A PROMISE OR A THREAT? A THEOLOGICAL CRITIQUE OF GENETIC ENGINEERING AND BIOTECHNOLOGY WITH PARTICULAR REFERENCE TO FOOD SECURITY AND SOVEREIGNTY IN AFRICA

By

SAMUEL MPELEKA CHINGONDOLE

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SUPERVISOR: Dr. Steve de Gruchy (Director of the programme of theology and development).

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ABSTRACT

Today, Africa has more countries with food security problems than any other region on the globe. Two-thirds of all countries suffering food insecurity are in Africa. Present trends would mean that the number of chronically undernourished people in the Southern region of Africa would rise from 180 to 300 million by the year 2010.

In this research, I note that in the face of this food or hunger crisis, particularly in Africa, some have argued that genetic engineering biotechnology promises to combat food insecurity. Opponents of the technology argue that, to the contrary, genetic engineering biotechnology undermines food security, food sovereignty and livelihoods on the continent. The technology is designed to block access to food and kill agricultural bio-diversity, vest excessive, monopolistic and exclusive power in the hands of a few bio-technologists and giant multinational corporations, and ultimately, create hunger and poverty in Africa and other developing countries by undermining organic and conventional means of farming.

The thesis offers a critical theological assessment of the structural, ecological and socio-economic effects of genetic engineering and biotechnology on agriculture, food production, food security and sovereignty in Africa against some core theological principles. The study, therefore, brings a careful critique to the growing area of science in its relationship to the current issues of food security and sovereignty. The theological framework provides a moral framework for analysis that can be applied in the debate about genetic engineering and biotechnology.

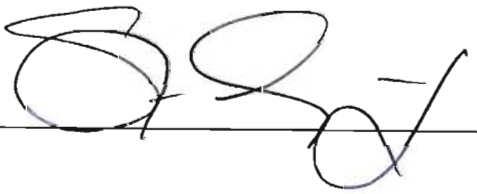
In this thesis, I will consistently demonstrate that opponents of the GE technology think that proponents of r-DNA technology are mostly driven by the intent to generate and maximize profits rather than a concern for the common well being, and the intent to control all the stages of agricultural production. The corporate control over essential agricultural resources such as seeds and food entails that multinational companies have control over fundamental human rights of access to healthy, safe and adequate food, nutrition, and ultimately to social and economic development itself. This, then, becomes an issue of justice and hence the concern of the churches and theologians. In this light, then, the study argues that issues of food security and sovereignty cannot be meaningfully and credibly pursued without taking adequate recognition of moral, ethical and theological insights. Such framework would guide scientific and GE technological activities.

DECLARATION

As required, I, Chingondole, Samuel Mpeleka, hereby declare that this thesis, unless specifically indicated in the text, is my original work. I further declare that I have not submitted this thesis for any other degree or examination at any other University or institution of learning.

Signature:  February, 2003

Samuel Mpeleka Chingondole

Signature:  February, 2003

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DEDICATION

This thesis is dedicated to the following people: My late dad -Paul, my living mother - Chrissie, my wife – Christine, my daughter –Gertrude, and all my brothers and only sister - Martha. These have been a source of inspiration and encouragement, each in his or her special way. It is also dedicated to the hungry and the poor of the world.

TABLE OF CONTENT

AN INTRODUCTORY OVERVIEW

This thesis is divided into six chapters. This introductory overview sets the stage for our discussion in this thesis. It offers an overview of this work, namely a theological critique of genetic engineering and biotechnology with particular reference to food security and sovereignty in Africa. Essentially, the overview aims at laying out my concerns, argument (the main hypothesis) and issues involved in the debate.

Section one deals with the origin and motivation of the study while section two focuses on the objectives, relevance and rationale of this study. Then, in section three of this introduction, we note the limitations of the study, which is followed by section four that dwells upon the details of the study. This section covers the summary statement of the debate and its brief description, the main hypothesis of the study, the three key sub-hypotheses, methodology, and the structure and organization of the study. First, let us turn to the origin and motivation of the study.

0.1 The origin and motivation of the study

Sproull argues that research problems emanate from "recognition of an existing problem; desire to improve the status quo; plans for the future and curiosity about some phenomenon"[1]. This study originates from discovering that genetic engineering and modern biotechnology has a negative impact on society, in particular, on developing African countries. Organic farming is today suffering, and food security is located in the hands of too few biotechnologists and large multinational companies, and food sovereignty and livelihoods are undermined. Bio-technologists and multinational companies have control over seed crops, food, life forms and economic production itself.

During my interaction with my supervisor, Dr. Steve de Gruchy, who has a special interest in the field, I became curious about the problem. This motivated me to begin to engage myself in the research with a view to understanding the problem more profoundly

[1] Sproull, N. 1995. *Handbook of research methods: a guide for practitioners and students in social sciences (2nd edn)*. Metechen, N.J.: Scarecrow, p.23.

and ultimately to propose ways and means through which the problem at stake could be minimized.

Thus, the study can be seen as originating from all four types of sources as argued by Sproull above: my discovery of the negative impact of GE technology, through my interaction with my supervisor, has brought me curiosity, which in turn leads me to seek plans for the future in the form of raising consciousness through ethical and theological critique.

Clearly, genetic engineering, animal cloning and new reproductive technologies[2] are being promoted as the keys to more productive agriculture and solutions to pressing environmental and medical (health) problems. But growing numbers of farmers, scientists and the concerned parties disagree, citing new hazards to our health and the environment, along with troubling ethical and theological questions. They believe that the hazards of genetic engineering and biotechnology are among the most critical threats facing us today. This question of whether genetic engineering and biotechnology are a promise or a threat has also motivated me to examine the topic more closely and attentively.

In addition, I think that the giant multinational corporations (MNCs) use the image of the poor and the hungry from the Third World countries, of which the African continent is part, to advance a technology that is neither safe nor economically beneficial to human beings and the entire creation of God. This has also driven me to examine the problem.

0.2 The purpose of the study

0.2.1 The objectives and relevance of the study

This study offers a critical theological assessment of the structural, ecological and socio-economic effects of genetic engineering and biotechnology on agriculture and food production in Africa against some core principles that will be elaborated in chapter one of

[2] For a broader understanding of Genetic Engineering and Biotechnology, please see chapter two of the thesis. This will structure our thinking on the subject under discussion.

this thesis. This objective is based upon the experience and observation that genetic engineering and biotechnology has had, and will continue to have a serious negative impact upon society at large, particularly to family unit farming. The study will show that proponents of genetic engineering are mostly driven by the desire for profit rather than a concern for the common good.

This thesis aims at serving as a medium through which the churches, governments and society at large may be "conscientized"[3] about the serious nature of this so-called modern biotechnology. This study urges such organs to address the issues relating to this technology with a firm stand before it is too late to manage the problem.

Modern biotechnology is mostly practised and promoted in the First World, yet it affects the whole globe. But, its most profound socio-economic impact is being felt in the Third World, of which the African continent is part. As I write this thesis, at this period of time, six countries in the Southern region of Africa have been severely hit by famine. Such countries are: Malawi, Zambia, Zimbabwe, Lesotho, Swaziland and Mozambique where "over 14.4 million people are starving".[4] This also makes this study relevant and worth pursuing.

0.2.2 The rationale of the study

Firstly, the study offers an opportunity to reflect and understand more profoundly this theme of biotechnology, a theme, which, according to the scope of this study, has direct animal and plant life implications. It is also clear to me that the hazards of this technology undoubtedly impact negatively on socio-economic development since agriculture and food production have a direct link to socio-economic development: animal and plant life[5] is at stake; farmers' rights are jeopardized; and the environment is also at stake. Consequently, socio-economic development itself is also at stake.

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[3] The term "conscientize" was made popular by Paulo Freire in his *Pedagogy of the Oppressed,* which refers to learning to perceive social, political and economic contradictions, and to take action against the oppressive elements of reality. See, Freire, P., 1993. *The Pedagogy of the Oppressed. (Revd. Edn.)* London: Penguin, p.17.

[4] Kneen, K., *The Ram's Horn. A Monthly Newsletter of Food System Analyst.* No.202, June 2002.

[5] Human life will also be at stake. However, it is within the scope of this thesis to discuss agriculture (organic farming) and food production, hence discussion of animal and plant life is relevant in this study.

Secondly, Africa has more countries with food security problems than any other region. Two-thirds of all countries suffering food insecurity are in Africa. Present trends would mean that the number of chronically undernourished people in Southern region of Africa would rise from 180 to 300 million by the year 2010.[6] This is alarming, frightening and threatening.

Finally, in this research, I note that a discussion of genetic engineering is often as current as the daily news. Christians, unfortunately, have often been the last group to speak clearly on the issues involved. It is, therefore, appropriate that this thesis brings a careful critique to this growing area of science in its relationship to the current issues of food security and sovereignty in Africa, the focus of the thesis. All this has encouraged me to investigate the topic more closely and attentively.

0.3 The limitations of the study

My proposed area of study is part of a broader context of academic enquiry and will be built upon what other scholars have studied before. In this regard, then, Neuman is correct in stating that: "Today's studies build on those of yesterday" [7]. This study will commit itself to such a task in some aspects. My specific and special focus, though, is on offering a theological critique of the impact of genetic engineering and biotechnology on agriculture and food security and sovereignty in Africa. I have narrowed down the study to genetic engineering of plants (crops – "green biotechnology"), often called GMOs such as cotton, maize, potatoes, tomatoes and tobacco.[8]

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[6] http://www.fao.org/waicent/faoinfo/SUTDEV/Fsdirect/FS002.htm prepared by the Environment and Natural Resources Service (SDRN) FAO Research, Extention and Training Division.

[7] Neuman, W., 1994. *Social Research Methods: qualitative and quantitative approaches (2nd edn).* Boston: Allyn and Bacon.

[8] According to USAID, Biotechnology can be applied in a number of ways: (1) Genetic engineering of crops (GMOs); (2) Molecular markers to enhance traditional crop breeding in which the resulting crops are not genetically engineered or GMOs; (3) Molecular diagnostics – used in agriculture to more accurately diagnose crop/livestock diseases such as HIV/AIDS; (4) Vaccines – used in both livestock and human health. They may hold efficacy or safety advantages over traditionally formulated vaccines; (5) Tissue Culture – reproduction of disease-free planting material for crops such as tubers, tree crops and coffee; (6) Phamarceuticals – more than 30 biotechnology-derived drugs have been approved – e.g. insulin, hemophilia drugs and heart-disease drugs; and (7) Industrial applications – these include food processing (enzymes used in making cheese, high-fluctose corn syrup), mining, textiles, thesis industry, etc. See, Ives, C.L., Johnson, A. and Lewis, J. 2001. *Agricultural Biotechnology: A Review of Contemporary Issues.* USAID, p.1.

The critique will be offered by taking adequate account of the structural, ecological, and socio-economic effects of biotechnology. In the same line, the study will be discussed within the discipline of theology and development, hence from a developmental socio-economic perspective.

The response to the debate comes from three main Church institutions, chosen to serve my purpose in this thesis: the World Council of Churches, the South African Roman Catholic Church and Christian Aid. It is also important to note that my theological framework heavily relies on the social teaching of the Roman Catholic Church and on what the Second Vatican Council Fathers articulated in *Gaudium et Spes* and other pastoral constitutions. In particular, the Pastoral Constitution's Chapter III (nn.63-72), dedicated to "Economic and Social Life," elaborated a number of principles, which are usually referred to as the Church's social doctrine of economic development.

We should also note that this thesis is not directly concerned with the issue of food aid in the current context of famine in Southern Africa, as this would require a full treatment of the ethics and morals of aid, charity and relief. However, the issue of food aid raises some important issues which illustrate the dilemmas of the use of GMOs in Africa, and we note this in our four brief case studies in chapter four, as an illustration of some of the key issues at stake.

0.4 Details of the study

0.4.1 The summary statement

Out of my research and critical reflection, one central question has emerged. To what extent is genetic engineering biotechnology a solution to problems about agriculture and food security in Africa? This question presupposes that a problem exists and needs to be addressed. This thesis seeks to explore and analyze this question in depth. "It is indeed imperative that Africa be placed on a development path that does not put her in danger."[9]

[9] NEPAD, www.dfa.gov.za/events/nepad.pdf, Abuja, Nigeria, October 2001.

0.4.2 A brief description of the problem

Proponents of genetic engineering and biotechnology argue that the technology brings about unprecedented advances in agriculture and food production (food security), sustainable environmental management and advanced medical care, among others.[10] Thus, new advances in biotechnology promise to make the path of socio-economic development a lot easier and shorter, and are offered as a solution to the problems about the environment, health, and agriculture and food production in Africa.

But those that argue against this technology have indicated that in many cases, the revolution of genetic engineering biotechnology is granting power to a few biotechnologists and large multinational companies over genetic structures of animal and plant life as well as power over economic production itself. In this perspective, then, "both reproduction and production are today facing drastic changes to their very essence"[11]. As a result, food security is located in the hands of a handful of biotechnologists and big multinational companies to the detriment of organic farming and community owned farming[12]. In the process, the environment also suffers due to the release of Genetically Modified Organisms (GMOs)[13].

To that end, hotly debated questions arise:

- Can genetic engineering and biotechnology end world hunger by vastly increasing agriculture and food production?

- Can recombinant DNA technology bring about environmental soundness?

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[10] In this technology, there are two basic areas: human and pharmaceutical biotechnology and agricultural biotechnology (food and GMOs).

[11] World Council of Churches, 2001. Working Group on Genetic Engineering. "Draft report of group one," (Unpublished), p.1.

[12] In the past, the whole cycle of the agricultural economy, from production to distribution was under the control of farmers themselves. Today, global corporations are taking over the agricultural sector. They are establishing their grip through tie-ups with public research; interference in national policymaking, further spread of chemical dependent technologies and now genetically engineered seeds. Agriculture is heavily commercialized, forcing farmers to buy seed every planting season from multinational corporations.

[13] GMOs are new organisms created by human manipulation of genetic information and material. See, Carter, Neil, 2001. *The Politics of the Environment: Ideas, Activism, Policy.* Cambridge: C.U.P., p.57.

- How ethical is it for biotechnologists and genetic engineers to have the monopoly of power and ownership over and against animal and plant life forms?
- Must we rely on the "potential benefits" enthusiastically espoused by the proponents of this technology?
- Is this technology worth pursuing amidst globalization, HIV/AIDS, abject poverty, huge debts and other excruciating socio-economic problems in Africa?
- Do Africa and the Third World need Genetically Modified or Engineered foods and seeds to combat food insecurity?
- Are there any alternatives to genetic engineering and biotechnology?
- What does this GE technology mean for concepts such as 'the sanctity of life' and the integrity of God's creation?
- What is the nature of plant and animal life forms and what does it mean when we talk about genetic integrity and respect for bio-diversity?
- Who is the author of life and where does life find its sustenance and destiny?
- How does the ethics of accountability, interrelatedness and creativity counter-face GE biotechnology?

This thesis seeks to investigate such thorny questions, with the main focus being on agriculture and food production along with the implications of biotechnology on food security and sovereignty in Africa.

It should be noted that the issue of genetic engineering and biotechnology also raises questions about ownership and control, and environmental impact. Besides technological tools to control the seed, multinational corporations are also securing the legal tools to control the seed. Trade Related Aspects of Intellectual Property Rights (TRIPS) gives global corporations the 'right' to claim monopoly ownership over agriculture and food

production through patents[14] and similar mechanisms. Such monopoly means that the multinational corporations are able to control the supply of the products such as seeds, pesticides, food, (and pharmaceuticals). By controlling the supply, they also have the means of controlling the prices of such products. To increase their profits, they can increase the prices. The control of essential resources such as seeds, drugs and food translates into the MNCs having control over fundamental rights of access to food, health and nutrition. This, then, also becomes an issue of justice, centered on the theme of food sovereignty.

In this thesis, we will see that opponents of the technology argue that genetic engineering biotechnology exacerbates starvation and poverty in Africa and in the Third World and that the Northern countries, represented by multinational corporations, are not totally committed to attaining global food security, but are rather more interested in increasing and securing their profits. From a theological perspective, this raises deep ethical questions, and calls for active engagement from the churches.

0.4.3 The main hypothesis of the study

My main hypothesis in this study is that genetic engineering biotechnology undermines food security and sovereignty in Africa. In the scope of this thesis, this argument starts from the premise that there are three key issues emerging out of the debate about genetic engineering and biotechnology. Opponents of genetic engineering biotechnology argue that the GE technology is a system that is designed to:(1) block access to food and kill agricultural bio-diversity; (2) vest excessive, monopolistic and exclusive power in the hands of a few bio-technologists and giant multinational corporations and (3) create hunger and poverty in Africa and other developing countries by undermining organic means of farming. Before proceeding, it will be useful and helpful to look at these elements and consider how they relate to one another and to the main argument.

[14] Patents vest exclusive, monopoly ownership rights over the patented subject matter

0.4.4 Basic assumptions (sub-hypotheses)

This research is grounded in the above mentioned three key assumptions or sub-hypotheses: In this study, we will note that opponents of GE biotechnology argue that genetically modified crops are irrelevant to ending hunger and that genetic engineering cannot feed the world without seriously doing harm to it. In this regard, James Wolfensohn, President of the World Bank, notes that "Even though global food output is adequate to feed the entire world's population, 800 million people are going hungry because they cannot afford to buy the food they or their families need."[15]

In this line, the study's first assumption is that conserving agricultural biodiversity is essential and crucial to long-term food security and sovereignty in Africa. In the same line, if the precautionary principle could be taken seriously in repositioning environmental issues in the policy-making process, then we would be promoting justifiable and sustainable economic and social development. The precautionary principle states that: "the lack of scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation".[16] Here, it is important to note that scientific uncertainties arise because of controversies over the possibility or the scope of environmental effects caused by human technological interventions. According to the scope of this study, there is a scientific uncertainty about whether GMOs pose an additional risk in comparison to conventional and organic cultivation methods.

Second, genetic engineering biotechnology vests too much power over food into too few hands: Monsanto, Syngenta, DuPont, Dow Chemical and Aventis CropScience dominate agricultural biotechnology today[17]. These multinational corporations have unprecedented control over markets, technology, and even processes of life itself.[18]

In this thesis, we will note that biotechnology poses as an instrument of power within the vast networks of power. Hence, this study also assumes that if power could be

[15] World Bank, 1996. *Food Security for the World.* Statement prepared for the World Food Summit by the World Bank, 12 November, 1996.
[16] The precautionary principle, in general terms, seeks to find out the meaning of proceeding with something we do not know the consequences. See, Carter, Neil, *Ibid.* p.84.
[17] See, www.safeage.org/
[18] The MNCs have power to interfere in God's creation and this is serious ethical and theological issue.

decentralized (bottom-up approach), then the hazards of biotechnology would be minimized. To the same end, if the process of dialogue and consultation[19] among different groups such as theologians, ethicians, social scientists, scientists, economists, small-scale farmers and others are included in matters of GE biotechnology, the situation could take a right and credible direction.

Our third assumption is that if much were done to assist small-scale and subsistent farmers to grow food in sustainable and organic ways[20], the socio-economic welfare would improve.

0.4.5 Methodology of the study

0.4.5.1 Procedure

The study has primarily relied on the consultation of published sources (library literature) from my local library, especially from the life sciences library and from my supervisor. Websites on the Internet were also a very useful tool in this study because things are moving fast in the Genetic Engineering and Biotechnology debate. Other relevant sources such as newspapers, brochures and magazines were used to substantiate this discussion.

0.4.5.2 Theoretical or conceptual orientation of the study

Bless and Higson Smith are correct in arguing that, "theory serves as an orientation for gathering facts since it specifies the types of facts to be systematically observed".[21] The scholars whom I deem significant in the scope of this study are; firstly, Brewster Kneen whose forceful analysis and passionate arguments are likely to become influential in his plea for a more rational and human approach to the production of food. In this regard, he

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[19] De Gruchy, Steve, 2001. *Comment on the Document: A National Biotechnology Strategy for South Africa.* (Unpublished), pp.2-3

[20] Organic farming is of significantly less negative impact on the environment and is proven to produce sufficient nutrients to ensure human health.

[21] Bless and Higson-Smith, 1995: 23 in Terre Blanche Martin and Durrheim, Kevin (eds), 1999. *Research in Practice: Applied Methods for Social Sciences.* Cape Town: University of Cape Town Press, p.19.

tackles the key issues of how science is made to serve the interests of capitalism and how the lack of any self-critiquing mechanism in science permits this to happen.

Secondly, Donald and Ann Bruce offer a lucid explanation of the pros and cons of genetic engineering. In this line, they persuasively argue that the risks outweigh the benefits in this modern biotechnology and that there is a need for considering ethical and theological implications. It is, therefore, in this light, that I will offer a theological critique by applying biblical and theological principles to the controversy over genetic engineering and biotechnology, along with environmental ethics, risk-benefit and socio-economic analyses.

Thirdly, the African leaders in the NEPAD document[22] note the urgent need to achieve food security in Africa by addressing the problem of inadequate agricultural systems and increasing the access of the poor to adequate food and nutrition. Finally, Michael Mann identifies four sources of social power: the networks of ideological, economic, military and political power by which human beings, and in our case the MNCs, "attain a very broad, but not exhaustive, package of their myriad goals".[23] Biotechnology poses as a tool of power within the networks of power. These four sources will structure the main arguments in this thesis.

0.4.5.3 The structure and organization of the study

The study is structured and organized as follows: this introductory overview sets the stage for our discussion in this thesis. Chapter one focuses on the theological framework, which is intended to guide this study. The chapter will be useful because it will provide a framework for analysis that can be applied in the debate. Chapter two examines an overview of genetic engineering and biotechnology and the politics of food supply. Chapter three dwells upon an assessment of the promises and threats of GE technology on agriculture and food security and sovereignty in Africa, the focus of this thesis. This will be followed by chapter four, which discusses the specific trends in the impact of

[22] NEPAD stands for New Partnership for Africa's Development. See, [www.dfa.gov.za/events/nepad.pdf.], Abuja, Nigeria, October 2001

[23] Mann, M., 1986. *The Sources of Social Power. Vol I, A History of Power from the beginning to A.D.* 1760. Cambridge: C.U.P., p.28.

genetic engineering and biotechnology on food production, food security and sovereignty in the context of the African continent. The chapter also identifies selected case studies of countries in Africa that have rejected and accepted genetically modified food and crops. The countries selected include Zambia and Zimbabwe, and Malawi and South Africa, respectively.

Chapter five will offer moral, ethical, and theological considerations and implications in GE and biotechnology, followed by the position of Christian bodies such as the World Council of Churches, Christian Aid and the South African Roman Catholic Bishops' Conference. In this chapter, my argument is that it is not only Western science with its attendant technology that always leads to truth and justice – but, moral, ethical and theological principles that are critical to shaping and guiding our actions, whether scientific, technological or otherwise.

Chapter six, the last chapter of this thesis, focuses on drawing conclusions with the intention of summarizing and recapturing the crucial arguments of the study. The chapter also proposes strategies and recommendations as a way forward. Part of the strategies and recommendations hail from the three key sub-hypotheses in which this thesis is grounded. First, let us direct our attention and concern to chapter one whose task is to offer a theological framework, which guides this study.

CHAPTER 1: THEOLOGICAL FRAMEWORK: BIBLICAL AND THEOLOGICAL PRINCIPLES CONSIDERED IMPORTANT IN THE SCOPE OF THE STUDY

1.0 Introduction

In this chapter, I will discuss the biblical and theological principles, which can contribute to the debate. Such principles will serve as a platform for our study. Our theological framework depends on the social teaching of the Roman Catholic Church, and specifically on what the Second Vatican Council Fathers articulated in *Gaudium et Spes* and other Pastoral Constitutions.[24] The Council looked at economic development as the "instrument capable of meeting the growing needs of the human family."[25] In particular, the Pastoral Constitution's Chapter III (nn.63-72), dedicated to "Economic and Social Life," elaborated a number of principles, which are usually referred to as the Church's social doctrine of economic development. I deem the following principles helpful and useful in guiding our debate about genetic engineering and biotechnology, namely: 'the sanctity and integrity of life'; livelihoods: economy and humanity; justice, equity, subsidiarity, cooperation and solidarity; truth telling, transparency and accountability; self-determination (freedom) and self-reliance; and food as fundamental to life and community building. Let us examine each one in turn.

1.1 'The Sanctity and Integrity of Life'

The principle of 'the sanctity and integrity of life' serves as a fundamental basis for a moral framework. On the ground of this principle, moral rules have been framed, human rights claimed and defended, and cultural, political and social priorities established. Basically, the principle is about the value of life. It provides the philosophical ground for moral conduct and demands full compliance with its implications for life. To that end, the Second Vatican Council Fathers in the Pastoral Constitution, *Gaudium et Spes,* clearly reiterated that "life is sacred because from its beginning it involves the creative action of

[24] The author of this thesis is himself a Roman Catholic Christian.
[25] Flannery, A., (ed.), 1988. *Vatican Council II: The Conciliar and Post-Conciliar Documernts, (revised edition), Gaudium et Spes,* no.63. Vatican: Dominican Publications.

God and it remains for ever in a special relationship with the Creator, who is its sole end..."[26]

It is clear in the above assertion that the author of life is God and, therefore, life in all its forms and species shares God's holiness and is God's most precious gift. In this perspective, the Fathers teach that animals, plants and inanimate beings, are by nature destined for the common good of past, present and future humanity.[27] But, human beings' dominion over other creatures is not absolute. It is limited by the concern of life as sacred and integral, and by the concern that life requires a religious respect for the integrity of creation. Animals and plants are God's creatures and are surrounded with His providential care. Thus, human beings owe them kindness and care.[28] Essentially, the principle looks at life in all its forms, species and stages as sharing God's sacredness and His gift – and deserving to be affirmed, cherished and respected.

This theological principle is critical to our controversy over genetic engineering and biotechnology, since the technology involves subjecting life forms of plants and animals to genetic manipulation. Intrinsic to the principle of 'the sanctity and integrity of life' is the principle of livelihoods, to which we now turn and direct our attention.

1.2 Livelihoods: Economy and Humanity

According to the social teaching of the Roman Catholic Church, "any system in which social relationships are determined entirely by economic factors is contrary to the nature of the human person and his acts."[29] The Council Fathers continued by stating that:

> A theory that makes profit the exclusive norm and ultimate end of economic activity is morally unacceptable. The disordered desire for money cannot but produce perverse effects. It is one of the causes of the many conflicts, which disturb the social order.[30]

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[26] When the Council Fathers talk about the sanctity of life, they had in mind human life. But, the focus in this thesis is on life in all its forms and species. See, CDF Instruction *Donum Vitae*, Intro.5
[27] Gen.1:28-31
[28] *CA* 37-38
[29] *CA* 24
[30] *GS* 63 Par.3; *LE* 7;20;*CA* 35

In the same line, and turning to communism, they also stated that "a system that subordinates the basic rights of individuals and of groups to the collective organization of production"[31] is contrary to human dignity. The Council Fathers emphatically argued that regulating the economy solely by centralized planning perverts the basis of social bonds; and on the other hand, regulating it solely by the law of the market place fails social justice, for "there are many human needs which cannot be satisfied by the market."[32] Instead, Pope John Paul II suggests a middle path when he commends a reasonable regulation of the market place and economic initiatives, in keeping with a just hierarchy of values and a view to the 'common good.'[33] This is to say that justice demands that people should become subjects, (that is, agents) and not objects of production.

In the above sense, then, the Council notes that the development of economic activity and growth in production are meant to provide for the needs of human beings. Economic life is not meant solely to multiply goods and increase profit or power; it is ordered first of all to the service of persons and the entire human and non-human community. This entails that economic activity, conducted according to its own proper methods, is to be exercised within the limits of the moral order, in keeping with social justice so as to correspond to God's plan for humanity. Here, the Council remarked that: "those responsible for business enterprises are responsible to society for the economic and ecological effects of their operations. They have an obligation to consider the good of persons and not only the increase of profits."[34]

Similarly, science and technology are precious resources when placed at the service of human beings and promote human integral development for the benefit of all. Science and technology are ordered to serve human beings, from whom they take their origin and development; hence, they find in the person and in his or her moral values both evidence

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[31] *GS* 65, par.2
[32] *CA* 34
[33] By common good is to be understood "the sum total of social conditions which allow people, either as groups or individuals, to reach their fulfillment more fully and more easily. The common good concerns the life of all. This consists of three essential elements: (1) It presupposes respect of the person as such; (2) it requires the social well being and development of the group itself; and (3) it requires peace. See, *GS* 26, par.1; *GS* 74, par.1.; *LE.* No.23, pp.22-24.
[34] *CA* 37 ; Interdicasterial Commission, 1994. *The Catechism of the Catholic Church,* Nairobi: Paulines Publications Africa, p.558.

of their purpose and awareness of their limits. In this regard, the Council Fathers argue that:

> It is an allusion to claim moral neutrality in scientific research and its applications. Science and technology, by their very nature, require unconditional respect for fundamental moral criteria. The two must be at the service of the human person, of his or her inalienable rights, of his or her true and integral good, in conformity with the plan and will of God.[35]

Here, it is clear that any economic system, and any system of science and technology are at the service of humanity and not vice versa. Hence, livelihoods find their meaningful expression where justice and equity exist.

1.3 Justice and Equity

Justice is one of the key concepts or basic values, which has great significance in Judaism, Christianity and Islam. According to a Roman Catholic theologian, Hans Kung, at the most basic level, justice means "fairness, exercising authority in maintenance of right."[36]

In the Pastoral Constitution, *Gaudium et Spes,* the Council explained that:

> The Church in the course of the centuries has worked out in the light of the Gospel, principles of justice and equity demanded by right reason for individual and social life and also for international relations and that, consequently, it was the intention of the Fathers to reiterate these principles in accordance with the situation of the world today.[37]

It is important to note that the Council speaks of "reiterating principles" and "outlining guidelines," rather than proposing concrete technical solutions. Nevertheless, the Council observed that: "to fulfill the requirements of justice and equity, every effort must be made to put an end ... to the immense economic inequalities which exist in the world..."[38]

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[35] Interdicasterial Commission, *Ibid.* p.533.
[36] Kung, H., 1997. *A global Ethic for Global Politics and Economics.* London: SCM Press Ltd., p.254.
[37] *GS,* no.63
[38] *GS,* no.66

As John Paul II observed in 1980, in the second encyclical of his pontificate, *Dives in Misericordia:* "It is not difficult to see that in the modern world the sense of justice has been awakening on a vast scale." The Pope continued:

> The Church shares with the people of our time this profound and ardent desire for a life that is just in every aspect, nor does she fail to examine the various aspects of the sort of justice that the life of people and society demands. The field of Catholic social doctrine demands this.[39]

Here, it is important to see that the principles of equality of opportunity and equal access to resources are vital to society to achieve equity in the distribution of both inputs and rewards. This entails that a society aims at sharing both consumption and production. Wrong allocation of resources is largely caused by differences in bargaining power between interest groups. The equal dignity of human beings requires the effort to reduce excessive social and economic inequalities. To this end, Vatican Council II clearly articulates that:

> Their equal dignity as persons demands that we strive for fairer and more humane conditions. Excessive economic and social disparity between individuals and peoples of the one human race is a source of scandal and militates against social justice, equity, human dignity, as well as social and international peace.[40]

Within the scope of the principles of justice and equity, are the principles of subsidiarity, cooperation and human solidarity. In this line, the Council's Pastoral Constitution's section on economic development opens by reaffirming the principle of subsidiarity's validity at all levels of human society. The Council states that:

> Economic development must remain under man's direction, it is not to be left to the judgement of a few individuals or groups possessing too much economic power, nor of the political community alone, nor of a few strong nations, and we must denounce as false doctrines ... those which subordinate the basic rights of individuals and of groups to the collective organization of production.[41]

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[39] Pope John Paul II, *Dives Misericordia, 1980,:37ff*
[40] *GS* 29, par.3
[41] *GS, no.65*

Alongside subsidiarity, *Gaudium et Spes* emphasizes the need for the principle of cooperation in which development is not left to the mechanical evolution of economic activity.[42]

As we will note in this thesis, on the international level, inequality of resources and economic capability is such that it creates a real gap between nations. In this regard, the principle of solidarity, also articulated in terms of "friendship', "fellowship" or "social charity," is a direct demand of human and Christian brotherhood.[43] This is to say that, social and economic justice finds its meaningful expression when it is inspired by true love.

1.4 Truth telling, transparency and accountability

Kung notes that numberless women and men of all regions and religions strive to lead lives of honesty and truthfulness. Nevertheless, all over the world we find endless lies and deceit, swindling and hypocrisy, ideology and demagoguery. In this respect, Kung argues that politicians and business people use lies as a means to success; and scientists and researchers give themselves over to morally questionable ideological or political programmes or to economic interest groups or justify research, which violates fundamental ethical values.[44] Kung urges people to constantly seek truth and incorruptible sincerity instead of spreading ideological or partisan half-truths, courageously serve the truth and remain constant and trustworthy, instead of yielding to opportunistic accommodation to life. Following this trend of thought, Kung proposes an ethically responsible way of engaging in business with a view to guaranteeing the foundations of human life. In his view, this points to the primacy of ethics over economics, politics, science and technology and that economic institutions must not be shaped solely by power, but must always have to do justice to human dignity.[45]

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[42] GS, no.65
[43] John Paul II, *SRS,* 38-40; *CA* 10
[44] Kung, H., *Ibid.* p.111
[45] *Ibid.* pp.211-213.

We also know that the eighth commandment of the *Decalogue* forbids misrepresenting the truth in our relationships with others.[46] This moral prescription flows from the vocation of people to bear witness to God who is the truth and wills the truth. Both the Old and New Testaments attest that God is the source of all truth. His word is truth and His law is truth.[47] Truth or truthfulness is the virtue or principle, which consists in showing oneself true in deeds and truthful in words, and "guarding against duplicity, dissimulation and hypocrisy."[48] In this line, the Roman Catholic Church, as expressed in the *Gaudium et Spes,* teaches that society has a right to information based on truth, freedom and justice.[49]

But truth finds its meaningful expression when people become transparent and accountable in their activities. Here, it is important to see that any credible ethical theory takes adequate recognition of the fact that we all belong to the earth and everything we encounter shares this existence with us. In the scope of this thesis, we will note that the principles of transparency, accountability and (inter-relatedness) in the acts of creativity are crucial when dealing with genetic engineering and biotechnology.

According to these principles, scientific and (bio)-technological activities ought to promote the common good of the society and environment. Here, it is advocated that the promotion of the common good can only be meaningfully achieved within the ethical and theological paradigm of a relational world-view in which accountability and just and responsible stewardship are pillars.

1.5 Self-determination (freedom) and Self-reliance

Self-determination is one of the most fundamental prerequisites of human dignity. This principle is centered on the freedom of individuals to organize their own lives, either alone or in cooperation with others. The Roman Catholic liberation theologian, Gustavo Gutierrez, argues that:

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[46] Exod.20:16; Deut.5:20
[47] Ps.119:90.142; Prov.8:7; 2 Sam 7:28; Lk.1:50; Jn1:14; 8:12.32; 12:46; 14:6; 17:17; 16:13; Mt.5:37.
[48] Interdicasterial Commission, *Ibid.* p.572.
[49] *Ibid.*, pp.572ff.

> Freedom implies the capacity we all possess in principle to be our own person and to act on our own initiative, so that we can go on fashioning community and participation to be embodied in definitive realities …the freedom to which we are called presupposes the going out of oneself, the breaking down of our selfishness and of all the structures that support our selfishness; the foundation of this freedom is openness to others. The fullness of liberation – a free gift from Christ – is communion with God and with other human beings and environment.[50]

Similarly, a nobel prize-winning economist, Amartya Sen, observes that the capability of people to achieve something in life is influenced by economic opportunities, political freedoms, social facilities and that individual persons with adequate social opportunities can effectively shape their own destiny.[51] This is seen as both the primary end and primary means of development, -called the 'constitutive role' and the 'instrumental role,' respectively.[52] Sen's freedom-centered understanding of economics and the process of development is very much an agent-oriented view. It provides a profound basis of evaluation of development or means and methods of agricultural production in terms of individual and community freedom and sovereignty, rather than in terms of the growth of GNP per capita, industrialization or technological advance.[53] This relates to Sen's understanding of the whole point of development, which is ultimately to improve the quality of life. In this perspective, then, markets, global corporations and states have an important role in promoting what people are capable of in view of achieving qualitative life.

From the Roman Catholic perspective, this is expressed in the idea that social and economic justice and equity cannot meaningfully exist in the absence of true freedom. As we know, God created human beings as rational beings, conferring upon them the dignity of persons, who can initiate and control their own actions. Freedom is the power, rooted in reason and will, to act or not to act, to do this or that, and to perform deliberate actions on one's own responsibility. Authentic freedom attains its perfection when directed towards God. It is important to see that freedom makes a person a moral subject. Following this proposition, then, human acts, that is, acts that are freely chosen in

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[50] Gutierrez, G., 1990. *The Truth Shall Make You Free: Confrontations.* Maryknoll, N.Y.: Orbis Books, p.127.
[51] Sen, A., 1999. *Development as Freedom.* New York: Anchor Books, pp.5.43ff.
[52] Sen, A., *Ibid.*, p.36ff
[53] *Ibid.*, pp.19-20

consequence of a judgment of conscience, can be morally evaluated. They are either good or evil.

This notion finds its ground in the Bible and Christian theology. God created us in freedom and out of love. The entire creation is the result of God's free will to love. He did not only create us all in freedom, but also endowed us with this precious gift of freedom - the freedom to choose. He intended human beings to make rightful decisions and choices so as to live qualitative life. Clearly, then, freedom is at the very heart of created reality, and authentic freedom is an exceptional sign of the divine image within a human being. In this perspective, the Vatican II Council stipulates that: "God has willed that a human being remain under the control of his own decisions so that he can seek his Creator spontaneously, and come freely to utter and blissful perfection through loyalty to Him."[54]

But, freedom, self-determination and responsibility can only be acquired where the space for actual exercise of freedom, self-determination and responsibility is granted to the population at all levels of life.

Along these lines, it is important to see that to be fully and authentically human, human beings need three things: empowerment, that is, control over their own lives and their environment; confirmation of their right of existence; and the meaningfulness of their lives and their world. All these three are deeply connected with creative activity. Hence, human beings are called to become subjects, and not objects of production. Self-determination entails control over the instruments or tools with which to earn livelihoods, so that people are to be agents or decision-makers in a realm such as agricultural production.

Self-determination leads to the principle of self-reliance. According to the principle of self-reliance, nations or communities should mobilize their own resources rather than depending on external forces. Self-reliance, as advocated by Julius Nyerere, (himself deeply influenced by Roman Catholic spirituality), was a communal, rather than an

[54] *GS*, no.17

individual principle, which had to move from bottom up.[55] For him, the basis for self-reliance is family, then the ward, the district, the region and finally the nation. These two principles are rooted in the Christian faith since God created human beings in freedom and endowed us with the gift of freedom in view of meaningfully becoming creative so as to sustain their communities.

1.6 Food as fundamental to life and community building

Given the focus on food in this study, we conclude our theological reflection by examining the theme of food as fundamental to life and community building.

John Madeley states that: "food is more than a commodity that is sold and bought ... and it is more than the nutrients we consume."[56] Food is a unique and bonding resource that should be shared at every level. Madeley states that the imperative of every person having enough food to eat is a sentiment that unites people throughout the world. In addition, food is also a deeply held religious, humanitarian and moral concern that is stressed in all the world's major religions.

Food is one of the most recurring themes in the bible, both in the Old and New Testaments. One of the notable stories concerning food and famine is the story of Joseph, the overseer in Egypt under the pharaoh of the time.[57] The strategy employed when the Egyptian land was, (foreseen by Joseph to be) hit by famine was to store foodstuff for seven years and then distribute it to people. Joseph was overseeing this work. Joseph, once powerless before his own kin became powerful and in control of the processes of storing and distributing food.

Another vivid illustration of food crisis concerns the Israelites in the wilderness under Mosaic leadership.[58] They were desperate for food. They expressed a willingness and preference for food even if it meant returning to the slavery and hard labor under the

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[55] Nyerere, J., 1973. *Freedom and Development: A Selection from the Writings and Speeches.* Dar es Salaam: O.U.P., p.180

[56] Madeley, J., 2002. *Food for All: The Need for a New Agriculture.* London and NY.: Zed Books, p.3

[57] For a detailed account of the story, see, Gen.41:1-57'42:1-38;43:1-34; see also, chapters 44-47 of Genesis.

[58] Exod.16:1-36

Egyptian pharaoh. Thus, freedom was being traded in for food. Is it possible that today there may be those like the Egyptian pharaohs who promise food security at the expense of sacrificing freedom and food sovereignty?

In the New Testament, specifically in Luke's Gospel, we note that the very first temptation of Jesus in the wilderness, just after his baptism, centered on food.[59] Food is central to life and is a vehicle of controlling power. Control of food is control of power. Again, there may be those like the 'devil' in the wilderness, enticing poor farmers to bow to them for food security at the expense of food sovereignty and livelihoods. The desire is to control food security, and to create the dependency of Third World agricultural communities upon such powers. In the long run, the motive is to undermine communities' food sovereignty and livelihoods.

Again, in John's gospel, the themes of food (bread) and feasts are not uncommon and are linked to life and 'fellowship' and community building. Jesus himself is depicted as the bread of life.[60]

'Give Us this Day Our Daily Bread' is part of the Lord's Prayer that is central to the Christian faith.[61] In this perspective, the Background Document for the Policy Reference Committee II of the World Council of Churches' Central Committee remarks that the Lord's Prayer "provides us with a theological vision to begin to address our concerns about food, agriculture and biotechnology."[62]

The Committee notes the following theological principles flowing from the petition: Essentially, food is directly linked to life and livelihoods. Lack of food means a lack of life and livelihoods. The question of food security is the question of life and livelihoods. Hence, food is critical to human and even to non-human species' existence and is important to building communities. 'Hungry people are angry people' and prone to divisions. Food holds communities together. But, food security and livelihoods find a

[59] Lk.4:1-4 but also Mt.4:1-4
[60] John 6:1-15.34-58; 7:1ff.; 13:1ff.; 14:7ff.
[61] Lk.11:1-4; Mt.6:7-13
[62] WCC Policy Reference Central Committee II, 2002. "Caring for Life: Biotechnology and Agriculture". Background Document for the Policy Reference Committee II of the World Council of Churches' Central Committee. Geneva: WCC

meaningful expression when communities' sovereignty is not destroyed. Food sovereignty and food security are critically important in this principle and lead to community building. All this entails that the principle of 'food as fundamental to life and community building' must be accorded a prominent place in theological reflection on genetic engineering.

1.7 Summary

We began this chapter by emphasizing that the principle of the sanctity and integrity of life is about the value of life. It is also the basis for a moral framework. I deem this principle to be key because the central issues of food security and food sovereignty in GE debate are the issues that have a direct link to life and livelihoods. All the other theological principles, which are also important in their own right, come into focus and explicitly or implicitly, directly or indirectly revolve around the principle of 'the sanctity and integrity of life.'

The theological and biblical principles discussed in this chapter have been mainly intended to shape and structure our theological critique to the debate. They also serve the purpose of giving moral direction. Having elaborated on our theological framework, it is now appropriate to turn to chapter two, which focuses on an overview of genetic engineering and biotechnology, and an overview of the politics of food supply.

CHAPTER 2: AN OVERVIEW OF GENETIC ENGINEERING AND BIOTECHNOLOGY, AND THE POLITICS OF FOOD SUPPLY

2.0 Introduction

In this chapter, I will lay out an overview of genetic engineering biotechnology and the politics of food supply with a specific focus on its relationship to traditional biotechnology.

2.1 An overview of Genetic Engineering and Biotechnology

2.1.1 Modern Biotechnology

According to the United Nations Environmental Programme, biotechnology is "a body of techniques that use biological systems, living organisms, or derivatives thereof to make or modify products or processes for specific use."[63] The *UNEP* articulates the three major phases of biotechnology and categorizes such phases as 'generations.' The first phase largely involves the use of selected biological organisms to produce food and drink such as cheese, beer and yogurt. The main feature in this generation is fermentation, plant and animal breeding and clonal propagation of plants. This is followed by a second phase, which makes use of pure cell or tissue culture to yield new products. This is associated with the production of antibiotics, enzymes and vitamins. The third generation is what is called modern biotechnology, which is associated with r-DNA (recombinant DNA) technology. This involves the "application of in vitro nucleic acid techniques including r-DNA and direct injection of nucleic acid into cells or organelles"[64] All genetic engineering (GE) and biotechnology practitioners use the third generation techniques.

Another definition comes from Klaus Leisinger. He defines biotechnology as "the integrated application of biochemistry, microbiology and process technology with the objective of turning to technical use the potential of microorganisms, cells and tissue

[63] UNEP, 1992. "Convention on Biological Diversity, Article 2. United Nations Environmental Department of Art, Culture, Science and Technology" in *A National Biotechnology Strategy for South Africa*, (June, 2001), p.1

[64] Cartagena Protocol on Biosafety to the Convention on Biological Diversity, Article 3.

cultures as well as parts thereof."[65] This definition points to the fact that biotechnology deals with the utilization of biological processes in technical operations and industrial production. He sees gene technology as a means to an end in as much as it allows the properties of microorganisms to be modified in such a way that a desired effect is brought about through biological processes.

In simplest, clearest and sketchiest of terms, biotechnology would therefore be understood as the manipulation of biological systems or processes for industrial applications. But, it is clear that the definition itself is part of the debate. For example, Brewster Kneen defines biotechnology as "the application of science and engineering in the direct or indirect use of living organisms in their natural or modified forms."[66] He also defines biotechnology as "the business of creating new products from living organisms."[67] This definition points to the main objective of biotechnologists and multinational corporations – to run business in the spirit of competition for profit and utility maximization. Hence, biotechnology is viewed as "the engine of an economic revival."[68] In this regard, then, opponents of genetic engineering biotechnology state that the technology places profits before people and serves the interests of neo-liberal capitalism, an ideology that has self-interest as the pillar to all economic activities.[69]

C. Talbot defines biotechnology along similar lines as "the expansion, institutionalization and misapplication of a particular scientific creed with the potential for the devaluation and exploitative manipulation of life."[70] This conception is not a repetition of the

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[65] Leisinger, K, 1999. *Biotechnology of Food Crops in Developing Countries.* Wien: Springer, p.41
[66] Kneen, B., 1998. *Farmageddon: Food and the Culture of Biotechnology.* Canada: NSP, p.42
[67] Kneen, B., *Ibid.,* p.193
[68] *Ibid.,* p.46
[69] Neo-liberal economic theory and practice is based on the assumption that the market is a privileged place for access to the information we need in order to engage in economic activies. The laws of supply and demand on the free market determine economic truth. In this trend of thought, the market is seen as an entity void of any relationships with other human being s and the environment. On closer scrutiny, one finds out that the market is seen as the absolute value to the extent that it. supercedes the human welfare. an economic system that regards the induividual interests more than those of society as awhole as well as the environment vitiates the morality of our common ninterest and common belonging. See, Cobb, J.B., and Daly, H., 1989. *For the Common Good: Redirecting the Economy Toward the Community, the Environment, and a Sustainable Future.* Boston: Beacon Press, pp.139-145.
[70] Talbot, C., (1991). "Transgenic animals and the reduction of life", *Humane Education Newsletter,* 2 (1), 12.

definition of biotechnology, but rather an exemplification and elaboration of my debate. This definition depicts the nature of biotechnology.

As we can see from the above definitions, the concept of biotechnology is of a controversial nature. What biotechnology is, clearly depends on who is defining it and for what purposes. In other words, it is a matter of context and perspective. The definitions clearly show that biotechnology is the application of technology to life. This is a serious ethical and theological issue. The definitions I deem important and useful in serving the focus of this thesis are B. Kneen, the *UNEP* and C. Talbot's definitions.[71]

2.1.2 Genetic Engineering

Genetic engineering, according to Donald and Ann Bruce, is a development of biotechnology. They define it as the deliberate restructuring of life to achieve an extrinsic value or goal.[72] This is clearly an expression of a loss or lack of respect for genetic integrity. The definition also entails furthering of corporate control and profit. Similarly, in crude and succinct terms, Kneen defines genetic engineering as "the identification and manipulation of the pieces of heritable material."[73] Genetic engineering allows, for example, the production of new combinations of genetic material by transferring DNA[74] into an organism in which it does not naturally occur. It is also referred to as genetic enhancement, genetic modification, gene manipulation and targeted genetics.

Modern genetic engineering began in 1973[75] when Herbert Boyer and Stanley Cohen used enzymes to cut a bacteria plasmid and insert another strand of DNA in the gap.[76]

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[71] I think that none of the definitions given here describe African traditional practices in animal and/or seed selection and breeding.

[72] Bruce, D. and Bruce, A.,(eds.), 1999. *Engineering Genesis*: *The Ethics of Genetic Engineering in Non-Human Species.* London: Earthscan, p.2

[73] Kneen, B., *Ibid.*,pp.289-290

[74] GE allows the 'creation' of transgenic organisms and that DNA defines the nature of an organism. As a rule of thumb, according to Reiss, any change to the genetic make-up of an organism resulting from the direct insertion of genetic material either from another organism or constructed in the laboratory is an instance of GE. See, Reiss, M.J., 1996. *Improving Nature? The Science and Ethics of Genetic Engineering.* Cambridge: C.U.P.,pp.12-15.

[75] Kneen, B., *Ibid.*, pp.287-295

[76] For detailed information on the structure of the genetic material, with copious illustrations, see the relevant chapters in any of the following: Campbell, N.A., 1990. *Biology (2nd edn).* Redwood City, CA: Benjamin/Cummings. ; Purves, W.K., Orians, G.H and Heller, H.C., 1992. *Life: The Science of Biology, 3rd edn.* Sunderland, MA: Sinauer ; Roberts, M.B.V., Reiss, M.J. and Monger, G. 1993. *Biology: Principles*

Both bits of DNA were from the same type of bacteria, but this milestone, the invention of recombinant DNA technology, offered a window into the previously impossible – the mixing of genetic traits between totally dissimilar organisms.[77] To prove that this was possible, Cohen and Boyer used the same process to put a bit of frog DNA into bacteria. Since 1973, this technology has been made more controllable by the discovery of new enzymes to cut the DNA differently and by mapping the genetic code of different organisms.[78] Tobacco was the first plant to be genetically engineered in 1983. Since then, there have also been other important plants like tomato, oilseed rape, chicory, soybeans, cotton, potatoes and maize that have been genetically engineered.

The first genetically modified organisms were commercialized in the early 1990s. In the mid-nineties, large areas of land were dedicated to grow GM crops. Similarly, the European Commission Directorate General of Agriculture records that in 1996, the first significant planting of GM crops took place on 2.6 million hectares of land. From 1996 to 1999, the area increased from 2.6 million hectares to 41.4 million hectares.[79] This clearly suggests that the introduction of genetically modified crops was going at a much faster speed than past innovations in plant varieties like hybrids.

At this juncture, it will be helpful to briefly touch on the nature and technicalities (science) of genetic engineering and biotechnology in order to get the sense of the nature of ethical and theological implications inherent in the technology which will be discussed in chapter five. Donald and Ann Bruce note a range of steps that are undertaken in the process of genetic modification of plants.[80] These steps include the following:

- Identification and isolation of a desired gene from a donor organism

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and Processes. Walton – on –Thames, Uk: Nelson; and Starr, C. and Taggart, R., 1989. *Biology: The Unity and Diversity of Life, (5th edn.)* Belmont, CA: Wadsworth.

[77] It is important to note that in nature, sex is the way in which organisms transfer genetic material from one species to another. In genetic engineering technology, interspecific breeding barriers are made to collapse. Genes can be transferred almost at will from one organism to practically any other, from bacteria to plants, from plants to bacteria, from humans to mice and from humans to bacteria, etc. See, Reiss, *Ibid.*, pp.33-34.

[78] http://vparker.home.texas.net/Thinkquest/Manipulating/Experimentation.genengineering/history.htm ; http://www.op97.k12.il.us/schools/julian/lessons/ISTF98/history.htm

[79] European Commission Directorate General of Agriculture, 2000. "Working Document: Economic impacts of Genetically Modified Crops in Agri-food Sector" in Villar, J.L., 2002. *GMO Contamination Around the World (2nd edn),* p.8.

[80] Bruce, D., and Bruce, A., *Ibid.*, pp. 11ff.

- Use of identified and isolated desired gene to 'create' the new gene or recombinant genetic sequence

- The multiplication and insertion of the gene into the host organism by using a particle gun or a 'bacterial vector'

- Process of selection of cells occurs using the marker gene

- Growth of each selected plant cell to become a "transgenic plant"[81] with every cell in the plant having the newly inherited DNA.

Similarly, Reiss articulates the basic procedure, for using genetic engineering. This basic procedure involves two fundamental steps or stages, namely:

- (1) Identifying the gene that makes the polypeptide the scientist is interested in and transferring this gene from the species in which it occurs naturally to the species in which the scientist desires the gene to be.

- (2) The second step involves use of the vector organism to carry the gene from one species, referred to as the donor species, to another, referred to as the genetically engineered species.

Genetic engineering, by means of a vector, involves three phases. The first phase is by obtaining the desired piece of genetic material from the donor species. The second phase is the insertion of such genetic material into the vector species. The last one is by infecting the species to be genetically engineered with the vector species so that the desired piece of genetic material passes from the vector to the genetically engineered species.[82] This can also be achieved through what Reiss calls 'vectorless transmission'. This is more direct and requires no intermediary organism. It is one way of getting DNA into a new organism by firing it in via a gun. This is known as 'biolistic delivery'.[83]

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[81] We should note that there are two basic types of transgenic plants. First, those in which the properties of the food is itself modified through the gene change. Second, those in which the food is not itself modified but which now carries a gene that enhances resistance to disease, drought or herbicide.

[82] Viruses can also be used as vectors in genetic engineering. See, Reiss,*Ibid.*, pp.36-39

[83] *Ibid.*,pp.35-36

Another way in this process (step) is by injecting it directly into the nucleus. The third type of 'vectorless' transmission is known as 'electroporation' and the fourth way is by shaking together a test-tube containing water, the plant cells, the foreign DNA and tiny crystals of a common chemical called silicon carbide. The crystals punch very small holes in the plant cells, through which the foreign DNA can penetrate. There is then a good chance that the new DNA will be inserted into the plant's own DNA.[84]

By way of concluding this section, it is of highest importance to note that the discovery of the structure of DNA has led directly to the advent of genetic engineering biotechnology, in which scientists can move bits of genetic material from one species to another. This is clearly very different to traditional biotechnology. The following section serves the purpose of distinguishing between genetic engineering technology and traditional biotechnology.

2.1.3 The relationship of GE technology to traditional biotechnology

We have seen in section 2.1.2 above that genetic engineering biotechnology involves moving or transferring genes from one species to another. This is not necessarily the case with traditional biotechnology. Traditional biotechnology is based on activities like the farming of animals and plants and the use of microorganisms in the manufacturing of beer, wine, bread, yogurt and cheese.[85]

Although, traditional biotechnology can result in major alterations in the genetic make-up of organisms, it differs from genetic engineering in at least three important aspects:

First, although traditional biotechnology sometimes involves crossing one species with another, these species are always closely related with one another. This is markedly different from genetic engineering where human genes have been inserted into pigs and genes from bacteria into plants. Secondly, the pace or speed of change in traditional

[84] For further information on the technicalities of genetic engineering, see, Bains, W., 1993. *Biotechnology from A to Z.* Oxford: O.U.P.; Weaver, R.F and Hedrick, P.W. 1992. *Genetics, (2nd edn),.* Dubuque, IA: Wm. C. Brown; William, J.G., Ceccarelli, A. and Spurr, N. 1993. *Genetic Engineering.* Oxford: Bios Scientific.

[85] For a detailed discussion of a long history of traditional biotechnology, see Reiss, *Ibid.,* pp.3-5; also Reiss, M.J., 1993. *Science Education for a Pluralist Society.* Milton Keynes: O.U.P.

biotechnology is much slower than in genetic engineering biotechnology. In genetic engineering, a gene from one organism can permanently be inserted into the genetic material of another organism within a short period of time, such as a few weeks. Thirdly, genetic change as a result of traditional biotechnology happened to only a relatively small number of species, namely those that provide us with food and drink, such as crop plants, farm animals and yeasts. With genetic engineering biotechnology, it has become possible to mix genetic traits from two totally different species. In traditional biotechnology, particularly and specifically in selective breeding, it is physically impossible to do this because the genetics of life are such that genetic traits from two totally different organisms cannot be mixed.

By way of closing this section and introducing the next, we need to take note that the opponents of genetic engineering and biotechnology argue that the technology is not just another contemporary expression of traditional plant and animal breeding as its proponents think. In contrast to this, they argue that genetic engineering biotechnology is a lack of respect for boundaries and an assault on the integrity of the organism, and thereby something fundamentally and profoundly different from traditional biotechnology.[86] This leads us to consider the power dynamics of science in society.

2.1.4 Science, technology and power dynamics in society

In view of making sense of the debate about genetic engineering and biotechnology, we need to situate it within the broader understanding of the history, place and role of science and technology in society in relationship to power dynamics. This is because much of the debate about genetic engineering and biotechnology depends on our understanding and knowledge of science.

We know that Western science emerged in the period of Renaissance, Reformation and Enlightenment.[87] In its embryonic stage, science was a clear protest against medieval

[86] *Ibid.*, pp.3ff.

[87] Renaissance is the revival of art and learning under the influence of classical models which began in Italy in the Middle Ages (14th century) and reached its climax in the 16th century; Reformation is the 16th century movement to reform the doctrines and practices of the Roman Catholic Church. Its roots go back to the 14th century during which the official and institutional church was attacked for its wealth and hierarchical structure (power); and the Enlightenment was a European intellectual movement of the late 17th and 18th

ecclesiastical power and at the forefront of human freedom. The official churches, especially, the hierarchy, controlled knowledge – and knowledge is power. In this line, then, no wonder the church had difficulty with scientists and their theories. Science became a powerful vehicle for those that sought 'truth' over and against the established institutions of the day. The way that this 'truth' was made was through 'public discourse'[88] as contrasted to church dogma which was expressed in Latin and 'hidden' from the public.

As we have noted above, what is perhaps of highest interest to the history of science is the 'Renaissance' period. It may not be entirely impertinent to remark here, that to my perception, the Renaissance must be taken as a distinct period in the history of science with its own characteristics, closely related to the humanism and scholarship of the age, and differing as much as from the middle ages as from the more recent period.[89]

De Gruchy notes that "it is critical to recognize science as a particular worldview emerging in a particular set of social circumstances."[90] Science views itself as a rational discipline and voice in society. Historically, the role and place of science has been understood as to help us have control over nature and (as such) have the power to develop nature – to make nature better. In the same vein, de Gruchy argues that: "the emergence of Western science led to the splitting off of nature as a realm that could be observed, interrogated, experimented with and altered."[91] Putting this differently, "nature became a 'thing' that could be dominated and manipulated by human beings and with that came the emergence of modern biology, zoology and a number of other scientific disciplines."[92]

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centuries, heavily influenced by the thinking of the 17th philosophers and scientists such as Rene Descartes, John Lock, and Isaac Newton. The movement had at its core a belief in reason as the key to human knowledge and progress. The movement criticized the church and the government.

[88] This is what I call a *QED* approach where *QED* stands for a Latin expression, *Quod Erat Demonstrandum,* which literally means, because it has been demonstrated or shown or proved. This is a principle that is usually applied in the science of Mathematics, but in our context, it is the approach that was rendered useful by Western science as opposed to church dogma and secrecy.

[89] Thus, the development of Science is somewhat analogous to the evolution of species. See, Horwich, P. (ed.), 1993. *World Changes: Thomas Kuhn and the Nature of Science.* Cambridge: MIT Press, p.137.

[90] De Gruchy, Steve, "Biotechnology as 'Cultural Invasion': Theological Reflections on Food Sovereignty and Community Building in Africa." A paper presented at the Theological Society of South Africa, at the University of Natal, Pietermaritzburg, 19-21 June, 2002, p.8.

[91] De Gruchy, S., *Ibid.,* p.8

[92] *Ibid.,*p.8

Dr. Vandana Shiva views modern science as a deeply patriarchal project that served the interests of capitalism and colonialism. In turn, capitalism and colonialism served Western science.[93] This powerful observation points to the fact that today, science functions not only as a protest against power, but is now more "of an instrument of power within the vast networks of power"[94], which are complex, systemic, often multinational or transnational, and which exist primarily to maximize utility and profit.

Scientists understand themselves as each proceeding by increasing observable facts, employing a set of non-deductive logical principles to determine which set of theoretical sentences best explains these facts, and thereby accumulating theoretical knowledge. Thomas Kuhn argued against this understanding, and offered a powerful alternative. His focus, as Hempel notes, is on the actual structure of scientific change. [95] He argued that there is no absolute truth: as science evolves, the world changes. Kuhn demolishes the logical, linear and empiricist view of science as an objective progression toward the truth. Instead, he erects from bottom up a structure in which science is seen to be heavily influenced by non-rational procedures, and in which new theories are viewed as being more complex than those they usurp, but not as standing any closer to the truth.[96]

According to Kuhn, science is not a steady, cumulative acquisition of knowledge that is portrayed in the textbooks; rather it is a series of peaceful interludes punctuated by intellectually violent revolutions in each of which, a new paradigm replaces the old conceptual worldview or "paradigm".[97] In that sense then, science is not simply the search for 'truth', and scientific progress cannot only consist in the construction of theories that approximate more and more closely to the truth. As we can clearly notice, Kuhn's approach to the methodology of science was of a radically different kind. Scientific progress is not quite what it was taken to be. Kuhn presented an alternative conception of science in flux, "of science driven not by the continuous accumulation of

[93] In: Kneen, K. *The Ram's Horn. A Monthly Newsletter of Food System Analysis No.*201, July-August 2002, p.3ff.
[94] Mann, M., *Ibid.*, pp.28ff.
[95] In Horwich, P., *Ibid.*,p.2.
[96] Kuhn, T.S., 1962. *The Structure of Scientific Revolutions.* Second revised edition. Chicago: University of Chicago Press, pp.92-98.
[97] Kuhn, T.S., *Ibid.*, pp.96.136-138

uncontroversial observable facts as by profoundly discontinuous conceptual revolutions in which the very foundations of old frameworks of scientific thought are replaced by radically new ones."[98] To put this simply, in Kuhn's language, science is not to be perceived as pure truth, but as truth in a 'paradigm'. Thus, science is embedded in a 'paradigm'.

No wonder Kuhn's critique of scientific method turned several fields or disciplines upside down. Kuhn's critique of science called into question many of the central elements of the traditional picture of science. The concept of absolute or pure truth, the observation/theory distinction, the determinacy of rational choice, and the normative function of philosophy of science were called into question.

This serves the scope of this thesis. It is possible that genetic engineering and biotechnology are locked in a particular paradigm and cannot therefore possess absolute truth. To those inside the paradigm, the technology seems logical and truthful. Yet, to those outside such a paradigm, the technology simply illustrates the flaws of the paradigm – mostly motivated by the power to control and increase profit.

In New Testament terms, 'principalities and powers'[99] have gripped our world, which entails that our struggle with the misuse of science and technology is essentially a religious one. On the one hand, the church affirms a faith in God's artistic work as the sustainer of creation, which includes the truth that God is still Lord over such principalities and powers, who to some degree, cannot but serve God. On the other hand, the attitude of the churches toward scientific and technological forces and structures should be one of fundamental critique for the cause of justice, truth and integrity of creation.

[98] *Ibid.*, p.37
[99] Colossians 2:8-10.14-15 ; Ephesians 6:12;1:23

2.2 An overview of GMOs and the politics of food supply

Having examined the definitions of biotechnology and genetic engineering, and noted their location within both science and society, we are ready to reflect on the impact that GE can have on food supply in society, through GMOs. However, this brings us into the very heart of the politics of food production, distribution and consumption.

It is important to take note that the very terms of the debate, the definitions themselves, and the tensions around language, for example, food *safety* versus food *security* versus food *sovereignty*, mean that there can be no neutral, 'objective' examination of these concepts. It is in this perspective that we have laid out our theological principles in the previous chapter, so that we can participate in the crucial debate of 'naming' the reality about which we wish to debate.

2.2.1 Food safety

Debates on the political implications of genetically engineered food and crops center around two major issues, namely, food security and food sovereignty, as will be noted below. But, they also center on other issues such as food safety, that is, suitability for human consumption and environmental safety. [100] When recombinant DNA techniques were developed, there was an immediate concern about its safety in relationship to food and environment as well as the safety of the technology in itself.

For genetically modified organisms, the risks classified as inherent or intrinsic in the technology are frequently summarized as biosafety risks. To that end, there is a wealth of scientific literature on the deliberate release of GMOs into either new environments or areas where they could particularly prove harmful. Proponents of genetic engineering and biotechnology demonstrate the safety of the technology. But, there is a broad consensus

[100] The safety assessment of food derived from recombinant DNA plant follows a stepwise process. Factors taken into adequate account in the assessment of the product include: identity, source, composition, effects of processing/cooking, transformation process, the r-DNA including the stability of insertion and the potential for gene transfer, potential intake and dietary impact and potential toxicity and allerginicity. See, *Codex Alimentarius,* Proposed Draft Guideline for the Conduct of Safety Assessment of Foods Derived form Recombinant-DNA Plants, 23 June, 2000.

amongst most scientists that serious concerns about the release of living GMOs are warranted.

Part of the problem in this debate is that the multinational corporations often market their products before carrying out an adequate scientific research on their safety. For example, an internal 1988 chemical industry document from a committee with strong pesticide company representation acknowledged that, "very little data exists to broadly respond to the public's perception and the charges of our opponents."[101] In this line, then, any claim about the environment and health safety of the products of multinational companies merits deep skepticism.

The Cartagena Protocol on Biosafety (CPB) was the first international law to regulate genetic engineering. The protocol was adopted by more than 130 countries amidst global concern about the safety, health and ecological risks of GMOs and the wider debate concerning the political and socio-economic implications surrounding genetic engineering and corporate-driven science.[102] Joan Lopez Villar notes that these countries are already signatories to the *CPB* and many more are in the process of ratification. The *CPB* calls for developing countries to ensure that genetically modified organisms are not slipping into the country illegally, or even released domestically. Currently, there is lack of an effective global identity preservation system, which will let GMOs enter the food and crop production chain. Cross-pollination and horizontal gene transfer exacerbate this problem. The likelihood is, therefore, that GMOs that get introduced in the environment contaminate non-GM food and crops.

Distribution of genetically engineered food aid is also a threat to biosafety. In this line, the European Commission remarks that: "Once a GMO is released into the environment, it could be impossible to recall it or prevent its spread and therefore adverse effects must

[101] http://www.chemicalindustryarchives.org/search/pdfs/cma/19871011_00000287.pdf; Caroline Hattam, Organic Agriculture and Sustainable Agriculture and Rural Development http://www.fao.org/organicag/doc/oa_sard.htm

[102] Foreword by Lim Li Lin, "Third World Network" in Villar, J.L.,*Ibid.*, p.5

be avoided as they might be irreversible."[103] Such concerns about the safety of GM crops have grown in several parts of the world and prompted calls for moratoria.

It is important to note that safety testing of genetically engineered foods is largely dictated by a concept of 'substantial equivalence'. The advocates of this view claim that a genetically engineered crop has similar chemical characteristics to the traditionally produced crops and are therefore as safe as the traditional crops. The tests commonly accepted as sufficient to establish substantial equivalence focus on known nutrients, toxins and allergens. But, the critics of this principle argue that its use as a basis for risk assessment is seriously flawed because it focuses on risks that can be anticipated on the basis of known characteristics, but ignores unintended effects that may arise from genetic modification.

2.2.2 Food security

Recent statistics indicate that in Sub-Saharan Africa 34 percent or 194 million of the population goes hungry. This daily humiliation of hunger that millions are living with is now reaching alarming proportions in Southern Africa. At the beginning of 2002, international monitors estimated the number of people facing starvation in Southern Africa at seven million. Seven months later, this figure has grown to 15 million. This is not caused by scarcity; there is an abundance of food in the world.[104]

Several countries in Southern Africa have declared national disasters due to the food security crisis: Malawi in February, Lesotho and Zimbabwe in April, and Zambia in May.[105] But, what is food security? Basically, food security means or entails healthy and nutritional food that contains enough vitamins and minerals to maintain good health. It also means abundant food, enough to become a source of income in the community.[106] The rationale behind food security is the continued existence of widespread under-

[103] See, European Commission, 1990. "The European Community and the deliberate release of Genetically Modified Organisms to the Environment.' Occasional paper.
[104] *Alternatives*, August 2002, p.12.
[105] Kneen, K., *The Ram's Horn. A Monthly Newsletter of Food System Analysis* No.203, July-August 2002.
[106] See, Caroline Hattam, Organic Agriculture and Sustainable Agriculture and Rural Development http://www.fao.org/organicag/doc/0a_sard.htm

nutrition and malnutrition and growing concern about the capacity of agriculture to meet both the present and future food needs.

In other words, food security means access by all people at all times to enough of the food that they want for an active, healthy life.[107] In broad terms, food security is a term that encompasses many concepts, including nutrition in the household, access (physical and financial) to food at the local, regional or national levels, and policy that can improve availability, quality of and access to food. This holistic view to food security entails an understanding of the inter-relatedness of production, consumption, storage, economic and nutritional issues to food access at household and national levels.[108]

Kathleen Kneen defines food security as "the right of a person to have assured access to nutritious, appropriate, safe food, which is adequate to lead a healthy life."[109]

2.2.3 GMOs and the politics of food supply

We note that in the past, new inventions might have started off to serve a recognized public need. At the most basic level, human beings have found ways and means to channel and shape natural things and processes to meet the necessities of providing themselves with food, water, shelter, clothing, warmth and so on. This is a feature of human living. To do this, they obtained general consent and approval. Today, that is no longer necessarily so.[110]

The big multinational corporations and biotechnologists justify GE technology upon identification of multiple food security problems and constraints that small scale farmers in developing countries face: crop losses due to insects, diseases, weeds, low soil fertility,

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[107] Committee on World Food Security, UN Food and Agriculture Organization (FAO), 1995; '... when all people , at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life', World Food Summit: Plan of Action.

[108] http://www.nu.ac.za/dep/foodsecurity

[109] Kneen, K. *The Ram's Horn. A Monthly Newsletter of Food System Analysis*. No.203, July-August, 2002, pp.2-3

[110] Today, science, with its attendant technology, has become a complex specialist discipline remote from ordinary people that not seek or respect public approval. Such is the case with genetic engineering and biotechnology, which I see as potentially harmful, not only to the environment but also to small-scale African farmers and the continent's food security. This, then, contradicts what biotechnologists and multinational corporations claim – that the GE technology is key and critical to more productive agriculture, and thus promise the world, and particularly, Africa, food security.

burden of using fertilizers, environmental pressures, climate changes, degradation of natural resources, overpopulation and droughts.[111] As a result, these farmers suffer from food insecurity and poor nutrition. Yet, most people in the Third World, of which the African continent is part, depend directly and indirectly on agriculture for their livelihoods. According to the proponents of GE technology, low productivity in agriculture is a major cause of poverty, food insecurity and poor nutrition in Africa. They are espousing genetic engineering and biotechnology as a significant contribution to social and economic development in Africa, and that the technology will address the problems and constraints outlined above.

For example, Dr. Florence Wambugu of Kenya believes that genetic engineering and biotechnology have arisen out of the context of the food crisis in Sub-Saharan Africa and emphatically articulates that the GE technology is the solution to such a crisis.[112] Similarly, at the meeting of the World Food Summit in June 9-13, 2002, the United States promoted genetically modified crops as a solution to famine.[113] Clearly, then, proponents of genetic engineering biotechnology view the technology as the timely savior of humanity, gripped by the humiliation of hunger and famine in Africa and other parts of the Third World. Thus, new advances in GE technology promise to make the path of socio-economic development a lot easier and shorter.

According to the biotech industry, GM foods or crops are aimed at solving the global food security crisis, evident in hunger and famines. In this light, Monsanto, the giant biotech multinational corporation explains:

> The world's population has topped six billion people and is predicted to double in the next 50 years. Ensuring an adequate food supply for this

[111] For a detailed discussion of the problems and constraints that small-scale maize farmers face in Africa, see, Prof. Mark Lang, "Genetic engineering: here to stay." *Focus Interactive*, Vol.13 No.2 (2002), pp.35-36. Also, see, www.nu.ac.za/focus/text/vol13no2/getechnology.text

[112] Dr. F. Wambugu www.modifyingafrica.net/news.htm

[113] Rory Carroll, "GM firms the only winners at food talks summit" www.guardian/co.uk/gmdebates/story/02763,737157,00.html in De Gruchy, Steve, "Biotechnology as 'cultural invasion': Theological Reflections on Food Sovereignty and Community Building in Africa." A paper presented at the Theological Society of South Africa, held at the University of Natal, Pietermaritzburg, 19-21 June, 2002.

> booming population is going to be a major challenge in the years to come. GM food promises to meet this need in a number of ways.[114]

This is one of the biggest hopes of proponents of genetic engineering, namely, that it may enable MNCs to feed more people from the available land, in the face of the expansion of the world's population.[115] In contrast to this view, opponents argue that it is poverty, inequalities, lack of access to productive resources and lack of economic (purchasing) power that are causes of food insecurity. Many worthy witnesses demonstrate that there is more than enough food in the world produced by conventional and organic means for everybody. But, part of the problem is the question of poor and unjust distribution.

Having discussed the context in which this technology comes from, it is also appropriate to articulate the perspective from which this technology is pursued. The proponents of genetic engineering and biotechnology argue from the dominant model of the official and institutional development perspective. In the scope of this perspective, they see "economic growth as the fundamental sign of development, capitalism as the mode of development and technology as the engine of development."[116] Genetic engineering fits perfectly into this dominant model of development in pursuit of commercial gain by those who control science. What we note here is that, the power of progress is intimately tied to technology. Technology is viewed as a tool of development or progress in the North or West. Yet, today, many people have legitimately become skeptical about any claims for progress. They have become, rightly, critical of all that is labeled 'development' or 'technology'. This, certainly, applies to biotechnology, which regards and utilizes living organisms as if they were another form of technology subject to manipulation. In this regard, Kneen writes:

> Once life is reduced to a matter of technology (to a tool or tools, whose value lies in their utility), then biology – 'the living' organism – is simply

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[114] http://www.Monsanto.com

[115] Bruce, *Ibid.*,p.20

[116] For a detailed discussion, see, De Gruchy, Steve, "Biotechnology as 'cultural invasion': Theological reflections on food sovereignty and community building in Africa." A paper presented at the Theological Society of South Africa, at the University of Natal, Pietermaritzburg, 19-21 June, 2002; and De Gruchy, S., "Life, Livelihoods and God: Why Genetically Modified Organisms oppose Caring for Life. *The Ecumenical Review* vol 54 No.3, July, 2002, pp.251ff.

> a means to an end. The end, unfortunately, is not the fullness of life or the nurture and well being of all creation, but all too often the profit of corporation.[117]

It is these concerns that have led to the promotion of "food sovereignty" by those opposed to the dominant model of development.

2.2.4 Food sovereignty

As we have seen, the proponents of genetic engineering and biotechnology focus their arguments on the issues of food safety and food security, though in a flawed manner. On the other hand, the opponents of the technology argue that genetic engineering and biotechnology not only undermines food security but also people's food *sovereignty*.

But, what exactly is food sovereignty? Kathleen Kneen defines food sovereignty as:

> The right of peoples, communities, and countries to define their own agricultural, labour, fishing, food and land policies which are ecologically, socially, economically and culturally appropriate to their unique circumstances. This includes the true right to food and produce food, which means that all people have the right to safe, nutritious and culturally appropriate food and to food-producing resources and the ability to sustain themselves and their societies.[118]

This simply means people exercising their power (control) or sovereignty over the food chain. Kneen notes two things that are crucial to food sovereignty: Firstly, community-control over productive resources, as opposed to corporate ownership of land, water, and genetic and other resources. Secondly, protecting seeds, the basis of food and life itself, for the free exchange and use of farmers, which means no patents on life and a moratorium on GM crops, which lead to the genetic pollution of essential genetic diversity of plants and animals.

In addition to Kneen's understanding of food sovereignty, the NGO/CSO Forum for Food Sovereignty, notes that: "... trade liberalization is the greatest force undermining livelihoods around the world, and has diluted the concept of the human right to food,

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[117] Kneen, B., "Caring for Life: Genetic Engineering and Agriculture". *The Ecumenical Review,* Vol.54, No.3, July 2002, p.266.
[118] Kneen, K. ,*The Ram's Horn. A Monthly Newsletter of Food System Analysis,* No. 203, July-August.

..."[119] The Forum counter-poses the unifying concept of food sovereignty as the umbrella under which they wish to outline the actions and strategies that are needed to authentically end hunger.

According to this forum, every community of people has the right to food and to produce food, which means that all people have the right to safe, nutritious and culturally appropriate food and to food-producing resources and the ability to sustain themselves and their societies. To such an understanding of food sovereignty, the forum notes several prerequisites to achieve food sovereignty. These include:

- According priority to food production for domestic and local markets, based on peasant and family farm diversified and agro-ecologically based production systems ensuring fair prices for farmers, which means the power to protect internal markets from low-priced, dumped imports

- Access to land, water, forests, fishing areas and other productive resources through genuine redistribution, not by market forces and World Bank sponsored 'market-assisted land reforms'.

- Recognition and promotion of women's role in food production and equitable access and control over productive resources

- Public investment in support for the productive activities of families, and communities, geared toward empowerment, local control and production of food for people and local markets.[120]

To summarize, for the NGO/CSO forum and Kneen, food sovereignty means the primacy of people and community's rights to food and food production over trade concerns. This entails the support and promotion of local markets and producers over production for export and food imports.

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[119] The NGO/CSO Forum for Food Sovereignty, June 14, 2002; http://www.foodfirst.org/progs/global/food.finaldeclaration.html
[120] The NGO/CSO Forum, *ibid.*, p.2

Similarly, Vandana Shiva notes that: "what is needed, all over the world, is a policy of food sovereignty, a concept that goes beyond the human right to food to include the ability of communities, peoples and nations to feed themselves as a first priority."[121] Her definition of food sovereignty is similar to Kathleen Kneen and the NGO/CSO Forum's definitions. According to her, food sovereignty promotes:

> The right to food for the entire population, through small and medium-sized production, respecting the cultures, diversity of peasants, pastoralists, fisherfolk, indigenous peoples and their innovation systems, their ways and means of production, distribution and marketing and their management of rural areas and landscapes.[122]

Embedded in this concept is the recognition that organic farming, or "agro-ecological methods", is key to food security and sovereignty.

The different definitions outlined above indicate that food sovereignty is a concept that transcends the concept of food security. It is the capacity to have control and sovereign decision-making throughout the food chain, from production through distribution to consumption. The small-scale farmers must maintain control of basic elements of production such as land, water and seed. If a farmer is in control of these elements, he or she is also in control of food, which is fundamental to human and other non-human existence. Food sovereignty takes adequate recognition of agricultural practices that involve small-scale and community farmers, indigenous peoples with the primary objective of satisfying local needs as well as local and national markets. The central concern here is welfare of human beings in relationship to their environment and not making huge profits, as is the case in genetic engineering and agricultural biotechnology.

2.3 Summary

In chapter two we have noted that there are many definitions of genetic engineering and biotechnology. Academics define such concepts depending on their context, purpose and perspective. This is to say that, what genetic engineering and biotechnology are, clearly depends on who is defining the concepts, for what purpose is he or she defining them and

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[121] In: Kneen, K., *The Ram's Horn, A Monthly Newsletter of Food System Analysis No. 202, June 2002, p.2.*
[122] Kneen, K., *Ibid.*, p.2

from what stand point. Nevertheless, we can rightly conclude that most definitions of genetic engineering and biotechnology entail a more deliberate elimination and manipulation of life forms to enhance corporate control and profit. In this very line, it is notable that multinational companies gain control over the food chain and are driven by the economic logic of delivering higher returns to their shareholders, not the environmental health or sustainability of life forms on the planet earth.

The chapter also focused on issues of food and environmental safety as crucial to the debate. In defining the concepts of food security and sovereignty, we have come to conclude that food security needs to be understood in the wider framework of food sovereignty. The latter is critical to the former. With these points in mind, we turn now to a thorough examination of the promises and threats or risks of genetic engineering biotechnology to food security and sovereignty in Africa.

CHAPTER 3: AN ASSESSMENT OF THE PROMISES AND THREATS OF GENETIC ENGINEERING AND BIOTECHNOLOGY TO AGRICULTURE, FOOD SECURITY AND FOOD SOVEREIGNTY IN AFRICA

3.0 Introduction

Chapter three commits itself to offering a critical and an analytical assessment of the promises and threats of genetic engineering and biotechnology. It will be argued that the threats will be of such a catastrophic nature and as such outweigh the benefits claimed.[123]

Biotech companies often claim that genetically modified organisms, specifically genetically engineered seeds are essential breakthroughs needed to feed the world, protect the environment and reduce poverty levels in developing countries. This view rests on two critical assumptions, both of which are open to doubt and question. The first is that hunger is due to a gap between food production and human population density or growth rate. The second is that genetic engineering is the only or best way to increase agricultural production and thus meet future food needs. But, studies show that there is no relationship between the prevalence of hunger in a given country and its population.[124] The real causes of hunger are poverty, inequality and lack of access. Too many people are too poor to buy the food that is available, but which is poorly and unjustly distributed, or lack the land and resources to grow it themselves.[125]

Essentially, proponents of genetic engineering and biotechnology argue that the technology is a solution to the global problems of food insecurity. This chapter examines such claims alongside with the threats envisaged in the technology. In the scope of this thesis[126], the following are the specific promises of GE and biotechnology, evaluated in

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[123] Krimsky, S. 1982. *Genetic Alchemy*. Cambridge, MA: MIT Press, p.322. see also, Reiss, Michael Jonathan. 1996: 53-59

[124] Miguel, A, Berkeley and Peter Rosset, "Ten reasons why biotechnology will not ensure food security, protect the environment and reduce poverty in developing world" http://www.foodfirst.org/progs/global/ge/altieri – 11-99.html

[125] Lappe, F.M., J. Collins and P. Rosset, 1998. *World Hunger: twelve myth* N.Y.: Grove Press, p.270.

[126] There are a number of envisaged benefits in the whole area of pharmaceuticals – therapeutic benefits, which are not the scope of this thesis, and as such will not be discussed.

the light of the theological principles noted in chapter one, and the concerns of safety, food security and food sovereignty raised in chapter two.

3.1 The Promises of Genetic Engineering and Biotechnology

3.1.1 Pest and disease resistance: Minimization of the use of fertilizers, agro-chemicals, insecticides and pesticides

Genetic engineers and bio-technologists claim that genetic engineering confers resistance to pests and diseases. This, then, has the potential to reduce crop loss or eliminate the application of agrochemical pesticides.[127]

Pest and disease resistance falls under three categories. Firstly, viral resistance, whereby fragments of DNA from plant viruses can be genetically engineered into crops to give natural protection against those viral diseases. The second category concerns insect pest resistance. The most common approach used to increase plant resistance to insect pests is the "Bt" strategy. Characteristic in this strategy is that "Bt" crops are engineered to produce their own insecticides. The third category is resistance to other diseases. Genes producing anti-fungal proteins get inserted into various plants, giving protection against diseases.

The result is minimization of the use of fertilizers, agro-chemicals, insecticides and pesticides. In this regard, Mark Lang, Professor of Plant Pathology at the University of Natal, Pietermaritzburg, looks at genetic engineering as a solution to "maize streak virus and stalkborer – two of the biggest problems facing African maize farmers in Africa."[128]

One might be tempted to assert or think that this promise sounds a blessing to farmers that lose crops due to pests, diseases and lack of purchasing power. On closer scrutiny, however, the picture is different. These uses of genetic engineering have been

[127] A summary of the benefits of GMOs is given by Monsanto who stipulates that "GM food is good for pest resistance, for herbicide tolerance, for disease, resistance for cold tolerance, for drought tolerance or salinity tolerance, for nutrition and for phamarceuticals." www.Monsanto.com ; Bruce also notes some benefits of GE such as "feeding an increasing world population, for economic benefit, for reducing environment degradation, for medical and veterinary benefits, for consumer benefits, for wealth and for job creation and for intellectual and cultural benefits." See, Bruce, 1999: 100

[128] Lang, M., *Ibid.*, pp.35-36

controversial. Critics observe and argue that those transgenic plants, which produce their own insecticides, closely follow the pesticide paradigm, which is itself rapidly failing due to pest resistance to insecticides. Research over time has clearly demonstrated that nearly all new insecticides and other pest management technologies appear to work well in the early years following introduction, but as time passes by, farmers encounter increasing insect resistance.[129] To that end, it therefore stands to reason that there is no reason why this would not be the case with "Bt" crops. In that case, then, farmers will undoubtedly return to synthetic pesticide use once the insects become resistant and insecticide usage will go up again.

We should also take note that research has shown that massive use of Bt crops affects non-target organisms and ecological processes. Evidence has also shown that Bt toxin can affect beneficial insect predators that feed on insect pests present on Bt crops.[130] Losey et al. observe that: "windblown pollen from Bt crops, found on natural vegetation surrounding transgenic fields can kill non-target insects such as the monarch butterfly."[131] Donnnegan et al and Palm et al. add by stating that: "Bt toxin present in crop foliage plowed under after harvest can adhere to soil colloids for up to three months, negatively affecting the soil invertebrate populations that break down organic matter and play other ecological roles."[132]

Concerning the viral resistance (the first category of pest and disease resistance), there is the potential for vector recombination to generate new virulent strains of viruses, especially in transgenic plants engineered for viral resistance with viral genes. The second potential risk is that recombination between a RNA virus and a viral RNA inside the transgenic crop could produce a new pathogen leading to more severe disease

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[129] Harrie Oppenoorth Hivos, The Netherlands. www.gefoodalert.org ; www.panna.org ; and Sue Mayer, 2001. "The Current Status of Genetically Modified Cotton and its Potential implications for Organic and Small-holder farmers", UK: Gene Watch.

[130] Hilbeck, A., M. Baumgartner, P.M. Fried, and F. Bigler, 1998. "Effects of transgenic Bacillus thuringiensis corn fed prey on mortality and development time of immature Chrysoperla carnea Neuroptera: Chrysopidae." *Environmental Entemology* 27, pp.460-487.

[131] Losey, J.J.E, L.S, Rayor and M.E. Carter, 1999. "Transgenic Pollen harms monarch larvae. *Nature*, 399, 214.

[132] Donnegan, K.K., C.J. Palm, V.J. Fieland, L.A. Porteous, L.M. Ganis, D.L. Scheller and R.J. Seidler, 1995. "Changes in levels, species, and DNA fingerprints of soil micro organisms associated with cotton expressing the Bacillus thuringiensis var. kurstaki endotoxin". *Applied Soil Ecology* 2, 111-124.

problems. Some researchers have shown that recombination occurs in transgenic plants and that under certain conditions it produces a new viral strain with altered host range.[133]

In addition, we should take note that opponents of genetic engineering argue that the biotech claims of minimizing the use of fertilizers, agro-chemicals, insecticides and pesticides, merit deep skepticism. This is so because the companies that produce and advertise genetically engineered seeds are the same companies that produce agro-chemicals. As we have come to note in this thesis, opponents of the technology state that the multinational corporations are profit-driven rather than common good-driven. In that regard, according to them, the real thrust of genetic engineering and biotechnology is not to make Third World agriculture more productive, but rather to generate profits for themselves.[134]

3.1.2 Herbicide resistance

Herbicide resistant varieties of soybeans, cotton, corn, canola and rice are presently in commercial production. Monsanto's "Roundup Ready" soybeans and other seeds to be tolerant to Monsanto's herbicide Roundup, so that when the herbicide is sprayed, those that are genetically engineered withstand the herbicide and live, whilst all other weeds die. As a result, agricultural crop productivity is increased since crops are not lost due to weeds. On critiquing this claim, Altieri argues that "the use of herbicide resistant crops undermine the possibilities of crop diversification, thus reducing agrobiodiversity in time and space."[135]

Again, studies show that the potential transfer through gene flow of genes from herbicide resistant crops to wild or semi-domesticated relatives can lead to the creation of "super weeds".[136] Opponents of this technology therefore note that such a technology potentially exacerbates, rather than solves the problems of weeds.

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[133] Steinbrecher, R.A., 1996. "From Green to Gene Revolution: the environmental risks of genetically engineered crops. *The Ecologist,* 26, 273-282.
[134] Busch, L., W.B. Lacey, J. Burkhardt and L. Lacey, 1990. *Plants, Power and Profit.* Oxford: Blackwell.
[135] Altieri, M.A., 1994. *Biodiversity and Pest management in Agroecosystems*. New York: Haworth Press.
[136] Lutman, P.W., (ed.), 1999. *Gene flow and agriculture: relevance for transgenic crops.* British Crop Protection Council Symposium Proceedings No. 72., Stafordshire, England ; Duke, S.O., 1996. *Herbicide resistant crops: agricultural, environmental, economic, regulatory, and technical aspects*. Boca Raton:

3.1.3 Tolerance of environmental stress

The environment in which crops are grown has a major effect on their productivity. Biotechnologists and multinational corporations promise the development and production of crops that will better be able to tolerate extreme environmental conditions such as heat, cold and water stress; adverse soil conditions, such as high salinity, acidity and alkalinity, and various types of toxicity. The goal and objective here is to increase crop yields in such environments, thus reducing the risks to food security in regions where farmers have to deal with extreme weather or soil problems.[137]

Such a claim seems to be timely when farmers in Africa are facing such environmental problems that are not conducive to productive agriculture. This could be advantageous to developing countries. But, the legitimate question in this regard is, to what extent is this possible without in turn negatively impacting the community and the environment itself? Furthermore, whilst GE companies promote this promise or benefit, there is in fact very little research in this area, and certainly no examples of such crops. In this respect, Donald and Ann Bruce observe that "although research discoveries point to some possible applications against drought, salinity and frost, on the whole this potential has so far proved quite difficult to realize".[138]

The study by the USDA Economic Research Service shows that in 1998, yields were not significantly different in engineered versus non-engineered crops in 12 of 18 crop/region combinations.[139] In six-crop/region combinations, were Bt crops. These exhibited increased yields between 5 to 30 per cent. Glyphosphate tolerant cotton showed no significant yield increase in either region where it was surveyed. This was confirmed in another study examining more than 8,000 field trials, where it was found that Round-Up Ready soybean seeds produced fewer bushels of soybeans than similar conventionally bred varieties.

Lewis Publishers, p.420. ; and Holt, J.S. and H.M. Le Baron, 1990. Significance and distribution of herbicide resistance, *Weed Technol,* 4, 141-149

[137] Ives, C.L. et al., *Ibid.*,pp.4-5

[138] Bruce, *Ibid.*, pp.22-23

[139] USDA, 1999. *Genetically Engineered Crops for Pest Management.* Washington, D.C: USDA Economic Research Service.

The examples above indicate that there is little difference in crop increase between GE crops and non-GE crops. For example, Research Foundation for Science, Technology and Ecology, India, Press Release of 6th November 2002 reported that farmers in India are angry because Bt. cotton has completely failed. As a result, the Research Foundation for Science, Technology and Ecology called for a withdrawal of conditional clearance given by Genetic Engineering Approval Committee (GEAC) of the Ministry of Environment and Forests. The Indian government gave the conditional clearance for commercial planting of the controversial genetically engineered Bt. cotton to Monsanto and Mahyco.[140]

The commercial clearance to Bt. cotton was granted on the grounds that it had been fully tested to suit Indian conditions, and recommended that it did not require pesticide sprays and that it would give higher yield, and farmers would have higher incomes. However, all the claims on the basis of which the clearance was granted have been proven false by the total failure of Bt. cotton in states where it was cleared for planting. Such Indian states included Andhra Pradesh, Maharashtra and Madhya Pradesh. Yields have been as low as twenty kilograms in one acre. Thus, the failure of Bt cotton exposes the false claim about higher yield by Monsanto, Mahyco as well as the GEAC, which said that a Bt. Cotton farmer would get an average increased income of Rs.10,000 per acre.[141]

3.1.4 Improved post-harvest life (shelf life), textures and flavour

Bio-technologists and multinational companies promise the possibility of genetically engineered fruit and vegetables with improved taste and post-harvest qualities. Genetic engineering has been used to slow down softening in many fruits, thereby increasing shelf life during shipment and storage. Attempts are also being made to modify some fruit and vegetables to make them sweeter and more palatable. For example, FLAVR SAVR™ tomatoes, genetically modified for longer shelf life, do not go soft during transport and thus can be left on the plant longer to develop their full flavour. These tomatoes are currently grown in Mexico.[142] This enhancement of texture, flavour or shelf

[140] Ge_info-owner@yahoogroups.com
[141] http://www.vshiva.net
[142] Ives, C.L., et al., *Ibid.*, pp.5ff

life of the plant is hoped to help global trade in foods that easily rot, particularly fruit and vegetables.

This promise sounds very positive in itself. But, what we know is that traditional and community farmers have for ages practiced traditional ways to store seeds, fruits and vegetables. Besides, a legitimate question to ask in this regard is, does promoting shelf life and therefore trade, not promote the growing of food for foreign wealthy markets rather than domestic markets? As we have noted, poor countries often export food to richer countries, rather than feeding their own population. An increase in food trade therefore does not mean a decrease in hunger – and may in fact lead to an increase in hunger.

3.1.5 Adding value to the plants and soil

Similar to the promise of high yields, is the promise of raising the nutritional value of plants. The corporations promise to produce crops that contain higher amounts of vitamins to improve their nutritional quality. For example, genetically engineered "golden rice" contains three transplanted genes that allow plants to produce beta-carotene, a compound that is converted to Vitamin A within the human body.

In addition to enhancing the nutritional properties of foods, biotechnology is being used to develop foods that have medicinal properties – so called functional foods or 'nutraceuticals.' Functional foods are products that are claimed to have a positive health benefit beyond 'normal' nutrition. These include, fresh fruit and vegetables with enhanced antioxidant content (Vitamins C and E, beta-carotene and Selenium); and brassicas with increased glucosinolates (anti-cancer substances). The genetic engineering of food crops to contain "health benefits" has also focused on vaccines – for example, hepatitis B vaccine.

The strong argument against this promise pertains to health itself. We may legitimately ask: how will the dose be controlled if such foods are consumed? Recent evidence shows that there are potential risks of eating such foods. This is so, because the new proteins produced in such ways could act themselves as allergens or toxins.

A further way in which biotechnology is being used is to enhance the ability of natural soil bacteria to give plants, nutrients, as well as natural fertilizer via nitrogen fixation. Bruce argues that:

> In practice, the introduction of the ability to fix nitrogen into plants is difficult and very complex, involving at least 15 different genes. The aim is to introduce either the ability to fix nitrogen directly or the ability to form a symbiotic relationship with *Rhizobium,* but either result is some way off yet. If this is successful, it could have a major impact upon world food supply, but it is also possible that it may not turn out to be quite the 'philosopher's stone' that is hoped.[143]

Another application to chemical processes in agriculture involves genetically engineered microbial products to increase their efficiency at modifying the acidity and other properties of silage and hay. Proponents of the technology argue that these microbes can dramatically reduce the losses in storage after harvesting which are caused by contaminating organisms.[144]

It is clear in this discussion of the promise of genetic engineering and biotechnology that GMOs present themselves as a solution to the global concerns about food security. To ordinary minds, the specific promises sound the 'Gospel' – good news or tidings of salvation. Surely, such a contribution to socio-economic development would be the timely blessing.

By way of concluding the section on the promise of genetic engineering and biotechnology and introducing the next, it is important to note that opponents of the GE technology contend that almost all the claims made by Genetic Modification producers prove false: Yields do not increase, but shrink; the use of chemicals does not diminish but rather increases; GM canola has become a super-weed, that is totally resistant to Round Up and which is growing everywhere; organic farmers have been destroyed – all the seeds are contaminated in Canada. Dr. Mae-Wan Ho, in succinct and crude terms, states that "GM crops are a dangerous diversion from the real task of providing food and health

[143] Bruce, *Ibid.* p.26
[144] *Ibid.* p.26

around the world and the promises advanced by the MNCs are far from being materialized."[145]

3.2 The threats of GE Biotechnology

Here, we now turn to the arguments of those who oppose GMO's. As will be evident, many of the arguments against genetically modified organisms echo our theological principles established in chapter one.

3.2.1 Monopolistic and exclusive control and ownership of genetic resources by multi-national corporations

The revolution of genetic engineering and biotechnology grants power and control to a few biotechnologists and giant multinational corporations such as, Monsanto, Syngenta, Du Pont, Dow Chemical and Aventis Crop-science, in the United States of America and Europe, over and against genetic structures of animal and plant life forms as well as power over economic production itself.[146] As a result, food security is placed in the hands of a handful of biotechnologists and big MNCs to the detriment of organic and community owned farming, and finally to the undermining of food sovereignty and livelihoods of the communities.

The multinational corporations even go to the extent of designing and securing technological and legal tools to control the genetic resources. This is evident in instances of patents and similar mechanisms. This means that the MNCs control the supply of the biotech industry's products such as seeds, pesticides, food, and (pharmaceuticals). The natural and logical consequence of this is that, by controlling the supply, the multinational corporations also have the means of controlling the prices of such products.

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[145] http://www.i-sis.org.uk

[146] The big five MNCs: control markets and researchers (through contract obligations); pressurise legislators; set up and fund 'non-profit' lobby groups; enforce patents; run illegal trials and take farmers to court; steal genetic resources from indigenous peoples and cultures; and develop 'terminator' seeds and 'traitor' crops. This is very sound and justifiable reason why many people are opposed to genetic engineering and biotechnology. See, Thayer, A.M., in *Chemical and Engineering News,* September 17, 2001 Vol.79, No.38, pp.25-32.

The implication of controlling such essential products such as seeds and food translates into the corporations having control over fundamental rights of access to food and nutrition. To this end, those that oppose the technology contend that genetic engineering technology aggravates starvation, food insecurity, poverty, and undermines people's sovereignty with regards to agricultural productive and genetic resources. This monopolistic power, ownership and control over and against animal and plant life forms is ethically unacceptable.

3.2.2 Aggravation of the prosperity gap

Today, we note the shamefully and scandalously inequitable distribution of wealth and power in the world, an inequity that has grown steadily over the past two centuries.

In Africa, it is clear that the most critical dangers have to do with such issues as aggravation of the prosperity gap between industrial and developing countries, and growth in the disparity in income and wealth distribution within poor societies. This is due, in part, to a gap opening between human scientific technical ability and human willingness to shoulder moral and political responsibility. As we all know, food insecurity is one of the most terrible manifestations of human deprivation (poverty) and is inextricably linked to every other facet of development. This is to say, poverty is one of the major causes of food insecurity, and poverty reduction or eradication is critical to improved access to food. Poverty, as we have come to know or experience it, is linked not only to poor national economic performance, but also to a political structure that renders poor people powerless.

In the above sense, Donald and Ann Bruce point out that:

> There is a comparable range of negative consequences of genetic engineering, which include: enhancing food surpluses in richer countries, while dumping on developing economies – disadvantaging those who object to genetically modified food, lack of public accountability in development, the skewing of research and applications towards western consumer market, so that wider world needs are neglected.[147]

[147] Bruce, *Ibid.*, p.101

That said, progress toward food security requires a proper macro-economic framework. In Africa, smallholder farmers do not have access to delivery systems, productive resources, markets and infrastructure. As a result, there is a considerable danger that the introduction of genetic engineering and biotechnology could lead to increasing inequality of income and wealth. Growing concentration among multinational corporations engaged in agricultural biotechnology may lead to reduced competition, monopolistic control and exploitation of small farmers and consumers. Thus, the productivity gap between developing and industrial countries will widen, and poverty and hunger will increase. This is ethically and theologically unaccepted.

3.2.3 Further marginalisation of women: women and food security

According to the study by Women in Development Service (SDWW), women produce between 60 and 80 per cent of the food in Africa and are responsible for half of the world's food production.[148] Yet their key role as food producers and providers, and their critical contribution to household food security, is only recently becoming recognized. Studies by the Food and Agriculture Organization confirm that while women are the mainstays of small-scale agriculture, the farm labour force and day-to-day family subsistence, they have more difficulties than men in gaining access to resources such as land.

Yet, food security has been defined by FAO not only in terms of access to, and availability of food, but also in terms of resource distribution to produce food and the purchasing power to buy food where it is not produced. In this line, then, given women's crucial role in food production and provision, any set of strategies for food security must address their limited access to productive resources. Women's limited access to resources and their insufficient purchasing (economic) power are products of a series of interrelated social, economic, and cultural factors that force them into a subordinate role, to the detriment of their own development and that of the society as a whole.

[148] Women in Development Service, "Women and Food Security" www.fao.org/waicent/faoinfo/SUSTDEV/Fsdirect/Fbdirect/FSP001.htm

Reflecting on this, Vandana Shiva argues, "GMOs destroy the bio-diversity that is sustenance and livelihood base of rural women."[149] Women farmers in the Third World are predominantly small farmers. They provide food security in partnership with other species. The partnership between woman and bio-diversity has kept the world fed through history. According to Shiva, agriculture based on diversity, decentralization and improving small farm productivity through ecological methods is woman-centered, nature-friendly agriculture. In this woman-centric agriculture, knowledge is shared, other species and plants are kin, not 'property', and sustainability is based on renewal of the earth's fertility and renewal and regeneration of bio-diversity and species richness of forms to provide internal inputs. GMOs, on the other hand, will undermine the friendly women-centric agriculture and consequently, food security and sovereignty.

3.2.4 Health hazards, the loss of biodiversity and the precautionary principle

GE crops come with a bewildering range of bio-safety concerns, requiring significant resources to manage, and presenting enormous risks of contamination to agricultural bio-diversity, the mainstay of food security. Genetically engineered crops are being introduced in Africa at a time when there is a worldwide move towards more sustainable agriculture in an attempt to address environmental and health concerns. There is a good reason for concern about the environmental and human health effects of genetically engineered living organisms turned loose in the environment and inside our bodies. But, as B. Kneen writes: "there is no way to predict the possible consequences, precisely because the organisms constructed are 'novel' and introduced without regard for the evolutionary forces that have shaped creation thus far."[150]

Dr. Vandana Shiva consistently and persuasively argues that genetic engineering has serious ecological risks ... "Bt cotton is not 'pest-resistant' but a pesticide producing plant."[151] The severe ecological risks of crops genetically engineered to produce toxins include the threat posed to the beneficial species such as birds, bees, and butterflies. The

[149] Shiva Vandana in Staarink, Inez, Hivos, The Netherlands, based mainly on articles, letters and reports from Vandana Shiva (Research Foundation for Science, Technology and Natural Resource Policy), see, www.vshiva.net

[150] Kneen, B., *Ibid.*, p.269.

[151] "Government of India clearance of BT Cotton will increase Farmers Woes", Dr. V Shiva, April 2002.

effects of massive Bt introduction into the environment are unforeseeable. There is limited knowledge available of the effects of the genetic modifications, because they are produced in a rather haphazard way. Already, however, studies show that Bt crop residues cause disruption of microorganisms in the soil. There are indications that other bacteria can assimilate the capacity to produce Bt toxins in the environment and toxicity may cause allergies. It therefore stands to reason that, since, not much is known, the precautionary principle should be applied and the crops should not be released into the environment until adequate research is carried out.

The United Nations Convention on Biological Diversity (CBD) has recognized that the precautionary principle should be used in connection with GE technology. In the Bio-Safety Protocol, adopted in January 2000, the precautionary principle is recognized as a key element for achieving bio-safety. Bio-diversity should not be risked for a technology that has not proved its worth.

Kathleen Kneen notes and talks about deliberate contamination by MNCs (specifically by Monsanto), as a global effort to contaminate food supply in view of making people give up resistance to the corporate-sponsored GE take-over of the world's food supply.[152] The use of the Monsanto RoundUp Ready corn could cause an intricate catastrophic destruction to the environment. In this regard, ecological theory predicts that large-scale landscape homogenization with transgenic crops will exacerbate the ecological problems already associated with monoculture agriculture. A main concern is that international pressures to gain markets and profits is resulting in companies releasing transgenic crops too fast, without proper consideration for the long-term impacts on people or ecosystem.

Contamination is one of the biggest problems that GMO releases into the environment pose today.[153] To this effect, studies have shown that when an organism is released in the environment, the consequences are unpredictable and the impacts are not known. The fact

[152] Kneen ,K., "Food Sovereignty", *The Ram's Horn, A Monthly Newsletter of Food System Analysis* No.202, June 2002, p.3

[153] Contamination is caused in several ways: cross-pollination in which pollen is carried to the next field by wind or animals and the GM genes start to proliferate in the GM-free crop; Insects can insert parts of GE DNA into non-GE maize and this would recombine with the plant's original DNA; and a third possibility is that farmers can use maize imported or donated by the U.S.A as seed, without knowing they are sowing a contaminated crop. This is probably the main factor responsible for contamination. See, www.hivos.nl

that once an organism is released into the environment it is very difficult, if not impossible, to call back has been ignored or downplayed. The problem of cross-pollination and other forms of transmission of undesired traits to non-targeted organisms or species, and the problems of commingling have not been properly and adequately addressed[154].

The problems of GMO contamination illustrate the fact that legal frameworks on GMOs created by the industrialized countries such as U.S.A are clearly inadequate. Also the scope of the contamination illustrates either limited knowledge of GMOs or intentional attempts to compel people to accept these crops with resignation. This indicates that food safety and environmental concerns have been accorded low priority. Many environmental groups have argued for the creation of suitable regulations to mediate the testing and release of transgenic crops to offset environmental risks and demand a much better assessment and understanding of ecological issues associated with genetic engineering and biotechnology.

What biologists feared some years back is already taking place. They warned against cross-pollination and hybridization. For example, in Mexico, the center of origin of maize, the natural gene bank of traditional varieties is already contaminated with GE characteristics.[155] Nobody can imagine what effects this will have on agro-biodiversity or natural relatives and other species. This also entails that it will be very hard to find traditional uncontaminated material that could be used for further improving the crop and maintaining genetic diversity.

Contamination is detrimental to seed diversity and in the long run to agriculture and to humanity. It is therefore clear that the precautionary principle should be applied.

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[154] Villar, J.L., *Ibid.*,p.23

[155] Oppenoorth, H., Hivos, The Netherlands in "The World as a Testing Ground: Risks of genetic engineering in agriculture" www.gefoodalert.org

3.3 Summary

In this chapter, it has become clear that there is indeed great tension between the promises and threats of genetic engineering and biotechnology in the face of the current food, ecological and health crises. Genetic engineering offers great promise in some aspects but also great danger in others. There is the potential to solve many problems, seemingly, but also the potential to create many more.

By and large, in this chapter, I have argued that the promises and claims made by bio-technologists and multinational corporations merit deep doubts. This is so because they have been proven false: yields do not increase, usage of agro-chemicals increases, super-weeds emerge, seeds get contaminated and organic farmers loose their rights and sovereignty. I have argued in this chapter that the most serious risks, perpetrated by the technology, center around three major issues: first, the widening of poverty gap between the rich and poor nations, the advantaged and disadvantaged groups. Secondly, there is growth in disparity in income and wealth distribution due to monopolistic power and ownership over genetic and agricultural resources, and thirdly, a loss of bio-diversity.

CHAPTER 4: GENERAL TRENDS IN THE IMPACT OF GE TECHNOLOGY ON FOOD PRODUCTION, FOOD SECURITY AND FOOD SOVEREIGNTY IN AFRICA

4.1 Introduction

Having examined and assessed the promises and threats of genetic engineering and biotechnology in chapter three above, chapter four critically reflects on the general trends in the impact of GE technology on food production and food security and sovereignty, specifically for the African continent. Here, issues of patents, privatization of genetic resources and intellectual property rights in relationship to their impact on small-scale farmers will be discussed. This includes the way such mechanisms undermine farmers' rights, food security, sovereignty and livelihoods.

The chapter also aims at discussing the trend of trade in the face of genetically modified organisms. In the scope of this thesis, the chapter has identified four countries; the first two of which Zambia and Zimbabwe, reject genetically modified food and crops, and the other two, Malawi and South Africa that accept genetically engineered crops and food as 'Food Aid'. Whilst it is beyond the scope of our thesis to explore all the ethical questions surrounding 'Food Aid', the positions adopted by these four countries illustrate some of the complexities of food security and food sovereignty in Africa today.

4.1.1 Patents, privatization of genetic resources and intellectual property rights

During 2002, representatives of local communities, Civil Society Organizations and Non Governmental Organizations from around the globe, gathered at the World Summit for Sustainable Development (WSSD) in Johannesburg, held in August and September. They discussed issues relating to the privatization of biological resources and of the rights of holders of indigenous knowledge and technologies, especially as related to bio-diversity. These representatives became aware that the increasingly powerful multinational corporations are destroying local communities and their natural resource base by privatizing biological, land and water resources and that a potent instrument in this

destruction is the patenting of living organisms. Similarly, the representatives strongly opposed bio-piracy and the patenting of biological resources and knowledge because it goes against human and cultural rights.

Following the position of the representatives of local communities, Civil Society Organizations and NGOs above, we would be correct to argue that the use of GE biotechnology in agriculture and industry creates profound and difficult concerns. We have seen in this thesis, that scientists are crossing species boundaries at an ever-increasing rate, inserting human genes into animals, and animal genes into other animals and plants for profit and utility maximization. In order to obtain a better return on the substantial capital investment required to create these 'new' genetically engineered life forms, corporations and research institutions seek patent protection for their biotechnology 'creations'.[156] Patenting negates the role of the farmers in breeding and selecting their seed. This clearly leads to economic injustice since major multinational corporations gain control of the genetic pool. The companies that patent the varieties or the GE characteristics refuse to allow them to be used or reproduced by others. This is so because the patenting and privatization of genetic resources are the source of their profit.

To further protect their invention, the corporations design sterile seeds, the so-called 'Terminator seeds' or ' Terminator Technology'. They claim they will not use this technology but a lot of new patents have been issued in precisely this area. If the seeds are not made sterile, they could be used to reproduce. Anyone saving or reproducing the patented genetic resources is asked to pay a license fee to the patent holder. In North America, this is already being enforced[157]. People are being brought to court for this, even if the use was unknown or involuntary.

Genewatch UK published information on the "gene patent rush" obtained from a commercial database. As of November 2000, patents were pending or were granted on

[156] Patents vest exclusive, monopolistic control and ownership over the patented subject matter. See, World Council of Churches, 1989. *Biotechnology: Its Challenges to the Churches and the World.* Report by the World Council of Churches Sub-Unit on Church and Society, p.21.
[157] Oppenoorth, H., Hivos, The Netherlands. www.gefoodalert.org; www.pana.org

more than 500,000 genes and partial gene sequences in living organisms.[158] Apart from an increased interest in the commercial use of genetic resources, this surge in patenting is largely due to the rapid development of genetic engineering that allows for 'novel' plants to be developed. To that end, we may legitimately ask whether it is appropriate and ethically and theologically sound for private individuals and multinational corporations to own the fundamental biological components of life?

In the sense above, it is therefore clear that patenting affects the agricultural community, particularly the community owned agricultural sector, since patenting further concentrates agricultural biotechnology in the hands of the multinational companies. Patents and intellectual property rights give global corporations the 'right' to claim monopoly ownership over agriculture and food production. For example, patents mean that farmers have to buy seed from the company each year rather than collecting, storing and replanting seeds, which they have done for thousands of years.

Certainly, the potential exists for this form of technology to have the same effect as the "Green Revolution" which increased food productivity in places like India while at the same time increasing the number of Indians going hungry.[159] Small-scale farmers were squeezed out by bigger farms, which grew mono-cultural crops that were exported to the First World countries for profits, which were often used to buy luxury goods from the First World. People that were squeezed off their farms ended up on marginal land or as squatters outside cities. Besides, patenting encourages the development and 'creation' of genetically engineered microorganisms, plants and animals, which is potentially harmful to the environment.

4.1.2 Undermining of farmers' rights, food security, sovereignty and livelihoods

The right of farmers to save, use, share and exchange their seeds and other planting materials is a cornerstone of agricultural practice in Africa. Traditionally, farmers saved,

[158] *The Gaurdian,* 15 November 2000. 'The Ethics of Genetics'. Special Report on Patenting of Life. London. www.guardianunlimited.co.uk/gene/

[159] Shiva, V., 1991. *The Violence of the Green Revolution: Third World Agriculture, Ecology and Politics.* London and New Jersey: Zed Books Ltd.

adapted and exchanged their best seeds from year to year to promote bio-diversity and food security. Now, however, contracts between seed companies and farmers for GM seeds stipulate that the seeds be used for only one season.[160] Farmers are thus forced to buy the company's seed every year. To that end, Tinashe Madava explains the feeling of the Conference on Sustainable Food Security for All by 2020, September 4-6, 2001 at the International Congress Centre of the Federal Parliament in Bonn, Germany, saying:

> Participants agreed that the food security situation in most developing countries is worsened by the arrival of multinational companies armed with patenting rights on genetically modified seeds that cannot be reused.[161]

This is a direct threat to and violation of the rights of farmers to save, use, and share their agricultural and productive resources. What this entails is that if farmers loose control over their seeds, they also loose control over their farming systems.

To substantiate this, if Canadian farmers who produce GMOs are found saving seeds, they are prosecuted. In India and South Africa the labels tell the farmers they are forbidden to save the seeds. In this case, life forms become the intellectual property of multinational corporations. Worse still, when their conventional crops become contaminated with GMOs, they will probably suffer prosecution and be sued by Monsanto or one of the other giant biotech companies for infringing on their patent as is increasingly happening in Canada and the U.S.A.[162]

Basically, this means that the right to use seeds is taken away from the farmers. The logical consequence of this is that, if farmers lose the right to save seeds, they will also lose their autonomy and become increasingly reliant on multinational corporations.

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[160] "Terminator" crops are engineered to give rise to plants that yield sterile seeds. Another aspect that creates farmer dependence on biotechnology industry is "Traitor" seeds, which require chemicals to be applied to the plant to 'turn on' or 'turn off' certain genetic traits. The implication of such technologies is the placing of the selection of traits in the hands of bio-technologists and genetic engineers and corporations. See, Skip Spitzer, Dec. 2000 "Riding the Bullet Train: The Impact of GE crops on U.S. farmers" http://panna.igc.org/resources/documents/bullet Train.html

[161] Madava, T., "GM food companies undermine food security." http://www.mg.co.za/mg/za/archives/2001sep/features/27sep-africa=.html ; http://www.ifpn.org/2020conference/PDF/2020Conference_Logistics.pdf

[162] Edited by Inez Staarink, Hivos, The Netherlands, based on articles and speeches by Percy Schmeiser. See, www.percyschmeiser.com

Genetic engineering creates farmers' dependence because it increases the corporations' control over seeds. Rick Weiss writes that "... Monsanto has brought legal action against hundreds of farmers to ensure compliance with its terms of use."[163] This, clearly, undermines food security, sovereignty and livelihoods for communities. We all know that the ability of farmers in Africa to control and decide how they use their seed is a question of survival and the basis of their food security. Farm-saved seeds represent about 90 per cent of the total planted seeds on the African continent.[164]

Thus far, it has become clear in this chapter that genetic engineering and biotechnology threaten national sovereignty and farmers' rights. The dissemination of these genetically engineered seeds helps to enforce the idea that GE crops are inevitable and that people cannot choose between different paths of technological development. It is beyond doubt that GE seeds, as time passes by, would become too expensive to afford and as we have already seen, the right of farmers to save, store, share and exchange their own seeds, would increasingly become limited by contracts. This is clearly an injustice to basic agricultural sector. Yet, in Africa, agriculture is made up of small agricultural units, based on family labour and structured as mixed crop systems.

It therefore stands to reason, that the introduction of genetically modified organisms in Africa undermines the right of small-scale farmers to access genetic resources, which they have been developing collectively for times immemorial. That smallholder farmers would benefit from GE crops because varieties can be adapted exactly to their conditions is an unlikely scenario. The varieties engineered by the MNCs are not designed with smallholder farmers in mind because, as a market, this sector is too small to serve the interest of the big multinational corporations, which is to make a large profit. It is appropriate to conclude that the technological strategy that genetically engineered seeds and crops will ensure food security fails to understand that food sovereignty is based on the control of the food production process. In this trend of thought, then, international

[163] Weiss, Rick, "Monsanto's Gene Police Raise Alarm on Farmers' Rights, Rural Tradition," *Washington Post,* 3 February 1999.
[164] Preparatory Meeting for the Establishment of an African Seed Trade Association, Lilongwe, Malawi 1999 in Wynberg R., 2000. 'Privatizing the Means for Survival, The Commercialization of Africa's biodiversity'. www.grain.org

trade policies that are designed to protect intellectual property rights pose a critical threat to food security, food sovereignty and livelihoods in Africa.

4.2 Trade and Genetically Modified Organisms: Market concentration, segmentation and power.

The belief that trade and technology is a quick fix to poverty and hunger is based on a simplistic quantitative perspective on food availability, disregarding many factors, above all the distribution of wealth and power.[165] According to a FAO report, global food production per person has outstripped population growth by 16 per cent and the United Nations FAO predicts it will continue to do so for at least the next 30 years, even without factoring in GE crops.[166]

Agricultural biotechnology is marked fundamentally by economic concentration, such that increasingly few and big multinational corporations dominate the stages of production. This means that control over food and markets is becoming concentrated within a handful of corporations. Consequently, concentration in the agricultural input sector results in high input costs. This has an enormous impact on community owned farms. This corporate power has become a defining feature of today's global economy.

4.3 Selected case studies of African countries rejecting and accepting GM food and crops.

In this thesis we have explored the promises and threats of GMOs for food security and food sovereignty in Africa. We have explored the relationship between hunger and food supply, and the possible impact that GE technology could have on this. At this present time in Southern Africa the general concern with hunger has been replaced by the crisis of famine, and this means that concerns with food security and sovereignty are now to be understood in relationship to food aid.

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[165] Einarsson, P., "Agricultural trade policy as if food security and ecological sustainability mattered." *Global Studier* No.5, Forum Syd., November 2000.
[166] FAO, July 2000. 'Agriculture: Towards 2015/2030' www.fao.org/es/ESC/at2015/toc-3.htm

Food Aid is a moral and ethical issue in its own right. Clearly, from a Christian perspective, if your neighbour is starving you are to share your food. However, food aid is subject to all the problems of charity. It creates dependency, undermines local food production, and wreaks havoc with local food supply mechanism – damaging long-term food security.[167] The advent of GE food aid further complicates the matter, with arguments raging backwards and forwards from proponents and opponents. The debate is divided between those who feel 'moral' and intellectual concerns about genetic engineering should be suspended in the light of such a starvation and those who feel that GE food aid is being forced by the USA on Africa not to feed the hungry but to undermine African agriculture and ultimately to undermine European resistance to genetic engineering, clearly the most lucrative market for food and which is currently closed to US agriculture. Once African food is contaminated by GE, the ability of Europe to withstand the GE lobby will be severely reduced.

To explore some of these concerns, we examine four case studies of African countries which illustrate the concerns of food security and food sovereignty thrown into relief by the food aid issue.

4.3.1 Selected case studies of African countries rejecting GM food

4.3.1.1 Zambia

Zambia has had public debates on genetically engineered food as food aid.[168] The debate centers on the issues of safety, human health and the environment. The safety of the GE maize from the U.S.A. is doubted although Zambia is one of the countries in the Southern African region that is affected by famine.[169] In this regard, Dr. T. Mwanza, secretary general of the University of Zambia lecturers and researchers Union accused the U.S.A.

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[167] For a detailed discussion of U.S.A Food Aid as aimed at feeding the hungry, see, Lappe, F.M, Collins, J., and Rosset, P., 1998. *World Hunger: 12 Myths. (second edition),* London: Earthscan, pp.129ff.

[168] According to *Reuters* News Service, October 18, 2002, the U.N. World Food Programme (WFP) has sent 16,000 tonnes of GE-free maize to Zambia to feed the hungry while the government there decides whether to accept U.S.-sourced gene-modified food.

[169] Dr. Mae-Wan Ho remarks that "Forcing GM food aid on famine-stricken Southern Africa is a sheer act of desperation. Behind the aggressive stance and rhetoric, the biotech corporate empire is crumbling. It is morally, scientifically and financially bankrupt." See, http://www.i-sis.org.uk/Good-byeGMOs.php

of trying to take advantage of the hunger situation in Southern Africa to maximize profits for its MNCs producing the GM maize.[170]

In Zambia, small-scale farmers express fear over the dangers of GM food and seeds. To that end, Dr. Mwanza writes that "if GM maize containing the terminator gene is planted and cross-pollinates with our organic maize, we risk destroying the engine of our food security that is driven by small scale farmers, that depend on storing seed from their own harvest."[171]

Similarly, Dr. Lewanika, a scientific advisor to the Zambian government explains why Zambia rejects GE food aid and why other African countries should do so too. According to Dr. Lewanika, currently, there is no regulatory system in place in Zambia to evaluate, accept or reject GMOs. Nevertheless, until the issues involved become clear, Zambia has chosen to take adequate account of the precautionary principle, which in sum, stipulates 'when unsure, don't!' The Zambian government also set up its research body to conduct its own tests in order to decide whether the GM food from the United States of America is fit for human consumption.[172] After the research into the issue, the government's latest decision has been to reject the GM food.[173] The *Lusaka Declaration* rejects GE technology as a solution for food security; it also rejects private intellectual property rights on genetic resources for food and agriculture, and demands that Biotech industry stop its "unethical influence on critical policy and decision-making instruments and processes on biotechnology." More importantly, the *Declaration* affirms that African countries can address food security through maximizing existing resources, tackling

[170] *The Post,* Zambia, 1/8/02 in *The Ram's Horn*, p.2.
[171] *Ibid.*, p.2
[172] Taynton, Andrew, Sunday October, 2002 tayntoza@yahoo.com
[173] The Conference, organized by Consumers International Africa Office and hosted by the Zambian Consumers Association (ZAKA), Lusaka, Zambia took place from the 18th to 20th November 2002 at Chrismar Hotel in which the African Consumer Leaders from twenty African countries addressed the urgent issue of food aid, food safety and labeling of GMOs and the implications of biotechnology for food security in the African region. The participants at the conference played a critical role in shaping the positions and stances of key representatives of civil society and the consumer movement throughout Africa. See, Steve de Gruchy DegruchyS@nu.ac.za, on 13/11/02 and 26/11/02, Source: Sustainable_World@yahoogroups.com . For more information, see, www.consumersinternational.org

distribution problems; and through promoting local foods which are low-tech and highly resistant to drought and other adverse environmental influences.[174]

4.3.1.2 Zimbabwe

According to Andrew Maykuth *Inquirer* Staff Writer, three million people in Zimbabwe are experiencing the worsening food crisis.[175] In the face of this hunger crisis, Zimbabwe has rejected genetically modified food as food aid. The Zimbabwean government banned genetically modified foods and outlawed the importation and movement of genetically modified organisms or products without the approval of the Biosafety Board. This move is viewed as a precautionary measure. The rejection of GMOs in Zimbabwe is grounded in the fears that consumption of such products could endanger the lives of local communities, particularly where the manufacturers do not inform the public that their products were not organically produced. Another fear is based on contamination of non-GE local varieties.

A third fear concerns Zimbabwe's markets. In this regard, the Zimbabwe's Financial Gazette stipulates that: "If we allow these modified products to enter our country without proper monitoring, they could adversely affect our markets."[176] In this line, Zimbabwe expresses fear that genetically engineered corn could devastate its crop exports if some of the corn is sown rather than eaten, as frequently occurs when emergency food aid is sent to famine stricken areas. The resulting plants would generate gene-altered pollen, spreading genetically engineered corn throughout the country. This would render Zimbabwe, which is normally a food exporter, unable to export to nations in Europe and elsewhere in the world where genetically engineered crops are restricted because of environmental and health concerns.

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[174] Dr. Mae-Wan Ho reports on an exclusive interview with Mundia Sikatana, the Zambian Minister of Agriculture, who reaffirms his country's rejection of GM Food. See, http://www.isis.org.uk/ZWFHFNOphp

[175] Andrew Maykuth, "Zimbabwe Rejects GE-Tainted U.S. Food Aid", *The Philadelphia Inquirer,* June 2002. http://www.organicconsumers.org/gefood/zimbabwe060702.cfm

[176] Financial Gazette (Zimbabwe)9sep01, "Zimbabwe Bans Genetically Modified Foods", http://www.mindfully.org/GE/GE3/Zimbabwe-Bans-GMOs.htm

However, Zimbabwe is willing to accept the whole U.S. grain as long as it was milled as soon as it entered the country to prevent it from being replanted.[177]

4.3.2 Selected case studies of African countries accepting GM food and crops

4.3.2.1 Malawi

Concerns in Malawi, just like in many countries, center on two issues: The first of which is about food safety, that is, whether the genetically modified maize being imported from US is suitable for human consumption or not. The second issue concerns environmental safety. On the suitability of the maize for consumption, the Malawian government issued the following statement in its Press Release of August 26, 2002: "There are no known risks to human health. Government has put in place measures to ensure that the maize is safe for human consumption."[178]

On the concern about environmental safety the major fear is on the understanding that the GE maize will contaminate local maize varieties, thereby compromising efforts to conserve indigenous genetic material or bio-diversity for future crop breeding programmes. To that end, the Malawian government says:

> This is a genuine concern because once our maize varieties are contaminated, the seed cannot be recycled, and in some cases, may not germinate. Therefore, the government would like to advise recipients of relief maize not to plant it. This maize is solely for consumption.[179]

It is clear, here, that the position of the government has been to accept the GE maize as food aid. This decision is mainly informed by the serious nature of food crisis in Malawi whereby almost 7 million people are starving and 300 people have already died of hunger in the first six months of the year 2002.[180]

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[177] Andrew Maykuth, Http://www.organicconsumers.org/gefood/zimbabwe060702.cfm
[178] Correspondence with Amos Chigwenembe, "World Relief Malawi", wrm@malawi.net, August 26, 2002.
[179] Correspondence with Chigwenembe, *Ibid,*
[180] 'Famine in Southern Africa: Sacrificing the poor at the altar of the market,' in *Alternatives,* August 2002, p.12.

4.3.2.2 South Africa

Studies show that South Africa has a very strong commercial seed market, along with a history of land dispossession and inequalities. Today, the focus is on supporting black commercial farmers and very little is paid to preserving agricultural bio-diversity. The South African government focuses her policies on international competitiveness. This context has led to the early and rapid introduction of genetic engineering.

According to the Department of Agriculture, to date there have been 175 field trials of GE crops and about 350,000 hectares of commercially planted GE crops. In 2000 alone, over 120 permits for field trials, import-export, commercial and other uses, were granted. The first commercial release took place in 1997 and permits have also been granted for the import and export of Bt maize for animal feed.[181] In addition, Biowatch observes that, "permits have been granted for trials and experiments with apples, canola, cotton, eucalyptus, maize, potatoes, soybeans, sweet potatoes, tomatoes, wheat and a host of microorganisms."[182]

In South Africa, several GE crops are planted on a commercial basis, including Bt cotton, Bt maize and Round Up Ready cotton and soybeans. During 2001/2002 season, South Africa planted its first GE white maize, for human consumption. As we all know, white maize is the staple food in South Africa, just like in many African countries, especially for the poor.

The GMO Act, which regulates the release of GE crops and other organisms, was finalized in December 1999, two years after the first crops were commercially released. To that end, BioWatch South Africa has commissioned a series of papers to review the GMO Act and its regulations.[183] South Africa is the first country in the world where smallholder farmers are planting GE crops. Bt cotton has been introduced to smallholder farmers in the Makhatini Floodplains in Northern Kwa-Zulu Natal and is reported to be very popular with a high rate of adoption. This is now Monsanto's flagship project and is

[181] Pschorn-Strauss, E., Biowatch South Africa, www.biowatch.org.za
[182] Friedman, Roger, "Fight for facts on frankenfoods." *Mail and Guardian,* September 20 to 26 2002, p.5
[183] Mayet, M., 2001. "Critical analysis of pertinent legislation regulating genetic modification in food and agriculture in South Africa." *BioWatch South Africa.*

being used to convince the rest of the world why Africa should adopt GE crops and so solve hunger.[184]

What is very significant and important at the moment is that South Africa's parliament plans an urgent discussion on whether the country has been rushed into accepting genetically modified foods and needs to amend its law. To this effect, Gwen Mahlangu, chairperson of the parliamentary committee on environmental affairs, told *Reuters*[185] she would convene a two-day workshop in the year 2002, to review the country's legislation on GM food production and use. The main concern, from the perspective of the committee centers on the health and safety aspects of using GM products and about the consequences for the international trade.

4.4 Summary

In this chapter we have discussed the general trends in the impact of genetically modified organisms on food production and food security and sovereignty in Africa. This chapter has offered an elaborate examination of how issues of patents, privatization of genetic resources, and trade related intellectual property rights undermine farmers' rights, food security, food sovereignty and livelihoods.

Notable among the general trends in the impact of genetic engineering is the question of market concentration, segmentation and power. In this trend, we have noted that agricultural biotechnology is heavily characterized by economic concentration in the hands of a few giant multinational corporations, who unsparingly dominate the stages of agricultural production. This undoubtedly impacts negatively on small scale and community farmers.

To substantiate the discussion, the chapter also focused on four countries in the Southern African region that have either accepted, adopted or rejected such GMO trends.

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[184] www.biowatch.org.za

[185] Boyle, Brendan, "South Africa: The Turning Point: South African Parliament to review law on GM foods.", Reuters, October, 15, Cape Town in Taynton, A. Sunday October 2701:18:47 2002 tayntonza@yahoo.com

CHAPTER 5: MORAL, ETHICAL AND THEOLOGICAL CONSIDERATIONS AND IMPLICATIONS IN MODERN BIOTECHNOLOGY

5.0 Introduction

In chapter five, I will direct my concern and attention to moral, ethical and theological considerations and implications in biotechnology and genetic engineering. Key themes, in relationship to this modern biotechnology, will be examined. This chapter will attempt to highlight the fact that modern biotechnology cannot be meaningfully pursued without taking adequate account of moral, ethical and theological principles. Here, I argue that it is not only science that always leads to truth and justice – but moral, ethical and theological principles are crucial to shaping and guiding our actions. Hence, those aspects of genetic engineering that appear to give rise to the greatest moral concern will be discussed, and the various ways in which that moral concern is expressed will be examined and subjected to ethical and theological scrutiny. In this perspective, the ethical approach will emphasize two objectives: the analysis and clarification of the key concepts that are used when such concerns are expressed, and the uncovering and probing of the underlying principles upon which the concerns appear to be based. The theological framework discussed in chapter one will directly or indirectly, explicitly or implicitly re-emerge in this chapter.

5.1 Specific moral, ethical and theological considerations and implications in r-DNA biotechnology

5.1.1 Risk and safety

In this thesis, we have noted that the most commonly expressed general concern about the possible consequences of genetic engineering and biotechnology is that these might be risky and even unsafe. To that end, Jeremy Rifkin, one of the eloquent critics of genetic engineering writes:

> Whenever a genetically engineered organism is released there is always a (small) chance that it too will run amok, because, like exotic organisms, it is not a

> naturally occurring life form...and can lead to an environmental explosion. Each new synthetic introduction is tantamount to playing ecological roulette.[186]

Rifkin is here referring mainly to agricultural applications involving plants and animals, the primary focus of this thesis.

But, what we should take note of is the assertion that risk and safety are not in themselves moral matters. For example, driving a motor vehicle can be both risky and unsafe, and yet not in itself a moral issue. Nevertheless, there is indeed a good reason for holding the assumption that any discussion of the morality and ethics of genetic engineering must immediately focus upon questions of risk and safety. In this line of thought, risk and safety become matters of moral concern when they raise further questions about responsibility, accountability and justifiability.

Reporting on genetic engineering, a Swedish Government Committee holds the view that the assessment of risks should be part of the ethical analysis.[187] Hence, the question of risk cannot be ignored in any ethical investigation of genetic engineering and biotechnology. The early history of the development of genetic engineering techniques was dominated by disputes about safety. These disputes have been graphically documented in great detail in a book by Krimsky, which describes the 'social history of the recombinant-DNA controversy.'[188] An American report justifying regulatory legislation in 1977 summed up the possible dangers as follows:

> Foreign DNA in a microorganism may alter it in unpredictable and undesirable ways. Should the altered microorganism escape from containment, it might infect human beings, animals or plants causing disease or modifying the environment. Or the altered bacteria might have a competitive advantage, enhancing their survival in some niche within the ecosystem.[189]

This is indeed a moral issue because the dangers or risks envisaged here are clearly of such a catastrophic nature.

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[186] Rifkin, J. 1985. *Declaration of a Heretic*. London: Routledge and Kegan Paul, p.48.
[187] Summary of the report by a Swedish Government Committee (SOU), 1992. *Genetic Engineering: A Challenge*. Goteborg, Sweden: Graphic Systems AB, p.11.
[188] Krimsky, S., *Ibid.*, pp.319ff.
[189] *Ibid.*, p.322.

5.1.2 The nature of plant and animal life forms: Genetic integrity and respect for bio-diversity

This thesis has argued that the use of GE biotechnology in agriculture and industry creates profound and difficult concerns and the issues involved in the technology call for ethical and theological scrutiny. In this line, it is therefore appropriate to note that at an important World Council of Churches Consultation in Norway, in 1988 on the "Integrity of Creation", the need for considering the limitations of the modern worldview and its understanding of creation was made clear.[190] In many respects, the scientific perspectives under-girding GE biotechnology function according to a mechanistic worldview where living organisms are objectified and manipulated.

Today, the dominant model of institutional development with its attendant industrial mode and technology looks at creation as something human beings can manage and manipulate. The integrity of life is reduced to the status of 'resources' to be mastered, efficiently used, engineered and – when no longer profitable and useful – discarded. Researchers in the field of molecular biology think that the important unit of life is no longer the organism, but rather the gene. They view life from the vantage point of the chemical composition at the genetic level, hence see no ethical problem in gene transfer. This argument leads to manipulation and 'desacralisation of life'.[191] This tempts us to think that genetic engineering shows a certain lack of respect for genetic integrity and environment. Clearly, this is a worldview that does not respect humanity's dependence on the earth as God's creation and gift and as the source of life and nourishment. The principle goal within this worldview is certainly not the welfare of human, animal and plant species but rather profit and utility maximization.

The importance of respect, as an ethical principle, was underlined by the German philosopher, Immanuel Kant, who argued that respect required treating others as ends, never as means.[192] So to use another being instrumentally, entirely for one's own

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[190] World Council of Churches, *Ibid.*, p.5
[191] Rifkin, J., *Ibid.*, p.53
[192] Kant, I., 1909. *Fundamental Principles of the Metaphysics of Morals, 6th edn.* (trans. Abbott, K.T.), London: Longman, p.47.

purposes, without taking any account of others' interests, involves a lack of respect and is morally wrong. Kant's account of respect makes it clear that we should never treat another being as means only, that is, in Kant's view at least, treating another life form as an instrument is not compatible with showing it respect. There is a distinction between using another creature's ends as your own – which is acceptable – and disregarding that other creature's ends entirely – which is not.[193]

There is need for the shift of this mentality to a more holistic worldview. We need to view creation and the genetic order as an undivided whole, in which all parts unite in one totality. Of course, we can still use animals and plants as sustenance, but not tamper with their genetic integrity.

5.1.3 Patenting: Life is not an intellectual property, but God's property

In this thesis, we have noted that scientists are crossing species boundaries at an ever-increasing rate, inserting human genes into animals, and animal genes into other animals and plants for profit maximization. In order to obtain a better return on the substantial capital investment required to 'create' these 'new' genetically engineered life forms, multinational corporations and research institutions seek patent protection for their biotechnology 'creations'.[194] This leads to economic injustice as major MNCs gain firm control of the biotech industry.

This is clearly a concern to theologians, ethicists, church leaders and society. Life in all its forms and species shares God's sacredness and is God's gift and property. As such, life should not be regarded as if it were a chemical product subject to genetic manipulation and 'patentable' for economic and commercial gain. This would be in violation of life as sharing God's holiness, and God's gift and property. No one can rightly claim to have invented something that has life. Animals and plants are creatures

[193] For a detailed discussion, see, Holland, A. 1990. The biotic Community: a philosophical critique of genetic engineering. In *The Bio-Revolution: Cornucopia or Pandora's Box?*, ed. P. Wheale and R. Mc Nally. London: Pluto Press, p.170. This thesis offers a very useful and thoughtful discussion of a number of issues.
[194] WCC, *ibid.*, pp.21ff

that have a life of their own. Animals, plants and microorganisms owe their creation and origin ultimately to God Himself, and not to any human endeavor.

The patenting system and intellectual property rights can theologically be categorized as 'playing God'. Literally, the concept of 'playing God' implies usurping the creative prerogative of God by doing something which belongs to God alone. In this sense, 'playing' denotes taking on a position, which originally was not ours to have. From a broader perspective, this expression 'playing God' has been used as a general label for the idea of taking upon us an inappropriate role of the way other living organisms are made up. Donald and Ann Bruce are correct in stating that: "the story of the tower of Babel in the book of Genesis illustrates the folly of human technological action in autonomy from God."[195]

The genetic modification of seeds so that plants do not naturally germinate and produce seed for the farmer may be said to involve a denial of intrinsic fertility of plant life on which community farmers rely for sustenance and livelihoods in view of promoting food security and sovereignty. This denial violates the life of the seed as bio-technologists tamper with the productive capacity of the seed to naturally carry on life to the next generation of plants. This defeats the very purpose of food security. This intervention in the natural genetic order, as is the case with genetic engineering and biotechnology, crosses over the line of behaviour, which is not permitted to us. This is, clearly, a sense of 'playing God' from a negative perspective.

There is also a positive understanding of the term 'playing God'. This positive sense is grounded in the 'imago Dei' concept in which human beings act out God's image before the rest of creation, in relationship and obedience to God. This, I think, entails just and responsible stewardship rather than domination and manipulation, as is the case with GE biotechnology. This takes recognition of the biblical revelation that creation is ordered by God, from whom it owes its very existence. All creation finds its origin, sustenance and destiny in God. In this line, then, human activity in nature, of which genetic engineering biotechnology is one, ought to be set within this theocentric context. Creation cannot be

[195] Bruce, Donald and Ann, *Ibid.*, pp.84-85

regarded simply as ours to do with as we please. The concept of 'playing God' understood from a negative perspective is very evident in the practice of patenting life as we have discussed above.

5.1.4 Ethics of accountability, inter-relatedness and creativity

An ethic based on the notion of relationships, inter-relatedness and accountability in the acts of creativity is crucial when dealing with GE biotechnology. This holistic dimension would enable us, upon further reflection, to come up with an ethic which embraces everything in existence, thereby avoiding the problem of manipulating genes at will.

Any credible ethical theory has to accommodate the fact that we belong to the earth and everything we encounter shares this existence with us. The problem of our ethical theory, however, is that it has been too anthropocentric in the sense that human beings come to exult themselves above nature so that the purpose of nature is seen primarily as that of serving human needs and to be subdued by human beings. Here, we should bear in mind that we human beings exist in an intricate web of relationships so that our moral actions and valuing should ultimately be seen as contributing to this web rather than to the individual or corporate self-interest. Scientific and biotechnological activities have to promote the common good of society as well as that of the environment and genetic composition. Hence, it is advocated that the promotion of the common good can only be meaningfully achieved within the ethical paradigm of a relational world-view in which accountability and just stewardship are pillars.

5.2 The position of Christian bodies

To see these specific moral, ethical and theological considerations and implications in r-DNA biotechnology in action, in this section, we will examine the position of three selected Christian bodies. Their positions are largely influenced and shaped by the theological framework discussed in chapter one as well as the moral, ethical and theological implications discussed in this chapter above.

5.2.1 The World Council of Churches

The World Council of Churches (WCC) notes that in many respects, the scientific perspectives under-girding genetic engineering biotechnology function according to a mechanistic worldview whereby living organisms are subjected to manipulation. To this effect, the WCCs writes:

> Living organisms are referred to, as 'self-replicating molecular machines' that can be snipped, programmed, cloned, designed, replicated and manipulated at will. Life is thus objectified and reduced to assemblages of molecules designed for purely utilitarian and instrumental ends.[196]

Clearly, this is a worldview that disrespects the dependency of humanity and other non-human existence on the genetic resources of the mother earth. The main goal and objective in such a worldview is obviously not the welfare of human, animal and plant species, but rather enhancement of corporate profit and control. It is in this perspective that the WCCs is strongly opposed to the trend towards patenting of foods and GMOs.[197] This objection is grounded in the fact that the patenting system leads to economic injustice as major multinational corporations gain monopolistic control of the biotech industry. Life forms cannot simply be regarded and treated like a product subject to genetic manipulation and patentable for economic and commercial gain. This practice or activity violates life in all its forms and species as sharing God's sanctity. Life is God's own property.

In the above regard, the WCC notes that those who patent GE 'creations' wield excessive and monopolistic power to get a better return on their capital investment, at the expense of the small-scale and community farmers. This is so because patents, as we have already noted, give global corporations the 'right' to claim monopoly ownership over agriculture and food production. In the long run, this infringes upon fundamental rights of access to food and nutrition.

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[196] WCC, *Ibid.*, p.5
[197] *Ibid.*,p.21ff

The WCC also argues against GE technology because the patenting system encourages the development and 'creation' of genetically modified organisms and the disruption that new versions of old plants and animals could cause to intricate ecological systems.[198]

At a deeper level, the Policy Reference Committee II of the World Council of Churches' Central Committee notes that the critics of genetic engineering argue that:

> Biotechnology is deeply expressive of a culture of inequity and exploitation of people and creation and that a technological fix is not possible since the concentration of power in the hands of the few MNCs that control the technology, leads to a greater marginalisation of poor communities. [199]

This further increases poverty and hunger. It therefore stands to reason that the churches make a clear theologically informed position in the struggle for food security that finds its meaningful expression in the existence of food sovereignty.

Here, it is important to see that the most notable concern of the committee is the critical question of access to food, which is the central question of justice in our world in the face of the existing dichotomy between over-production, over-consumption and people dying of hunger. This is a scandal par excellence. It is critical, in this perspective, then, for churches to make a clear position in the struggle for food security and sovereignty. The WCC therefore challenges the member churches and ecumenical partners to reflect on GE biotechnology debate and develop a theologically informed position. The WCC itself does this by reflecting on the Lord's Prayer, specifically on the petition that says "... Give us this day Our Daily Bread..." The Committee views this part of the prayer as a powerful vehicle for providing a theological vision in addressing concerns about food, agriculture and GE biotechnology. In this reflection, the Committee argues that the right to control food production and distribution cannot be given to MNCs or any food system of control at the expense of the poor. The Committee also stipulates that genetic engineering is not based on respect for the miracle of life and the integrity of the organism.

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[198] *Ibid.*, pp.21ff; Oh, Cecilia, "Ten Questions on Trips, Technology Transfer and Biodiversity." Third World Network. Twnet@po.jaring.my

[199] WCC Policy Reference Central Committee, *Ibid.*

Critics of the technology describe it as "an expression of monoculture that assumes nature to be alien, stingy, deficient and in need of control."[200] This is what the critics call a reductionist and mechanistic world-view in which life in all its forms and species is reduced to a status of 'resources' or 'assets' to be mastered, efficiently used, engineered and - when no longer useful and profitable - discarded. This is a world-view that does not respect the integrity of organisms and the primary goal in this world-view is not the welfare of human, animal and plant species but rather profit and utility maximization.

5.2.2 Christian Aid

Christian Aid, the relief and development arm of the Protestant churches in Great Britain, working with the Third World, is concerned about the implications and possible effects of genetically modified crops on developing countries and on poor farmers and their communities in those countries in particular. Christian Aid remarks that on the one hand, many of the promises or envisaged benefits of GM crops could prove to be highly advantageous to poor farmers on the African continent. While, on the other hand, it is not at all very clear whether such benefits can or will be delivered without accompanying and unacceptable costs, either in terms of the technology itself or in terms of how the technology is controlled. Besides, it is also unclear what the balance of benefits and costs might be, or, most importantly, assuming that the benefits exist, for whom do they exist?[201] In the perspective of this question, Robert Vint, in his answer to the question, 'who benefits from the World Food Programme – U.S corporations or the poor?' said: "if the World Food Programme were serious about ending hunger then most of its U.S.$1billion expenditure per year would go to help the world's poorest farmers and landless peasants to obtain their own land and grow their own food."[202] It is clear here that, like all imperial and colonial endeavors, its purpose is to gain the ability to exploit the resources of the colonized area and people for the benefit of the imperial powers. The new twist is that the imperial powers are now the multinational corporations, not states. It

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[200] *Ibid.*

[201] Bundell, K., 2002. *Forgotten Farmers: Small farmers, trade and sustainable agriculture.* Christian Aid, 15ff.

[202] Vint, R., "Who benefits from the World Food Programme – U.S corporations or the poor?" http://www.connectotel.com/gmfood/gf100902.text

is such corporate powers that benefit from the GE biotechnological activities and processes.

Essentially, Christian Aid has three main concerns: the first is that a handful of bio-technologists and big multinational corporations have too much power and control over agriculture and food security. Here, the primary interest is to maximize profits for themselves rather than the desire to improve the common welfare. The concentration of power in the hands of few bio-technologists and big agri-business companies, results in increasing the poverty of small scale and community farmers. In the same regard, John Madely argues that "this monopolistic power and control over productive resources prevents small scale farmers from becoming able to meet their own or their community's food needs or gain a viable livelihood from agriculture."[203]

Their second concern is about the little knowledge or ignorance of the possible ecological and health effects of GM crops, particularly in developing countries. Thirdly, Christian Aid observes that there is too little opportunity, time and assistance allocated to developing countries to meaningfully debate and decide for themselves and to ultimately build the necessary capacity to test and control GM crops.

In the face of these genuine concerns, Christian Aid proposes that sustainable agriculture is the one that can help poor farmers feed families and their communities and manage their livelihood vulnerability due to multiple environmental, economic and social problems.

Thus, genetically modified crops have been and are being introduced too quickly and there is need for calling for a moratorium on the commercial application of GMOs in the food system. The moratorium is intended to give ample time for the issues to be further researched, discussed, agreed and implemented both at the national and global level.

To summarize, Christian Aid is correct in arguing that:

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[203] Madely, John, 2000. *Trade and Hunger – an overview of Case Studies on the Impact of trade liberalization on food security.* Forum Syd.: Stockholm.

> Genetically modified crops are irrelevant to ending hunger, the new technology vests too much power over food into too few hands, and that too little is done to assist small-scale farmers grow food in sustainable and organic ways. [204]

In addition to this, Christian Aid concludes that GM crops will cause unemployment, exacerbate Third World debt, threaten sustainable farming systems and damage the environment. It predicts famine for the poorest countries.

5.2.3 The South African Roman Catholic Bishops' Conference (SACBC)

In this thesis we have noted the conception that life in all its forms is God's most precious gift, shares God's sanctity and belongs to Him, the creator. In this regard, it stands to reason to conclude that life should not be subjected to genetic manipulation and patented for economic and commercial gain. Following this trend, the SACBC called for the rejection of the trend towards patenting foods.[205] The rejection is grounded in two principal reasons: First, patenting further legitimizes the technology and contradicts the duty of human beings to care for the earth and to ensure that our natural resources are conserved for future generations. Secondly, patenting food undermines the right to food security, which must always take precedence over profits and patents. Food or bread in the bible is not just a commodity or product like any other; it is basic and fundamental to life itself. Without (healthy) food, we die. Thus, the question of food security is the question of life.

In rejecting the trend towards GMOs, the bishops note that: "many thousands of hectares in South Africa have been planted with genetically modified crops. And because we have no proper labeling of foodstuffs, we do not know how much of the food we eat everyday has been contaminated by genetic manipulation."[206] In this perspective, they argue that there is no comprehensive understanding of the consequences of consuming genetically engineered food. More horrifying to the SACBC is the fact that big multinational

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[204] Christian Aid, 1999. *Selling Suicide:farming, false promises and genetic engineering in developing countries.* London: MIT Press. See also, www.christian-aid.org.uk/indepth/19905sui/suicide1.htm

[205] Independent Catholic News, 2000 (November). *Genetically Modified Food: The Impending Disaster.* Pretoria: ICN.

[206] SACBC, 2001 (November). "Genetically Modified Food: The Impending Disaster," in Wally Menne, South African Bishops on GMOs, planet@iafrica.com

companies put these foods on the market before adequate scientific research is done to ensure the safety of the GMOs. To that effect, the SACBC issued a press statement in November 2000 in support of the campaign calling for a five-year freeze on genetic engineering and patenting in crop and food production. The SACBC's position on the debate is firmly grounded in the precautionary principle. This is clear when the bishops remark that:

> So far, no rigorous long term testing has been carried out to ascertain the effects of genetically engineered crops and foods on humans, animals, plant life and soil. Doubts about the safety of the new biotechnologies have been confirmed by the results of scientific studies and many scientists are warning that genetically modified organisms (GMOs) pose risks to health, for example, increasing the incidence of allergies, toxic reactions and antibiotic resistance.[207]

To that end, the Bishops' conference declared in their statement that it is morally irresponsible to produce and market genetically modified food.

5.3 Summary

The chapter highlights the argument that modern biotechnology cannot be meaningfully and credibly pursued in the absence of adequate account of moral, ethical and theological principles. It is thus clear that moral, ethical and theological principles are critical to shaping and guiding our scientific and GE technological activities. To substantiate the discussion, positions of the three selected church organs were identified. In this way, it has become very clear that all the three church institutions are strongly opposed to the trends towards genetically modified organisms.

In the above light, then, it is useful and helpful that strategies and recommendations be drawn. This is the task of the following chapter, to which I now turn. But, first, let us recapture and summarize the major conclusions of the study.

[207] SACBC, *Ibid.*

CHAPTER 6: OVERVIEW, STRATEGIES AND RECOMMENDATIONS

6.0 Introduction

Chapter six focuses on summarizing and recapturing the crucial contentions and the three key sub-hypotheses upon which this study is grounded. The chapter also offers some strategies and recommendations as a way forward. First, let us turn to the conclusions of the thesis.

6.1 Overview and critical remarks

In this thesis, we have noted that the risks or threats of genetically modified organisms to both farmers (food security and sovereignty) and to biodiversity are great, and the promises of GE technology are subject to question and doubt. This entails that there is great tension between the envisaged benefits and risks or threats. To that end, the first drawn conclusion is that GE and biotechnology are not the solution to problems about the hunger crisis in Africa and other parts of the Third World. The technology rather exacerbates the food crisis and continues to widen the poverty gap between the industrialized and developing countries. This research has consistently shown that proponents of genetic engineering and biotechnology are driven by the motive to generate and maximize profits rather than a concern for the common wellbeing. In this regard, then, opponents of genetic engineering and biotechnology state that the technology places profits before people and serves the interests of neo-liberal capitalism, an ideology that has self-interest as the pillar to all economic activities.[208]

Along similar lines, even someone such as the billionaire, George Soros recognizes that: "Business is conducted for private gain and not for public interest ...markets are

[208] Neo-liberal economic theory and practice is based on the assumption that the market is a privileged place for access to the information we need in order to engage in economic activities. The laws of supply and demand on the free market determine economic truth. In this trend of thought, the market is seen as an entity void of any relationships with other human beings and the environment. On closer scrutiny, one finds out that the market is seen as the absolute value to the extent that the human welfare is superceded by it. An economic system that regards the individual interests more than those of society as a whole as well as the environment vitiates the morality of our common interest and common belonging. See, Cobb, J.B., and Daly, H., *Ibid.*, pp.139-145.

eminently suitable for pursuit of private interests, but they are not designed to take care of the common interests."[209]

In addition to profit maximization, the few bio-technologists and giant agri-business corporations are interested in wielding excessive and monopolistic power and control, and ownership of the stages of agricultural production. This is clearly elaborated in the patenting system. This monopoly of power and control over life forms and over economic production itself has been subjected to ethical and theological scrutiny. No one can rightly claim to have a monopoly of power over life in all its forms and species. This morbid hunger for power defeats the very emotionally powerful claim of ending hunger and promoting food security because in the process, food sovereignty and livelihoods are undermined.[210] Yet, as has become clear in this thesis, food sovereignty is a true expression of and critical to long-term food security.

The corporate control over essential agricultural resources such as seeds and food entails that MNCs have control over fundamental human rights of access to healthy, safe and adequate food, nutrition, and ultimately to social and economic development itself. Clearly, then, this becomes an issue of justice. This would be such because the question at stake is not (simply) a lack of food in the world but rather poverty, inequality and lack of access due to lack of control and purchasing power.

In this thesis, we have also noted that issues of food security and sovereignty cannot be separated from the crucial question of the sanctity and integrity of life. This is why GE biotechnology cannot be meaningfully and credibly pursued without taking adequate account of ethical and theological insights. Such insights should guide scientific and GE technological pursuits. Accordingly, the church institutions we examined stand in strong

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[209] Agulhas, Bernard, (ed.), "NEPAD: An Indigenous Solution". In *A Journal for Accountancy South Africa*, August 2002, p.3.

[210] Sentiments against GE biotechnology are many. See, "Keeping Brazil GM-free." ISIS Report, 22 February, 2002. Press-release@isis.org.uk; Madava Tinashe. "GM food companies undermine food security" http://www.mg.cp.za/mg/za/archive/2001sep/features/27sep-africa=.html; Christian Aid. "The Biosafety Protocol – Controlling trade in GMOs" www.christian-aid.org.uk/indepth/0003biosafet.htm; Von Schomberg, Rene. "Agricultural Biotechnology in the Trade-Environment Interface: Counterbalancing Adverse Effects of Glabalization." In Barben, D. and Abelsl, G., (eds.), 2000. *Biotechnologie-Globalisierung-Demokratie.* Berlin:Edition Stigma, pp.111-131. English Translation.

opposition to the current trends of genetic engineering and biotechnology of plants and animals, the focus of this thesis.

I now propose strategies and recommendations that serve as a way forward in this hotly debated subject.

6.2 Strategies and recommendations

Here, I would like to propose some strategies and recommendations that could be taken seriously by the Churches. The church's task in this regard would be to engage itself in advocacy and civic education. The issues to advocate for and educate the public would concern the government and its policies, and issues of conscientization and civic education amongst citizens.

6.2.1 Issues for governments and their policies

6.2.1.1 Conservation of agricultural biodiversity: A tool for long-term food security and sovereignty in Africa

The churches could call for all governments in Africa to sign and ratify the Biosafety Protocol in view of implementing a regulatory framework to protect biodiversity in Africa. To the same end, countries could also create national regulatory frameworks on GMOs and GMO products. To arrive at this, governments must have the right to apply the precautionary principle and establish moratoria on GMO crops. The release of GM seeds, food or feed must be banned. In this perspective, Friends of the Earth International, on the basis of the precautionary principle, supports the right of any country to impose a moratorium or ban on the introduction of GMOs into the environment and the food chain, until the safety of GMOs has been proven through comprehensive and independently conducted assessments.[211] Biodiversity and biosafety priorities to protect the environment and human health should not be subordinated to trade conditions imposed through WTO legislation.

[211] Villar, J.L., *Ibid.*, p.1

It would be appropriate for national governments to establish a globally binding regulatory framework to control corporate activities so that they do not impact negatively on biodiversity, the environment and the rights of the global population, including women, indigenous peoples and local farming communities who, for ages, have been the stewards and curators of biodiversity conservation.

6.2.1.2 Promotion of organic means of food production to small-scale farmers

The churches could also engage governments in Africa to promote ecologically friendly alternatives to genetically modified organisms, such as agro-ecology and organic production. Government policies must give adequate support for organic and ecological agricultural practices and production, as the basis for national development and agricultural policies, and as a fully viable and credible alternative to genetic engineering and biotechnology.

GE crops belong to a system of agriculture that views the farm as a factory and farmers as contract labor, where the only goals are to increase yields and decrease costs of production, regardless of the costs to human health and the environment. By contrast, sustainable agriculture is a system of farming that can produce high yields without destroying the environment and threatening human health. Sustainable and organic agriculture looks at a farm as "agroecosystem",[212] not as a factory. This system takes adequate account of conserving biodiversity and is critical to long term food security and sovereignty in Africa. Practices involved in such a system include crop rotation, growing of cover crops, increasing soil fertility, intercropping and rotary hoeing. Sustainable and organic agriculture offers a viable model of a locally based, socially just, and environmentally and economically sustainable food system.

Furthermore, most organic farms are small, independently owned and run. By buying locally produced foods, we keep local farms alive and viable and minimize the environmental and social costs of the worldwide transport of foods or support a system

[212] Organic Farming Research Foundation, http://www.ofrf.org

based on the exploitation of third world labour. In this manner, a community would attain food security as well as food sovereignty.

6.2.1.3 Compulsory labeling of Genetically Modified Food and enforcing liability system

Labeling and liability has been a bone of contention for years. *Codex Alimentarius* first adopted a code of ethics for International Trade in Foods in 1979. The General Principles of the Code state, among other things, that:

> International trade in food should be conducted on the principle that all consumers are entitled to safe, sound and wholesome food and to protection from unfair trade practices, ... and no food should be in international trade which: ... is labeled, or presented in a manner that is false, misleading or deceptive.[213]

From this, we can legitimately conclude that the trading and marketing of foods produced through GE biotechnology and not labeled as such is clearly deceptive and unethical by the standards of *Codex Alimentarius.*

Because genetically engineered food remains unlabeled, consumers cannot distinguish between GE and non-GE food should health problems arise. It is also extremely difficult to trace the anticipated health or environmental problems to their source. This lack of labeling only helps to shield the corporations that could be potentially responsible from liability. To the same end, the churches could call for a liability system to be established in case contamination is not prevented. Companies responsible for introducing GMOs should be made liable, and not farmers.

In addition, the churches in conjunction with Friends of the Earth International, on the basis of precautionary principle, could support the right of any country to impose a moratorium or ban on the introduction of genetically modified organisms into the

[213] *Codex Alimentarius,* Article one of the "Code of Ethics for International Trade in Foods," Rome, 1979 (revised 1985).

environment and the food chain, until the safety and viability of the GMOs have been proved through comprehensive and independently conducted assessments.[214]

6.2.2 Issues of conscientization and education

6.2.2.1 The decentralization of power

At the heart of this GE technology is the quest to control – to control life forms, trade and gain huge profits through patents and similar mechanisms. To that end, I think, the decentralization of power is critical to food security and food sovereignty in Africa. To realize this, there must not be patents or other types of intellectual property rights granted on seeds or any other living material. The farmers' right to save, store, share, exchange seed is crucial and fundamental to food security, sovereignty, and livelihoods on the African continent. In this regard, churches could encourage the decentralization of power. To succeed in this, it would have to revisit its own power structure, which is currently hierarchical. This would certainly be a difficult task, but a challenge to its own conversion.

The traditional or community farmers must have the power, as they have had for centuries, to grow food in ways that fit local circumstances. Power ought not to be concentrated in a few large multinational corporations or in national governments. The churches could emphasize the fact that the responsibility of national governments must be realized in facilitating and supporting the initiatives of local and indigenous communities to save their traditional seeds, exchange them for others, share them with others, cultivate and improve them in view of promoting food security and good livelihoods, rather than oppressing and dictating new and complicated methods of agriculture to the small scale agricultural communities.

6.2.2.2 A shift of paradigms: revisiting our understanding and definition of development

The current dominant models of development, which are driven by economic liberalization and corporate control, reinforce social inequalities throughout the world

[214] www.hivos.nl

and particularly in Africa. Such models are grounded in the Western cosmology of linear history and progress in which technology is both a means and an expression of progress. It is seen to be both "the process (or a collection of processes) by which people achieve progress and in turn, a product of the progress."[215] In this model, economic growth is seen as the fundamental sign of development, capitalism as the mode of development and technology as the engine of development. What we note here is that the power of progress is intimately tied to technology. Technology is viewed as a tool of development or progress in Northern or Western terms. Yet, today, the majority has, and rightly so, become skeptical about any claims for progress or development. [216] In our context, such a paradigm of development undermines the sovereignty and livelihoods of nation states to take care of the their own people.

It would therefore be appropriate for the churches to help shift our understanding of development so that it is understood in terms of relationships. Authentic development should not look at nature as something that can be manipulated at will, but as a companion on this journey of existence in obedience to God, the Creator, the author of all life forms and species. The church has moral authority in such matters, and it could address the necessity and importance of shifting our present understanding of development to a more holistic approach.

6.2.2.3 Increasing the awareness of consumers

Touching briefly on the question of increasing awareness, I would like to suggest that church forums or gatherings could be used as a powerful medium to disseminate information and unpack issues surrounding the GE debate. In this regard, workshops could be conducted to 'conscientize' consumers so that they would be better able to participate in the politics of food supply – to do with food safety, security and sovereignty.

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[215] Bruce, *Ibid.*, p.155

[216] For a detailed discussion of the debate about development, see, Rist, G., 1997. *The History of Development: From Western Origins to Global Faith.* London: Zed Books.

Again, educational institutions could be another fertile environment to bring about such awareness. So too, the tools of newspapers, magazines and other relevant means of communication could be useful and helpful in this task. The increased awareness would motivate the public to vehemently oppose to GMOs.

6.3 Summary

This chapter directed its concern and attention to recapturing and summarizing the crucial arguments of the study in which issues of corporate power and profit were reviewed. This was followed by a brief discussion of recommendations as a way forward. Part of the recommendations took account of the three key assumptions of the study. The issues reviewed in this thesis are too enormous to be left to scientists, bio-technologists and multinational corporations. Hence, the input of ethicists, moralists and theologians is critical to a meaningful and credible assessment of the controversy over genetic engineering and biotechnology.

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press-release@isis.org.uk