests, which includes supporting the US economy, US agriculture and US trade, as a key part of its remit.

The USAID website candidly states:

The principal beneficiary of America's foreign assistance programs has always been the United States. Close to 80% of the USAID contracts and grants go directly to American firms. Foreign assistance programs have helped create major markets for agricultural goods, created new markets for American industrial exports and meant hundreds of thousands of jobs for Americans.

In recent years this has meant the explicit support of the biotech industry by insisting on shipping genetically engineered crops as food aid, both directly and through the World Food Programme and other agencies including the churches. USAID has been a very aggressive and explicit proponent of GMOs in food aid, and the insistence upon shipping whole grains would make it seem that deliberate contamination was and is part of the programme to undermine local agriculture and the integrity of traditional seed sources. Furthermore, once the agricultural produce from a region has become genetically contaminated through such food aid, it will weaken that nation's ability and will to establish a rigorous regulatory framework that protects agriculture in terms of its organic integrity and therefore its export possibilities.

2.4. *Threats to biodiversity*

A Christian response to genetic engineering cannot ignore questions of science and power, of scientific rationality versus a relational, social rationality of life; the relationship between market and power and of the freedom of the market versus the freedom of people; the recognition of diverse ways of knowing, and of poly-culture versus mono-culture. It must also face the ecological implications of genetic engineering.

While biotechnology and genetic engineering are promoted as science that offers the true epistemology of biology and biochemistry, they recognise wholeness and complexity only as an agglomeration of reducible parts or components. Organisms, including humans, are not fully recognised as having any inherent integrity, nor are clans, cultures and societies.

By understanding organisms as simply compositions of identifiable and discrete components, one can then develop a technology that can 'improve' on nature, identifying the problems it wishes to address according to solution it wishes to offer. For example, human diversity that is not seen as 'normal' has to be treated as sickness and 'cured' by means of genetic manipulation. Unintentional diversity ('weeds') in a monoculture crop must be eliminated, and genetic engineering in combination with agro-toxins is promoted as the most efficient and environmentally friendly means to that end. The fact that 'weeds' are a problem because the crop is a monoculture is excluded from consideration, because the problem might then be understood as cultural rather than technological. In this way, genetic engineering becomes a threat to biodiversity.

Genetic Engineering operates on the basis of manipulating DNA from living organisms and is applied to a level of functioning in nature for which our scientific understanding is still insufficient. For this reason, precaution should be the rule, particularly since the consequences of genetic engineering are irreversible once in nature. Questions regarding gene transfer and impacts on non-target species must be adequately addressed before the products of plant biotechnology are allowed to spread. This is particularly applicable in Southern countries which possess a much greater level of biodiversity than is present in the North.

Environmental Impact Assessments (EIAs) call for multidisciplinary teams, and in the case of the impact of GMOs this requirement is even more necessary, given the multiplicity and gravity of potential impacts: to nature's biodiversity, to human health and to social and economic wellbeing. Therefore the decision to introduce or not GMOs to the socio-economic and natural environment cannot be left solely to molecular biologists, but must be the responsibility of a team comprised of specialists in, for instance, at least ecology, genetics, biochemistry, epidemiology, entomology, phytopathology, botanics, zoology, bioethics, sociology and economics. Most biosafety commissions are comprised of considerably less diversity of knowledge.

The extent to which monoculture and the introduction of GE seeds will foster inequality and degradation of the natural environment in any particular economy, society or region suggests that GMOs are an ecological threat and therefore of grave concern for those who seek to care for life on God's earth.

3. A theological response: food, faith and freedom

The biblical text offers deep insights about food and hunger. In order to sharpen our focus, we make use of the familiar petition in the Lord's Prayer, "Give us this day our daily bread" (Matt 6:11). This is a prayer that Jesus specifically taught his followers to pray, and is indeed something that all Christians pray, often daily and at least weekly. That this profoundly material request should appear in this profoundly spiritual prayer, signals for us the centrality of food in our lives, as well as the indivisibility of the material and spiritual in the eyes of God. The prayer suggests four crucial theses about food and hunger:

3.1. It is life that sustains us, not we who sustain life

The first word in the phrase, give immediately raises the question as to the intended recipient of the petition. To whom are we addressing this request? Is it to the government? The market? Scientists and engineers? Multi-national corporations? Charities and food aid organisations? No. Clearly, the request is embedded in the prayer to God, "Our father in heaven". This simple point is the profound foundation for any theological reflection on food. The prayer acknowledges that the creator of life is also its sustainer, and therefore that God is not absent from life but "is still working" - even on the Sabbath - as Jesus rather provocatively puts it (Jn 5:17). So we see God as both the creator and the sustainer of life through the gift of food.

Embedded in the first creation story in Genesis 1 is the account of God's provision of food for the man (Adam) and woman God created. (Eva). We often speak of the creation of humans as the climax of the sixth day of creation, but in fact the sixth day comes to a close only after God has provided food for both the humans and the animals of the earth. In vs. 27 God creates humans, in vs. 28 God gives them 'dominion' over all things, and then immediately we read:

29 God said, «See, I have given you every plant yielding seed that is upon the face of all the earth, and every tree with seed in its fruit; you shall have them for food. 30 And to every beast of the earth, and to every bird of the air, and to everything that creeps on the earth, everything that has the breath of life, I have given every green plant for food.» And it was so. 31 God saw everything that he had made, and indeed, it was very good. And there was evening and there was morning, the sixth day. (NRSV)

Here we note that this interconnection between the food we eat and the food animals eat is an oft-forgotten qualification of what 'dominion' over all living things may mean, and locates our needs within a wider framework of the needs of such creatures. The second creation story (Genesis 2:4 ff.) is even more rooted in the concerns of agriculture, irrigation and food.

8 And the LORD God planted a garden in Eden, in the east; and there he put the man whom he had formed. 9 Out of the ground the LORD God made to grow every tree that is pleasant to the sight and good for food, the tree of life also in the midst of the garden, and the tree of the knowledge of good and evil. 10 A river flows out of Eden to water the garden, and from there it divides and becomes four branches...15 The LORD God took the man and put him in the garden of Eden to till it and keep it. 16 And the LORD God commanded the man, «You may freely eat of every tree of the garden..."

However we understand these stories of creation there can be no doubt that they make the point that God is the provider of food for humanity. This gives deep symbolic meaning to the fact that sin comes into the world through a transgression

of the rules God sets for eating, undermining God's gracious provision of food. And the curse that God lays upon Adam when he is thrown out of the Garden is all about the provision of food. This is an important signal of how deeply rooted issues of food and hunger are in the relationship between God and humanity.

We noted above that God is not just the creator of food, but that we learn from the bible that God is also the ongoing provider of food. In many ways this is subsumed under the wider providence of God, but there is a special recognition of the role that God plays in providing food for the people. We see this most starkly in the religious obligation of offering a sacrifice of 'first fruits' to God as a thanksgiving for the food that God has provided. This is raised to prominence in the giving of the Law in Exodus, again in Leviticus, and in the reconstruction led by Nehemiah.

> You shall observe the festival of harvest, of the first fruits of your labor, of what you sow in the field. You shall observe the festival of ingathering at the end of the year, when you gather in from the field the fruit of your labor. (Ex 23:16)
>
> The LORD spoke to Moses: "Speak to the people of Israel and say to them: When you enter the land that I am giving you and you reap its harvest, you shall bring the sheaf of the first fruits of your harvest to the priest". (Lev 23:9,10)
>
> We obligate ourselves to bring the first fruits of our soil and the first fruits of all fruit of every tree, year by year, to the house of the LORD. (Neh 10:35)

These religious rituals are rooted in a belief in the providence of God, and a deep recognition of our dependence upon God for our food.

But it is more than this. It is clear that the reason there is such an emphasis on the provision of food in the creation stories, and in the religious rituals of Israel, is that food means life. God provides food because God is the author of life, and without food we cannot live. This is a powerful recognition that God sustains us, and that life sustains us, rather than we

who sustain life. It puts into perspective where we stand in the chain of life, and provides both caution and hope: Caution that we do not overstep ourselves in our arrogance about what we can achieve with life, through our intellect and our technologies and hope that is born of faith in the one who does provide and will provide.

3.2. Food production involves human labour

It is significant that we ask God not for our daily water or cereals or fruit, but for our daily bread. Immediately we face the conundrum that whilst we can accept that God creates natural foods, God certainly does not create bread. People make bread, and it is a culturally defined task that makes use of available technology. Not all cultures and people make bread; some make porridge, others make chapattis or tacos, or pita. But in all cases it requires labour, fire and utensils. So when we pray to God for our daily bread we not only are acknowledging the providence of God (as we saw above), we are accepting that our labour is a vital component of God's labour in the world.

This is vital in two important respects. Firstly it reminds us that human beings have a vocation to participate in the work of God (Missio Dei), and that the petition in the Lord's Prayer that God would provide us with bread on a daily basis is not a statement of laziness or resignation. Having prayed the prayer, we cannot fold our arms in the expectation that God will drop loaves of bread from heaven. Grain perhaps, cereal perhaps, but not bread. Bread requires us, and this means that we also are being petitioned in the prayer.

This co-labouring task for humanity is, of course, right there at the start. We perhaps noted in the story of the Garden of Eden the intent of vs. 15: "The LORD God took the man and put him in the Garden of Eden to till it and keep it." This needs to be held in tension with the labour involved in food production as part of the curse that God lays upon Adam when he sends them from the Garden of Eden:

17 And to the man he said, «Because you have listened to the voice of your wife, and have eaten of the tree about which I commanded you, 'You shall not eat of it,' cursed is the ground because of you; in toil you shall eat of it all the days of your life; 18 thorns and thistles it shall bring forth for you; and you shall eat the plants of the field. 19 By the sweat of your face you shall eat bread until you return to the ground, for out of it you were taken; you are dust, and to dust you shall return.»

This conflict between labour as a gift from God and labour as a curse for sin speaks to our human experience in the production of food. There is the positive side, the creative side, the sense of working for the benefit of ourselves, and our neighbours, in harmony with God. Against this there is the negative side, the exploitative side, the sense of being alienated from the produce of our labours, of working in a way that God does not sanction. There are ample examples of both of these experiences, but they must speak volumes to one who was a peasant farmer producing for her family and selling any surplus, and who now - under the pressure of global or national political policies - ends up being a farm labourer who no longer eats of the produce of her labour. The ethical shortcomings of a system that turns labour into a curse are clear to see.

The second vital issue also has to do with the ethical implications of our co-labouring with God, but in a slightly different way. If we are to accept God's gift of work, then we should keep in step with the author of life. This provides clear boundaries for the use of labour and technology - it must be in harmony with God's creative intent, and with the life that sustains us. Industrial agriculture with its reliance on chemicals, fertilizers, pesticides, bio-technology and genetic engineering, and its demeaning of labour through the reduction of farming into factory-type work, conflicts with God's good gift of work.

3.3. Food is a communal rather than individual entitlement

The Lord's Prayer is a communal prayer. We pray to our Father. This comes out clearly in this petition for bread which

is not for ‘me, alone’; but it is a request to God to give ‘us, our’ bread. This is a radical notion; one that the Church has seldom taken seriously, for it calls into question our ideas of ownership, entitlement and distribution.

The economic model that is dominant in the world today values private property and privatization - so that even God’s gift of water can be controlled by the few. This has also been the case with food for many centuries, but it has been exacerbated by the technological advances of the ‘green revolution’ and current practice in bio-technology. What we have seen happen is both an increase in the food supply and an increase in hungry people.

The tragedy is that there is enough food to feed everyone in the world, with estimates varying between 110% and 150% global food supply per person. The problem of hunger then is not about the total supply of food but about access to that food, and therefore about the just distribution of the available food supply. And the question of access and distribution is a question of entitlements. People have to earn the ability to acquire food, either directly in the fields, or through wages from other labour that is then exchanged for food through some form of market. Hence, people go hungry and starve not necessarily when food supply diminishes, but when they cannot afford to acquire the available food.

These points help us to understand some of the stories surrounding famines. For example in the worst famine in recorded history, in Ireland in the 1840’s, Ireland was exporting food to England - wheat, oats, cattle, pigs, eggs and butter - food that the Irish could not afford to purchase. In the terrible famine in Ethiopia in 1973, food was moving out of the famine-struck Wollo region, to the more prosperous regions of Ethiopia. Clearly the fundamental cause of famines is not a lack of food, but an absence of entitlements.[15] When there is a failure in the regulatory and distributive frameworks that hold society together, and that ensure that people have both access to food and the ability to acquire it, then a drought or local food shortage turns into a large-scale famine.

We are reminded of the communal nature of the petition in the Lord’s Prayer by the reality of famine. We should not be

seduced into thinking that our concern with food should end with total aggregate food supply, or even food supply per capita; but with whether that food is justly distributed so that all of us, receive our daily bread. Distributive justice that must challenge Christians to question the dominant economic paradigm in the world today, which downplays these concerns believing that 'the unseen hand of the market' solves them. But the evidence of this false truth is to be found in the almost 800 million starving people in the world today.

This challenge brings to mind the words of Dom Helder Camara from Brazil:

When I gave bread to the poor they called me a saint. When I asked why they had no bread they called me a communist.

This, however, is the direction that the Lord's Prayer, with its radically egalitarian stance, is taking us. It is pushing us to be concerned not just with our own access and entitlement to food, but to that of our neighbour, and particularly our neighbour whose own entitlements to food is rather weak. Within the life of the church we see this dramatically portrayed in Paul's admonition to the Corinthians. We often forget the immediate context in which the familiar words of the institution of the Lord's Supper are recounted:

18 For, to begin with, when you come together as a church, I hear that there are divisions among you; and to some extent I believe it. 19 Indeed, there have to be factions among you, for only so will it become clear who among you are genuine. 20 When you come together, it is not really to eat the Lord's Supper. 21 For when the time comes to eat, each of you goes ahead with your own supper, and one goes hungry and another becomes drunk. 22 What! Do you not have homes to eat and drink in? Or do you show contempt for the church of God and humiliate those who have nothing? What should I say to you? Should I commend you? In this matter I do not commend you! 23 (1 Cor 11:18-23)

We also see this communal concern in the actions of the young church at Antioch towards the church in Judea.

27 At that time prophets came down from Jerusalem to
Antioch. 28 One of them named Agabus stood up and
predicted by the Spirit that there would be a severe famine
over all the world; and this took place during the reign of
Claudius. 29 The disciples determined that according to their
ability, each would send relief to the believers living in Judea;
30 this they did, sending it to the elders by Barnabas and Saul.

3.4. Food and freedom are indivisible

The petition is for bread to be given daily. This is a request that God's provision would be of such a nature that it frees us from anxiety and want, and therefore from the manipulation of those who control food. The Roman Emperors knew that with 'bread and circuses' they could keep the poor masses happy, and therefore keep themselves in power. Satan also knows about the power that comes with the control of food. We see this clearly in the first of the temptations that Jesus faces in the wilderness: 'turn this stone into bread' (Matt 4:3, Lk 4:3). Jesus knows however that this is a manipulative request, and his answer that 'humans do not live by bread alone' is a pointer to the fact that 'bread alone' is not what God desires for us. Food and freedom are indivisible.

Perhaps the most striking illustration of the relationship between food and freedom is in the story of the Israelites in the wilderness, after their miraculous exodus from Egypt.

2 The whole congregation of the Israelites complained against
Moses and Aaron in the wilderness. 3 The Israelites said to
them, «If only we had died by the hand of the LORD in the
land of Egypt, when we sat by the fleshpots and ate our fill
of bread; for you have brought us out into this wilderness to
kill this whole assembly with hunger.» 4 Then the LORD said
to Moses, «I am going to rain bread from heaven for you, and
each day the people shall go out and gather enough for that
day. In that way I will test them, whether they will follow my
instruction or not. 5 On the sixth day, when they prepare what
they bring in, it will be twice as much as they gather on other
days.» 6 So Moses and Aaron said to all the Israelites, «In the
evening you shall know that it was the LORD who brought you

out of the land of Egypt, 7 and in the morning you shall see the glory of the LORD, because he has heard your complaining against the LORD. For what are we, that you complain against us?» 8 And Moses said, «When the LORD gives you meat to eat in the evening and your fill of bread in the morning, because the LORD has heard the complaining that you utter against him--what are we? Your complaining is not against us but against the LORD.»

God simply will not allow the people to sacrifice their freedom to get food. Both are important, they are indivisible to God - and therefore his response is to offer 'daily bread'. Our request for this daily bread from God, thus stands in this tradition of not being willing to give up our freedom for the sake of food.

But this temptation that the Israelites faced continues to plague us today. We see this in the promises of the giant multi-national agro-chemical and bio-technology companies. With their power in the market, their access to government subsidies, their control of research through sponsorship, their desire to patent seeds, and their constant propaganda that they alone are able to solve the world's food crisis - Third World farmers and people are being offered the possibility of getting unlimited food in exchange for our freedom. It is a seductive offer, but it is nothing other the offer to return to Egypt where there is food to be had, but also slavery. To help us stand firm in our desire to have both food and freedom we pray, together with the Israelites in the wilderness, for that daily bread which only God can provide.

This brings us full circle back to where we began - for our first thesis concerned the life that sustained us, the life that God has given us, and the food that he has provided for us. Given all that we have reflected upon it should not surprise us that Jesus uses this notion of food and life to speak of himself in the phrase, "the bread of life". For indeed in Christ who is "the bread of life", we find the indivisibility of food and freedom most profoundly expressed. The life that God gives us and that sustains us, all of us, is the food that gives freedom.

4. The ethical-theological critique of genetic engineering in agriculture

This reminder of the life that God gives us, and the concern of "caring for life", is why the WCC has committed itself to the ethical guideline of upholding life in dignity in just and sustainable communities. This provides us with a foundation from which to make seven key criticisms of genetic engineering in agriculture. We intentionally use the verb "to mess" in advancing these criticisms, in order to express something negative about human action that claims to 'make nature better'.

4.1. GE messes with life

With the possible isolation, manipulation and transfer of genetic material a very powerful tool to alter life as we know it was developed. Far beyond the immediate ethical questions which arise with the use of any new technologies, these technologies touch the fundamental ethical fabric of our societies, the meaning and the quality of life people seek for themselves and future generations, our understanding of our relationship to all living things in the rest of Creation, and faith in the God of Life. At stake is not only our understanding of what it means to be human, of the dignity of human beings and the integrity of all creatures, but of the future of human and other life on earth.

4.2. GE messes with the truth

There are four clear ways in which the proponents of genetic engineering hide the truth. These are: First, the manipulation of scientific truth through the shaping of the research agenda by controlling the funding of research projects and the attempt to discredit any critical voices. Secondly, the cynical marketing of genetic engineering as the answer to the problem of hunger in Africa and Asia, or as a solution to the

environmental degradation caused by industrial agriculture. Thirdly, the manipulation of government regulatory frameworks to ensure the promotion only of the views and information which serves the interests of the biotech industry. Fourthly, the refusal to allow the labelling of GMOs is itself a hiding of the truth, but also makes it impossible to ensure the integrity of the trade in food.

4.3. *GE messes with our common inheritance*

Closely associated with the messing with truth is the way in which GE and the biotech companies mess with our common inheritance by seeking to destroy the way in which food has been produced, preserved and shared for centuries in many and diverse cultures. This invasive action geared towards the ownership and control of food, has a huge impact upon both human culture and biodiversity. A clear expression of this is the assertion of patents on genetic sequences, which means that life forms that have been known to diverse civilizations over many generations are being expropriated for the sole ownership and control by private interests.

4.4. *GE messes with justice*

Traditional forms of food production and distribution have been communal, and have usually sought to ensure a just distribution amongst all in society so that hungry people are cared for. The emergence of industrial agriculture and the 'green revolution' may have increased staple crop production, but it also increased the number of hungry people. The biotech industry is deeply embedded in this industrial system, and offers to solve hunger in and through this system. However, it is clear that it is the self-same system which produces the deprivation that leads to hunger. Biotech companies, driven by market signals related to profit, seek to control seeds and food supply as well as their distribution. The corporate search for profit stands in direct contrast to the cooperative search for justice.

4.5. *GE messes with our health*

Because of the embodiment of life, in the end something that messes with life, truth, inheritance and justice will soon mess with our health. The whole question of the kind of agriculture that is vital to sustaining healthy bodies in healthy communities seems to be avoided by the biotech companies. Behind the plans of these companies and others pushing the GE agenda lies the assumption that industrial agriculture is the only model for the rest of the world to follow. Apart from the serious questions about the sustainability of this system in itself, given that it is dependent upon huge government subsidies, there are important questions to be asked about the healthiness of the food produced by industrial agriculture given the sharp rise in such diseases as diabetes, high-blood pressure and obesity. The impact of GMOs on human health and the immune system in a time of AIDS is also a matter of deep concern.

4.6. *GE messes with agency*

A further and fundamental assumption underlying the GE approach to agriculture is the notion that people, who live in 'developing' countries, Indigenous Peoples, and small-holder farmers, are incapable of producing their own food and therefore must rely on outsiders from 'developed' countries to come and sort out their problems. GE in agriculture therefore suggests to people that they are simply objects of other people's efforts to secure food for them. In this way we have seen the cooption of the idea of 'food security' by the big TNCs, in much the same way that Pharaoh's economy did offer food security to the Hebrews in Egypt. In order to entrench the notion of the agency and vocation of the poor, many have moved from talking about food security to talking about food sovereignty.

4.7. *GE messes with relationships*

Ecological science indicates that all life is a web of complex inter-relationships that are necessary for ecological balance.

We have noted above that human health is compromised by GE, but we must also consider the health of all living things. The reductionism at the heart of GE, in which life is reduced to a genetic code, reinforces a culture of individualism in which the only way that life forms can relate is as marketable commodities. By doing this GE undermines fundamental life-giving interrelationships, not only between God and humans and among humans, but also between humans and other forms of life. The result is that all life suffers, biodiversity is undermined, and there is the growing extinction of life forms. This brings us back to our first criticism that GE messes with life, and reminds us that life is far more complex than we can possibly imagine.

5. The way forward

In the light of our work on genetic engineering agriculture we therefore call upon the WCC, member Churches, individual Christians and people of good will to embark on the following six forms of action

1. To build partnerships with civil society, people's movements, small scale farmer groups and Indigenous Peoples in opposing the science, philosophy and practice of genetic engineering in agriculture

2. To challenge Christians in the employ of those promoting genetic engineering to reflect upon the implications of their work in the light of the Gospel's concern for truth and justice, and to consider the possibility of being whistle-blowers and conscientious objectors

3. To encourage Christian theological reflection to shift from issues of food security to issues of food sovereignty so that our concerns for justice, freedom and participation are not compromised.

4. To encourage Christians involved in medical research to continue to investigate the impact of genetic engineering in agriculture upon human health, as called for by the European Commission.

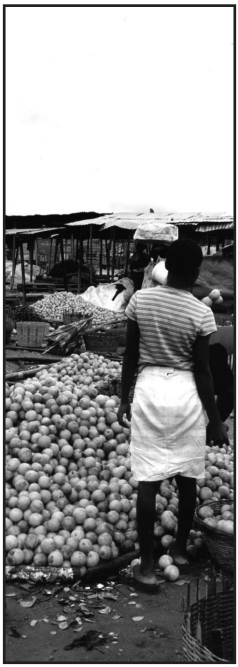
5. To stand in solidarity with those working in local communities to promote healthy food and good nutrition amongst the deprived, especially in a time of HIV/AIDS.

6. To recognize in our work and reflection the way in which access to food stands on the interface between ecology and economy in the struggle for life against commodification and control

7. To engage biblically and theologically in reflection on food, faith and freedom, and especially to consider the possibility that the agapé meal at the heart of Christian worship – the Lord's Supper or Eucharist – could be envisaged as a sacrament of resistance against those who seek to control food.

In doing these things, we stand in continuity with the AGAPE document, and particularly section 3.3., "from food security to food sovereignty":

> We believe that God's economy of solidarity and justice for the household of creation includes the promise that the people of the world have the right to produce their own food and control the resources belonging to their livelihoods, including biodiversity. It is therefore the right and responsibility of governments to support the livelihoods of small farmers in the South and in the North. It is their right to refuse the demands of agribusinesses that seek to control every aspect of the cycle of life. Such an approach requires respect for indigenous spiritual relationships to land and the bounties of mother earth.[16]



A Primer

Biotechnology
and the issues interconnected with and through it[17]

by *Tewolde Berhan G. Egziabher*[18] and *Vandana Shiva*[19]

1. Introduction

Biotechnology is avant-garde. But it is also one of the oldest of technologies. This is a contradictory condition deliberately engineered by genetic engineers and their mentors to confuse and fuzz the major social political, economic, moral and philosophical issues interconnected with genetic engineering tissue culture (including cloning) and protoplasm fusion (the artificial fusing of cell nuclei).

Any action humans take through the intermediation of living things, even through inducing other humans, is now referred to as biotechnology, e.g. beer fermentation, waste composting, ploughing with oxen, producing a baby through surrogate motherhood , producing new trees through tissue culture, sheep cloning, changing the genetic composition of tobacco through recombinant DNA technology.

The older biotechnologies have been with us for millennia without needing a collective noun to identify them as a group with some essential commonality. The need never arose. Even now the need does not exist. It is difficult to see why we would ever need to treat fermentation, animal traction, and animal cloning as the same technology.

The term «biotechnology» came into use in the last 3 decades of the emergence of genetic engineering. Those who introduced the term wanted to relate genetic engineering to such well-known technologies as fermentation and animal traction so as to impart it familiarity and harmlessness. Hence all the confusion and fuzz.

Genetic engineering enables the breaking down of all reproductive barriers and the mixing of genes across all living things. It is now possible to take any genes from any organism belonging to any species and introduce them to any other organism. Sexual reproduction normally mixes the genes of individuals of the same species. Occasionally, some genes of individuals of very closely related species can mix during sexual reproduction through a process called introgression. Genes of unrelated organisms do not mix through sexual reproduction.

Some types of genes of bacteria (example, those in plasmids) can naturally transfer to other bacteria and genetic mixing can thus occur horizontally across species. Bacterial parasites (phages) are believed to mediate some, but not all, the cases of horizontal transfer. Parasite mediated horizontal gene transfer is known even in higher organisms, e.g. among species of fruit fly, but it is much less common than among bacteria.

The natural or parasite mediated horizontal transfers and the sexually induced mixings of genes are ecologically important and may be significant also in evolution. But, the major part of any organism's genome remains unavailable for such transfers in nature, and thus the natural barriers of sexual reproduction, which have maintained the bulk of the species in the biosphere, are maintained in nature unbreached. It is thus only to add to the confusion and fuzz that sexual reproduction and horizontal gene transfer are being invoked to make it seem that, for example, the mixing of pig and human genes is natural and should cause no worry. Genetic engineers and their mentors claim that genetic engineering does nothing that sexual reproduction does not do. Talk of bestiality! The aim of the confusion and fuzz they create is to divert society's attention from the safety, economic, social, political moral and

equity problems that might arise out of major interferences with the foundation of life.

But even the proponents of the confusion and fuzz, though happy with the reassurance that their stratagem produces, still require to refer to the new technologies at least when they claim intellectual property rights protection on them. Hence the use of the term « modern biotechnology».

2. How does modern biotechnology work?

The term «modern biotechnology» is open ended in conceptualization, and any technique of modifying and harnessing into use of any living thing or any component of a living thing that came into use after the first half of the 20th century will qualify for inclusion. Of interest to us at the moment because of their possible impacts on nature and human society are enzyme technology, tissue culture, animal cloning, protoplast, fusion, genetic engineering and the resuscitation of extinct ancient organisms or the introduction of ancient (fossil) genes into present day organisms.

2.1 Enzyme technology

The body uses enzymes to break down biological molecules into their components, e.g. meat is digested in our alimentary canal into amino acids which we then absorb inside the body cells. Another set of enzymes then reassembles the amino acids into the specific human body proteins. Similarly enzymes are used for fats and carbohydrates. Inside our cells, the reassembling process can use parts derived from proteins as building blocks for carbohydrates or fats. Proteins, fats and carbohydrates can thus become interchanged through the use of enzymes.

These processes have now been developed industrially. The full flexibility of combining enzymes at will is being used to make commodities of plant, animal or microbial origin fully interchangeable. Obviously, this interchangeability of commodities has social, economic and political implications.

2.2 Tissue culture

Placed in appropriate enzyme solutions, cells of meristematic tissues or even isolated individual cells of many plants species can be induced to divide into a mass of cells, differentiate, and develop into new individual plants. This technique is called tissue culture. It can be used to produced new plants out of an existing plant without going through sexual reproduction. It can thus hasten the process of propagating any plant variety. It can also be used to select individual cells which have some desirable trait, e.g. being virus-free though taken from an infected mother plant. It can also be used to isolate cells with mutant genes of some desired trait, e.g. salt tolerance by immersing a mass of cells in a salt solution and using the surviving few cells to regenerate the desired salt tolerant plants.

Tissue culture is obviously an extension of the traditional technique of plant cloning by planting a branch or any other small piece and letting it root in the soil, e.g. figs. However, such cloning worked only with a limited number of species. Tissue culture makes such non-sexual propagation a technique which can be widely used.

2.3 Animal cloning

In the some of the lowest animals, a piece of tissue cut off from an individual may develop into a new individual identical with the parent, e.g. hydra. In higher animals, such easy cloning can take place only at the early division stages of the fertilized egg. It is in this way that identical twins are born.

It has recently become possible to take a cell of a higher animal, introduce it into an unfertilized egg and put inside a womb. The introduced cell takes over control of the egg cell and the egg nucleus degenerates. The new individual born is at least in theory a replica of the animal from which the introduced cell was taken. However, it is possible that, as already pointed out under the heading «tissue culture», the cell could have acquired new mutant genes. In practice, more experience with animal cloning would be required before

we can say for certain that the cloned animal is indeed a complete replica of its parent. This is because, though genes are certainly the most important determinants of traits, their expression is influenced by their immediate environment, and the immediate environments in which the parent and the clone develop are not identical.

Animal cloning can do the same for animal selection and breeding that tissue culture does for plants.

The likely social, political and moral questions that would arise should human cloning be tried are overwhelming.

2.4 Resuscitation of fossil organisms and ose of fossil DNA

A microorganism preserved in amber for millions of years will have functional DNA still in it. If the microorganism is placed in appropriate media solutions it can become alive again and continue normal functioning. For example, yeast from the Jurassic age has been brought back to life and used to make beer.

Similarly, the DNA of microorganisms or of larger organisms from distant eras can be introduced through genetic engineering into the cells of modern-day organisms.

2.5 Protoplast fusion

Normally, any chromosome or DNA sequence which finds its way into a living cell is digested by enzymes and destroyed. However, sometimes naked cells of related plant species can be made to fuse and their nuclei may combine in whole or in part. From this fusion, sometimes a new individual may be developed through tissue culture and a plant with a genetic make-up that would not have existed in nature is brought into being.

Initially, protoplast fusion promised to be a highly creative technique. However, its application has turned out to be limited. It can thus be largely disregarded. New methods may bring it back into greater use. Its impact would be similar to that of genetic engineering.

2.6 Genetic engineering

In genetic engineering, a DNA sequence from a donor organism representing a gene or genes is introduced into the cell or cells of a recipient organism in such a way as to enable the introduced DNA sequence to remain undigested by enzymes and become expressed. The donated DNA sequence may be physically introduced into the protoplast of the recipient organism. Usually, however, such a physical introduction is not easy and the required DNA sequence is first combined with a vector which can breach the recipient cell's defenses against foreign DNA. The vector is usually a bacterium, a virus or even a transposon (or jumping gene). The DNA sequence when combined with the vector is called recombinant DNA. This is why genetic engineering is often referred to as recombinant DNA technology. It should be pointed out that unlike what the name denotes, the process of introducing a DNA sequence into the genome of a recipient organism is very imprecise and its whereabouts in the recipient cell cannot be determined in advance.

The vectors are usually parasites or pathogens which normally easily breach the host's natural foreign DNA barrier. When used to carry the genes being introduced, they are in some way disabled from being parasites or pathogens.

The new organism in which the introduced DNA is expressed is said to be a transgenic organism.

3. Safety considerations

The safety considerations in the use of modern biotechnology concern human health, socio-economic well-being and environmental protection. These considerations arise from the fact that the implications of the induced changes in trait may not be fully anticipated, and that they may even be associated with other unthought of traits. It is for these reasons that the Convention on Biological Diversity saw the need for a Protocol on Biosafety, and why such a protocol is now being negotiated. There was an initial resistance, led by the United States of America, to the make of a Biosafety

Protocol. The fact that the United States is not a party to the Convention on Biological Diversity, and the fact that a number of industrialized countries, especially the Nordic countries and Austria strongly supported the call of developing countries for a Biosafety Protocol forced an acceptance of the negotiations. This acceptance was consistent with the Precautionary Approach, which stipulates that lack of adequate knowledge is no reason for not taking action to forestall environmental problems, and against the opposition view that since modern biotechology only mixes genes, which sexual reproduction has always been doing, action is not called for.

The same trends are now evident in the negotiations. Almost all the developing countries and many industrialized countries want an effective Protocol which will set the required minimum standards for a safe world. Some industrialized countries, which feel that such a Protocol will regulate the biotechnology market which they dominate, and less than a handful of developing countries who support them for various country specific complex reasons, want the world to accept a very weak Protocol.

The safety issues being debated include human health, socio-economic well-being, environmental protection, liability and compensation, and risk assessment and risk management.

3.1 Human health

There are many worries with regards to human health.

Some of the microorganisms being modified by modern biotechnology could develop new pathogenic or parasitic traits or their products could be toxic.

The disabled vectors used in genetic engineering could regain their virulence as disease causing organisms.

These vectors could combine with hitherto harmless microorganisms, give them the new capacity of invasiveness, and enable them to develop into serious pathogens.

In experimenting with insects and other animals which are vectors or intermediate hosts of parasites and pathogens,

inadvertent extensions of geographical ranges could be made, introducing old diseases into new areas.

Pathogen DNA used as a vaccine may, through horizontal transfer, be incorporated into a hitherto safe microorganism which could then become a new pathogen causing an old disease.

Antibiotic producing genes introduced into genetically engineered organisms as markers[20] may spread antibiotic resistance, which is already a serious global problem.

Food allergies are bad enough as they are. The exchange of genes among crops could make hitherto safe crops allergenic. This has already happened with soybean which had genes from brazil nuts introduced into it. The soybean developed the widespread allergenicity of the Brazil nut.

Fossil organisms preserved in amber and brought back to life will be entirely new to the human body. It is possible that some of them could become health hazards.

Some crops are being genetically engineered to produce vaccines. Is the effect of continuous and constant vaccination known? What happens to the crop if later studies show the vaccination to be no longer necessary or even possibly a health hazard?

3.2 Socio-economic well-being

The global social and political implications of modern biotechnology are intimately linked with the present economic and political structure in the world and with its emerging trends. It is obvious that all these issues cannot be governed by a Protocol on biosafety. We should, therefore, restrict ourselves here to the socio-economic issues which should be within the scope of the Biosafety Protocol. We shall return to the bigger global dimensions later.

The introduction of a transgenic crop, forage, forest plant or domestic animal species into agriculture could cause disruptions in existing livelihood systems. An impact assessment should thus precede its introduction, and the

necessary corrective measure taken to ensure the social and economic well-being of the target population.

In particular, traditional developing country commodities could be produced in hitherto importing countries. For example, tissue culture has been used to produce vanilla in factory vats, and transgenic kenaf is now being grown outside of the tropical climate normal for this crop. Transgenic rapeseed is now producing oil with properties of palm oil. Such developments would not only cause much social and political upheaval by destroying the livelihoods of poor small farmers and undermining the economic base of their country, but would also force the abandonment of the production of crops and result in serious crop genetic erosion. It may be thought that, if modern biotechnology can give us a way of doing without those crops, they might as well disappear. But the precautionary approach would indicate that we should keep our options open. According to the Convention on Biological Diversity, developed countries should help financially and technically in biodiversity conservation. It is thus the duty of importing developed countries as well as exporting (developing) countries to ensure the conservation and sustainable use of biodiversity Socio-economic considerations should, therefore, be included in the Biosafety Protocol being negotiated.

3.3 Environmental protection

There are many ways through which an organism modified by modern biotechnology, or brought back into existence from a fossil state of preservation or their products could be dangerous for the environment.

The resuscitated species is obviously now new to the biosphere, and the modified species may have acquired new characteristics which, for all practical purposes, make it also new to the environment. These newcomers to the environment may cause changes to the plant, animal or microorganism communities through the usual ecological interactions of competition, predation, pathogenicity or parasitism. They may

also introduce chemicals new to the environment and likely to adversely affect ecological interactions.

As pointed out in the previous section, genetic engineering in crops may result in the discontinuation of their cultivation and thus in genetic erosion.

A gene introduced into a given variety may find its way into other varieties of the species and into other species either through sexual reproduction or through horizontal transfer. It should be recalled that some horizontal transfer happens naturally, but that the combining of the gene in question with a bacterial, viral or transposon (jumping gene) vector enhances the possibility of horizontal transfer. A gene expected to be useful in a given variety could have adverse environmental effects in another.

For example, a gene which produces a chemical toxic to insects has been taken from the bacterium, Bacillus thuringensis and introduced into cotton to make the crop resistant to insect attack. If this gene became transferred into other species, many unintended insects could be eliminated. Even cross pollination, which in many species requires insects, may be negatively affected and unintended plant and animal species be eliminated. Conversely, resistance could be developed by insects and the previous problem of insect attack exacerbated.

Genetic engineering is used to develop crops resistant to a certain herbicide, e.g. the Round-Up Ready soyabean of Monsanto is resistant to the herbicide Round-Up. This encourages the excessive use of the herbicide in question, thus devastating the immediate environment. It increases the development of resistant weeds through selecting resistant mutants. Besides, the introduced resistant gene, now made mobile by combining it with an invasive vector, may be transferred into other species taking the resistance into the natural ecosystem.

Plants, animals and microorganisms are now being genetically engineered to produce large quantities of specific chemicals. Even when the use of these chemicals is no longer needed, it may not be possible to withdraw the transgenic organisms

producing those chemicals. It is even possible that the ability to produce those chemicals will be introduced to non-target varieties and species through sexual reproduction or horizontal gene transfer amplified by the invasive vectors combined with the genes. An insidious new form of chemical pollution impossible to clean up may thus be ushered in.

3.4 Liability and compensation

Modern biotechnology promises many useful applications. But, as seen in the sections preceding these, it is possible that the applications could also go wrong. In all previously introduced technologies, the technology owner benefits from its use, but is also held liable in its adverse effects. The majority of the countries which are rushing into being suppliers in the new and growing market in modern biotechnology refuse to consider liability. They verbally reassure the world that modern biotechnology is useful and cannot go wrong. However, the only reassurance the developing world will take seriously is the acceptance of liability and the commitment to pay compensation. Efforts at verbal reassurance while refusing to accept a liability and compensation regime will do nothing other then conjure up sinister motives. The Biosafety Protocol must thus include provisions on liability and compensation.

3.5 Risk assessment and risk management

All negotiators of the Biosafety Protocol accept the need for putting in place risk assessment and risk management regimes. The debate is on how rigorous they should be. Most of the modern biotechnology industry is in the hands of transnational corporations. The developing countries fear that the minimum standards enshrined in the Protocol will become the norm owing to competition to attract these corporations by minimizing conditionalities. They, therefore, believe that the risk assessment and management regimes of the Biosafety Protocol should be detailed and rigorous enough to ensure global protection, not mere indications to prompt countries into developing their own internal regimes.

4. *Intellectual property rights protection.*

Modern biotechnology has accentuated the differences in intellectual property rights (IPRs) protection (example, patents, breeders= rights) between developed and developing countries.

IPRs were introduced by the industrialized countries. They are explicit on being designed to protect only individual interests of members of the industrial society. One condition for patentability is that the technology be industrially applicable. By denying patentability for non-industrial applications the system discriminates against collectively produced and communally used indigenous and local community technologies. Initially, it treated such communal knowledge and technologies as unpatentable. But this condition has been relaxed and community knowledge and technologies are being taken as fair game for the industrial sector to privatize, e.g. the old Indian technology of parboiling rice has been patented.

One condition of patentability within the industrial system itself has been that what is to be patented should be an invention, not a discovery. With the development of biotechnology, discovery is being subsumed in invention so that the mere identification of a DNA sequence which determines a trait is being taken to be an «inventive step», the same as if describing the sequence creating it from scratch were the same thing. Even if that DNA sequence were made in the laboratory, it would merely be synthesizing a natural product, which is a chemical achievement but not an invention of the natural trait determined by that product. This has lead to the patenting of living things by merely describing a DNA sequence in them. Such patenting will lead to complex legal barriers that will stand in the way of the use and conservation of biodiversity. For example, by merely decoding the genes responsible for gluten in wheat and patenting it, one could control all the research and development in wheat. It is said that a comparable actual patent taken out on cotton is causing problems in cotton research and development.

In the United States, it has now become possible to patent traits without even decoding their genetic causation. For

example, male sterility in quinoa has been patented. It should be added that this trait in quinoa was developed by Andean farming communities and an American patent on it is thus unjust.

If adherence to the criterion of invention were adhered to, active ingredients of herbal medicines, even when synthesized, would not be patentable.

It is contrary to the letter and the sprit of industrial society IPRs that all these patents are allowed. It is contrary even when farmers' varieties of crops from farming local communities are taken and, with little or no further breeding, given Breeders' Rights protection as the intellectual property of individuals. Unfortunately, this is happening extensively in industrialized countries, and increasingly so in developing countries.

The Convention on Biological Diversity recognizes that it is indigenous and local communities who have generated and given us our knowledge and technolgies on, and who continue to conserve and use, biodiversity sustainably. It stipulates that the knowledge, technologies and biodiversity of indigenous and local communities should be accessed and used with their prior informed consent, and with their involvement. It also stipulates that IPRs should be supportive of, and should not run, counter to its objectives, which are the conservation and sustainable use of biodiversity and the fair and equitable sharing of its benefits.

It is obvious, therefore, that the predatory and disruptive IPR systems related to biodiversity and the knowledge and technologies on it go contrary not only to our sense of justice, but also to international law.

In contrast to this, the Trade Related Intellectual Property (TRIPs) component of the Uruguay Round of negotiations which created the World Trade Organization insists that microbiological applications and plant varieties are protected by IPRs.

Is the world schizophrenic then?

We do not believe it is. The CBD was negotiated by nearly all the countries in the world. The Uruguay Round was initially

also similarly negotiated. When the powerful industrialized countries saw the insistence for greater justice and environmental sensitivity, they highjacked the process. They manoeuvered it so that four groups of 10 countries, each group handling issues different from those handled by the other three, finalized the negotiations. The forty countries involved were actual or asking members of the OECD. The TRIPs agreement is, therefore, an embodiment of only the advantaged section of humanity and a nightmare of the rest. For example, Africa was practically unrepresented among the 40 countries.

A sense of justice and an appreciation that affluence in some parts of the globe at the expense of other parts will destabilize even the affluent parts should, therefore, force a reorientation of IPRs.

It is in line with this that a task force established by the Scientific, Technical and Research Commission of the Organization of African Unity has recommended an Africa-wide ban on IPRs on life, called for the whole world to join in this ban, and for a continuation of the unimpeded global flow of biological resources. This would free indigenous and local communities from corrosive corporate pressure, and all the interest on them would turn constructive, and aim at supporting their global service of generating, conserving and sustainably using biodiversity.

5. Biotechnology and a new monpolization process

Modern biotechnology was initially developed in universities and other public institutions of developed countries, mostly in the United States of America.

In most cases, the researchers established small biotechnology firms and went into the private sector.

At about the same time, big chemical transnational corporations were buying up seed companies in order to develop crop varieties tied to their agrochemical products (herbicides, pesticides and fertilizers).

These same chemical transnational corporations followed this by buying up the small young biotechnology companies for the same reasons that they bought up the seed companies.

These corporations also often own huge commercial farms in many developing countries. Therefore, they have come to control more and more of the research and development production and end use of agricultural products.

It should be recalled that these same transnational corporations are the users of agricultural products as raw materials in chemical and food processing factories.

Through the use of enzyme technology, these corporations have been developing processes that make the biological raw materials, usually their own products, interchangeable for the production of any processed food or chemical end product.

Through genetic engineering, they are now replacing industrial plants for chemical production by transgenic microorganisms, plants and animals in the factory vat, or arable field or factory farm, as the case may be. This makes agriculture and the chemical industry interchangeable.

With «free trade» guaranteed by the World Trade Organization (WTO) they can shift their investment and thus their agricultural and chemical operations at will from any part of the world to any other. This makes labour globally interchangeable.

Again, through the rules of WTO, any transnational corporation can establish offices any where in the world. This makes all countries interchangeable.

All these combined usher in a kind of monopolization unheard of in the past. Some countries have antitrust laws aimed at the domestic control of economically unhealthy monopolization. The countries where such antitrust laws exist are not many. At any rate, legislation developed for the domestic scene cannot cope with such global process. The world should develop international antitrust legislation that prevents monopolization within a sector, across sectors and across frontiers. Without this, a healthy social and economic development will not be possible, and the disadvantaged global citizens, both

in developed and developing countries, are uniting in this contracted world to force their will against it.

6. Biotechnology and moral issues

Religion is global. The least religious are probably the most industrialized. But even there, religion is a force which the political establishment can forget only at the risk of its own peril.

Modern biotechnology brings out many religious dilemmas.

Would the eugenics, the redesigning of humans, be acceptable. For example, some religions prohibit the eating of pork. When pig genes have been introduced into cattle, where does pork end and beef begin?

The overwhelming majority of religions and all common decency prohibit cannibalism. When human genes are introduced into cattle, where does human flesh end and beef begin?

When a human being is cloned, is the soul also cloned? Or is the cloned human being without a soul? If so, is she/he a full human being, with all human rights, or merely a lump of flesh to be used and disposed of by an owner as a sheep or a goat is used and disposed of?

Would it thus be in order to clone humans as mere sources of organs and biochemicals? Would it be morally acceptable to produce by cloning defective humans complete only in the context of a given required organ or biochemical?

Many other moral questions could be raised C these will do as examples.

7. Biotechnology and political issues

With or without modern biotechnology, the old political fights between the powerful few and the weak majority will continue. So will the struggle between the oppressed women and the oppressing men. Modern biotechnology seems set to fuel these struggles by supplying new weapons.

For example, now that cloning is possible through the use of women, will the billionaire, the oligarch and the dictator work towards eliminating all other men, whom he sees as potential rivals, and using all women to clone himself and progress towards both filling the present world and perpetuating himself into the future? Of course he will have to clone also the women as necessary tools for his self perpetuation.

Or will some group of women do away with men altogether, multiplying and perpetuating themselves by cloning themselves, working towards eliminating men altogether and solving their age-old problem?

Progress in biotechnology has made it possible to identify the genes of individual human beings. There are theories of various degrees of credibility associating certain genes with the predisposition to certain conditions. Should, for example, an insurance company be allowed to test applicants for health of life insurance and vary the premium it charges depending on genetic composition? Should it be allowed to exclude some gene bearers from insurance coverage?

There could be other sinister political implications. Some genes may be found which are peculiar to certain ethnic groups. What political system should the world develop to ensure that these differences are not used to engineer differential vulnerabilities to diseases or toxic substances and eliminate “unwanted» ethnic groups? The rise of neonazism and the growth of other right wing organizations in the industrialized countries adds urgency to the matter. The history of industrialized countries of the last 500 years is not reassuring in this context.

It should perhaps be recalled here that the areas in which strikingly distinct human genes are to be found are outside Europe, and that the present international law was created by Europe when the world was its colony. Very little change has occurred since decolonization and international law is still entrenched to serve the interests of Europe and the European diaspora. The rest of the world should unite to fight for an international legal system that protects the weak and the peculiar so that we can co-exist in harmony and use the whole

range of human evolutionary adaptation to cope with the vagaries of nature, and not to eliminate any of it.

8. Biotechnology and philosophical issues

An opinion often expressed, especially by those who are supposed to be the best informed, is that humans have so far adapted to all changes, including the changes they themselves bring about, and they will continue to do so. The implication of this attitude is that we should not try to regulate biotechnology.

It is true that humans have always overcome all hurdles, be they natural or human made. However, this is not peculiar to humans. Every species has overcome all the hurdles it encountered between its emergence and its extinction. The logic is based on induction, but it violates the basic rule of mathematical induction. This rule points out that overcoming a hurdle or even a million successive hurdles is no guarantee that the million and first hurdle will also be overcome. It is possible, and sooner or later likely, that humans can fail to overcome some problem and go extinct.

There is a particular worry at this juncture in human history. These has been no known species that could undertake to directly redesign itself. We know that our knowledge about our body has changed with time. For example, it is known that letting blood cured diseases. If such an understanding of blood had coincided with the ability to eliminate blood, can we be sure that the medieval Europeans would not have engineered themselves to be bloodless? This is an example deliberately chosen to be ridiculous to show how ridiculous it is to assume that we know ourselves sufficiently to be able to redesign ourselves. We may genuinely redesign ourselves into extinction.

Whatever we do with biotechnology, we must prohibit genetic engineering of human beings. Whether we believe in any deity or not, we can all agree that we are not our own creators. We should thus not accept to be our own designers and redesigners. There must be strict national and international

laws prohibiting human cloning and the production of transgenic humans.

9. Conclusions

Whether we could or we could not do without modern biotechnology, it is probably too late to get rid of it. At any rate, it promises to be useful even though this promise has not materialized to any significant degree. On the other hand, modern biotechnology is new and it may yet prove itself very useful . It seems, therefore, to be set to continue with us.

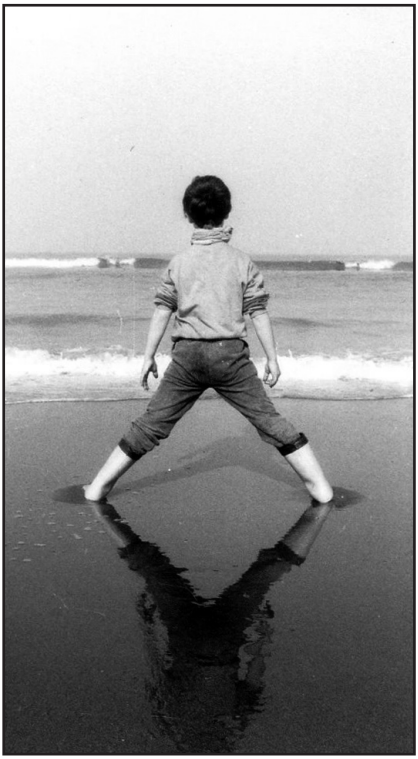
But if it is to develop usefully, the risks involved with it should be prevented. There is, therefore, need for a Biosafety Protocol and for national biosafety laws. These laws should have rigorous provisions on risk assessment and risk management to ensure human and biodiversity health and environmental integrity as well as socio-economic well-being. The owners of biotechnologies, like the owners of any other technology should be held liable for any harm inflicted and they should compensate for damage done.

All IPRs on living things should be eliminated since any achievement relating to life is at best a discovery and never an invention. Such an abandonment of IPRs would at the same time eliminate the predation on the livelihoods of indigenous and local communities.

There should be an effective international law to prevent the use of biotechnology to build trans-sectoral, trans-labour, trans-commodity and trans-geographical corporate monopolies. This new monopolization process cannot be tackled at the national level alone.

In this and in other issues, international law should change to cater for the needs of the whole world and not be allowed perpetuate the interests entrenched during the colonial era.

Also through international law, humanity should protect itself from the use of genetic engineering to target for destruction certain of its social or ethnic groups, and to redesign itself possibly into extinction.



[1] It sems to be possible to re-program adult stem-cells so that they can develop like embryonic stem cells.

[2] Frankfurter Allgemeine Zeitung, September 26, 2000 p. 55

[3] http://clinton4.nara.gov/WH/Work/062600.html

[4] see www.wcc-coe.org/what we do/ Faith and Order/

[5] The term in their own language that they used was "gneia".

[6] The literature covering the scientific aspects of genetic engineering and DNA is growing rapidly, and we encourage readers to find the most up to date material on this. A good introduction for Christians is Donald and Ann Bruce, Engineering Genesis: The ethics of genetic engineering in non-human species (London: Earthscan, 1999

[7] See B. Kneen, Farmageddon: Food and the Culture of Biotechnology. (Canada: New Society Publishers, 1999) p 1

[8] United Nations Resolution 2001/21 on Intellectual Property and Human Rights

[9] Cf. the example from South Korea in the WCC-JPC team dossier on Globalising Alternatives to Globalisation, Geneva, 2000 with its analysis of the role of agribusiness and WTO in this process

[10] The destructive effect of trade-related privately owned intellectual property rights on Indigenous Peoples' community based knowledge and of biopiracy has already led the WCC to support the Statement of Indigenous Peoples on the WTO Agreement on Trade Related Property Rights (TRIPS) and initiatives against biopiracy.

[11] For a fuller discussion see Andrew Kimbrell (ed), The Fatal Harvest Reader: the Tragedy of Industrial Agriculture (Island Press, May 2002) See also www.fatalharvest.org and www.centerforfoodsafety.org

[12] The WCC supported the Indigenous Peoples' statement on "No to Patenting of Life", see at http://wcc-coe.org/wcc/what/jpc/earthdocs.html#bio

[13] Cf. the Christian Aid report "Selling Suicide" at http://www.christian-aid.org.uk/indepth/9905suic/suicide1.htm.

[14] Final document of the Iguaz Counter conference on the impacts of Soy and Monocultures, San Miguel de Iguaz, Brazil, 16-18 March 2005. See <www.iguazu.grr.org.ar

[15] See also Curry, Bruce.1979. Mapping Areas Liable to Famine in Bangladesh (Ph. D dissertion) Department of Geography- University of Hawaii. Curry, in conducting geographic research on famine for the Bangladeshi government, found that availability or the lack of availability of capital after a natural event like a cyclone was the best predictor of famine areas.

[16] World Council of Churches, JPC Team, Alternative Globalization Addressing Peoples and Earth, Geneva 2005, p 22

[17] Paper prepared already for the World Council of Churches Eighth Assembly, Harare, Zimbabwe, 7–11 December 1998

[18] in 1998 Institute for Sustainable Development, P.O. Box 30231, Addis Ababa, Ethiopia; later representative of Ethopia in UN negotiations concerning biodiversity and bio-safety

[19] Research Foundation for Science, Technology and Ecology, A-60, Hauz Khas, New Delhi – 110016, India

[20] The desired gene together with the antibiotic producing gene is introduced into cells. When the cells are treated with that antibiotic those without the antibiotic producing gene, i.e. those without the required introduced gene, are killed off.