PERCEPTIONS OF GENETICALLY MODIFIED MAIZE (AS FOOD AID) BY THE PEOPLE IN CHONGWE AND MAGOYE DISTRICTS, ZAMBIA

Davy Siwila

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School of Agricultural Science and Agribusiness

Faculty of Science and Agriculture

University of KwaZulu-Natal

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DECLARATION

I hereby declare that the research in this thesis is my own investigation. Where use has been made of others, this has been duly acknowledged in the text. I declare that this research has not in its entirety or in part been submitted to any university or institution for degree purposes.

Signed _____ **Date:** 22/09/2006

D Siwila

Signed _____ **Date:** 22 Sept 2006

Professor J M Green

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ABSTRACT

Zambia is one of the Southern African countries that experienced drought between 2001 and 2003. As a result the country had low levels of maize harvest, which is the country's main staple food. The Zambian population depends on maize for both household food security and cash. For this reason the Government of Zambia appealed for help from the international community in order to meet the shortfall of maize with a view to feeding its starving population, particularly in the rural areas. In response to the government's appeal, World Food Programme, (WFP) a United Nations Food agency brought assistance in the form of 27,000 tonnes of genetically modified (GM) maize into the country in July 2002.

The Zambian government, however, rejected GM maize in both grain and milled forms, citing health, environmental and trade concerns with the European Union. Thus the focus of the research was to understand, on one hand the government's action of rejecting GM maize as food aid, while on the other hand accepting that drought-stricken small-scale farmers would go hungry as a result of this decision. Understanding the perceptions of government action was therefore essential to understanding the situation the situation fully. In other words, was it a good scientifically based government decision, or was it one made for political gain?

Moreover, the purpose of this research was to present arguments about the safety and benefits of Genetic Modification technology for the world, particularly the developing countries. The findings of the study were that the levels of GM technology awareness in Zambia low among technocrats and too low among the rest of the population. To this end, government officials, relevant NGOs and small scale farmers were interviewed. In addition, small scale farmers in Chongwe and Magoye participated in focus group discussions.

The findings were that although the Chongwe community experienced drought in their area, they were of the view that the government was justified in rejecting the GM maize from 2001/2 because they did not want to contaminate their land which they regarded as very suitable for farming.

On the contrary, the Magoye people were among the communities that had been anxious to get food and were therefore not happy with the government's decision. The hunger suffered at the time in this community caused them to loot the government stores of GM Maize (provided as food aid) before the government could recall the stocks. The issue of access to the GM maize was apparently more important than debating on the potential impacts that might have occurred to their community.

Other findings were the Zambian government's decision to reject GM maize (as food aid) impacted negatively, both economically and socially, in these areas. The majority of small-scale farmers experienced food shortages and resorted to various coping strategies such as picking wild-fruits and roots in the bush in order for them to survive.

ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
BOSZ	Biotechnology Outreach Society of Zambia
BBC	British Broadcasting Cooperation
Bt	Bacillus thuringiensis
CAP	United Nations Emergency Consolidated Appeal
CBD	The Convention on Biological Diversity
CMA	Crop Marketing Authority
DFID	Department for International Development
DNA	Deoxyribonucleic acid
DMMU	Disaster Management and Mitigation Unit
DMU	Disaster Management Unit
FAO	Food and Agriculture Organizations
FFW	Food for work
FOE	Friends of the Earth
FDA	The US Food and Drug Administration
FNS	Food and Nutritional Security
FRA	Food Reserve Agency
HIV	Human Immune –Deficiency Virus
IMF	International Monetary Fund
GART	Golden Valley Agriculture Research Trust
GM	Genetically Modified
GMO	Genetically Modified Organisms
GDP	Gross Domestic Product
JCTR	Jesuit Centre for Theological Reflection
KATC	Kasisi Agriculture Training College
PAM	Programme against Malnutrition
SAP	Structural Adjustment Programme
UNICEF	United Nations Children's Fund
UNDP	United Nations Development Programme
WCC	World Council of Churches
WHO	World Health Organization
WFP	World Food Progamme
WTO	World Trade Organisation
ZACA	The Zambia Consumers Association
ZNFU	Zambia National Farmers' Union

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CHAPTER 1

INTRODUCTION

1.0. Introduction

Zambia is one of the Southern African countries that experienced drought between 2001 and 2003. As a result, the country had low levels of maize harvest, which is the country's main staple food. The Zambian population depends on maize for both household food security and cash (Lewanika, 2003:1). The Zambian government initially enjoyed a prosperous economy following independence (1964) on account of its successful copper industry, which has since declined. This situation was subsequently balanced by increased investment in the agriculture industry in the 1970's and 1980's when the agricultural production was increasing steadily (Samatebele, 2003:1).

The onset of the Structural Adjustment Programmes of the World Bank and the International Monetary Fund (IMF) in the 1990's changed the situation as the government could no longer be involved in agricultural production. Therefore, the government removed agricultural subsidies and stopped procuring agricultural inputs such as seeds and fertiliser for farmers. This shift negatively impacted on the small-scale farmers who produced 80% of the food in Zambia (Lewanika, 2003:1). Subsequently food production dropped, thereby making it difficult for the government to manage food emergencies. In 2001/2002 agricultural season, the country experienced a food crisis because of unfavourable weather conditions. The food crisis was most severe in the Southern Province of Zambia as well as some extent in parts of Eastern, Central, Western and Lusaka Provinces. Moreover, the food crisis was nothing unique because famine in Southern Africa which is often caused by drought is cyclical (Lewanika, 2003: 1).

There is a trade imbalance between the developed and poorer countries (Lewanika, 2003:1). One particular area of imbalance is the removal of agricultural subsidies by African countries at the expense of small-scale farmers who are the major producers of food, while many

farmers in the European community, for example are subsidised. This means that Zambian small-scale farmers' production can be costly compared with their counterparts in Europe or the United States where production is subsidised. Another point to consider in relation to food crises in Africa is the challenge for African governments to ensure that early warning systems are implemented to avoid situations where droughts impact negatively on food security because the government officials are inefficient in their work (Rosset, 2000:3-4).

In 2002, the United Nations estimated that 12.8 million people in six Southern Africa countries, namely, Malawi, Mozambique, Lesotho, Swaziland, Zambia and Zimbabwe urgently needed assistance to avoid mass starvation caused by erratic weather and exacerbated by government mismanagement in some countries (Iafrica, 2002: 1). Apart from the periodic droughts in Southern Africa, government mismanagement of resources in Africa has also contributed to generally poor agricultural efficiency.

In Zambia, the drought resulted in the maize crop being almost 40% lower than the expected harvest. Some small-scale farmers recorded little or no harvest at all. Given this background, the Zambian government declared a disaster in May 2001 and requested external assistance from donors (Samatebele, 2003:7). In response, the United Nations Agencies, United Nations Development Programme (UNDP), World Food Programme (WFP), United Nations Children's Fund (UNICEF, Food and Agriculture Organisation (FAO) and World Health Organisation (WHO) produced the United Nations Emergency Consolidated Appeal (CAP), to address the food insecurity crisis in Zambia in July 2002. The CAP sought funding of US $71.39 million for emergency food assistance as well as to boost the capacity of the United Nations to respond to pressing new needs in health, education, water and sanitation, child protection and food production (Samatebele, 2003:7-8).

Kalinda *et al*, (2003) quoted a government source as stating that Zambia (according to the food balance sheet based on the final crop forecasting figures) of 634, 274 metric tonnes. However, surpluses of 251, 636 tonnes for cassava and 26, 998 tonnes for sweet potatoes (other tubers) still resulted in a total food deficit of 432, 588 tonnes (Kalinda *et al*, 2003:1). For this reason the Government of Zambia appealed for help from the International

community in order to meet the shortfall of maize with a view to feed its starving population particularly in the rural areas. In response, World Food Programme, (WFP) a United Nations Food agency brought assistance in the form of 27, 000 tonnes of genetically modified (GM) maize into the country in July 2002 (Programme against Malnutrition PAM, 2002:3).

According to Michael (2002) responses differed across the region. Swazi officials did not object to GM food, but Lesotho, Malawi, Mozambique, and Zimbabwe asked that GM seeds be milled before distribution to prevent contamination of local crops. Zambia's President Levy Mwanawasa, initially blocked GM Food calling it "poison". Due to popular outcry, however, a team of local scientists was sent on a fact finding mission to the United States, Great Britain, South Africa, Norway and to the headquarters of the European Union in Brussels to study the safety of genetic modification foods before the final decision (Michael, 2002:1).

There was also debate regarding the rejection of GM maize both in Zambia and abroad, thereby making it difficult for the Zambian government to decide whether to distribute the maize or not (PAM, 2002:3). Programme Against Malnutrition, (2002:3) stated that:

> To overcome the inertia, the government convened a national consultative meeting to decide on whether to accept the GM maize relief food. Consequently, a national consultative meeting which included natural scientists from government institutions, the University of Zambia, University Teaching Hospital and independent ones; traditional leaders, civil society such as Jesuits Center for Theological Reflection (JCTR) and the Kasisi Training Center (KATC) farmers' organizations and members of the public was held from 12 August 2002. More than three quarters of those who presented their views at the meeting recommended for the rejection of GM maize. As a result of the recommendation, on 16 August 2002, the Zambian government announcement that it would not accept the 27,000 tonnes of GM maize aid from the United States of America to feed over 2 million of its people threatened by famine.

After extensive discussions, consultations and deliberations, the team reported to President Levy Mwanawasa, who in turn announced six days later that his government would not accept any genetically modified food aid and recommended that the government should maintain its position not to accept genetically modified maize (PAM, 2002:3). The government simply endorsed and communicated its decision based on the Precautionary Priniciple regarding the concerns over the potential harmful impacts of genetically modified maize on human health and environment in Zambia. (PAM 2002: 3). Further, the observation

was that the Zambian government had no national bio-safety regulations and it also lacked adequate ability to undertake reliable risk evaluation in the absence of evidence of safety to human health (Li Lin 2002:3).

The government therefore depended on a national consultation process and an investigating team in order to reject genetically modified maize (PAM, 2002: 1). The issue of proving whether a new plant or food is safe or nutritious is subject to debate. Since the introduction of genetic biotechnology in plants and crops, many contrasting views and evidence over the years have shown that statements regarding the safety of engineered foods cannot go unchallenged.

Another aspect is uncertainty over the appropriateness of the policies that would govern the full safety assessment procedures for genetically modified maize. It is also argued that the crops and foods improved through DNA (Deoxyribonucleic acid) technology have been developed with much precision and that the human health and environmental safety has been assessed in more depth and detail than for any other crops (Nestmann *et al*, 2002:41). The issue of commercialisation of products with regard to genetically modified foods raises more questions than answers because to date, in spite of regulations and assessments carried out by the relevant authorities to ensure the safety of the consumers, several countries are still facing widespread boycotts and rejection of these products, for instance, Britain and France (BBC news, 2003: 1).

1.1. Main Research Problem

The focus of the research was to understand, on one hand the government's action of rejecting GM maize as food aid, while on the other hand accepting that drought-stricken small–scale farmers would go hungry as a result of this decision. Understanding the perceptions of government officials, stakeholders and small-scale farmers towards the government action was therefore essential to understanding the situation fully. In other words, was it a good scientifically based government decision, or was it one made for political or commercial gain?

1.1.1 Sub-Problems

1. What were the perceptions of the government (and other stakeholder) officials to the Zambian government's decision process in relation to hunger in the country and genetically modified foods?
2. In Chongwe and Magoye, what were the small–scale farmers' perceptions regarding public health in relation to consumption of genetically modified maize?
3. In Chongwe and Magoye, what were the perceptions of impacts on farming and the environmental aspects of genetically modified maize?
4. What were the small-scale farmers' perceptions of the government's actions on rejecting genetically modified maize?

1.2. Hypothesis

The hypothesis of this study was that the rural people's perceptions of the Zambian government's decision to ban genetically modified maize (as food aid) in spite of being previously distributed to the food insecure, were negative.

1.3. Conceptual Framework of the Study

Smyth (2004) citing Reichel and Ramey, (1987) described a conceptual framework as a set of broad ideas and principles taken from relevant fields of enquiry, which were also used to structure a subsequent presentation. The author argues that when a conceptual framework is clearly articulated, it has potential usefulness as a tool to structure research, and therefore assists a researcher to make meaning of subsequent findings. The author also adds that such a framework should be intended as a starting point for reflection about the research and its context (Smyth, 2004:2).

The conceptual framework was therefore utilized as a research tool by the researcher and the conceptual framework of the research is related to Sustainable Agriculture and Rural Development (SARD). The flow chart in figure 1.1 reflects a relationship between the

decisions made by the government; districts with and without GM food aid and perceptions of the people at grassroots level in relation to health, environment and food security with GM maize.

In this regard, the conceptual framework is linked to Sustainable Agriculture and Rural Development (SARD). According to Avila, and Gasperini (2005), sustainable agriculture and rural development is a global action agenda. SARD is a key chapter of Agenda 21 that was adopted by the international community at the Earth Summit in Rio, and ten years later reaffirmed and revitalized in Johannesburg at the 2002 World Summit on Sustainable Development.

The diagram below shows the conceptual framework of this research.

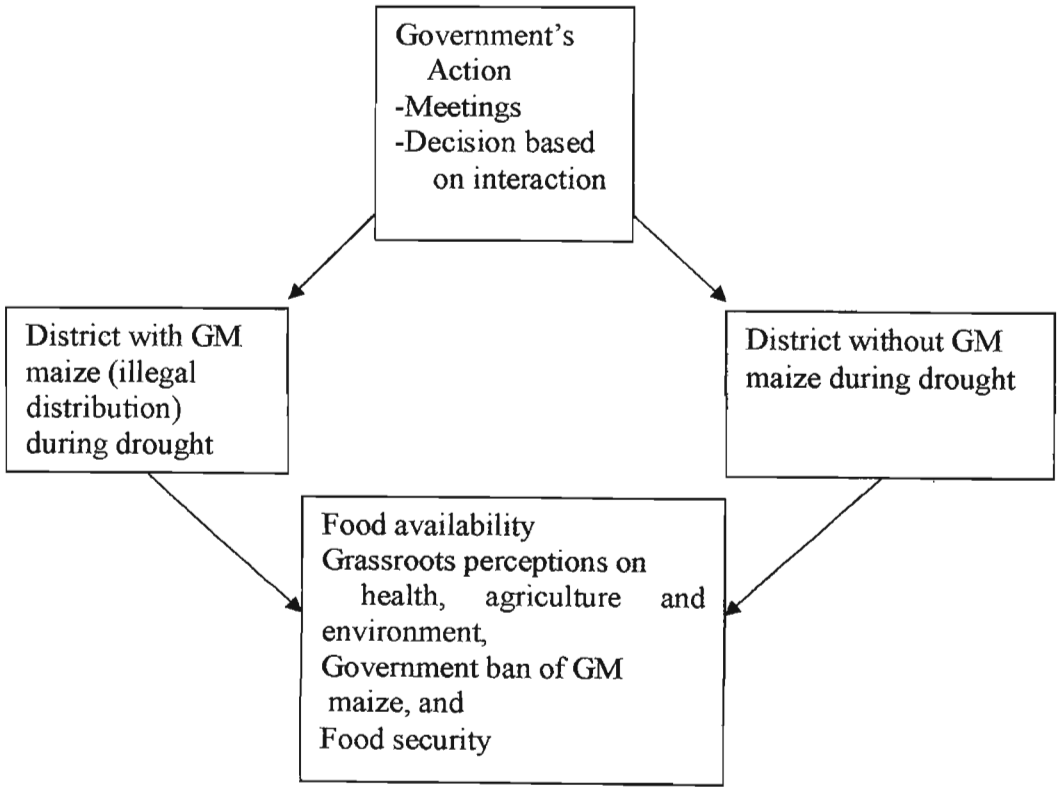

Figure 1.1 Conceptual Framework of the Study

By focusing on strengthening agriculture through focusing on improved livelihoods, Avila and Gasperini (2005: 1) aver that the cultural, social, economic and environmental needs and aspirations of the present generations should be met without endangering the ability of future generations to do the same. This puts the position of GM maize in a debatable position.

1.4. Methodology

The reason for choosing Chongwe and Magoye districts for field research or sites was that during 2001/2002 season, these districts had experienced drought. According to the Ministry of Agriculture and Co-operatives, (MOAC) their office was monitoring the situation in Chongwe, Magoye and other districts that had experienced drought. Newspaper cuttings also revealed that Southern Province was the hardest hit by drought during that time.

Through contacting World Vision offices in Mazabuka, who distributed relief in Magoye at the time, the researcher identified the research sites with a view to compare how the two districts were affected by drought and their perceptions about GM maize. The reason for their selection was that they were perceived to be similar in terms of agricultural practices, infrastructure and environment. In addition, they should be able to articulate on issues that related to GM maize (See Picture 64) with the presence of retired civil servants along with their children who had completed tertiary education living in those communities. Another reason was that respondents in both Chongwe and Magoye were familiar with GM maize because they were recipients of food aid previously; one village had stored GM maize as food aid while the other had not.

It had been reported that genetically modified maize (food aid) had been distributed in Magoye sub-district illegally following the looting of the warehouse near Magoye. This was the maize which was later sold to the hungry villagers. Some families therefore had experience of GM maize in Magoye. Chongwe rural district, which also experienced the same drought, did not receive the same illegal food aid as Magoye sub-region. In both areas, the peoples' perception of the 2002 Government action regarding food aid was sought in the form of in-depth case studies.

The researcher used both qualitative and quantitative approaches to formal and informal interviews and focus group discussions. These were conducted with both government officials in the Ministry of Agriculture Co-operatives, Non-governmental organizations (NGOs) like the World Food Programme and also small-scale farmers from Chongwe District in Lusaka Province and Magoye sub-district in Southern Province.

The small-scale farmers in these communities were the social actors because they related to the context of rural life. Social actors are not passive recipients because they are active knowledgeable participants who can arrive at decisions. They are also able to take and implement decisions on the basis of their own perceptions, interests, agendas and understandings, as well as the opportunities they are able to see (Kit, 2005:1). Purposive sampling was used in the research to select a number of different levels of decision makers for the study.

- The officials interviewed were the Principal Agricultural Research Officer, Ministry of Agriculture and Co-operatives, Regional and Public Relation Officers, World Food Programme, Chairperson, Biotechnology Outreach Society of Zambia.
- A group of small-scale farmers in Kanakantapa, village C, Chongwe district in Lusaka Province and the small–scale farmers in Ngwezi settlement section B, Magoye sub-district of Southern Province of Zambia were interviewed using both focus group discussions and questionnaires. Both these groups were interviewed so as to determine the impact of the government's decision to reject genetically modified maize, which they had once benefited from in times of food shortages under the previous government (Mulvany, 2004:2). Selection was purely based on volunteers who arrived for focus groups discussions in the villages.

1.5 Methods of Data Collection

The primary phase of data collection involved fieldwork research. The following methods were used to generate the data, namely: questionnaires, interviews (both formal and informal), focus group discussions.

❖ *Formal interviews:* This involved seven officials from the Ministry of Agriculture and Cooperatives and randomly selected small-scale farmers in Chongwe and Magoye who were interviewed using questionnaires. I really did not follow this - that you did it.

❖ *Informal interviews:* These were conducted with the following people from relevant organizations - Principal Agricultural Research and Senior Seed Officers, Ministry of Agriculture and Co-operatives, respectively; the Regional and Public Relations Officers, World Food Programme; the Chairperson of the Biotechnology Outreach Society of Zambia. Rural small scale farmers were represented by: the village coordinator and headman of Kanakantapa Village C in Chongwe district and Ngwezi Settlement B in Magoye sub-district respectively. All of these people were interviewed using open–ended questions.

❖ *Focus group discussions:* These were held in Kanakantapa village C and Ngwezi settlement B with the small-scale farmers and investigated their general views on the government's rejection of genetically modified maize, and how the decision had impacted on their families and the communities in relation to health, environment and food security.

❖ *Secondary data collection:* Both published and unpublished documents relevant to the researcher's study were obtained from journals, articles from the Internet, papers presented in various forums, and other important articles were used for the study. Government data on policy, attitudes as well as procedures that led to the decision for rejecting genetically modified maize were also consulted.

1.6. Sampling

A purposive sample of three categories of people was used in the research. These were the officials in the Ministry of Agriculture and Co-operatives, The World Food Programme officials and small-scale farmers from Chongwe and Magoye. For the sake of gender balance, the researcher interviewed both men and women in all these interviews.

McMillan and Schumacher (2001: 433) state that: the researcher searches for information-rich informant groups, places, or events from which to select subunits for more in-depth study. Purposive sampling is a strategy to choose small groups or individuals likely to be knowledgeable and informative about the phenomenon. In keeping with this view the researcher was in a position to

identify people particularly in the MOAC and World Food Programme (WFP) who were technocrats and conversant with the subject-matter.

1.7. Scope and Limitations of the Research

This research was limited to those officials in government and World Food Programme who were available during the data collection period. Obtaining data from targeted senior officials sometimes proved difficult in government offices due to the nature of the research. From the two villages of small-scale farmers only those who attended the focus group discussion from the selected areas were used as informants. Therefore, the results obtained are not generalisable or representative of all small–scale farmers in Zambia, nor strictly of the villages concerned.

1.8. Study Assumptions

The main assumption of the study was that the socio-economic settings of the two districts were sufficiently similar as not to bias perceptions and limit competing hypotheses influencing those perceptions. In addition, it was assumed that the farmers were representative of the general small-scale farmer present in those areas, and that officials were open and honest about their points of view and not just being politically correct.

1.9. Significance of the study

The study was conducted so that the experience of what happened in Zambia may produce lessons for other countries through this experience, such as:

- By learning from the outcome of this study in Zambia in the two districts studied,
- To input into the future policies dealing with drought, hunger and food aid and GM food,
- To highlight the types of education and further study needed to guide the population in the future.

1.10. Dissemination of findings

This research will be published in the researcher's Thesis and a journal; Development Brief. This will be disseminated to the organisations from which the information was collected, namely, the Ministry of Agriculture and Co-operatives, World Food Programme, small-scale farmers in Chongwe and Magoye communities, including the sponsoring institution through an executive summary document.

1.11. Summary

The report is presented as a number of chapters in the following way:

Chapter 1 Includes the introduction, background of the study and brief methodology.

Chapter 2 The focus of this chapter is to review the literature related to the research.

Chapter 3 Describes the characteristics of Chongwe and Magoye as well as the demographic profile of the sample of small–scale farmers. It also focuses on the Department of Agriculture and Golden Valley Agriculture Research Trust (GART) and Kasisi Agriculture Training Centre (KATC).

Chapter 4 Describes and justifies the methods used in the research.

Chapter 5 Deals with results and discussion from the interviews.

Chapter 6 Includes summary of the thesis, conclusions and recommendations.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In Africa, the controversy over genetically modified (GM) crops began in 2000 and eventually reached its peak in 2002 when several Southern African countries rejected GM food aid during food crises (Dauenhauer, 2003:2). Among the countries that rejected the food aid were Malawi, Mozambique, Zimbabwe, and Zambia. However, Malawi, Mozambique and Zimbabwe accepted milled GM maize in order to prevent the spread of genetically modified organisms (GMOs) as seed. Zambia rejected GM maize in both grain and milled forms, citing concerns to human health and the environment (Michael, 2002:1).

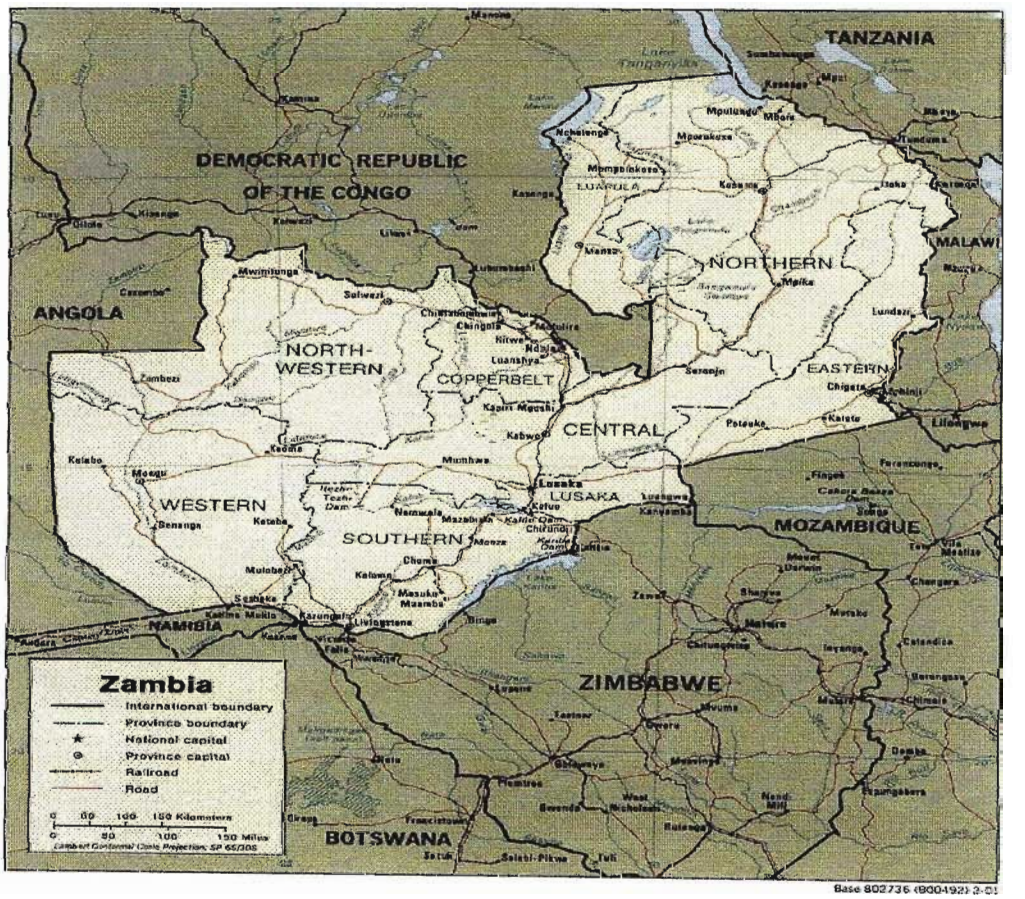

Figure 2.1: Map of Zambia (http://www.lib.utexas.edu/maps/africa/Zambia)

This chapter will review the literature that relates to the issues of genetically modified maize, biotechnology, food security and food aid. In a review of the Zambian situation, the role of the World Food Programme (a United Nations agency) and views of both antagonists and proponents of GM foods will be discussed. The opinions of those who were involved in the technology of manipulating seed will be reviewed.

2.1. The Situation in Zambia in Relation to GM Maize

Zambia is among the Southern African countries that experienced drought during the agricultural seasons between 2001/2002. As a result, the country experienced reduced yields of maize, which is the country's main staple food. For this reason the Government of Zambia appealed for help from the International community in order to meet the shortfall of maize that was needed to feed its starving population, particularly in the rural areas of Zambia. In response to the Zambian appeal, the World Food Programme brought 27,000 tones of GM maize into the country in July 2002 (PAM, 2002:1).

On the recommendations of a national consultative gathering as well as the Zambian GM aid fact-finding delegation, President Levy Mwanawasa subsequently announced that his government would not accept any GM food aid and recommended that the government should maintain its position not to accept GM maize (PAM 2002:3). The national consultative meeting included natural scientists from several government institutions, including the University of Zambia, University Teaching Hospital as well as some independent bodies; traditional leaders (chiefs from hunger stricken areas); civil society organisations such as the Jesuit Centre for Theological Reflection (JCTR) and Kasisi Agricultural Training Centre (KATC), farmers' organisations and members of the general public (PAM, 2002:3).

Even though the consultative meeting was held at national level, the Zambian people were unlikely to have participated fully in the designing and implementation of the food aid programme (PAM, 2002:1).

The GM maize issue that has ignited so much controversy in Zambia for the past 2 years has faced similar rejection by European Union countries. According to Mnyulwa and Mugwagwa (2002:25) the levels of biotech awareness in Zambia is low among scientists and too low among the rest of the population. Additionally, Panos (2005) reports that of the five case study countries, Zambia's print media seemed the least engaged in reporting on developments in GM technologies or policy processes during the period that was surveyed (January to June 2004). However, coverage was more frequent in 2002 during the controversy over GM ingredients in food aid to Zambia (Panos, 2005:31). This demonstrates that these countries were not very sure about the safety of the GM foods and this led to implementation of precautionary principles in countries like Zambia where the issue of GM foods is under serious debate.

2.1.1 Precautionary Principle on Genetically Modified Organisms

Panos (2005) reports that in 2004, Zambia ratified the Cartagena Biosafety Protocol. During the same year, Zambia's Ministry of Science, Technology and Vocational Training published a draft Biosafety-Bill. This bill sought to set up a national Biosafety Authority responsible for protecting human, animal and environmental health from the potential adverse impacts of scientific research such as the commercial application of GM technology including food, animal feed and medicines (Panos, 2005:30).

Further, the Cartagena Protocol on Biosafety is actually the Principle International legal instrument regulating international trade in GM organisms; known in the Protocol's text as "living modified organisms". The Cartagena Protocol gives the right to refuse imports of genetically modified organisms. Under the Protocol, a country that wants to export GM materials needs to notify the importing country in advance. The importing country has the right to authorise or refuse the shipment based on its own assessment of the risks to human health and the environment. Refusal is allowed on the basis of potential harmful effects, even if scientific proof of harm is lacking (Panos, 2005:16; SADC, 2005:1).

But Turvey *et al,* (2005) with reference to the Southern African countries, argued that the Precautionary Principle was being used to prevent as yet unknown human effects and harm to trade with Europe, both of which were uncertain, while threatening millions of people with near certain starvation.

By contrast, du Plessis (2004: 98) cited Dr Viljoen of the Department of Botany and Genetics in the faculty of Natural and Agricultural Sciences of the University of the Free State as saying that:

> Africa desperately needs disease-free, drought resistant crops with improved nutritional value to feed its people. The problem is that these traits are not priority issues for an industry which is predominantly driven by First World needs. It is not possible to determine the long-term implication of any new technology. It is safe to proceed with caution. This approach is the heart of the precautionary principle.

The previous statement explains that one of the reasons for the Zambian government to take a precautionary approach is similar to the concept of "safety first". This means that the Zambian government was holding back from using a GM technology until there was conclusive evidence that it can be used without harm (Panos, 2005:9).

2.2. Food Security in Zambia

Koc *et al,* (1999:1) quoted the United Nations Food and Agriculture Organization's (FAO's) widely accepted definition of food security.

> Food Security means that food is available at all times; that all persons have means of access to it: that it is nutritionally adequate in terms of quantity, quality and variety; and that it is acceptable within the given culture. Only when all these conditions are in place can a population be considered "food secure".

Additionally, Lubozhya (2002:4) an agro-scientist, stated that households would be food secure when the following conditions were met:

- First, enough food must be available in both quantity for adequate energy intake and diversity of food types (quality) for adequate intake of nutrients. These foods must also be culturally acceptable.
- Second, households must have access to these food supplies.
- Third, food supplies must be sustainable through seasons and over years.

- Fourth, household food security must be equitably distributed to ensure that the poor and the vulnerable have secure access to the food they need.
- Fifth, household food security is intricately tied to livelihood security, and is more likely to be achieved when livelihoods are sustainable.

Food security cannot therefore reach the required standards when households at grass-roots level do not have access to the right amount and variety of safe foods. The issues of food security and nutrition remain some of the biggest challenges for sustainable development in Southern Africa.

Food Security issues are further compounded by the HIV/AIDS pandemic, which has claimed millions of lives, leaving many households destitute. Malnutrition and hunger are said to encourage the spread of HIV. The concept of food security therefore also implies that (FAO / WHO, 2004:1; Foster and Leathers, 1999:98):

- All people at all times have physical and economic access to enough food;
- The ways in which food is produced and distributed are respectful of the natural processes of the earth and thus sustainable;
- Both the consumption and production of food are governed by social values that are just and equitable as well as moral and ethical;
- The ability to acquire food is made secure;
- The food is obtained in a manner that upholds human dignity.

The question at this point is where GM maize supplied as food aid fits into the picture, given that the consumer's trust and confidence in these products is actually declining, especially among the European Union member countries (BBC news, 2003:1). The reason why there has been an ongoing dispute between the European Union and the United States is due to the European Union's refusal to accept genetically modified food. Another reason is that the United States and 12 other agricultural exporting nations are pushing the European Union to end its five-year moratorium on GM crops. For instance, French protestors have made their feeling clear by saying "No to GMO" (Li Lin, 2002:3).

With regards to sustainable food production, Sahai's (2000) argument is that the introduction of new technology, such as high-yielding seed varieties means that small farmers tend to get marginalised because seed production and food production are then ultimately controlled by large corporations. This poses a great threat to self-reliance in developing countries and their ability to feed themselves. The response to this argument is that if the technology only serves to increase corporate profits and marginalise the poor even further, then it will not be acceptable (Sahai, 2000:29-30).

Africans should invest in crop research that addresses their concerns in agriculture and not always rely on adapting Western technology that may not always be relevant to the cultural norms of the people. There are traditional methods of farming in Africa that require improving in order to reduce dependence on the developed nations. Unless these measures are put in place in terms of resource mobilisation among African scientists with the objective of addressing the problems of hunger, the continent will continue to be marginalised (Sahai, 2000:29-32).

Unfortunately, the situation of food (in)security in Africa is also characterised by droughts, floods, poor soils and poor policies put in place by some African governments. In situations where a community's normal means of accessing food is compromised by disaster, people are likely to resort to short–term survival strategies in order to access food, such as excessive disposal of household assets. This can lead to destitution, ill health and other long-term negative consequences such as malnutrition, which could lead to death especially among children (McConnan, 2000:131). In this case, food aid intervention may be required.

2.3 Maize Production in Zambia

Samatebele (2003) states that Zambia is dependent on one staple food crop, maize. The Department for International Development (DFID), Great Britain (2002) cites the Ministry of Agriculture and Fisheries (2001) as acknowledging that maize is the major staple food for most Zambians; with small and medium scale farmers still producing 70-80% of the maize consumed in Zambia (DFID, 2002:13; Lewanika, 2003:1). The Department for International

Development (DFID) (2002) cites the World Trade Organisation (WTO) (2002) stating that although Zambia has a relatively high urban population within the region; approximately 45% of the total population comprises rural poor, dependent on agriculture. The document also mentions that small-scale or subsistence farmers account for a large share of the maize crop (more than 60% of Zambia's cultivated land), but they generally lack irrigation capacity, so this production is largely rain-fed. This makes the country vulnerable to changes in rainfall patterns, which can result in a serious food shortage (The IDL group, 2002:4).

In addition, Samatebele (2003) observes that the food security situation in Zambia has deteriorated over the past ten years leading to situations of poverty in the country. Statistically, the country's maize production during the 2001/2002 season was reduced by 25% from 801,889 tonnes in 2000/2001 to 610,606 tonnes in 2001/2002 (Fewsnet, 2002:1-2; Samatebele, 2003:5). The agricultural sector in particular, is facing serious challenges that have led to the inability of many households to procure sufficient food from their own production and purchase. The following are considered to represent the underlying causes of this trend: the unreliable supply of fertilizer, inadequate seed supply, lack of credit facilities for small–scale farmers and poor extension services. Other challenges associated with food insecurity are insufficient, erratic and poorly distributed rainfall.

Samatebele (2003) stated that agriculture generates about 22% of Zambia's Gross Domestic Product (GDP) and provides direct livelihood to more than 50% of the population. The agricultural sector employs 67% of the labour force and is the main source of income. It also provides employment for women who make up 65% of the rural population. This sector is currently the mainstay of the rural economy (Samatebele, 2003:2).

In relation to the sale of maize, Samatebele (2003:3) observed that because of the poor harvest, the market price of the little available local maize as well as imported maize increased drastically between the months of August and December 2002. In the rural areas prices had risen sharply relative to the urban prices during the months between November and mid–December. Similarly, the price of mealie-meal followed the trend but was unevenly

spread between urban and rural districts. In addition, the price increases varied between 6% to over 50%.

2.4 Hunger and malnutrition

Runge *et al*, (2003) describes hunger as: "A general term related to not getting enough to eat. Chronic hunger is a persistent state: transitory hunger a more temporary one (Runge *et al*, 2003:15). Pinstrup-Andersen *et al*, (1997:19) mention that:

> The depth of hunger is measured by comparing the average amount of dietary energy (kilocalories) that people take in to the minimum amount of energy they need to maintain their body weight and undertake light activity. The gap between dietary energy consumed and dietary energy needed is known as a "food deficit"; the greater the food deficit the deeper the hunger.

According to Nurnberger (1999:77) the reason for hunger at present is that people have no money to purchase existing food. He argues however, that soon there may be no food to buy or give away any more because the countries which have large surpluses today, which they need to dispose of, may have to keep those surpluses for their own use.

McConnan, (2000:159-160) explains about the overall estimates namely, measures of national food availability as well as income measures of hunger as follows:

> First an estimate is made of dietary energy supply per head by dividing national food availability by the population of the country. Then for each country an estimate of the statistic distribution of food across the population is made. The distribution of food is estimated from the distribution of income or from the income distribution in neighbouring countries. With these estimates (per capita food availability distribution of food intake), the number of people falling below a minimum nutritional level can be estimated.

Moreover, Runge *et al*, (2003:15-16) observed that hunger can persist even when food is relatively cheap. The authors point out that throughout the 1980's and 1990's substantial agricultural surpluses came to recipients from many countries including the United States. The resulting low world prices created a severe problem for local farmers, but failed to eliminate chronic under-nourishment in poor countries. They also pointed out that the denial of access hits within the household, which is the basic unit for acquiring and sharing food the world over. Households tend to acquire food by growing it, buying it, or receiving it as a gift

or loan from a relative or neighbour, or through a government food programme such as food for work. The word of caution is that at any point this chain of access may be blocked.

The World Bank (1990) was cited by Runge *et al,* (2003:18) as stating that:

> Studies of rural households have found that differences in living standards are primarily related to a lack of human capital and resources such as land and livestock. Rates of pay for the hungry poor are low because they typically have few skills and little education (and also low levels of health and nutrition), and are therefore less productive.

Runge *et al,* (2003:15) defines malnutrition as: Poor nutrition, which may include under nourishment, over consumption (obesity) or specific nutrient inadequacies. While McConnan, (2000:115) describes malnutrition in terms of wasting (thinness), stunting and /or nutrition oedema.

> Stunting is also a form of malnutrition but in disaster–affected populations is an indication of longer-term nutritional problems, which preceded the disaster event. Correction of wasting and oedema reduces the risk of death. For these reasons, the nutrition standards only apply to nutrition activities which correct wasting and oedema (as well as micronutrient deficiencies).

Another point that McConnan, (2000:71-72) made was that malnutrition can be the most serious public health problem and that it may be a leading cause of death, either directly or indirectly. The most commonly affected are children between the ages of six months and five years, though younger infants, older children, adolescents, pregnant women, breastfeeding women as well as older adults may be affected. McConnan, (2000:104) also argued that malnutrition is associated with increased risk of death on the patterns of disease as well as infection, which in turn, are influenced by local environment. Another vital aspect mentioned is that the combined impact of malnutrition and infection is greater than would be expected from their total individual contributions to mortality.

According to the report of Kalinda *et al* (2003:1) the following issues of malnutrition were mentioned regarding the Zambian situation:

> Chronic malnutrition (stunting) has affected about 45-47 percent of the rural households, whilst malnutrition (wasting) has affected about 6 percent of all rural households. In addition to this, only 59% of the population has access to safe water and this has serious negative implications on the health and nutrition status of the people. Therefore, the children affected with chronic malnutrition will remain physically and /mentally impaired for life, even if they survive. This high rate of malnutrition has serious implications on Zambian development prospects (Kalinda, *et al* 2003:1).

2.5. Why Food Aid?

McConnan, (2000:150-151) explains the objectives of targeting food aid, which may include the following:

- Saving lives, if nutritional status is of immediate concern.
- Strengthening food security and / or the local economy.
- Protecting the nutritional / health status of specific sub-groups within a population who are physiologically vulnerable (such as young children, adolescents, breastfeeding mothers, pregnant women, elderly people, and people with disabilities).
- Preserving household assets (if these are being sold to cover food needs).
- Providing food supplements to those whose food need is caused by social/political vulnerability (e.g. separated minors, refugees or displaced persons, female-headed households, people with disabilities and ethnic or religious minority groups.

These objectives stand to benefit the recipients of food aid if they are monitored, implemented and evaluated professionally. However, the situation on the ground is often different in the sense that in as much as all the stakeholders may agree upon the targeting objectives, the selection of the recipients is mostly based on partisan politics, and not on the basis of food need or vulnerability to food insecurity (McConnan, 2000: 152). Sometimes women are not represented in the committees that are involved in the assistance programmes. Failure to ensure that there is equity in decision-making, programme design and implementation of food distribution among the people is a recipe for ineffectiveness in the task of targeting food aid. Participation in food aid by the local people can serve to add force to peoples' sense of dignity and sense of worth in times of crisis. Moreover, it generates a sense of community and a sense of ownership. When ordinary people are involved directly they experience and practice good levels of participation (Ife, 2002:127-133).

One of the ways in which the targeted group would benefit from food aid is through "food for work," which is very popular in Africa. Foster and Leathers (1999:293) cite Mellor (1988) who stated that food for work (FFW) had the potential to increase the productivity of the

region in which it is applied, at the same time providing productive activities for recipients who would otherwise be unemployed or underemployed. The FFW projects may be aimed at improving the drainage system in a community, road reconstruction and other community activities that would enable the community members to earn an income in the form of groceries, such as 5 litres of cooking oil, 2 kg sugar, 25 kg maize meal and 5 kg of sugar beans.

McConnan's (2000:131) argument is that food aid can thus act as a significant mechanism to help develop peoples' self-reliance and restore their capacity to respond to future shocks. Though food aid has assisted many African countries in terms of saving lives, especially in cases of emergencies, it is worth noting that food aid can be an instrument of dependence and politics. McConnan (2000:131) further observes that aid creates dependency among the people who tend to look to the West for assistance each time there are emergencies that arise as a result of environmental shocks such as flooding or drought. It should be stressed that it not just the people on the ground but also people in power, for instance politicians, who sometimes look to the West, to get them out of the trouble they themselves have caused.

In addition, McConnan, (2000:132) highlights the purpose of food aid as:

- Sustaining life by ensuring adequate availability coupled with access to food by people affected by disaster;
- Providing sufficient food resources to eliminate the need for survival strategies that may result in long-term negative consequences to human dignity, household viability, livelihood security and the environment; and
- Providing a short-term income transfer or substitution for people to allow household resources to be invested in recovery and longer–term development.

Food aid can either impact positively or negatively on the community, depending on the knowledge of the stakeholders (the local authorities, agency, donors, and community) and the appropriateness of the interventions that are proposed (PAM, 2002:1). Failure to analyse the interventions that are appropriate for food aid has led to difficulties in responding correctly to disasters. One of the contributing factors is lack of participation at grass-roots level by

community members. Much as the consultative meeting held in Lusaka was on the national level and which included traditional leaders from the hunger stricken areas, it is unlikely that the local people fully participated in the design and implementation of the Zambian food aid programme.

2.5.1. Distribution of Food (Food Reserve Agency) in Zambia

There are factors that should be considered in relation to the distribution of food to the affected people meaning, the food that is meant for distribution should be of adequate quality, be safely handled and be fit for human consumption (McConnan, 2000:159). The Food Reserve Agency (FRA) which was established for the purpose of operating a national food reserve through an Act of Parliament in 1995 is responsible for the administration of the government-owned storage facilities, the introduction of grades and standards for maize, and the annual registration of traders as well as processors of designated commodities. It is also responsible for receiving and storing of the food donations meant for alleviating food insecurity (Kalinda, *et al* 2003:4). However, most of the stakeholders in the agricultural sector perceive the Food Reserve Agency as having failed to meet their expectations and that it has failed to impact positively on food (in)security. It is against this background that the current government is in the process of establishing a Crop Marketing Authority (CMA) through an act of Parliament to replace the Food Reserve Agency (Kalinda, *et al* 2003:4).

Gross, *et al,* (2000) stated that Global Food and Nutrition Security have had more than 50 years of history and a sequence of definitions and paradigms. The author adds that after the historic "Hot Springs Conference on Food and Agriculture" in 1943, in which the concept of a "secure, adequate and suitable supply of food for everyone" was accepted internationally, bilateral agencies of donor countries such as the USA and Canada, which were created in the 1950s, started to dispose of their agricultural surplus commodities overseas. Further, it was rapidly accepted that availability, although a necessary feature of food security, is insufficient in and of itself for food security because the food may physically exist but be inaccessible (or unaffordable) to those most in need (Gross, *et al,* 2000:20).

Although the climatic changes taking place in Southern Africa have caused droughts and floods among the people in the region, it is important to note that the widespread hunger is not actually caused by lack of food but is often the result of a total breakdown of distribution mechanisms put in place by governments (FAO, 2000:230). It should be realized that food surpluses do not mechanically transform into achieving food-security because even when the country produces a food surplus, the issue of transport to collect the produce from the rural areas may be inadequate. In the long run, the produce may not survive because of inefficient storage. Marketing and distribution of produce can also be a major setback if not handled carefully by the officials in spite of a good harvest (FAO, 2000:230)

2.5.2. How Food Aid Works

Food aid is given to countries that face famine, war, and violence. However, Sharma (2002:3) argued that the Bengal famine in 1943 was not as the result of a drastic slump in food production but because the colonial masters had diverted food for other commercial purposes. Food diversions create a deficit in a country's cereal stock. It should also be noted that drought and flood impacts negatively on the country's food security. In the context of Zambia, in June 2002, the government signed a Memorandum of Understanding with the Millers' Association of Zambia (MAZ) for maize importation to fill the deficit for the 2002-2003 seasons. The millers were to import 300,000 tonnes while government was to import in 155, 000 tonnes of maize (Samatebele, 2003:9).

The government also appealed for assistance from the international community to avert its citizens from starvation. In response the World Food Programme also made an appeal for 126, 921 tonnes of relief food and eventually, 27,000 tonnes of genetically modified (GM) maize arrived in Zambia in July 2002 (PAM, 2002:1).

On the other hand, Paggi, (2002:2) argued that:

> While the motives behind food aid programmes can be laudable, as in the case of humanitarian efforts to address conditions of famine and malnutrition, they are not without their critics. Criticism of food aid generally relates to three main areas: disincentive effects, mis-allocation of resources, and problems associated with the distribution of food aid.

2.5.3. Who Controls Food Aid?

Kalinda *et al,* (2003:3) mentioned that the responsibility of food aid in Zambia falls under the Vice–President's office, with a Disaster Management Mitigation Unit (DMU) having the task of overall management and coordination of responsibilities for all sectors that deal with food security. This DMU unit coordinates and networks with all governmental departments, UN organisations, Non-governmental organisations (NGOs), and private institutions, to minimize overlaps and duplications of effort in the implementation of food security programmes. The rationale for establishing this unit was due to the adverse weather conditions that prevailed during the previous two successive agricultural seasons (2000/1 and 2001/02). The unit reports to a Technical Committee of Permanent Secretaries, and provides secretarial back up to the apex committee on ministries and is chaired by the Vice-President (Kalinda, 2003:3).

For its relief operations, the Unit depends on government as well as other institutions such as the World Food Programme (WFP), United Nations Children's Emergency Fund (UNICEF), the Food and Agriculture Organisation (FAO), United Nations Development Programme (UNDP), United Nations Population Fund (UNFPA), as well as national and international non-governmental organisations (Kalinda, *et al* 2003:2-3). As indicated earlier, World Food Programme, (WFP) is the United Nations frontline agency (established in 1963) in the fight against global hunger, operations aim to:

- Save lives in refugee crises and other emergencies.
- Improve nutrition and quality of life of the world's most vulnerable people at critical times in their lives.
- Enable development by:
  (a) assisting people to build assets that benefit them directly.
  (b) promoting the self–reliance of poor people and communities (Clay, 2003:702).

It should be noted that after the Zambian government rejected 27,000 tonnes of (GM) maize, WFP was expected to deliver a total of 80,000 tonnes of non–genetically modified (GM) maize food aid to the country (IRIN–news, 2003:1). Apart from WFP playing a pivotal role in redressing hunger, other agencies such as The Food Reserve Agency (FRA), through the private sector facilitates the transportation of food relief to food deficit areas (Kalinda, *et al* 2003:4).

2.6. Biotechnology

The Food and Agriculture Organisation (FAO) (2000:1), citing the Convention on Biological Diversity (1992) defined biotechnology as: any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

2.6.1 Advantages of Biotechnology

Mackey and Santerre (2000: 120) argue that because of an ever-increasing world population and decreasing available land, there is an urgent need to improve the quantity as well as quality of food crops in an environmentally sustainable manner. However, the authors are quick to note that the use of biotechnology in agriculture will have profound implications for agriculture, the environment, and the global economy. Livermore (1999) concurs with this statement by saying that biotechnology has the potential to offer the essential increases in crop production and reduce the need to encroach on fragile environments for crops as more and more agricultural land is used for house building (Livermore, 1999:7).

The FAO (2000:1) also argued that biotechnology provides powerful tools for the sustainable development of agriculture, fisheries, forestry, and the food industry. Another point mentioned is that when appropriately integrated with other technologies for the production of food, agricultural products and services, biotechnology can be of significant assistance in meeting the needs of an expanding as well as increasing urbanised population in the new millennium.

In the same vein, FAO (2000:4) states that biotechnology could lead to higher yields on marginal lands in countries that cannot grow enough food for their people. Genetic engineering is helping to reduce the transmission of human and animal diseases through vaccines. For instance, rice that has been genetically engineered to contain pro-vitamin A (beta Carotene) and iron, could improve the health of many low-income communities (FAO

2000: 4). There is no doubt that there is good will on the part scientists to improve the well being of the people particularly in the developing countries. However, what is needed at the moment is that such information has to disseminate to the people at the grass root level so that ordinary people are able to appreciate the food production especially during drought.

Mackey and Santerre, (2000:123) also cited the World Bank report, which outlined a potential list of agricultural improvements that could help solve the problem of insufficient food production through improving pest control, soil conservation, developing new crop strains with increased yields, resistance to pests, tolerance to drought conditions, and reducing dependence on pesticides, and herbicides. Moreover, they were of the view that crops improved through this biotechnology have the potential to help protect the world against widespread famine.

Those in favour of biotechnology however imply that improved crops can resolve the problems facing poor farmers without addressing the complex and intractable issues of poverty, land rights, lack of access to credit coupled with weak extension services (Glover, 2003:1). Taylor and Fauquet (2000:10) also acknowledged that biotechnology is not panacea for world hunger. However, when combined with traditional breeding, good agricultural practice and sound economic policies, they argue that it could be an important factor in achieving improved standards of health and economic security for the world's people.

2.6.2 Disadvantages of Biotechnology

On the contrary, Glover (2003:1) was of the opinion that both the crops and their characteristics tend to be designed for industrialised, capital–intensive, temperate farming. Much as there is need for biotechnology in Africa, the problem is that it requires huge funding for a biotechnology programme to be implemented. In addition, there is need to address the issues of land ownership, effective extension work, access to credit facilities from both private and government lending institutions so as to assist the small holder farmers in Africa. Further, Glover (2003:1) stated that harnessing biotechnology to address issues of food security and economic development in the developing countries is proving to be problematic. Working with poorly understood tropical and subtropical crop species certainly

provides challenges, but the majority of obstacles to applying biotechnology to developing country requirements are more a consequence of economics and politics than of biology (Taylor and Fauquet, 2000:5).

2.6.3 Other studies undertaken in Zambia on Biotechnology

A joint Panos Institute Southern Africa and Zambia National Framers' Union (ZNFU) project was undertaken to raise awareness and stimulate debate about Genetically Modified Organisms in the Zambian farming community in 2001 (prior to GM food aid becoming an issue). Panos Institute, Southern Africa is an independent regional information as well as communication organisation that seek to cultivate an enabling environment for marginalised people to participate actively in informed and inclusive public and policy debates and decision-making processes by generating information and creating effective communication channels (Panos, 2004: 2-3).

Panos' study area included the farming communities in Kabwe, Monze and Mkushi in Zambia. These areas were chosen because they were within reach of Lusaka given the limited resources available to the researchers. Another rationale was that these areas adequately represented various categories of farming activities ranging from activities that ranged from grain, vegetables, potatoes, fruits, cotton, tobacco, floriculture, poultry, cattle, pigs, goats as well as other livestock commonly found in Zambia (Panos, 2004.1-3).

In these studies, two separate focus group discussions were conducted in Kabwe, one for commercial farmers and the other one for small-scale farmers. In Mkushi small-scale and commercial farmers took part in one focus group discussion. While in Monze only small-scale farmers participated, because the commercial farmers did not make themselves available (Panos, 2004: 2-3). The small-scale farmers mentioned some common problems namely: disease, weeds, lack of market, low yields, lack of storage facilities, limited access to land, low prices for agriculture produce, lack of government support, limited credit facilities to mention a few (Panos 2004, 4). The study found that the majority of small–scale farmers had not heard of biotechnology. However, some of them who were familiar with the term had heard about it from the Voice of the Farmer radio programmes on Radio Phoenix (a series of

radio programmes produced by the ZNFU in 2001, with support from Panos). A few small-scale farmers had heard of biotechnology through listening to the news, reading articles in newspapers and magazines, in addition to talking to people (Panos, 2004:5).

On the other hand, the majority of commercial farmers had heard of biotechnology. They knew about the subject through broadcast news, the Internet, colleagues who had access to information on biotechnology, and through reading articles in newspapers and magazines. The study also mentioned that the majority of the small-scale farmers expressed no opinion on whether or not biotechnology could provide solutions to some of their problems. This was due to lack of familiarity with biotechnology. It also mentioned that there was a general apprehension that biotechnology and GMO could be imposed on them (Panos, 2004: 5).

2.6.4"What then is the way forward?" for Biotechnology in Africa?

What then is the way forward? Glover (2003:2) proposes that making the biotechnology work for the African agriculture requires harnessing the technology so as to address the socio-economic and agronomic constraints faced by African small-scale farmers, rather than relying on technologies developed for other contexts. Taylor and Fauquet (2000:5) argued that the greatest need for improved crop production lies in the developing countries. A major challenge is to ensure that the huge potential of biotechnology is directed to where it is most needed, that is to benefit small farmers and the populations of the developing countries. Recent advances in scientific research and the performance of GM crop plants in the field, provide indications as to how biotechnology could be applied to impact food production in the developing countries.

Further, Livermore (1999:7) cited Holiday (1999) as stating that:

> We see biotechnology as a critical enabling technology that is very broad and offers many platforms for building a sustainable future world. I believe that the concerns of the public must be addressed openly, and I support whatever steps may be necessary to ensure that biotechnology, in all areas, is developed and used safely. Biotechnology cannot be about removing choice; it must be about increasing it.

Pinstrup-Andersen and Pandya-Lorch (2001:240) however, pointed out that the issue of biotechnology is particularly pressing in the light of the current controversy between the

United States and the European Union over GM foods. The benefits and the risks of biotechnology in food weigh differently in areas where there is a food surplus, rather than where there are life threatening diseases in the same areas.

Pinstrup-Andersen and Pandya-Lorch (2001:240) also mention that in order to determine whether modern technology could benefit the poor in developing countries, policy makers need to analyse the problems that are currently constraining agricultural productivity or damaging the environment, assess whether these problems may be solved by integrating modern biotechnology with conventional methods of farming and prioritise the solutions.

Taylor and Fauquet (2000:6) are of the view that the developing countries will most likely continue to benefit from crop biotechnologies developed in the North. For example, India will commence cultivation of transgenic cotton in the near future. However, the biotechnologies do not by themselves provide the answer to developing country requirements. The application of biotechnology as a contribution to food security in the developing countries requires that the specific needs of small farmers in the tropical and subtropical regions are targeted (Taylor and Fauquet, 2000:6). As stated above, small scale and subsistence farmers still constitute the majority of the land users in developing countries. If biotechnology is to have a real impact on world health and nutrition resources must be directed at producing improved varieties of the relevant local corn and other necessary varieties.

There is an urgent need for increased agricultural output in the developing countries and biotechnology could be applied to contribute to this effort. Despite the recent negative public reaction to biotechnology, it remains convincing that the genetic engineering of crop plants has a vital role to play in addressing the world's present and future agricultural requirements (Taylor and Fauquet, 2000:10). In their opinion, the scale of the risks involved if developing countries are not provided with the opportunity to secure their own food supplies and economic development far outweighs the inconclusive evidence of any environmental damage attributable to genetically modified organisms.

Biotechnology in agriculture is critical in that it has implications for food security and innovations that have been undertaken by scientists. It must also be beneficial not only to the commercial but also to small-scale farmers who contribute to agricultural production in the Sub-Saharan Africa.

2.7 Orphan Crops

In this context Naylor *et al* (2004) describe orphan crops as those that receive little scientific focus or funding relative to their importance for food security in the world's poorest regions, especially in Southern Africa (Naylor *et al,* 2004: 15-16). Glover (2004) agrees that the so–called orphan crops have qualities, which could be relevant to the subsistence as well as smallholder farmers such as drought resistance, salt tolerance, and nutrient use efficiency (Glover, 2003:1). Orphan crops include millet, cassava, cowpeas, indigenous vegetables, fruits, roots and tubers.

Taylor and Fauquet's (2000) argument was that genetic engineering technologies must be developed for the orphan crops such as cassava and plantain on which a large proportion of the population depend, for which so little yield improvement has previously been achieved and for which conventional breeding is both difficult and lengthy. If the technical hurdles could be overcome, success would be likely as past neglect means that the latter crops retain a large potential for yield improvement (Taylor and Fauquet, 2000: 6).

Taylor and Fauquet, (2000) also stated that in Africa cassava for example produces on average 7-8 tonnes/hectare fresh weight harvested product. Field trials performed on cassava under optimised conditions, which eliminated pressure from weeds, insects and virus infections, have demonstrated that yields from 80 tonnes / hectare are possible. Achieving and sustaining production improvements of only a fraction of this would have a significant impact on food supplies in many parts of Africa (Taylor and Fauquet, 2000:6). Other vital facets that Naylor, *et al,* (2000) mentioned are that the challenges for scientists are threefold. They include:

1. The extent of knowledge about the sensitivity of pathogen or pest control of orphan crops that has been useful in developed countries with temperate environments. The concern of the authors is that the usefulness of known transgenic approaches is not yet available for many of these crops.

2. The availability of the techniques for transferring genes into orphan crops.

3. The major limitation in the use of these promising technologies in orphan crops to date is the lack of approaches that can be successfully applied to the control of diseases caused by bacteria, fungi, the oomycetes and nematodes (Naylor, *et al,* 2004: 23-29).

Naylor, *et al,* (2004) also examines the opportunities for utilising numerous forms of modern biotechnology in order to improve orphan crops such as millet, cassava, cowpeas, indigenous vegetables, fruits, roots and tubers. The authors summarise some vital ways in which genetic technologies can be harnessed for orphan crops and provide examples of potential genetic and genomics research that is likely to benefit poorer regions (Naylor, *et al,* 2004:15). However, the question remains, would they be acceptable since they would be genetically modified?

Earlier, James (2001) cited by Naylor *et al,* (2004) observed that most investments in agricultural biotechnology have centered on widely consumed crops that are traded internationally, such as maize, rice, wheat, cotton, soybeans and canola (Naylor, *et al,* 2004:16). The opportunities for utilising numerous forms of modern biotechnology to improve orphan crops receive little public or private investment. Much as the views on orphan crops seem to support food security in Southern Africa, it should be noted that the same controversy on GM food would remain unchanged because the technology is basically similar.

In the context of Southern Africa, cowpeas, cassava, sweet potatoes and other indigenous crops have great potential to resist drought and famine, thereby already contributing to food security in the region. Cassava, which has been overlooked in the past, is a major staple food crop in these regions in North-western, Northern and Luapula Provinces in Zambia. These regions make up 30% of the Zambian population and produce a surplus of cassava in these

regions. The surplus is estimated to be over 300,000 tonnes /year at national level (PAM, 2002:4-5).

2.8. Issues from the Green Revolution

Chataway *et al,* (2000) stated that in many respects the biotechnology debate extends earlier arguments that the Green Revolution commenced prior to the existence of GM crops. The term "Green Revolution" refers to the development of high-yielding varieties (HYVs) in the 1960s. The authors added that these were also "high-response varieties on account of their yield" which depended upon the use of agrochemicals, irrigation and other purchased inputs. These high yielding varieties substantially increased grain yields of wheat and rice, especially in the Punjab district of India. Once distributed, some of the grain helped to avoid local shortages (Chataway *et al,* 2000:474). Additionally, Taylor and Fauquet's (2000) observation is that over the last thirty years, the practices of the Green Revolution have been instrumental in achieving increased crop yields. In this strategy a combination of plant breeding, agrochemical applications and irrigation is used to maximise yields in the cereal crops; most especially rice and wheat (Taylor and Fauquet, 2000:3).

Taylor and Fauquet (2000:3) acknowledged however, a number of negative aspects relating to Green Revolution:

- Reliance on agrochemicals is environmentally damaging as well as overuse of irrigation has resulted in loss of soil fertility and falling yields in some regions.
- The majority of subsistence farmers, who still constitute 75% of the land users in the lesser developing countries, cannot afford to purchase the required chemical inputs and as a result they have not benefited from the Green Revolution.
- The major beneficiaries in Green Revolution have been the larger landowners whose affluence has increased in the developing countries.

Chataway *et al,* (2000:474) cited Conway (1998) who criticised the high yield varieties favouring those farmers who could obtain loans for the purchased inputs. Financial dependency as well as market competition drove numerous people into debt, even out of

business, leading some to commit suicide. Landless peasants eventually became wage labourers for the successful farmers or migrated to cities. Moreover, Chataway *et al*, (2000) also cited Van de Sande (1994) who was critical of the Green Revolution. The observation made was that it offered standard solutions from a far-off institute that was oblivious to local needs and conditions. Given that the high yields depended upon prescriptive inputs, farmers had to be persuaded to apply often-inappropriate innovations for instance pesticides and irrigation. By contrast, the real biotechnology revolution could thrive only in a different culture, by integrating top-down and bottom up interactions. Moreover, biotechnology research should provide tailor-made answers to local problems in local processes (Chataway *et al*, 2000:474-475). Continuing on the above subject, Walgate, (1990) is cited by Chataway, *et al* (2000:475) as stating that: "This argument suggests an important distinction between the two 'revolutions.' Genetic modification techniques have greater flexibility, being available for redesigning a crop for various purposes, not just for the chemical-intensive methods of the Green Revolution".

Warnock and Bonner (1999) also contributed opinions on the Green Revolution versus the GM debate by stating that: "Critics are concerned that GM crops might repeat some of the characteristics of Green Revolution, in which higher yields were achieved at such a cost in inputs that the prosperity of small farmers was not increased and indeed many were forced into debt and off their land" (Warnock and Bonner, 1999:11).

2.9 Genetic Modification

Genetic modification is a specific aspect of biotechnology. Mackey and Santerre (2000:124-125) see biotechnology as improving plant breeding because biotechnology can improve the nutritional content of foods and their quality of taste. Scientists are now modifying soybeans; maize and canola plants so that the oils derived from these plants have improved fatty acid profiles.

On the other hand, AfricaBio (2004:2) gives the following definition of genetic modification:

> Genetic Modification is the process whereby genes are moved into living organisms giving them useful and desired characteristics. Over the centuries, man has learned to accelerate this modification through classical plant breeding and selection, induced mutations, and most recently through recombinant DNA techniques (gene isolation and transfer technologies).

The Nutrition and Agriculture Journal (2000:76) explains that 'trans' meaning "crossing from one place to another" and genic referring to genes. When this process is done then there is disruption of the native by the foreign genes, which could lead to complications as explained earlier.

Friends of the Earth (FoE, 2003:2) mention that genetic modification is very different from traditional plant-breeding bio-techniques. It is a technology, which allows the scientist to take genes from one organism and put them into another. As a result, this changes the characteristics of the organism, or the way it grows and develops. Moreover, it should be noted that transferring DNA and genes from one organism to another is a difficult and fairly haphazard procedure (FoE, 2003:2). FoE (2003:2) adds that as of now, there is no way to perfectly control or direct what takes place. This can result in new genes ending up being inserted at random into the genetic makeup of an organism. In addition, it has been discovered that genes are found in groups, and that inserted genes tend to end up in these groups; so randomly inserting a new gene has the capacity to disrupt the native genes and how they operate. Because of these developments, scientists have voiced concern that such disruptions could lead to unexpected toxins being produced, or to changes in the levels of utilisation of nutrients and naturally occurring toxins. Further, it has been discovered that genes are found in groups, and that inserted genes tend to end up in these groups; so randomly inserting a new gene has the capacity to disrupt the native genes and how they operate. On account of these developments, scientists have voiced concern that such disruptions could lead to unexpected toxins being produced, or to changes in the levels of utilisation of nutrients and naturally occurring toxins (FoE.2003: 2).

However, Thomson (2002: 11) an expert in biotechnology gives a scientific definition and explanation of how DNA works. She defines DNA as follows: "Deoxyribonudeic acid, the complex that makes up genes, stores genetic information". The structure of the DNA

molecule looks like a double helix: two chains wrapped around each other rather like a spiral staircase. The two strands of DNA are held together by base pairing. The steps of the DNA staircase consist of four chemical amino acid bases: adenine, thymine, guanine and cytosine. These bases are arranged in various permutations that constitute the genetic code. This is an alphabet which, despite relying on only four letters delivers massages to the cell that enable it to behave in different ways (Thomson, 2002:11). In other words the above explanation puts the subject-matter into perspective by demonstrating very clearly that the speculations about DNA could mislead the public without scientific knowledge. It follows therefore that in-depth knowledge and expertise is required for organisations that are responsible for educating masses on the issues of biotechnology.

Further, Taylor and Fauquet (2000:4) also described the gene technologies as follows:

> This capability is rooted in the biological reality that the genetic codes (genes) for all living organisms are organised in a similar manner and can, with changes, be made to operate in a non-native genetic background. It is possible, therefore, to transfer genetic information from algae, bacteria, viruses or to move genes between sexually incompatible plant species. For example, crop plants can be engineered to produce their own pesticides, to have resistance to previously toxic chemicals or to have elevated nutritional qualities. Technical advances over the last five years have also demonstrated the ability to simultaneously transfer as many as 12 genes into a plant genome. This greatly enhances the potential to engineer complex disease and pest resistance pathways to produce more robust crop plants. The ability to transfer beneficial agronomic traits across species boundaries, within and out with the plant kingdom, opens a multitude of possibilities which are limited at this time only by our imaginations and by ethical and biosafety considerations.

Sahai (2000:28) offers a critical perspective to the technological developments promoted by and in the interest of affluent economic actors by stating that numerous people have reservations about the possibility of a technological 'fix' and are convinced that the concentration of power in the hands of the few multi-national corporations that control the biotechnology industry leads to a greater marginalisation of vulnerable people and in fact increases their chances of poverty and hunger.

As for the direction of the genetically modified research, the following issues are mentioned:

1. The focus of the corporation's research targets commercial agriculture and that the goal is to maximize corporate profits.

2. Corporate research is not targeted towards meeting the needs of small–scale farmers and that genetically modified crops are not targeted towards helping to alleviate hunger and poverty because there are no regulatory systems in place coupled with a lack of financial investments. The other reason for GM research being concentrated in the private sector is because this is where the purchasing power for its products lies in the developed countries,
3. The increase in the number of genetically modified varieties might strike a further blow to genetic diversity and exacerbate genetic erosion (Sahai, 2000:28).

This latter theory was backed by Warnock and Bonner (1999:8) who mentioned that currently, many small-scale farmers in developing countries maintain a rich diversity of plant varieties. The evidence given is that of India where 50, 000 varieties of plants are grown, and where one survey found 70 different varieties of one crop in a single village in the north-west of the country. These plants all demonstrate different characteristics and can survive under different conditions, so the genes they contain provide 'insurance' against drought or disease, both for small-scale farmers and, ultimately, globally. It is against this background that replacing this richness of local varieties with vast monocultures of a single variety leaves a crop vulnerable to attack by pests or disease (Warnock and Bonner, 1999:8).

The issue is that small-scale farmers always preserve maize seeds for the next planting season, which is not practical for the multi-national corporations because they promote terminator seeds (that cannot produce viable seeds for planting) as part of a strategy to have dominance over the whole food chain (Makanya 2004 :1).

The Background Document for the Policy Reference Committee 11 of the World Council of Churches (WCC, 2002:2-3) mentioned that biotechnology solutions proceed on the premise that humans need to interfere with the bounty of God with a view to satisfy, not first of all the need for sufficiency of food, but for the increased profits of especially multi-national companies. These are the major players in agribusiness and effectively control the global market. In addition, WCC (2002:4) also argued that the theory of poor farmers in the

developing countries benefitting from GM technology is a far-fetched concept because they have no voice that represents them on issues that relate to this technology.

Moreover, Taylor and Fauquet (2000:1) stated that the human race had recently passed two milestones, which caught brief international press coverage. Late in 1999, the world's population passed the 6 billion mark, having doubled in only 40 years. A few months later the billionth Indian citizen was born. The authors added that presently, 80% of the world's population lives in what are considered the developing countries. Despite declining birth rates, world population will continue rising, reaching between 8 and 10 billion persons by the year 2050. Taylor and Fauquet, (2000:1) also mention that almost all this increase will occur within developing countries, adding an extra 2 to 4 billion people to the nations of the developing countries. Described in another manner, population density in developing countries will increase from approximately, 55 per person/km^2 at present to 90-100 people/km^2, or nearly one person per hectare, by 2050. These statistics highlight a reality that has far reaching consequences, and in the opinion of many, constitutes the single most important challenge facing mankind for the coming decades. The challenge is how to manage the environment without depleting it as a result of overpopulation as well as ensuring that sufficient food is produced while measures of family planning educational campaigns are carried out, monitored and evaluated (Taylor and Fauquet, 2000: 1).

However, Livermore, (1999:6) pointed out that concerns about the potential negative effect on the third world farmers can really only be addressed via fair national as well as global regulatory systems. Those with the appropriate technology have a duty to ensure that it is available to poor countries to help their populations feed themselves in the future. Companies should not be doing this for direct financial gain but to help the world's poor to achieve a better standard of living will ultimately be to the benefit of us all.

This point is reinforced by the FAO statement (2000:4) that mentions that:

> FAO considers that efforts should be made to ensure that developing countries, in general, and resource–poor farmers, in particular, benefit more from biotechnology research, while continuing to have access to a diversity of sources of genetic material. FAO proposes that this need be addressed through public funding and dialogue between the public and private sectors.

Additionally, Taylor and Fauquet (2000) acknowledged that it is not to imply that all possible applications of the new technology are inherently safe. Each new product must be viewed as a separate case and assessed in context. For example, release of transgenic cassava in Africa or Asia where there are no naturally occurring related plant species, carries different risks than in South America which is the centre of origin for this crop, and where possible release of the trans-genes into the wild by cross-pollination with its wild relatives must be considered (Taylor and Fauquet 2000:10).

2.10. Different Views on Genetic Modification

Lubozhya (2002:10) does not share the same view with the proponents GM crops and therefore gives evidence to prove that the GM crops do not consistently yield more than conventional crops:

- In May 2001, at Nebraska University' Institute of Agriculture and Natural Resources (in the United States of America) released experimental results showing that Roundup Ready soyabean yielded 6 percent less than their closest non-GM relatives and 11 per cent less than high–yielding non-GM varieties.

- The University of Wisconsin found that GM soyabeans yields from the 1998 harvest were lower than non-modified varieties in over 80 per cent of cases used in trials across nine states of the USA.

- Research published in 1998 by the University of Arkansas and Cyanamid revealed reduced profit levels and lower yields for GM soybeans and cotton compared with unmodified varieties.

- In the United Kingdom, reports of crop trials from the National Institute of Agricultural Botany show yields from GM winter oil seed, rape and sugar beet were between 5-8 percent less than the high yielding conventional varieties (Lubozhya, 2002:10).

The above evidence demonstrates clearly that the claim of GM crops producing so much more food than ordinary crops cannot be accepted at face value. In contrast, Chataway *et al*,

(2000:472) stated that genetically modified crops gave a new meaning to the phrase "high–input" agriculture in the sense that practitioners of this theory concentrate on specialised production of few commodities and use genetically homogeneous seeds. Further, the production environment is controlled using fertiliser, pesticides as well as systems that reduce natural conditions. This type of agriculture is capital intensive and tends to be highly mechanised Chataway, *et al*, 2000: 472,).

However, it should be noted that GM crops are possible only where ecological conditions are relatively uniform and can be controlled (for instance irrigated systems) and where delivery, extension, marketing as well as transport systems are good. Another aspect mentioned is that the seed itself is being further commoditised to ensure that farmers pay for new seed each season. These various technologies include hybrids license conditions, which forbid farmers to save seed for resowing, as well as genetically modified insects that render the progeny infertile (Chataway *et al*, 2000: 472, 475).

Further, Sahai, (2000:28) acknowledged that GM technology has been most successfully applied to the field of agriculture thereby giving rise to what are called genetically modified or transgenic crops. He points out that whereas the application of genetically modified technology to the field of vaccines and medicines has gained public acceptance, its function in agriculture and production has been met with heated debate on account of the safety of GM crops being seriously questioned, thus causing division in the scientific community (Sahai, 2000: 28).

However, the FAO (2000:3-4) states that:

> FAO supports a science–based evaluation system that would objectively determine the benefits and risks of each individual GMO [in relation to the effects on human and animal health and the environmental consequences]. This calls for a cautious case–by-case approach to address legitimate concerns for the biosafety of each product or process prior to its release. The possible effects on biodiversity, the environment and food safety need to be evaluated, and the extent to which the benefits of the products or process outweigh its risks be assessed. The evaluation process should also take into consideration experience gained by national regulatory authorities in clearing such products. Careful monitoring of the post-release effects of these products and processes is also essential to ensure their continued safety to human beings, animals and the environment.

Additionally, Sahai (2000:28) provided evidence of where resistance to genetically modified foods is strongest namely in Europe, followed by Japan and the United States where large scale demonstrations and protests target the practitioners of genetically modified technology, both in the laboratory and in the field. The reason for resisting GMOs is that the consumers are tired of contradictory statements regarding the crops and plants that are grown by the seed companies.

Another factor is the potential risk to human health and the environments as highlighted by the antagonists which have led to boycotting genetically modified products.

Warnock and Bonner (1999:3) reported that:

> Environmental campaigners in Europe are so concerned about the potential dangers of GM crops that they are prepared to break the law to disrupt testing, and the cautious attitude of the European regulatory authority is symptomatic of public concerns about GM technology in food production. The debate over GM crops and their patents rages around the world, whether on farms or in law courts. Key to its resolution will be peoples' access to accurate, under-standable information, not public hype or scaremongering.

Given that there was need for the study to have balanced information on the GM debate the researcher attended a seminar organised by the University of KwaZulu-Natal, the guest speaker was Jeffery Smith, from the United States. Smith (2005) spoke on "The Health Dangers of Genetically Modified Foods and their Cover Up" on genetically modified (GM) foods and crops based on his book titled Seeds of Deception. His work documented the manipulation by industry over the research, media coverage, as well as approval process of GM crops and the author also demonstrated how unsafe the foods are and that they should never be approved.

Among other issues Smith mentioned were that scientists were offered bribes or threatened. There were instances where evidence has been stolen and that data has been either omitted or distorted. He also mentioned that US Government employees who complained about the GM foods were harassed, stripped of their positions, or dismissed. Evidence of ill–health the author mentioned that laboratory rats that were fed on GM crops developed stomach lesions and that 7 out of 40 died within a fortnight. It should be noted that the crop had been approved without further tests being undertaken. An effort by a top scientist to alert the

public regarding his alarming discoveries cost his job and was silenced with threats of lawsuit. Further, he told the audience that internal memos by Food and Drug Administration scientists, warning of toxins, allergies and new diseases were ignored by their superiors. He also alleged that FDA withheld information from the congress after a genetically modified supplement killed nearly a hundred people and disabled thousands (Smith, 2005).

In the light of the above discussion, it is very clear that the debate on GM technology in agriculture as regards the health risks and environment is uncertain. Therefore, it is imperative for governments in Africa to take into account the potential risks as well as benefits and also cultural, economic and social development as they make decisions. The researcher found that though Zambia has a strong history of success in the first and second generation biotechnology such as plant and animal breeding, tissue culture, microbial process and diagnostics, there has been no research as well as development underway in the country on GM crops (AfricaBio, 2004: 31).

2.10.1. Health Effects of Genetic Modified Foods

Bernstein *et al,* (2003:1114) stated that three possible modes of adverse health effects have been hypothesised: toxicity, impaired nutrition, and food allergies. Modifications of expression of protein in foods occur with all kinds of plant breeding; however, these theoretical concerns are not actually unique to genetically engineered foods. Bernstein *et al* (2003:1114) point out that because genetic engineering is a powerful tool for making such changes, government authorities in the United States, Japan, Canada, and other countries have actually put regulatory measures in place for this class of food. For Zambia, there is apparently no recorded evidence of ill health having been experienced by citizens as a result of consuming genetically modified food.

Makanya (2004:4) also stated that little is known about the impacts of GM crops on human health. Extensive and independent studies have simply not been done. But the risks are clearly real, especially for Africa, where diseases, which are effectively controlled in the West, still run rampant (Makanya 2004:4). Moreover, de Gruchy's (2003:90-93) opinion is that whereas biotechnology as well as the genetic engineering of foodstuffs removes control

of the food sequence from the poor and vulnerable people, it is cultural invasion. Food autonomy provides a framework for understanding food within the context of community building. He therefore concludes that it is the building of strong, vibrant and healthy communities that is surely the aim of solving hunger in our continent.

The above statements raise many questions. If the technology is really beneficial for agriculture why has there been an ongoing dispute between the European Union and the United States, over the European Union's refusal to accept genetically modified food, which continues to the present and in addition why has resistance to genetically modified foods increased especially in Africa (Sahai, 2000:28). While Sahai (2000:28) agreed with the view that GM technology has the potential to increase food production as well as improving the nutritional quality of food, the observation is that it is not being utilised by its dominant practitioners, the private corporations that produce either more or better food (Sahai 2000:28).

Warnock and Bonner (1999:11) gave an illustration to support this point of view by stating that:

> The commercial development of genetically modified crops is dominated by Monsanto and a few other major agrochemical companies, including DuPont, Dow Elanco, Novartis, AgrEvo (jointly owned Hoechst and Schering) and Zeneca. The efforts of these companies have so far been concentrated in high-volume crops that offer the most opportunity for sales large enough to recoup research costs and generate profits. The main target crops have been soya beans, maize, cotton, oilseed, rape (canola), potatoes and tomatoes.

Another observation is that it is only the public research institutions financed by public funds that are trying to apply genetically modified research to the crops of interest to poor farmers in developing countries (Sahai, 2000:28). Leaving the task of genetic research to public researchers when the seed corporations are claiming that their technology will help overcome hunger in Africa is a far-fetched concept. These corporations must demonstrate real commitment by investing in genetic research that will also take into account the concerns and fears of the subsistence farmers in Africa (Warnock and Bonner, 1999: 11).

2.10.2. Environmental Effects of Genetic Modified Foods

There has been growing debate around the implications of genetic engineering for agriculture as well as food security from the perspective of social development. The argument presented by de Gruchy (2003:85) is that used by the delegates of African countries participating in the 5th Extraordinary Session of the Commission on Genetic Resources, 8-12 June 1998, Rome. The document states that huge multinational corporations market a technology that is neither proven safe, environmentally friendly, nor economically beneficial to small-scale farmers in Africa but are using the image of the poor and hungry to sell the technology. Further the document states that the delegates are not convinced that such institutions or gene technologies will help their farmers to produce the food that is needed in the 21st century. On the contrary, they were of the opinion that genetic modification does not boost biodiversity but adds new organisms to the environment that could impact negatively on it. This includes local knowledge and the sustainable agricultural systems that local farmers have developed for millennia; thereby undermining their capacity to feed themselves (de Gruchy, 2003:85).

Lubozhya (2002:1,6) stated that there is widespread growing concern among the small–scale farmers in Zambia (who consist of more than three-quarters of the farming population in the country) about the effects of genetically modified crops in the informal seed sub-sector which supplies 80 per cent of their planting seed. The country hosts four seed companies (two of them indigenous namely, Zambia Seed Company (Zamseed) and Mazabuka Research Institute) with superior varieties of various crops that are commonly grown. These companies supply some certified seeds to some neighbouring countries such as Malawi, Angola, Congo DR, and Namibia. Moreover, genetic engineering involved in the seed manufacturing should actually target the small-scale farmers for the reason that they are not in a position to keep buying the seed every farming season, as this is not the tradition in Africa. What needs to be done is to intensify seed research, which could help produce drought resistant as well as nutritious food that is suitable for the continent and its farming processes (Sahai, 2000:29; Warnock and Bonner, 1999: 11).

Regarding the environmental and agricultural impacts, the Nutrition and Agriculture Journal (2000) describes genetic modification as generally used to improve plant resistance to pests as well as weed-killers. Irrespective of whether being destined for human or animal

consumption, the environmental impact of genetically a modified crop is the same (Lubozhya, 2002:5; Nutrition and Agriculture, 2000:76).

Moon (1999:14) also argues that the terminator technology is introduced into some seeds whereby they will not produce crops from the collected seeds in subsequent years. He is convinced that seeds for basic staple crops may be patented, which cannot possibly be right or ethical. The argument here is that in the past people have worked with nature, but genetic modification seems to be working against this because of the risks to human health, contamination of the environment as a result pollen movement from genetically modified maize.

2.11 Conclusion

There are growing fears that GM crops do not offer the benefits that the proponents claim. On the contrary, the GM crops are likely to bring numerous problems, which include serious negative effects on the development of the subsistence farmer in the context of Zambia and other Sub-Saharan Africa.

From literature, the key factor that influenced the Zambian decision to reject genetically engineered food aid is the potential health impact of the engineered maize. Another factor is the risk that the country's maize crop would be contaminated in view of handling techniques that are not in place. The small-scale farmers have a traditional way of saving seed for planting of the next season instead of buying it each year, which would be disrupted upon the introduction of GM. There are fears of unknown impacts of GM crops and damage to the environment. Another area of concern is interbreeding the GM crops with similar crops that might introduce genes that can actually facilitate weeds to resist pests.

However, GM technology has the potential to increase food production as well as improving the nutritional quality of food. It is has been observed that it is only the public research institutions financed by public funds that are trying to apply genetically modified research to crops of interest to poor farmers in developing countries. In terms of food security, women

are responsible for generating food security for their families in many developing countries, especially in the Sub-Saharan Africa and may well be excluded from improving their crop productivity. They not only process, purchase and prepare the food, but also play a vital role in national agricultural production, producing both food as well as cash crops.

Having discussed the literature review, the next chapter will describe the characteristics of where the research will be carried out as well as the demographic profile of the sample.

CHAPTER 3

DESCRIPTION OF STUDY AREAS

3. 0. Introduction

This chapter describes the characteristics of Chongwe rural district and Magoye sub-district where the research took place as well as the demographic profile of the samples participating in the research. See Figure 3.1 for the position of the villages in relation to Lusaka, the capital of Zambia. The rationale for selecting these districts was:

- Both had an experience of agriculture resettlement schemes designed by the government in order to resettle retired public workers under the Public Sector Reform Programme. Therefore the areas were assumed to be similar.
- Most of the land in these areas is under the control of tribal chiefs as well as their village headmen/ women.
- Both areas experience three distinct seasons, namely a warm rainy season from November to April, a cool–dry season from May to August, and a hot dry season in September and October.
- Institutions that deal with research and training for small-scale farmers are available in both districts.
- Animal traction technologies have been developed in both areas for small-scale farmers who are trained through these institutions.
- Heifer International has invested in dairy projects in Magoye and Kanakantapa in Chongwe that benefit both areas through provision of training and dairy cattle, bulls and women's dairy goat projects respectively.
- The districts have also both experienced deforestation although the impact has been different in two areas. In Chongwe, for instance, deforestation was caused by charcoal production and woodland conversion to agriculture. These therefore remain the main cause of land cover changes in this area. In Magoye, deforestation has been attributed to drought, leading to hunger in the area.

Figure 3.1: Map of Zambia showing research sites of Chongwe and Magoye.

(Source: **http://www.multimap.com/map/browse.cgi?)**

This chapter will provide details of the study area relevant for later discussion. It should be observed that though GM maize (as food aid) was distributed in both Chongwe and Magoye, it was later withdrawn by the World Food Programme following instructions given by the Office of the Vice- President that the grain should be removed in order to prevent looting which had been reported near Magoye. Prior to this, the GM maize had been stolen from warehouses and sold to the hungry villagers. As a result, some villagers in Magoye accessed the grain through relatives who distributed it to them. In other words there was an illegal distribution of GM maize among the hungry villagers (Njoroge, 2002:1). There was no record or report of people in Chongwe accessing GM maize after it was withdrawn from the area.

3.1 Small-scale farmers

Prior to discussing the research sites namely, Chongwe and Magoye, it is important to understand the role of small-scale farmers in Zambia. Panos (2004:2) describes small-scale farmers as:

> Small-scale farmers are peasant and emerging farmers practicing mixed farming. Their activities focus on subsistence crops, commercial crops and livestock. The main subsistence crops, mostly for domestic consumption, are maize, sorghum, rice, millet, groundnuts, cassava, and various fruits. Livestock are normally traditional breeds of chickens, goats, pigs, cattle and pigeons. Commercial crops planted are cotton, tobacco, paprika, maize, wheat and rice. Commercial livestock are mainly hybrid chickens for eggs or meat, cattle, goats and pigs.

As for farm systems Kalinda (2002: 66) asserts that small-scale farmers constitute about 75 percent of farm households in Zambia operating on an average farm of two hectares using farm labour and simple hand tools. Conservation farming (CF) offers a set of low input, sustainable agronomic practices for Zambian small-scale farmers using hand hoes or animal draft tillage (Haggblade and Tembo, 2003:2). These authors estimate that roughly 75, 000 Zambian small-scale farmers farmed CF plots accounting for approximately 3% of cultivated area in applicable regions during 2002/3. The livelihoods of small-scale farmers are dependent on agricultural production, except in times such as drought and other natural disasters when they are forced to work on commercial farms so that they can use the funds to buy food for their families. Another dimension is where they sell some of the household assets including cattle as coping strategies (Haggblade and Tembo, 2003:2).

3.2 Chongwe Rural District - Biophysical characteristics

Chongwe District is situated about 50 kilometers east of Lusaka, which is the capital of Zambia, and is located in Lusaka Province, central Zambia (See figure 3.1). The District was created in 1995 out of the former Lusaka Rural district that was split into two districts: Chongwe and Kafue (Chidumayo, 2001:5-6). The landscape of the district consists of a series of east-west hill ranges at between 1200-1500 m above the sea level and a plateau at an altitude of between 910- 1,200 m that is bound by a hilly escarpment to the east and south that merges into the Lunsefwa and Zambezi rivers.

3.2.1. Demographic Features of Chongwe

According to Chidumayo (2001:8-9), the population increased by nearly 41% from 68, 000 in 1980 to 95,750 in 1990; the highest increase of about 67% occurring in the eastern portion of the District under Chiefs UndaUnda and Mpanshya. The population in 1997 was estimated at 144, 000. A survey of eight villages revealed that the number of households increased by 157% in ten years between 1990 -2000. The major cause of population increase in Chongwe district, which includes returning emigrants as well as new immigrants, can be attributed the to availability of land for agriculture and forest resources for charcoal production. An important observation is that the large expansion of village settlements in the area resulted in a shortage of social services, such as schools and health centres (Chidumayo, 2001: 8-9).

Another important aspect about Chongwe District was that the rural population estimated (85% in 1991) were engaged in agriculture. Crop land increased by 3.4 % from 18 700 hectares in 1992 to 19 300 hectares in 1997. Almost 87% of the crop land was devoted to maize, a staple food as well as a cash crop in the area, with the remainder occupied by groundnuts and other cash crops such as sunflower, soyabeans as well as seed cotton The predominant group of farmers are classified as small-scale (Chidumayo, 2001: 10).

3.2.2 Resettlement Schemes in Chongwe

Zambia has experienced several kinds of resettlement programmes. The most important are voluntary resettlement programmes, managed by the Department of Resettlement in the Office of the Vice-President. The two main objectives of the resettlement programmes under the Department are improving the standard of living of the settlers and increasing agricultural production. The settlers include retirees from formal employment and unemployed youth from urban areas (Mutelekesha, 1997: 1).

Mutelekesha's paper (1997:1) described Kanakantapa resettlement scheme in Chongwe district as a case study. Kanakantapa resettlement scheme was established in 1988 and is situated about 50 km east of Lusaka. The scheme covered about 10, 400 hectares of land and involved about 1004 settlers. The main objective of Mutelekesha's study was to undertake an

economic evaluation of the resettlement scheme. This was conducted by analyzing the settlers' socio-economic characteristics and also by undertaking a financial analysis of the settlers' on-farm and off-farm activities. Their estimated income was then compared with the national average to determine their performance on the national level. A cost-benefit analysis was also performed to assess the profitability of the scheme (Mutelekesha, 1997: 1).

The empirical findings of the study survey revealed that the settlers' standard of living had improved and their annual income was above the national average for an average worker. This was not surprising because the majority of the settlers were unemployed before being recruited into the scheme, though the agricultural productivity of the scheme was lower than that of typical small-scale farmers in Zambia, the category into which the settlers were classified. This is mainly because the settlers had difficulties in accessing credit for purchasing farm inputs. Cost-benefit analysis of the scheme revealed that the scheme was profitable only when the high initial capital costs (a grant aid from Japan) were included. This agrees with the conventional theory that the profitability of resettlement schemes are usually impaired by high capital costs (Mutelekeha, 1997-99: 1).

3.2.3 Kasisi Agricultural Training Centre (KATC)

The Swedish Co-operative Centre (SCC) is a non-governmental and non-profit organization for the provision of support to self-help development initiatives such as cooperatives, farmers' associations and informal groups in developing countries. This organization focuses on sustainable development in the sectors of agricultural production and food security, habitat preservation rural financial services and development at local level (SCC, 2005:1).

The SCC observed that the primary objective of this project was to train small-scale farmers in environmentally friendly and sustainable agriculture. The Kasisi Agriculture Training Centre (KATC) is a Christian NGO owned and run by the Society of Jesuits and the Credit Union in Zambia. They offer training in organic agriculture, dairy/pastures, agro-forestry, bee keeping and blacksmithing. Working with the schools and communities, KATC also puts up demonstration plots and hosts field days, with others on the various sustainable agricultural practices (SCC, 2005:1).

SCC also runs primary and secondary schools. Brother Paul Desmarais started the Agricultural Training Centre in 1974 with a two-year intensive course training groups of 10 farmers at a time. Trainees were (and are) provided with a house and a piece of land and they have to grow something on the land to support themselves. Brother Paul's motivation is to grow healthier food and work towards a better environment. For the trainees the main motivation is learning a more sustainable and viable way of growing their crops. The vegetables (cabbage, rape, tomato, onion, pumpkin etc) produced at KATC are sold at Lusaka's Soweto central market. The produce is believed to have a better shelf life than the conventionally produced vegetables (FAO 2001:5).

Training in Agriculture is also given to small-scale farmers, primary school teachers and government extension officers. Since 1997, five-day training courses have been given in sustainable agriculture, covering subjects including soil fertility, crop rotation, inter-planting, conservation tillage, green manure, biological control, compost making and agro-forestry. KATC is currently developing study group manuals that contain about 10 lessons on topics like agro-forestry, sustainable agriculture and minimum tillage. The lessons are linked with radio transmissions on the same agricultural topics. Approximately 35 percent of the farmers being trained at Kasisi are female (FAO, 2001:6).

3.2.4 Funding of the Kasisi Agriculture Training centre (KATC)

The Swedish Co-operative Centre pays the course fees. KATC encourages people from the Southern African Region to come and follow the five-day courses. It was established that they had trained approximately 1 200 Zambian small-scale farmers (FAO, 2001:6).

In 1982 the Workshop for Appropriate Technology was established, carrying out research and development of equipment and tools suitable for production and use in rural areas. Products include oxcarts, treadle water pumps, an ox-powered grinding mill, improved neck yokes and harnesses for oxen, a hand-operated oil press, sisal cement roof tiles, wheelbarrows, small weighing scales and a biogas digester. Research and Development

on passive solar power was undertaken from 1994-96. As a result a solar box oven has been built, which will cook chicken and bake bread (SCC, 2005:1).

Figures 3.1 and 3.2: Appropriate Technology in Chongwe

The technologies, such as treadle water pumps could be very effective in Chongwe and Magoye given that the small-scale farmers are dependent on rainwater for their crops. This would also help the small–scale farmers to avert crop failure by irrigating their crops during drought. If such technology were instigated, the distribution of GM maize (food aid) (or any other aid) would not be necessary because all the measures to avert hunger as a result of crop failure or low yields would have been put in place by small-scale farmers through the Ministry of Agriculture and Co-operatives. These above technologies deserve government investment so as to boost agriculture in the rural areas such as Chongwe and Magoye (SCC, 2005:1).

3.3. Magoye Sub-district

Magoye Sub-district is 164 kilometers from Lusaka, the capital city of Zambia. This Sub-district is predominately inhabited by the Tonga people of Southern Province and falls under Mazabuka District, where the administrative issues of Magoye are dealt with (Heifer International, 2005:1). Ngwezi falls under Magoye constituency with a population of 19 750.

Farming is the major occupation in the area and although thousands of hectares of land are owned by commercial farmers, there is also a reasonable amount of land allocated to small scale-farmers through the Ministry of Agriculture and Cooperatives (National Assembly, 2004:3). Many villages in remote areas of Magoye are in dire need of more stable farming systems that include integrated sustainable food production with conservation of natural resources to prevent urban migration and to sustain the cultural heritage of the population (Heifer International, 2005:16). There is a single dam which is the only supplier of water to farmers and is completely dry. There is no water retention capacity at all (National Assembly, 2004:3).

The impact of this on the small-scale farmers is that they and their livestock are unable to have enough water. The shortage of water in the area is as a result of the poor rainfall which is experienced almost every year, coupled with lack of sufficient boreholes for irrigation. By contrast, most of the commercial farmers around this area have access these facilities. It is considered that the most sustainable solution for increasing the harvest yields of the small-scale farmers is for investment in irrigation technology appropriate to them (i.e. small-scale). The opportunities posed by this need to be seriously considered by the government and other stakeholders.

3.3.1 Weather pattern

The recent rainfall pattern in Magoye has been unpredictable in the past 8 years. People in the area have experienced late rains and also for short rainy seasons, which have affected the harvesting of crops in the area. According to the Golden Valley Agricultural Research Trust (GART) Yearbook (2003:7) the seasonal rainfall for the 2001 -2002 was below the 50 year mean by 8.8%. Between October 2002 and February, 2003 a total of 355.4 mm was recorded in Magoye. This was at a critical stage of crop establishment. Crop performance was adversely affected and resulted in lower yields during the season. Hence, Magoye experienced an agricultural drought during this period. The GART Yearbook (2003:7) describes an agricultural drought as one, which causes low yields in a season, for instance where the rainfall does not exceed 25% of the national average (GART, 2003:7).

Meteorological drought is when rainfall is below normal, low and erratic in a season i.e. November–March /April. The rainfall in Magoye in March 2003 was similar to that recorded in the time amounting between October 2002 and February 2003 (GART, 2003:7). The arrival of Cyclone Japhet brought 401 mm within March 2003 and averted another drought. The situation in Magoye was that the small-scale farmers had water to drink but did not have sufficient food to eat. Therefore, Magoye had both an agricultural and meteorological drought during 2002-2003 (GART 2003:7).

3.3.2. GMO in Magoye

The Zambian government was caught unawares over the issue of GMO because there were no effective biosafety regulations in the country. A Cotton Trust run by Dunavant (USA) engages local farmers in out-grower schemes and in a research component recently. Without the knowledge of the farming community or other key stakeholders, *Bacillus thuringiensis* (BT) cotton was grown for one season in trials at the organization's fields in Magoye, Zambia's Southern agricultural belt. Later, without any announcement or further information, these trials were discontinued, apparently because of a lack of biosafety legislation (Chinsembu and Kambikambi 2001:13-14).

Additionally, the Zambian government did not have the capacity to debate whether food or this case cotton was genetically modified; the government had not yet ratified the Categena agreement which covers the transport as well as use of modified organisms (IRIN news, 2002:3). Moreover, in the same year, 2002, the Zambian government only had *ad hoc* arrangements for dealing with applications for field trials of GM crops (Thomson, 2002:115). In other words, it was too early for the government to deal with BT cotton trials prior to embarking on GM maize trials which constituted the staple food for the majority of the Zambian people who were starving at that time.

3.3.2. Magoye Research Station

Although Magoye Sub-district is a remote area, there is an important institution that plays a pivotal role among the commercial and as small-scale farmers in the area, called Magoye Research Station. This institution was previously under the jurisdiction of the Ministry of

Agriculture and Co-operatives, but it has since been taken over by Golden Valley Agricultural Research Trust (GART). Included in the institution's scientific programmes are the following strategic themes relating to GM Maize: Development and Promotion of Conservation Farming.

Their main areas of research are:

- conservation tillage research;
- farm implement testing and development; and
- soil fertility improvement research (GART, 2003:27).

These are researched through three main areas of activities:

1. Contract research and scientific technical partnerships in the following areas:
   - Testing of crop variations from seed companies; and
   - Testing of agricultural chemicals from chemical companies (GART, 2003:27).

2. Development and promotion of smallholder's livestock systems, focusing on the following areas:
   - Development of a dual–purpose dairy animal suitable for small holder situations (annual sale 200- 250 calf heifers)
   - Adaptive research in dual dairy-purpose dairy production
   - Provide at cost imported goat breeds to smallholder farmers (GART, 2003:27).

3. Engage in innovative and commercial farming:
   - Conducting large–scale demonstrations of proven and promoting technologies. For their relevance to Zambian farmers, for instance, zero and minimum tillage, irrigation systems, new crops (GART, 2003:27).

Another institution that works closely with Golden Valley Agricultural Research Trust is The Institute of Agricultural and Environmental Engineering in the Netherlands, (IMAG). GART and IMAG formalised their relations in 1999 with the signing of a technical partnership on testing and development of agricultural equipment and the promotion of post–harvest

technologies. IMAG has been in Zambia since 1987 cooperating with Africare and other non-governmental organisations, as well as the private sector and recently also with GART (GART, 2003:28).

3.3.4 Impact of Deforestation in Magoye

Magoye Sub-district has undergone considerable loss of forests due to settlement of small-scale farmers who cleared the land for farming and sold charcoal to city dwellers and firewood as a source of income. In recent years there has been decreasing rainfall over the sub-district following deforestation. It should be noted that the physical mechanisms of deforestation have actually affected the climate of Magoye and that the area has been undergoing appreciable loss of forest cover (Meher-Homji, 1991: 5).

Magoye Sub-district has become drier with a greater frequency of droughts influenced by large scale of forest clearance over the past ten years. An important point to consider is that of evaportranspiration within the forest. Trees transpire much more water than short crops and deforestation therefore reduces the amount of water vapour in the atmosphere. Drought can be caused by insufficient moisture in the atmosphere, not just a lack of means of cooling air to condense the water vapour into rainfall. Further, the decline of forest cover therefore impacts significantly on the rate of evaporation and drought dryness (Meher-Homji, 1991:5) The above development has had a negative impact on Magoye in that drought has been experienced thereby leading to crop failure.

3.3 Conclusion

Chongwe and Magoye have been characterised by poverty, high rates of infant mortality coupled with malnutrition. In spite of recent droughts experienced in Chongwe and Magoye institutions have invested in agricultural developmental and other projects. The Golden Valley Agricultural Research Trust and Kasisi Agricultural Training Centre have not only been actively training small–scale farmers in animal traction, but also developing and testing appropriate technologies since early 1980's. Other institutions such as Heifer International have also responded positively toward the need of more farming systems that include integrated sustainable food production with protection of natural resources.

In the Chongwe and Magoye areas, the food security situation had deteriorated because of the poor 2001-2002 harvest. It was also evident that drought had reduced the communities' direct access to food thereby affecting domestic supply. Therefore, food aid was possibly the only way that the hungry villagers could have access to food. The Zambian government's decision to reject GM maize (as food aid) may have impacted negatively, both economically and socially, in these areas. Having considered the two target areas for this research, the next chapter will discuss the method used to collect data in these two places.

CHAPTER 4

METHODOLOGY

4.0 Introduction

The previous chapter described the setting of the research areas in two Provinces of Zambia: Chongwe (Lusaka) and Magoye (Southern) provinces. The justification for selection of the two areas and a description of the study areas were all discussed. This chapter presents the research methodology that was used to determine the views and assess the impact of genetically modified maize (as food aid) on the people of Zambia in these stated areas. Before discussing the findings, the chapter will first describe sampling of the population in the areas of research. The next stage will be to analyse the three methods used to collect data: focus group discussion, informal interviews and questionnaires. This chapter will then describe the data techniques and analysis and summarise the findings.

4.1 Design of the Study

The focus of the research was to understand, on one hand the government's action of rejecting GM maize as food aid, while on the other hand accepting that drought-stricken small–scale farmers would go hungry as a result of this decision. Understanding the perceptions of government officials, stakeholders and small-scale farmers towards the government action was therefore essential to understanding the situation fully.

Food Aid was distributed to all districts that experienced drought in 2002 but was later withdrawn. However, it had been reported that genetically modified maize (food aid) had been available in Magoye sub-district illegally following the looting of the warehouse near Magoye. This was the maize which was later sold to the hungry villagers.

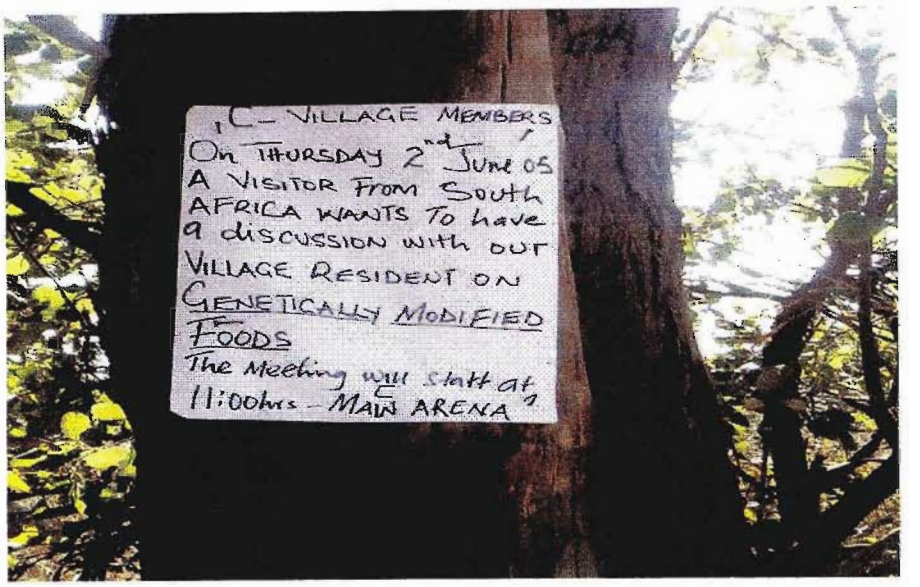

Figure 4.1: Poster advertising the Focus Group Discussion with the researcher in Kanakantapa, Chongwe (June 2005)

4.2 Population Selection

Purposive sampling was used in the research in order to work with different levels of groups of people namely, the government officials, World Food Programme officials, Non-Governmental Organisations (Biotechnology Society of Zambia), headmen and local farmers in Chongwe and Magoye districts. The method facilitated the researcher's ability to collect in-depth data from the targeted informants. Babbie and Mouton (2001:166) argue that sometimes it is appropriate for the researcher to select the sample on the basis of his/her knowledge of the population, its elements and the nature of their research aims: in short, based on the researcher's judgment and purpose for the study. This is important especially in the initial design of a questionnaire: the researcher might wish to select the widest variety of respondents to test the broad applicability of the questions.

In relation to this study, the population was deliberately selected so as to obtain a diversity of ideas from targeted informants on the impact of Genetically Modified maize (as food aid). Permission to conduct interviews and administer questionnaires to the Ministry of Agriculture and Co-operatives officials was granted by the Permanent Secretary. However,

only a telephone interview with the Public Relations Officer was granted by the Country Director, World Food Programme.

The researcher was refused permission to distribute questionnaires to the officials of the World Food Programme because of the political sensitivity of the subject. Consultations with the village co-coordinator and headman and from the villages concerned allowed the researcher to conduct focus group discussions and informal interviews with the participants. Informal discussions with the local people and the government officials also provided some valuable information for the research.

4.3 Survey Materials and Approaches

Data collection began from April through June 2005. The key officials interviewed were, the Permanent Secretary, in the Ministry of Agriculture, followed by the Public Relations Officer of the World Food Programme and then small scale farmers from Chongwe and Magoye. The interview schedule was specifically designed to understand:

- why the present government had decided to reject GM maize at the expense of starving communities,
- why the donor agencies felt that this food aid was safe for human consumption and
- the response of small-scale farmers from Chongwe and Magoye over the government's decision to reject the GM maize.

The interviews were conducted in English, which is the official language in Zambia, while focus group discussions were conducted in Chinyanja and Tonga which are the local languages of Chongwe and Magoye.

4.3.1 Methods of Data Collection

The research used three methods for data collection namely; questionnaires, interviews (both formal and informal interviews) and focus group discussions. Data were collected from the informants and verified according to the method used.

Since the main aim of this study was to assess the perceptions of genetically modified maize (food aid) on the people of two villages in Zambia, data were collected from these categories of people namely; the government officials, World Food Programme, small-scale farmers' village coordinator / headmen and Biotechnology Outreach Society of Zambia.

The data collected were interpreted in the light of available literature. Table 4.1 summarises how data were collected from each of the three levels during the fieldwork. The table shows the target groups and the methods used to collect information.

Table 4.1 Tools for collecting data

LEVEL	KEY INFORMANTS	TOOLS	CHARACTERISTICS
Level One	Government Officials	Questionnaires– quantitative method	**Quantitative** Questionnaires Instruments were used to collect numerical data Meaning derived from statistical procedures
Level Two	World Food Programme Chairperson: Biotech-nology Outreach Society of Zambia	In-depth informal interviews qualitative method	**Qualitative** Data collected "freestyle" Data appears as words Meaning derived from themes, topics
Level Three	Village Coordinator/ Headman Small-scale farmers from Kanakantapa, Chongwe District/ Ngwezi, Magoye Sub-district	Informal interviews qualitative method Questionnaires (quantitative method) Focus group discussion (qualitative method)	

4.3.2 Questionnaires

Questionnaires were administered to both government officials and to relevant NGOs who had been involved with either the provision of Food Aid to drought stricken districts in Zambia or to GM activities.

Department of Agriculture

Questionnaires are an effective method for collecting much data in a short period of time. The questionnaires used were mostly closed ended questions so that the key informants who had knowledge on genetically modified maize could share their present perceptions on the subject with the researcher. The variables were; experience, perception and the impact of banning GM maize in view of drought that hit the country in 2002. The themes of the questions put to the Ministry of Agriculture and Co-operatives officials consisted of personal details, and their views on Genetically Modified maize. The informants were to express their opinion on what basis the government decided to reject GM maize (as food aid).

The officials were also asked why they thought the government took so long to reject the GM maize having distributed it during the previous seven years. Another question the officials were to respond to was the role of the government in ensuring that its citizens were enlightened about GM maize. Further, the officials were to reflect on how the banning of GM maize by the government impacted on the people of Zambia, both socially and economically. The officials' opinion of what governments' measures in ensuring food security in the country were vital.

World Food Programme officials

The variables investigated were: perceptions, ethics, environment and safety of GM maize. The purpose of administering the questionnaires to officials was to ascertain their position regarding GM maize in view of the Zambian government rejecting the grain. The officials were asked to give their opinions on the factors that influenced the Zambian government to reject GM maize and their response to accusations by some African nations that WFP was imposing GM maize on them.

The officials were also asked to state the measures that WFP was putting in place to convince African governments experiencing droughts to accept GM food. In relation to this study, the fieldwork undertaken took place in the natural setting, of the participants' own environment. The data required were collected within a specified period of two months, yet the nature of this kind of study is that it is an on-going study which requires further research.

4.3.3 Small-scale farmers

The set of questions for the small-scale farmers in Chongwe and Magoye included personal details, details about their land, type of cultivation as well as their personal views on the farming constraints and their understanding of GM maize. Their personal views towards the government's decision to reject GM maize were also requested. The focus group discussion themes revolved around personal experiences of food aid, GM crops, and GM food and their personal perspective on how the rejection of GM maize affected their families and the community as a whole.

In case of Chongwe and Magoye, it was relatively economical to distribute similar questionnaires for each group of informants that were selected to respond to the questions. The questionnaires distributed to the respondents by the researcher were collected after 30 and 40 minutes respectively depending on the writing speed of the informants. The majority of the small–scale farmers were literate, except for a few who were assisted by their friends to fill in the questionnaires.

4.3.4 Focus group discussions

Focus group discussions were used to measure the small–scale farmers' general views on the government's rejection of genetically modified maize and how the decision had impacted on their families and the communities. These farmers were grouped in small groups of eight to ten people and then a leader in each group was chosen who administered the topics to the group. The group was allowed enough time to freely discuss these while the researcher acted as a facilitator to each of the groups.

The task of the researcher was to write the views of the respondents in the notebook, and to record the discussions on a tape-recorder for comparative and analysis purposes. Krueger (1994) cited by Litoselliti (2003:1) describes a focus group as a carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment, where participants share and respond to comments, ideas and perceptions.

The group discussions in Chongwe were conducted at a shelter, which was used by these farmers as a meeting place. The centre was also used as a distribution point for food aid. The choice of the site also acted as a catalyst for the focus group discussion. The group in Magoye met at the headman's homestead where most of the meetings that affected their livelihoods were held. The main purpose for using focus group discussions was to allow the participants an opportunity for in-depth discussion on the topic presented to them. Macum and Posel (1998:114) define focus group discussions as small groups of people gathered to participate in a carefully planned discussion on a defined topic. The aim of the focus group is thus to use group interaction to produce in-depth insight to qualitative data.

Babbie and Mouton (2001:292) have also made similar suggestions by stating that the second way of utilizing focus groups is by using the group to find information the researcher would not otherwise be in a position to access. Therefore, the focus groups are beneficial because they tend to allow a space in which people may come together and create meaning among themselves rather than individually.

According to Litoselliti (2003:49), tape recording is very important for the purposes of transcription as well as analysis and recommends use of equipment that allows for high quality recording. Because of the number of people often involved in a focus group discussion, it is often difficult to get high quality recordings and to identify who is speaking at any given time. Consequently, the researcher used a high quality tape-recorder in order to record the proceedings of both groups in Chongwe and Magoye.

After the discussions in Chongwe and Magoye were recorded on a tape, they were transcribed and translated into English by the researcher who conducted these events. All the participants in the focus group discussions were requested to fill in the demographic questionnaires, which were submitted to the researcher after being completed. The village coordinator and headman were interviewed in order to find out their position on the distribution of food aid in their areas.

4.4 Data Analysis

The techniques used for this research were both quantitative and qualitative. Quantitative techniques required that some of the questions asked by the study be answered by giving numerical information to describe phenomena, while the qualitative technique required the use of narrative description. In this case, most of the work in this study used qualitative techniques because this is a case study design.

Chi-square non-parametric analysis was used in order to interpret the responses to the questionnaires and to identify overall trends in the data. In addition, the procedure includes computational equations as well as tables for determining the level of significance of results McMillan and Schumacher (2001:383) state that nonparametric techniques are concerned with frequencies, percentages, and proportions.

The researcher therefore, adopted this method because this was the way of answering questions regarding relationships based on frequencies of observations in categories. In this context, frequencies were mostly people, and these were simply counted in each category. Thus the researcher formed the categories and then counted the frequency of observations in each category.

According to Neuman (1997:426-427) qualitative data analysis entails a search for patterns in data-recurrent-behaviour to develop a body of knowledge and interpreting the patterns in terms of a social theory or the setting in which it will happen. Other findings on the same subject assert that qualitative modes of data analysis provide ways of discerning, examining, comparing, and contrasting and interpreting meaningful patterns or themes. Meaningfulness is determined by the particular goals and objectives of the project at hand: the same data can be analysed and synthesised from multiple angles, depending on the particular research or evaluation questions being addressed.

Qualitative analysis is fundamentally an iterative set of processes (Frechtling and Westat 1997:1). It is worth noting that there are three streams of analysis that play an important role

in qualitative research as discussed by Miles and Huberman (1994:21). These are data reduction, data display and forming, and verification of conclusions that were used as the basis of analysing the data obtained from the research.

Consequently, the data were reviewed by concentrating on what was deemed as relevant to the research questions. For this reason, the important field notes were used in the interpretation. The notes were then grouped according to the sub-problems. Connections and common factors were sought with in the data. These were then compared with existing research, literature and theories. Finally, the conclusions drawn were verified by cross-checking the information obtained.

4.5 Data Reduction

According to Miles and Huberman, (1994:21) data reduction refers to the process of selecting, focusing, simplifying, abstracting and transforming the 'raw' data that appear in written-up field notes. They also note that data reduction takes place continuously throughout the life of any qualitatively oriented project. As data collection proceeds, there are further periods of data reduction (doing summaries, teasing out themes, making clusters, making partitions, writing memos and soon). The authors add that the data reduction transforming process continues after fieldwork, until a final report is complete.

Frechtling and Westat (1997:2) also pointed out that not only is the data needed to be reduced for the sake of manageability, but that they also have to be transformed so that they can be made intelligible in terms of the issues being addressed. Another aspect mentioned is that data reduction often forces choices about which facets of the assembled data should be stressed, minimized, or set aside completely for the purposes of a particular project at hand. In this study, discretion was used to select which data was much more relevant to the research. This was to be done due to the enormous amount of data collected, in view of the heated debate around the topic of GM crops.

Miles and Huberman (1994:21) define display as an organized assembly of information that permits conclusion drawing and action taking. The authors observe that displays in daily life vary from gasoline gauges to newspapers and computer screens. Looking at displays helps people to understand what is taking place and to do something, for example, further analysis or action-based on that understanding. The diagrams in this research were all used to display the findings in this study as a way of assembling information in an organised manner. Miles and Huberman (1994:21-22) include that numerous types of matrices, graphs, networks, and charts designed to assemble organized information in an immediately accessible, compact form, so that the analysts can see what is taking place in order to draw justified conclusions or to move on to the next step.

Finally, Glaser and Strauss (1967) cited by Frechtling and Westat (1997:5) refer to data display as:

> Method of constant comparison, an intellectually disciplined process of comparing as well as contrasting across instances to establish significance patterns, then further questioning and refinement of these patterns as part of an ongoing analytic process.

According to Frechtling and Westat (1997:8) conclusion drawing requires the researcher to become objective when considering what the analysed data mean and in assessing their implications for the research questions at hand. This process calls for stepping back as well as interrogation of the data, using what Miles and Huberman (1994:245-262) have coined "tactics for generating meaning." This includes noting patterns, and themes, clustering cases, making contrasts and comparisons, partitioning variables, and subsuming particulars in general (Frechtling and Westat 1997:9).

As for validity, it was necessary for the researcher to judge the extent of legitimacy that was present, based on all the available evidence during data collection. The researcher also demonstrated that the assumptions and conclusion made by the study had evidence and that validity therefore existed. In order to make this study reliable, the researcher had to ensure that there was consistency of measurement to the extent that the results were similar using different techniques of data collection. Reliability of the study was also established with the individuals who were familiar with the topic of the research question and was done through the interviews with people like the government officials and the Officials from World Food

Programme. Ultimately, the goal of the researcher was to provide credible conclusions which were based on the research problem and sub-questions.

4.6 Conclusion

The focus of the research was to understand, on one hand, the government's action in rejecting GM maize as food aid, and on the other the response of the drought stricken small-scale farmers on GM maize. Understanding the small-scale farmers' perceptions of the government action was therefore essential if one was to understand the situation fully. In other words, was it good scientifically based government decision, or was it one made for political gain. This chapter dealt with the methodology that was used in the research.

The use of qualitative and quantitative research methods that were applied in the research has been discussed. The methods of data collection, population selection and measurement of the sub-problems were all included and described in this chapter. Having discussed the methodology used in this research, Chapter 5 will present the results of the study and the interpretation of the findings.

CHAPTER 5

FINDINGS OF THE STUDY

5. 0 Introduction

The previous chapter presented the research methodology which was used by this study to determine the perceptions of genetically modified maize (food aid) by the people of Zambia in the following areas namely: Chongwe and Magoye. The key informants in this study were the Government officials from the Ministry of Agriculture and Cooperatives, World Food programme, Biotechnology outreach of Zambia and the small-scale farmers from Chongwe and Magoye. This chapter will commence by focusing on the government's position on GM maize as food aid and the response of World Food Programme as a donor agency and then perceptions of the drought stricken small-scale farmers on the government's action. Through the fieldwork findings, the research will systematically present the results of the study for both the main research problem and each sub-problem.

5.1 The Government's Position on Genetically Modified Maize.

The researcher conducted an interview with the Principal Agricultural Research Officer in the Ministry of Agriculture and Cooperatives with a view to understand the government's position on GM maize. See Appendix A. The respondent was among the delegates on the fact-finding mission that was assigned by the Zambian President to investigate the issue of GM maize. When asked how he viewed the Zambian government rejection of GM maize (food aid), which was imported by the World Food Programme in 2002, his response was that the organisation had not informed the Zambian government prior to import that GM maize was to be brought into the country. The respondent also stated that it was feared that the distribution of GM maize could lead to accidental plantings and subsequent contamination of the local maize varieties and germplasm.

Another aspect the respondent mentioned that the Zambian government was not satisfied with information regarding the safety of GM foods to human health, and therefore decided to take a precautionary approach. When asked about the public response following the government's decision to ban GM maize, the respondent mentioned that the response from the public following the government's decision to ban GM maize was mixed with the majority supporting the government's position. He went on to say that the affected communities were anxious to get food and therefore, they were not happy with this position (See Appendix A).

5.1.1 Responses from the Ministry of Agriculture and Cooperatives

The researcher visited Ministry of Agriculture and Cooperatives officials at Mount Makulu Research Station (Seed Control and Certification Institute) in Chilanga, Zambia, with a view to give them the questionnaires. Seven officials were available at the time and responded. See Appendix B. These officials were mostly middle management. They were generally aged between 30 and 35 (4) and mostly male (5). It was imperative to access data from the government officials in management levels because they were better placed in society considering their knowledge on seed breeding and GM technology. In other words, the researcher was confident that the officers were rich key informants or were likely to be knowledgeable and informative about GM technology.

Table 5.1 Views on government's decision to reject GM maize according to agriculture officials (2005)

		Frequency
1	Consensus by the Zambian people	2
2	Concern for future consequences (health)	4
3	Economic ties with EU at stake	1
	Total	7

The informants were to express their opinion on the basis for the government's decision to reject GM maize (as food aid). These were basically that the government decision was correct in the light of concern for the possible future consequences in relation to human and environmental risks (4 officials). While others suggested that the decision to reject GM maize was based on the consensus of the Zambian people and economic ties with European Union (EU) were at stake (See Table 5.1). . Literature supports this reason because Zambia is one country that has maintained GM free policies to certify and protect domestic food markets to Europe (Cohen *et al*, 2003).

The officials were also asked why they thought the government took some years to reject the GM maize. Most (six officials) responded that lack of information was the main reason. Though the issue of economic ties with the European Union was not regarded as one of the reasons for banning GM maize, it was an important factor to consider because two government officials were quoted as saying that the government would lose its European market if they started growing GM foods and that if the government engaged GM, its exports would be thrown overboard which would cost thousands of lost jobs (Iafrica, 2002:2; Michael, 2002:2). Additionally, none of the respondents indicated that it was pleasing to the donors. The reason could be that the Zambian governments' decision reject GM maize was unpleasant for the United States government, while this decision pleased the European Union in that GM maize was rejected by its trading partner (Zambia) (See Table 5.2).

Table 5.2: Agriculture officials' responses for the delay by government in banning GM maize.

		Frequency
1	Lack of information	6
2	Political mileage	1
	Total	7

Zambia has been a recipient of food aid for 7 years and yet the issue of banning GM maize was not debated until 2002. The lack of information could be attributed to ignorance by the

technocrats in the government on GM technology. None of the other reasons provided in the questionnaire were supported as relevant to the government for banning the GM Maize: evidence of allergies from GM maize, ignorance and to gain political mileage did not feature much. Lack of information was felt to be the underlying factor for the delay in banning GM maize. (See Table 5.2)

Another question the officials responded to was the role of the government in ensuring that its citizens were enlightened about GM maize. The main avenues recommended were radio (three officials as top method) while four officials suggested newspapers as the most suitable route. Seminars were not thought to be very important. The respondents were unsure about how to address this issue although one respondent suggested capacity building in GM technology, development, commitment and understanding within the government would play a vital role to the citizens of Zambia.

Further, the officials were to demonstrate how the banning of GM maize by the government impacted on the people of Zambia, both socially and economically. Two officials suggested that the banning of GM maize had been a threat to food security. While five officials were of the view that the people of Zambia were not affected socially and economically. These views contradict both press reports and information from United Nations agencies that about three million people were threatened with hunger as a result of drought that in Zambia (Iafrica, 2002).

The government officials' views on the measures the government was taking to ensure food security in the country varied. Three officials suggested that equipping agricultural extension officers with more information on early warning systems for droughts would be important. While two officers were of the opinion that encouraging irrigation among small-scale farmers would lessen dependency on rain and enable them to grow food more food. Another two officials proposed that making agricultural inputs available to small-scale farmers would contribute positively to production of food thus enhancing food security in the country. Another aspect was that no officials saw the need to increase funding in the Department for Extension work (See Table 5.3).

Encouraging alternative cultivation of crops in provinces that are prone to drought was not seen as an important factor to food production in the country by the officials. From the literature Panos (2004) mentioned that expensive inputs, lack of extension support from the Department of Agriculture, drought, and dilapidated road infrastructure, coupled with late delivery of agricultural inputs are among the constraints that the small-scale farmers face. The researchers' interpretation was that the officials did not appear to pay much attention to Food Security at all.

Table 5.3 The views of agriculture officials on government measures for ensuring food security in the country

		Frequency
1	Equip extension officers with more Information	3
2	Encourage irrigation among small-scale Farmers	2
3	Make agricultural inputs available for Farmers	2
	Total	7

Additional views of the government respondents on genetically modified maize were as follows: Precautionary and biosafety assurance is required. Prior consent and specifications of food aid is important. It can be safe or harmful to human beings or animals, depending on what has been modified. There are uncertainties over: biosafety regulations which should play an important role (not in place yet). One officer said that it was difficult to provide a specific answer, unless it was for a specific variety and specific testing procedures.

As mentioned earlier, the government officials were not aware of the specific issues regarding GM maize that had a bearing on the government's decision to ban GM maize. This lack of knowledge was supported by Mnyulwa and Mugwagwa (2002:25) who stated that the

levels of biotech awareness in Zambia are low among scientists and even lower among the rest of the population.

These views are relevant to the study because literature reflected that the potential risks to human health and the environment were among the key factors that influenced the Zambian government to reject GM maize as food aid due to scientific uncertainty surrounding the issues of importing GM maize into the country (Cohen *et al*, 2003). Lewanika (2003:3) who defended the governments' decision to reject GM maize, argued that health and environmental concerns were based on the following three reasons:

Genetically Engineered (GE) foods might contain new food toxins or new allergens, and might increase antibiotic resistance because of the widespread use of antibiotic resistance marker genes in GE products. The environmental concerns were based on the fear of genetic contamination of traditional varieties since some recipients of the GE food aid would save of it for planting since it came in the form of grain. This could lead to the loss of agricultural diversity in Zambia.

During the fieldwork in Zambia, the researcher informally visited the Ministry of Science and Technology with a view to accessing the publication of National Biotechnology and Biosafety Strategic Plan 2003-2007 March 2003. The views of government officials regarding the Biosafety Strategic Plan were that there was need for the nation to institute an enabling environment for biotechnology research, development applications, and commercialisation. This paper was the first step towards the establishment of an enabling environment, thus the government developed a national biotechnology and biosafety policy. AfricaBio (2004) also points out that the legal framework is missing, though this omission was supported at the opening of the third session of the ninth national assembly, when the President implored the members of parliament to support the biosafety bill when government presented it (AfricaBio, 2004: 31-32; Mumba, 2004:1).

5.2 Other Non-governmental Organisations

Other NGOs provided information for this study. These included the Biotechnology Outreach Society of Zambia, Panos, and World Food Programme. Their perspectives are included below:

5.2.1 Biotechnology Outreach Society of Zambia

An interview was held with the current chairperson of Biotechnology Outreach Society of Zambia, (BOSZ) and a Senior lecturer in Genetics and Biology in the School of Natural Science at the University of Zambia. His views regarding the factors that led to the rejection of GM maize in 2002 by the Zambian government were that there were both scientific and trade issues: scientific in that Zambia had no capacity to monitor GM food's coupled with a lack of qualified personnel with knowledge on biotechnology. Another factor was that the legislation has not been put in place to regulate biotechnology. The other aspect was the fear of losing the European Union market for the products exported to Europe. (See Appendix C for the transcript)

During this interview with the chairperson of BOSZ, it came to light that his organisation has embarked on campaigns to sensitise the public about biotechnology. The target groups include:

- Members of Parliament
- Chiefs
- Editors representing both print and media
- General public through conducted programmes on both radio and television.

Moreover, the respondent added that scientifically speaking there is no empirical evidence of GM maize causing harm to either humankind or animals. He also pointed out that there were no reported records of people experiencing ill-health since GM maize had started to be consumed. As for the concerns raised about the environment, the chairperson observed that it was important to take precautions on behalf of the environment because it has not been determined scientifically as to what extent the GM maize could contaminate the environment. Given this background, the evidence for negative environmental impacts was inconclusive.

5.2.2 Panos

The researcher also linked up with Panos Institute Southern Africa, an independent regional information communication organisation that seeks to cultivate an enabling environment for marginalised people to take part actively in informed and wide-ranging public and policy debates and decision–making processes by generating information. An appointment to have

an informal interview with the Director was not possible. However, the senior information officer provided some information about the debate regarding Genetic Modification. This explained the debate about GM world-wide and also featured the rejection of GM Maize in Zambia. Another issue was that the government should allow all stakeholders to participate in the debate with a view to contributing positively to GM technological awareness. He also stated that there had been very little information available before 2002 in Zambia. This contributed to ignorance amongst ordinary people.

5.2.3 World Food Programme

The researcher interviewed the Public Relations officer of World Food Programme by telephone. Her response the questions on the WFP's position on GM maize was that her organisation had no stand on the Zambian government's rejection of GM maize from 2002 to date. The role of WFP was to cooperate with the government of the day on issues of food aid. Further, the respondent also mentioned that when the government rejected the GM maize, the organisation had brought 80,000 tonnes of non-GM maize (food aid) into the country. At that point, the respondent was not willing comment on the remaining questions. (See Appendix D for questions).

The researcher was not allowed to interview any other officials. However, the researcher contacted the Regional Public Affairs for Southern Africa, whose response was that WFP could not be drawn in the debate on whether GM maize was fit for human consumption or not. From the respondent's point of view, the Food and Agriculture Organisation and other United Nations agencies had endorsed that the maize was fit for both human and animal consumption. Moreover, he did not want to paint a picture that World Food Programme was acting as an advisory institution to the Zambian government in ensuring food security especially in the areas that are prone to drought.

5.3 Responses from the Small-scale farmers' Perspectives.

In order to obtain the small scale farmers' perspectives of this government decision and their understanding of GM maize and Food Aid, a number of people were interviewed. These

included the village coordinator for Kanakantapa settlement, Chongwe; the village headman, Ngwezi settlement, Magoye; and farmers from both these villages. Informal interviews with the senior key informants were conducted and focus groups discussions were conducted with village members.

5.3.1 Response of the Village Coordinator, Kanakantapa village, Chongwe

The researcher was privileged to have an audience with, the village coordinator for Village C in Chongwe southeast of the capital city of Lusaka. When asked to comment on the problems faced by the community. The respondent explained that there are 300 households in Village C sharing three boreholes that are not functioning well because the rods are broken and thus, requiring spare parts in order for them to supply water for both domestic use and gardening. According to the respondent, this situation has forced women to travel long distances to fetch water for domestic use. As a result their efforts to grow more food have been hindered.

Asked about the impact of the drought in the area in 2002 after the government burned the GM maize, he pointed out that the situation was very bad though no deaths were recorded because most of the small–scale farmers have relatives in Lusaka which is the nearest city who supplied them with food.

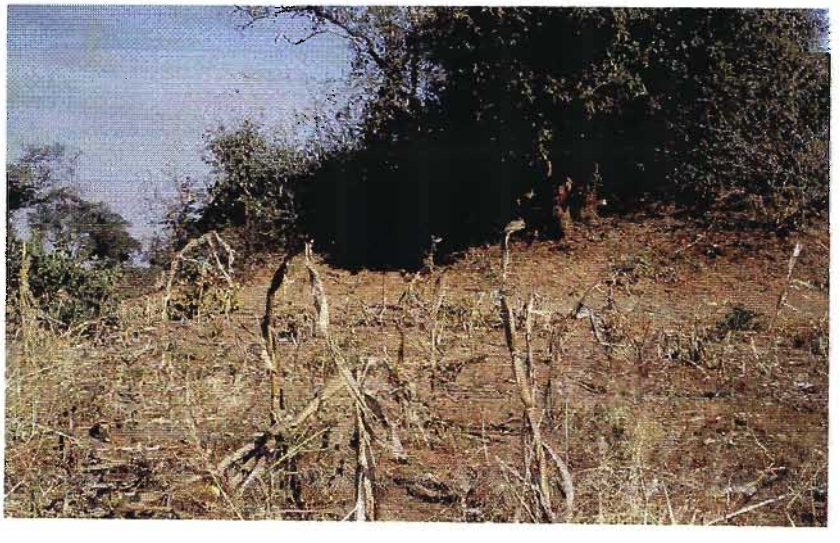

Figure 5:1 The Effect of drought in Kanakantapa, Chongwe (June 2005)

However, some members of the community resorted to food for work with people who brought maize, sugar and salt from Lusaka. For instance, working 1 lima/hectare = 20 kg of maize, 1 kg sugar and 1 kg salt. He also referred to 2004/2005 farming season as having experienced low yields and crop failure in the area due to erratic rainfall. The respondent also stated that it only rained in November for about 2 weeks and late January thereby affecting crops (maize) at tasselling stage. This situation led to crop failure in the area.

Commenting on the people's knowledge about GM maize, the respondent stated that people were ignorant about GM maize and that the government has not given enough information to the public. He also added that it is only the negative side of this technology that has been demonstrated as harmful to both human and environment without explaining the benefits to the public so that they could make informed decisions about consuming GM maize or not.

As for the government's role in food security in the country, he asserted that the community is more than ready to cooperate with the government in enhancing food security as long as boreholes are repaired so as to facilitate farming activities in the area. He also revealed that the community is not only growing maize (it is the staple food) but also groundnuts, and green vegetables which they sell to government and private institutions in Lusaka. In this respect, they need the support of the government by providing agro-inputs early as well as loans for seeds and other farming prerequisites that play an important role in boosting agricultural production in the area.

5.3.2 Response of the Village Headman, Ngwezi village, Magoye

The researcher had an audience with the headman of the above village Magoye sub-district. When asked about the farming constraints in the area among the small–scale farmers, the headman said that the previous government of Dr Kenneth Kaunda ensured that agro-inputs were readily available to the small–scale farmers prior to the farming season. This is no longer the case; small–scale farmers prepare their fields early in view of the onset of the rains, but their plans are frustrated because fertilisers are distributed when the crop (maize) is almost tasselling. This affects the crop as well as yields among the small-scale farmers.

Another aspect he mentioned is marketing of their produce (maize). The headman stated that Food Reserve Agency is the only recognised government institution that buys their produce. But he observed that the agency delays in processing the purchase of maize. As a result, private businessmen from Lusaka exploit them by trading their maize with clothes and wrappers for women (for example, 6 meters of wrappers = 50kg of maize). Sometimes they are forced to sell their produce cheaply because they are stranded and would like to sell it so that they can support their families financially. The respondent's response to the question of the community's reaction to government's rejection of GM maize was that, the people were actually opposed to burning GM maize because they have been consuming the maize for the several years without experiencing any of the illnesses as perceived by the government.

He added that people had found it difficult to take sides with the government because it has been distributing the same maize without raising any concerns. He went on to say that the people's perception is that condemning GM maize when they have been starving has not solved the problem; instead it has worsened the situation and made them resort to looking for wild fruits and roots which were a risk to their lives.

As regards the diversification of crops in view of persistent drought in the area, the headman said that the people have been used to growing maize as the only staple food traditionally speaking. However, he mentioned that people also grow sorghum and millet on plots of half a Lima/hectare. He also consented that encouraging people to grow other foods such as sorghum and millet would be beneficial considering that they are drought resistant, but was quick to observe that it would take a lot of education for the community to begin to grow such crops for food because the mentality among them is that these crops are cultivated for the sole purpose of brewing beer. He also agreed that it is important that people weigh the advantages and disadvantages of growing these crops.

The headman also added that apart from growing maize, the small-scale farmers grow groundnuts; sunflower and cotton. However, he observed that growing cotton has proved profitable because the Dunavant Company gives the farmers loans in the form of seed and chemicals to spray against the diseases and also delivers empty bags for the harvest of cotton.

The other advantage he mentioned was that the same company also buys cotton from the farmers at reasonable prices thereby uplifting the lives of the farmers economically. The respondent's response to the question of government's role in ensuring food security in the country was that animal dipping plays an important role in agriculture in the sense that healthy oxen assist in tilling the land for farming purposes which helps to improve food security.

Another point he raised was that healthy animals are needed to transport produce to the depot (sales office) for sale. He expressed fears that dipping of animals costs K5,000.00 Kwacha (R6.00 per head) which is not economically viable for poor farmers. However, dipping of animals would also reduce the spread of diseases such foot and mouth that has claimed thousands of animals in the area.

5. 3.3 Focus group discussion report for Kanakantapa village, Chongwe

Kanakantapa village discussions

The above meeting took place in Kanakantapa resettlement in Village C from 14.00 to 17.30 hours. All the focused group discussions were held at the main arena. The total number of participants was 35 (25 men and 10 women). Three groups were formed and each group discussion took about 30 to 40 minutes. The local language which was used by the researcher and the community was Chi-nyanja. (See Figure 5.2).

Group 1

The first group consisted of five men and three women. Describing their personal experience about food aid, all eight of them acknowledged that they had been recipients of food aid during droughts in their area. Three members however, expressed unhappiness with the distribution of food aid in the past because some of the villagers registered for food aid even when their rich relatives from Lusaka supported them with food; and yet they could not disclose the truth to the committee responsible for distribution of food aid.

When asked about their experience of genetically modified crops, five expressed ignorance about such crops. They mentioned however, that they have heard rumours that such plants

could cause trouble for the future generations if they are grown and cultivated by the scientists especially in Africa, where the people experience hunger most of the time. Two members stated that what they have heard is that GM crops can actually help alleviate hunger in Africa by the processes that enable them to multiply very quickly.

One member however, cautioned the rest of the group that the GM crops are said to be harmful to other farm crops through pollen and that they are capable of destroying large hectares of crops if they are not controlled or stopped by the farmers. Asked as to whether any member of the group has had an opportunity to attend a seminar on GMOs. The response from all of them was that none has attended any gathering instead; they just hear people in the community talk about it.

In the case of GM food, two members stated that their suspicion was that any food aid could be GM food. Their argument was based on the government's withdrawal of food aid in 2002 from the drought stricken areas and yet food aid has been the trend over the past six years or so. They were therefore, convinced that there was a relationship between food aid and GM food. Three participants also observed that the current food being imported from South Africa such as oranges and bananas are very unusual in terms of their size. They added that apart from their size, oranges in particular that are imported are actually tasteless and have too much water. Asked if they know different varieties of oranges, they mentioned that they may not know the names but they were aware of different varieties and they were convinced that there was something extraordinary about the mentioned food.

Their views on the government's rejection of the GM maize were as follows: two members disagreed with the government because the community was given what they called "half baked" information (which was actually negative) in that only the harm to both human and animal and the environment were mentioned and not any advantages of the maize. Three members felt that the government had a valid point and that it was concerned about the welfare of the people and also about the consequences of consuming the maize. One member felt that the whole issue was politicized in that it did not make any sense at all. To him, the

most important thing was the immediate need for food aid in the country and not the quality of the maize.

With regard to the impact of the government's rejection of the GM maize, all eight members of the group were adversely affected in that the majority had only harvested very little food due to crop failure. They mentioned that they had to work in people's fields in exchange for 10 kg of maize per day on half a hectare. This was how they survived until the government brought in non-GM maize.

Four members felt that the government's role in ensuring food security in the country, could be achieved by introducing irrigation systems that are suitable for the small–scale farmers in their area. The other four were of the view that if the idea of irrigation proves to be too expensive, then the alternative solution to sink more boreholes which would be an appropriate way to help alleviate hunger in the area. At the time of the interview, 300 hundred families were currently depending on three boreholes. The group felt that such projects would encourage the small–scale farmers to produce not only crops but also grow green vegetables throughout the year and could also provide extra funds by supplying their produce to Lusaka.

Group 2

This group comprised of ten members (six men and four women) Asked about their personal experience of food aid, all ten members agreed that it is food that is distributed to communities that are in need of food as a result of drought in their area.

It was also observed by three members that food aid in most cases was donated by rich countries like the United States and the United Kingdom. Another observation made by two members was that sometimes food aid is distributed through food for work programmes. Further, all members except for one demonstrated that they had no knowledge about GM crops. However, they were able to link the crops with GM food, because three members said as far as they were concerned that GM crops and GM food meant the same thing.

These participants went on to say that the only difference is that GM is divided into two groups namely crops and food while the technology involved was basically the same. In agreement with the other members, four members said that GM was a relatively new term that would require a long time for them to understand what it is and how it operates. Two members added that they needed someone to fully explain to their community what this technology entails in order for them to know how this technology is affecting their lives.

Asked whether they have seen GM maize before, five members recalled having received some yellow maize during the drought in 1990's. It was at this point that they were able to state that they did not see any difference between ordinary maize and GM maize except for the colour. Three members also mentioned that the only knowledge they had on GM crops and GM maize was the belief based on the information from the government that the maize was harmful.

Four members were not happy about the government's rejection of the GM maize, because it denied them food at the critical time of drought. This was viewed as government's neglect of its people. They also stated that no matter how genuine the reasons were for rejecting the GM maize, people's welfare comes first and that non-GM food aid should have been sought first before distributing the GM maize in the affected areas and later withdrawing it from the starving people. By contrast, six members felt that perhaps the government meant well and that it should be given a benefit of doubt that it made such a decision, which apparently was not in favour of the people. This was said in relation to fears of health hazards that these members have heard of concerning this GM maize (as food aid).

All ten members stated that the impact of the government's rejection of the GM maize, adversely affected their families both economically and health-wise. Economically, in the sense that they could not sell any of their produce because of crop failures that were attributed to drought experienced in 2001-2002 season. The community also experienced health problems in that they did not have adequate food for their families and thus their health was affected. Meals were reduced from three to two and sometimes to one meal per day, thereby undermining the nutritional status of the families.

As for the government's role in ensuring food security in the country, five members proposed that it is imperative that they construct dams in every district that could serve the purpose of farming. This could facilitate year-round farming thereby producing food throughout the year. Three members added that if dams are constructed that would mean having enough water even to water their gardens. Another aspect mentioned by two other members was that cash crops such as maize should be grown throughout the year thereby supplying the country with enough maize meal.

Group 3

This was the last group the researcher worked with in this community. The number of participants in this group was eleven comprising six men and five women. Their explanation about food aid was that they received food aid in the past years. Three members mentioned that the late arrival of food sometimes rendered the whole exercise difficult because of the process involved in distribution of food aid. One member said that food aid was not as free as he thought because there were times when people had to work for the food even when they did not have the energy to do so. Four members felt that the distribution of this food aid should be done freely to all the needy people.

In response to their understanding of GM crops, one member said GM crops are those crops whose genes have been altered in order to produce different crops. He went on to say that according to the workshop he attended in Lusaka on GMOs genes from a camel or any other animal or plant can be combined with the genes of the maize seed in order to produce the desired seed so that it can withstand the drought. However, he was quick to mention that the disadvantage of this technology is that it is harmful to humankind and the environment. As for GM food, three members of the group stated that they thought that the banned GM maize by the government could be among the foods being discussed in the group. The other four participants mentioned what they had heard about this food and that it is harmful to people especially the future generations.

Some examples given were that future generations/children/people may have eyes at the back of their heads as a result of the present generation consuming the GM maize. Another example was that children born in the next generation are likely to be deformed because of consuming the GM maize. Two members suggested that among the contributing factors to illness such as cancer could be attributed to the current GM food that people are consuming. They gave examples of chickens that grow so quickly because of chemicals given to them in order to grow quickly and be ready for consumption. Asked about their views on the government's rejection of GM maize, five members responded that the government should first have secured non-GM maize in advance and distributed the food to the people rather than tell them that GM maize is harmful when they desperately needed the food.

They added that they had been consuming the maize for along a time and therefore did not see much sense in the government preventing the people from eating the food now. Four participants however, countered these views by stating that perhaps the government meant well by rejecting the maize in order to prevent future consequences (such as illness). They even quoted an old adage which says "prevention is better than cure". One member said the government's timing was not right though it meant well because denying people food when they are starving did not solve the problem.

Asked how the participants were affected by the government's decision by rejecting GM maize, all eleven participants mentioned that they were adversely affected in that they had harvested very little food in the field as a result of crop failure. The consequences were that they had to leave their families early in the morning in search of wild fruits, and food for work. Some went to the extent of selling some property in order for them to buy some food which did not last very long. It took several months before the government delivered non-GM maize to their area.

In response to the government's role in ensuring food security, five members stated that one critical issue the government should seriously look at is the delays in distributing agro-inputs (fertilizers) to the farmers which also slows their farming activities and affects their harvest as well. Three members supported the idea and cautioned the government against causing unnecessary delays in the agricultural sector if the nation is to move forward in enhancing

enough food in the country. Four members also added that it was the government's responsibility to ensure that agro-inputs are distributed in time in order to encourage the small–scale farmers to produce more food in the country.

Figure 5.2 The researcher with Focus Group discussion team in Kanakantapa, Chongwe (2005)

5.3.4 Focus group discussion report for Ngwezi village, Magoye

Ngwezi settlement village B

The focus group discussion in Magoye took place in Ngwezi settlement section B with small–scale farmers. The meeting was held at the house of the headman of that area. Most of these farmers had lived in this place for as long as 30 years. The people of the village organized the meeting. The total number of people who attended was 25, 16 men and 9 women. These 25 participants were divided into two groups.

Group 1

The first group began the discussion with ten members and eventually ended up with thirteen members because three participants joined the group. The group was made up of five women and seven men. When asked about what their experience of food aid was they mentioned that they have been recipients of food aid in the past eight years.

Their definition of it was that, it was some kind of food that is distributed by the government to the communities especially in rural areas during the crop failure period (drought season) known as the *danga* period in Tonga. During the discussion, three elderly men stated that this food mainly comes from developed countries to help the developing countries like Zambia to feed its people during these periods of drought. This according to the group this was the reason why the people in the area gave this food aid a special name as *cihole-hole* (meaning food for free distribution). Food aid was a very familiar topic to this group because all the people in the group had been beneficiaries of the food aid from the government.

When asked what they knew about GM crops, one member mentioned that he had planted the maize seed which he thought was GM maize and he stated that he did not see any harm with the crop to people or to the animals at that time. He was however quick to mention that during that time he had not taken the issue of GM seriously because the government had not said anything negative about GMOs then. This farmer could not tell whether the seed had yielded any crop because at that time he regarded this seed like any other seed. In fact, he had

mixed it with other maize seeds as a result he was not able to monitor the developments in terms of its effect among the ordinary crops.

Other six members from the group could not agree with the idea that GM maize can even germinate. According to them, they had never seen any GM crop germinate before. Three members observed that there was lack of knowledge on the issue of GM crops both from the government and from the community. The members felt that this kind of ignorance was dangerous because whatever information they had concerning GM maize was based on rumours. Therefore, they felt that there was need for someone to provide accurate information that would help the community to understand the new thing that everyone was talking about.

With regards the genetically modified food, all the members felt that there was nothing wrong with the food as opposed to the rumours that the food is harmful to humankind. Four women commented that the food is meant for consumption irrespective of the technology. They also mentioned that the world is changing in terms of technology; the argument therefore that some foods are dangerous could not be over-emphasised in this era. The women went on to say that hunger knows no technology.

Two participants commented that they did not know much about GM food and went on to say that it was better to have food than to starve when there is food available for consumption. The group's view on the government's rejection of the GM maize was that the government had treated them as orphans by withdrawing the supply of food at the time when they needed the food most. The group felt that this was an unjustified act by the government. They also argued that the people who made the decision to burn the GM maize are those who are busy enjoying the balanced meals in their homes in the city and had nothing to do with the GM maize consumption.

When the group was asked how the rejection of GM maize affected their families they expressed disappointment. Two participants said that some villagers were actually forced to get this maize from the storage facility illegally because they could not stand the situation

where they saw their children starve to death when there was maize in Magoye storage facility. The group concluded by saying that the rejection of maize affected the whole settlement area to the point that four children died in Chitongo village after eating poisonous wild fruits due to hunger.

The groups however observed that this case could not be reported to the press for fear of victimisation by the authorities who wanted to give the impression that all was well with the people without GM maize. Though the number of the families that consumed the stolen maize was not mentioned during the discussion for fear of victimisation, the researcher found out that about eight families had had access to the GM maize (inferring that 61.5% of those present in the group had consumed GM maize). The people's emotions at this point were very high as they murmured against each other and spoke to the researcher in a form of plea to be their spokesperson to get the government to rescind their decision.

Their views on the government's role in ensuring food security in the country were that that the government has not done much because even after withdrawing the GM maize, the government could not come up with any alternative that could help alleviate hunger to the people. The group also cited the late arrival of agro-inputs like seed and fertilizers as a serious drawback to the farmers in the area. The group argued that if these farming inputs are brought in time then farmers will be able catch up with the rainy season which they also saw as having changed its pattern drastically.

The other point raised was the unfair distribution of these inputs to the farmers. The women in the group observed that sometimes the agriculture extension officers do not consider women's applications for seed and fertilizers and yet some of these women also have fields like men. This was seen as unfair treatment, which sometimes has even left out the widows and single parents. The meeting with this group ended late at 11:00 hours and much discussion continued as these participants went back to their homes.

Group 2

The second focus group met at the same venue as the first group on the same day. The group consisted of seven men and five women. Asked about their experience about food aid, all the

members agreed that they were recipients of the food aid from the government and that sometimes it came in the form of food for work. Three members added that the package of food came in a form of food for work. This included construction of roads, up-grading the community school and working on the farms of the leaders. As for the building of the school, the community had agreed that since the people in the community were not willing to help in school construction, the only way to have the people to work was through food for work.

This system worked very well and at this time the school, which started as a lower primary school, has been upgraded to high school. When it came to working for the leaders, the people who were involved in the distribution of food aid sometimes made people work in their fields in exchange for the food. (All this information was disclosed with a lot of caution since some of the leaders who were culprits of the food for work programme were also there in the meeting). The package that the people worked for included 5kg mealie-meal, 1kg rice, 1kg beans, and 750mls cooking oil. The food and the amount of work done never matched and even the mode of distribution was not very good. In most cases the people who benefited more were the leaders in the community and the families of those who were in charge of the distribution. The people in this group appreciated that food aid had helped them to survive the hunger in their area.

As for GM crops, the group members consented that they had no knowledge at all and that they just heard rumours that the GM crops are harmful to other crops if they grow in the same field. As regards the GM food, all the members expressed ignorance apart from hearing rumours that the people who eat this kind of food would fall ill in the future though they did not notice anything wrong now. When the group was asked to comment on the government's rejection of GM maize in 2002, their reaction was that the government owed them an apology for withdrawing GM maize from them and claiming that the maize in question was not good for human consumption without explaining in detail the risks involved to the public. None of the members supported the idea of withdrawing GM maize from them. Three members added that they did not care about health matters because their primary concern was to feed their families and not the dangers of consuming the maize. Four other members also observed that the government through the Ministry of Agriculture and Cooperatives has scientists

employed who are capable of examining the crops as well as the maize seed and that this was what they could have done before withdrawing the maize.

According to the group the rejection of GM maize did not only affect their families but also the entire community in Ngwezi. The entire group mentioned that they resorted to picking wild-fruits and roots, which could be dangerous for children, but they had no option at all. Some members of the community, about eight families accessed GM maize which was stolen from the warehouses near Magoye, when the policemen were overcame by hungry people. This infers that 66.6% of the group had eaten GM Maize.

As for the government's role in ensuring food security, two elderly participants brought in a point on land rates which they thought affected their income saying, the government has to a large extent neglected their community in that each family with a bigger plot is obliged to pay K530,000.00 Kwacha (R884.00)annually for land rates. Their argument was that out of this fee, the balance could be used to bring electricity to the area which will help with irrigation and thus improve food production. This proposal was backed by four participants who mentioned that the government should not just look at the loss it incurs when bringing development to the people because if the area develops and is able to produce enough food, the government's efforts will pay dividends in the end. Five participants also proposed that sinking of bore-holes would help in boosting agricultural activities in the area. The group cited a well near one of the villages that caters for three families which has also been used to grow vegetables because of the availability of a water table. The group felt that this well needed to be improved by digging it deeper so that it could be used for irrigating large fields as a way of improving food security. On the other hand, three participants also suggested that the government should encourage small-scale sugar cane growers to venture into growing maize in order to increase maize production in the district.

Figure 5.3 A vegetable garden near a well which supplies water to more than three families, Ngwezi, Magoye (June 2005)

Group 3

The above focus group discussion took place in the afternoon about 15.30 hours. The rationale for holding the discussion in the afternoon was that the majority of the mothers had taken their children to the under-5 clinic which is about 15 Kilometers from village B and only managed to arrive later in the day. Upon arrival in the village, they were told about the meetings that took place in the morning. This news prompted them to mobilise themselves and seek an audience with the researcher. When the researcher was told about the developments, an immediate meeting was held. The number of participants was nine (six women and three men).

When asked to describe their personal experience of food aid, GM crops and GM food, they responded by consenting that it is food given to the people who are experiencing hunger. And that they have been beneficiaries of food aid as a result of crop failure in their area in the past years. Three participants however, expressed unhappiness about the food distribution in the village because the people who benefitted most from the exercise were relatives of the

officials appointed by the headman to administer the distribution of food and this caused a lot of conflict among the people. As a result some families with little food had no alternative but to enroll for the food for work programme.

As for the knowledge of GM crops, their response was that they knew nothing about it and the same applied to GM maize. However, four members said that there have been rumors that the GM maize was poisonous and that people would fall sick in the future as a result of consuming the maize. In response to the former respondent, two participants also observed that no illnesses have ever been reported since they started consuming the maize from food aid in the 1990's.

Asked about the their views on the government's rejection of GM maize, one participant's response was that the government acted like a parent who brings food on the table which is ready to be eaten and then suddenly withdraws it and says wait for other food to be prepared when the children are starving. "How long can they wait for the food?" This statement was supported by the other five members. Two participants wondered why the government brought the genetically modified maize in the first place. The whole group felt that the government should not have brought the GM maize to the warehouses for storage because it was tempting for the starving people to just look at the prohibited maize.

When the participants were asked how the rejection of the GM maize affected their families and the community as a whole; all of them agreed that hunger had hit their area so badly that most of the parents spent time looking for food, not only to feed their immediate families but also the extended members. None of these families had admitted to eating stolen GM maize. Another point made was that farming was on a decline in the area because people paid their attention to food gathering. In terms of education, they mentioned that children in the lower primary could not manage to go to school because there was insufficient food in the families to feed them and as such did not have enough strength to cover long distances to school.

As for their views on the government's role in ensuring food security in the country, three members proposed that all feeder roads in their area, which become impassible during the

rainy season, should be graded before it begins to rain and also ensure that bridges that were swept away by water are repaired by the Ministry of Works and Supply. The group also observed that the poor roads prevented the government from supplying them with farming implements on time.

Four members also suggested that the government should seriously consider giving loans to small–scale farmers so as to purchase irrigation equipment which is economically suitable for them as well as teaching them about the advantages and disadvantages of the technology so that they could improve their farming. The participants saw the Magoye River as the main source of irrigation. Two members also supported that idea and added that they were convinced that this kind of approach would go a long way toward alleviating crop failure in their area.

Figure 5.4 Magoye River, the main source of water supply (apart from wells) for Ngwezi (June 2005).

Another area the participants looked at was the preservation of seasonal local foods which they thought was a good way of ensuring food security in the area. Three women observed that during the times of harvest there are certain foods that can be preserved locally and kept for consumption during the drought period.

One woman cited that she had just been preserving foods like pumpkin leaves, cucumbers, okra, sweet potatoes and wild fruits for future consumption. The group felt that the government can help them improve their method of food preservation by proving the appropriate technology. The most important aspect is that food preservation enhances food security in that people could fall back on the food they have preserved.

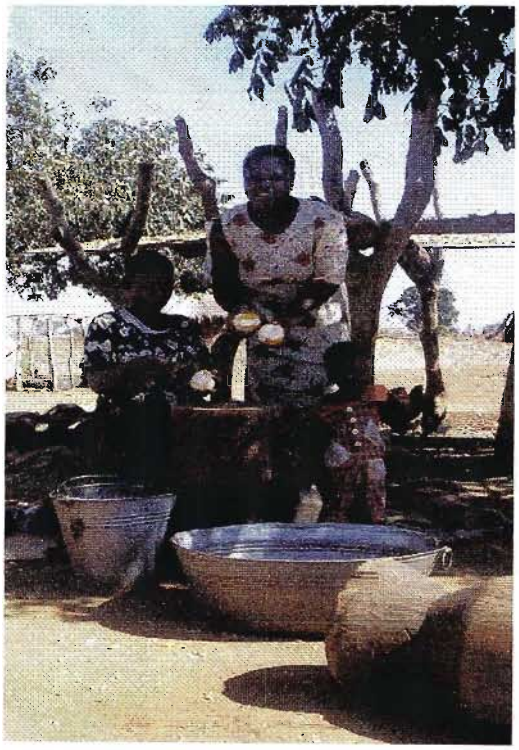

Figure 5.5 Preserving indigenous cucumbers in Ngwezi, Magoye.
(June 2005)

5.4 Interpretation of Chongwe and Magoye focus group discussions

There were six focus group discussions held with 60 people participating, 41 men and 19 women small-scale farmers. The focus group discussions demonstrated that the decision made by the government to reject the GM maize adversely affected the population economically, socially and health-wise. From the response above, there is evidence that people were engaged in distressful coping strategies in order to survive. The most common ones included:

- Changing consumption patterns, this meant reducing from 3 meals to 1 per day.
- Starvation leading to death (the account of one recorded person who died in Magoye region, and four children dying from eating poisonous wild roots)
- Introduction of food for work programmes where people worked for food on different projects.
- Removing children from school: lower primary were affected most. These are the young ones who were sent to find wild fruits and roots and were unable to cover long distances going to school on an empty stomach.
- Sale of capital assets such as radios, cattle, ploughs and other valuable assets.
- Village–farm migration: the villages were deserted on account of searching for work on the farms as well as townships.

The following data was obtained from various groups that participated in Focus Group Discussions both in Kanakantapa, Chongwe and Ngwezi, Magoye. First their coping strategies in the light of delayed food aid and drought are discussed, and then their perceptions of GM foods.

Kanakantapa, Chongwe

Group 1 mentioned that they had to work in people's fields for exchange for 10 kg of maize per day on half a hectare. This was how they survived until the government brought non-GM maize.

Group 2 said that meals were reduced from three to two and sometimes to one meal daily, thereby undermining the nutritional status of the families.

Group 3 mentioned that consequences were that they had to leave their families early in the morning in search of wild fruits, and food for work. Some went to the extent of selling some property in order for them to buy some food which could not even last long. It took several months before the government delivered non-GM maize to their area.

Ngwezi, Magoye

Group 1 and 2 participants stated that they resorted to picking wild-fruits and roots, which could be dangerous for children, but they had no option at all. Some members of the community said that about 8 families' in each group accessed GM maize which was stolen from the warehouses, when the policemen were overcome by hungry people. This was how the GM maize found its way into the village, this is how they survived.

Group 3 members said that food production declined in the area because people paid more attention to food gathering. In terms of education, they mentioned that children in the lower primary were affected because there was insufficient food in the families to feed them.

Interpretation of Focus Group Discussions in Chongwe and Magoye in relation to food aid, GM crops and foods and their responses towards government rejection action in 2002.

Personal experience of Food aid

All the groups had an experience of food aid in their communities.

Genetically modified crops

There was lack of knowledge regarding GM crops in all the groups.

Some groups stated that GM crops and food were the same in terms of technology.

Others mentioned that GM crops were harmful to humankind and environment as indicated by the government.

One of the groups also said that future generations could be affected by GM technology.

Genetically modified food

Some groups linked the GM food to food aid, while others could not see anything wrong with GM food because it was meant for consumption.

Others linked GM food to banned GM maize by the Zambian government.

Views on government's rejection of GM maize

Their views on government's ban on GM maize were that they were give half-baked information.

They also argued that they had been consuming GM maize for a long time.

Others said the timing was wrong altogether in that GM maize was withdrawn when the people were starving.

Effects of governments ban of GM maize on families

All groups mentioned that the government's decision to reject GM maize adversely affected their families both economically and health-wise.

Some mentioned that the government treated them like orphans and neglected them.

Four children died in Chitogo village as a result of eating poisonous wild-fruits.

Others resorted to little food for much work.

They had very little harvest or nothing at all.

5.5 Maize cultivated in Chongwe and Magoye

The results from individual questionnaires given to farmers to complete (See Appendix H) related to farming systems, cultivating of GM crops and the general understanding of livelihoods in areas where drought was common. Farmers were also asked about their attitude to GM crops and foods. These questions reflect the potential for farmers ward off hunger during frequent droughts, reducing the tendency to rely on food aid. These farmers were volunteers who remained after the focus group discussions (24 from Chongwe and 20 from Magoye) and were mostly men.

There was a tendency for Chongwe to have larger maize fields compared with Magoye with a chi-square significance of p = 0.06 (See Table 5.4). One of the contributing factors was that the Kanakantapa resettlement of Chongwe had more potential for development in terms of infrastructure such as roads, electricity, and construction of dams. The market for their produce was closer to Lusaka in comparison to Magoye. In Magoye most small-scale farms had up to one hectare under maize. Chidumayo (2001) added that almost 87% of the crop land in Chongwe has been devoted to maize, a staple food as well as a cash crop in the area.

In view of the persistent droughts being experienced in the country it would be prudent for the small-scale farmers to diversify their production to food crops other than maize. Although maize has been traditionally grown in Chongwe for many years, there is need to educate small-scale farmers to seek alternative cash crops that could improve rural household incomes. This could be done slowly with the technical assistance of the agriculture extension officers in the area. Programme Against Malnutrition also supports crop diversification especially in the areas that are prone to droughts (PAM, 2002:4).

Table 5.4: Size of land under maize cultivation in the two villages

Size of Land under maize			Village	
			Chongwe	Magoye
1	No cultivation	Count	1	2
2	Half-1 hectare	Count	15	17
3	2-3 hectares	Count	8	1
	Total		24	20

Chi square a tendency (p=0.06)

5.5.1 Maize Harvested in 2001/2 in Chongwe and Magoye

Despite the drought, Chongwe had a tendency towards greater maize harvests than Magoye (p=0.57) (Table 5.5). So was the larger harvest the result of more land planted under maize? Maybe, but fertilizer also played a role because it was applied earlier (at planting) in

Chongwe than Magoye. Maize production in Magoye was drastically reduced because of the drought in 2001/2002. There had been not enough investment in maize production because small–scale farmers did not see it as economically viable. Another important aspect was the removal of agricultural subsidies in 1990 by the Zambian government that impacted negatively on production of maize countrywide and resulted in the increase in the production of non-food cash crops such as cotton.

Table 5.5: Maize harvested according to village in 2001/2 season

Maize harvested			Village	
			Chongwe	Magoye
1	no harvest	Count	1	4
2	1x50kg	Count	13	15
3	2 x50kg	Count	7	1
4	3x50kg	Count	1	0
5	4x50kg	Count	2	0
	Total		24	20

Chi-square a tendency (p=.057)

5.5.2 Maize Sales for 2001/2 in Chongwe and Magoye

Small-scale farmers in Chongwe managed to sell some maize during 2001/2 because of early planting coupled with greater soil fertility in the area (sandy loamy soils) (See Table 5.6). Chongwe is predominately the maize producing area of Lusaka Province. The impact of harvesting so much maize in Chongwe meant that the community could sell the product and be self–sustained economically and that some of the produce could also stored for future use. A large harvest of cotton would mean that the farmers could pay back the loans and be in a position to buy maize or maize-meal and other food for their families to feed. This amount of maize in Chongwe was significantly greater than Magoye (p=0.000). The lack of agro-inputs, coupled with erratic rainfall, were contributing factors that led to low yields in Magoye. Production of maize in this area was basically for household consumption.

Table 5.6 Maize sold in 2001/2 according to village

Produce sold for 2001/2 season maize			Village	
			Chongwe	Magoye
1	Nothing sold	Count	1	7
2	1-2x50kg	Count	8	3
3	3-4 x50kg	Count	8	0
4	5-6x50kg	Count	2	0
5	0ver 7 x50kg	Count	2	0
6	For consumption only	Count	3	10
	Total		24	20

Chi-square very significant: (p= .000)

5. 6 Effects of other Crops on Food Security and Income Generation in the two villages

- **Groundnuts for Consumption**

There was a tendency for the Magoye small-scale farmers to produce groundnuts for consumption, while their counterparts in Chongwe sold some of their groundnuts (Only a tendency because X^2 test found p=0.062). Few farmers cultivated groundnuts (four in Chongwe and six in Magoye). It was also noted that groundnuts do not require fertiliser and that the cost of inputs is low and thus more profitable.

Table 5.7: Groundnuts Produce sold in 2001/2 season by village

Produce sold for 2001/2 season groundnuts			Village	
			Chongwe	Magoye
1	nothing sold	Count	20	14
2	1x50kg	Count	1	0
3	2x50kg	Count	2	0
4	For consumption only	Count	1	6
	Total		24	20

Chi-square: a tendency (p=.062)

- **Cotton Out-grower Scheme in Magoye**

The cotton harvest in Magoye demonstrated very significant differences when compared to Chongwe on account of the incentives offered by Dunavant Zambia Limited (P=.000) (See Table 5.8) This company bought out Lonrho Cotton in 2001 and is the leading company in cotton growing with a ginnery capacity of 95,000 tonnes of seed cotton. Further, Dunavant contracts with out-grower farmers (in Magoye) by providing them with inputs, such as seeds, fertiliser, insecticides and empty bags for the produce. The distributors working with Dunavant manage between 20 to 40 small-scale farmers each, to whom they lend inputs and recover the input loans at harvest. Additionally, the cotton out-grower scheme provides training and extension service programmes for all its small-scale farmers. The out–grower scheme recruits the farmers and aims at improving productivity and quality standards of the cotton produced by the small-scale farmers.

Table 5.8: Cotton harvested according to Village (2001/2)

cotton harvested			Village	
			Chongwe	Magoye
1	no harvest	Count	24	2
2	1 x 100kg	Count	0	16
3	2 x 100kg	Count	0	2
	Total		24	20

Chi square highly significant (p=.000)

At present the company is working with more than 100,000 small–scale farmers producing cotton across Zambia (RATES, 2002/3:14). No cotton growing was reported in Chongwe.

Figure 5.6 Cotton growing in Ngwezi Village B, Magoye. June 2005

- **Sorghum and other crops**

Only three small-scale farmers in Chongwe and Magoye cultivated and harvested sorghum. This demonstrates that this crop is not popular among the small-scale farmers in the two areas mentioned. In Magoye it is used for brewing beer. It is labour intensive as the grain is vulnerable to birds. This means that the small–scale farmer has to spend a lot of time in the fields to prevent birds from eating the grain. The crop is basically grown for own consumption. Another crop that is only cultivated for consumption is beans, known as Kabulangeti. Only two small-scale farmers from each district had grown this crop for consumption purposes. This crop is not popular among the people in Chongwe and Magoye and is mainly grown in Northern Province. It is labour intensive in that it requires weeding in the early stages and it depends on rainwater.

5.7. Perceived Impacts of GM Maize

There was a tendency for the people of Chongwe to be more knowledgeable about GM maize in comparison to Magoye. The contributing factor could be their proximity to Lusaka where there could be more access to newspapers and other sources of information. However, it is important to note that the knowledge the people have is based on rumours rather than on

science. Statements such as: "GM maize is harmful to our health and animals" had no supporting evidence that GM maize was actually harmful to the humans and animals in their own villages.

In relation to such statements, it is important that the people are given accurate information about biotechnology and literature on GM maize. This is a challenge for the Zambian government to ensure that the extension officers in the Ministry of Agriculture and Cooperatives are trained on the above topics and are in a position to disseminate the information to the local people so that they can make informed choices. The small-scale farmers in Magoye tended to express greater ignorance about genetically modified maize than those in Chongwe in spite of consuming it (p=.02). (See Table 5.9)

Table 5.9 Understanding of GM maize by village

Responses relating to GM Maize				Village	
				Chongwe	Magoye
Understanding of GM maize	1	Yes	Count	20	1
	2	none	Count	16	19
		Total	**Count**	**24**	**20**
Experience of GM maize	1	none	Count	24	17
	2	yes	Count	0	3
		Total	**Count**	**24**	**20**
Impact of GM on health	1	have no knowledge	Count	16	19
	2	have some idea	Count	8	1
		Total		**24**	**20**
Impact of GM maize on environment	1	have no knowledge	Count	18	19
	2	have some idea	Count	6	1
		Total	**Count**	**24**	**20**

5.7.1 Experience of GM maize

The small–scale farmers in Magoye had a tendency to have more experience of GM maize because the looters that stole more than 500 hundred bags of GM maize from warehouses near Magoye and sold it to the hungry villagers. The initial information about Magoye was that the distribution of GM maize did actually take place; which is why it was selected for this study.

Other literature findings were that the Office of the Vice-President's Office ordered the international aid organisations to remove GM maize from the storage warehouses across the country so as to prevent further looting (Njoroge, 2002:1). Though the grain was not distributed directly to the people, some of the villagers in Magoye had had access to it. The Chongwe community did not access GM maize after the government withdrew the grain from the area and therefore, had no direct experience of the grain. There was no evidence of the community in Magoye planting the GM maize seed thus there was no negative agricultural impact reported in the area in terms of maize crops being affected by GM maize through either pollen or land contamination. See Table 5.9.

5.7.2 Perceived Health Impacts in relation to G M maize

Levels of knowledge about health impacts of GM food in the villages were very poor. There was a tendency in Chongwe for the ideas about health issues relating to GM maize to be based on rumour. The general understanding was that the consequences of consuming GM maize were bad. However, the rumour was contradicted by the current chairperson of Biotechnology Outreach Society of Zambia, and a Senior lecturer in Genetics and Biology in the School of Natural Science at the University of Zambia, who said there is no empirical evidence that GM maize causes harm to either humans or the environment. He also pointed out that there were no reported records of people experiencing ill-health since GM maize had started to be consumed.

Furthermore, a Zambian government official had called on Zambians not to consume GM maize because of the lack of scientific evidence of its health effects (Njoroge, 2002:1).

Though the experience of consuming the GM maize in Magoye may not have had any effect, it is probably a long term impact that needs to be critically examined by the scientific community. See Table 5.9.

5.7.3 Perceptions of the People in Chongwe and Magoye about GM maize

There was a tendency for Chongwe to have more accurate ideas about GM diseases than Magoye. However, the researcher observed that there were major differences in knowledge about GM technology and its potential risks between the government officials and the people at grass-roots level.

The perceptions of the people in Chongwe, (who had no experience of eating GM maize) were that people are likely to experience stomach upsets, headaches and that boys may become impotent because of the chemicals found in genetically modified food. These concerns are based on rumour as discussed previously. The Zambian government, however, rejected GM maize in grain and milled forms, citing health, environmental and trade concerns with the European Union in August 2002. Magoye's perceptions (who had eaten the GM maize) were that there was nothing wrong, no-one had become ill and that they had been eating such food aid maize for years with no ill-effects.

5.7.3 Perceptions of the people in Chongwe and Magoye about Environmental Impacts or Cropping of GM maize

The absence of accurate knowledge about GMO's in Magoye made the situation difficult for the people to articulate the issue confidently, even though they demonstrated enthusiasm about the subject and mentioned that the visiting researcher was the first person to officially discuss this subject in their community in an open forum.

As for the concerns raised about the environment, the chairperson observed that it was important to take precautions on behalf of the environment because it has not been determined scientifically as to what extent the GM maize could contaminate the environment. The people in both these villages were ignorant of the ramifications of growing GM Maize.

See Table 5.9. Given this background, the evidence for negative environmental impacts found by this study was inconclusive.

5.8 Views on Government Action regarding GM maize in Chongwe and Magoye

Significantly, although the Chongwe community also experienced drought in their area, they were of the view that the government was justified in rejecting the GM maize from 2002/3 because they did not want to contaminate their land which they regarded as still suitable for farming (See Table 5.9). It should be noted that the Chongwe people were not enlightened about the "precautionary principle". They would just rather not compromise their support for the government's decision. The Chongwe community represented the people who supported the government's position. See Table 5.9.

Table 5.10 Perceptions of the government decision on agricultural activities by village

Impact on agricultural activities			Village	
			Chongwe	Magoye
1	Ignorant	Count	5	15
2	Do not allow GM maize to come	Count	4	5
3	Govt did well to reject GM maize	Count	12	0
4	Use of natural methods	Count	3	0
	Total	Count	24	20

Chi square very significant (p=.000)

The views of the Magoye community, however, were based on ignorance: that there were no disadvantages of using GM maize. The impact of genetically modified maize was not a reality because they had previously consumed this GM maize and had experienced no impact in their area, either in terms their farming activities or personal health. The people in Magoye were not concerned about the potential impact that GMO might have and that accessing the GM maize was the most important thing at the time because they were starving. The Magoye people were among the communities that had been anxious to get food and were therefore not

happy with the government's decision. The issue of access to the GM maize was apparently more important than debating on the potential GM impacts that might have occurred in their community.

5.9 Future Consequences taken into account by Chongwe and Magoye communities

Very significantly, (P=0.00) see Table 5.11, the Chongwe community was more concerned about potential health matters than the people in Magoye. The people of Chongwe agreed in principal with the government's position in spite of their ignorance on the subject-matter, whereas in Magoye there was no agreement with the government. Their hunger was more important than any other issues. The views in Magoye were supported from literature, although Taylor and Fauquet (2000:10) acknowledged that biotechnology is not a panacea for world hunger.

Table 5.11 Future consequences of consuming GM maize by village

Future consequences on consuming GM maize			Village	
			Chongwe	Magoye
1	health concerns	Count	17	3
2	improve farming	Count	1	0
3	no problems yet	Count	5	7
4	not convinced	Count	1	10
	Total		24	20

Chi square very significant (p=0.000)

5.10 Conclusion

The views of the officials in the Ministry of Agriculture and Cooperatives towards the government's decision to reject GM maize were basically a concern for future consequences about potential human health and environmental risks, in the face of inconclusive evidence which the Zambian government cited as reasons for rejecting GM maize (as food aid) in 2002.

The cotton harvest in Magoye demonstrates significant differences when compared to Chongwe because of the incentives offered by Dunavant Zambia Limited, although this

organisation does not provide food for the people. The earnings from cotton sales enable them to buy maize-meal for their families. Although this institution has been present in Chongwe, it has not impacted on this area because not many farmers are growing cotton compared to maize.

Harvesting lots of maize in Chongwe meant that the community could sell the produce and be self–sustained economically and that some of the produce could also stored for future use. Although the small-scale farmers in Chongwe had also experienced drought in their area they were of the view that the government was justified in rejecting the GM maize because it did not want to contaminate the land which they regarded as still suitable for farming. Chongwe's unscientific concepts related to people who eat GM maize were likely to experience stomach upsets, headaches, and other illnesses.

Small–scale farmers in Magoye had a tendency to have more experience of GM maize because of the looters who stole more than 500 hundred bags of genetically modified maize from warehouses close to Magoye and sold them illegally to the hungry villagers. Magoye had no health concerns relating to GM maize. It should be noted that hunger concerns were expressed in both areas.

Evidence is that the farmers in Chongwe and Magoye resorted to working in other's fields for payment in form of maize-meal and also wild fruits and roots for their survival. Other coping strategies were also identified.

Chapter 6 will focus on conclusions as well as recommendations. It will begin with an introductory summary which will describe the problem statement and purpose of the study, and a discussion on what was done in order to resolve the research issues in the study.

CHAPTER 6

CONCLUSIONS, DISCUSSION AND RECOMMENDATIONS

6.0 Introduction

This chapter concludes the work covered in this study, and aims to give a brief summary of the work covered, to discuss some of the issues that have been raised by the study and to provide recommendations for further research. The chapter will provide a summary on the impact of the Zambian people of its government's rejection of the GM food aid to the people of Zambia when the country was undergoing a serious shortage of food. Special reference will be made to the small-scale farmers of the two selected research areas: of Kanakantapa settlement village C Chongwe, and Ngwezi settlement village B Magoye.

Since the purpose of this study was to determine the government's motivation for removing GM maize as food aid in 2002 and the impact of genetically modified maize as food aid on the people of two villages in Zambia, the research targeted specific groups of informants who were in some way connected to the issue of GM maize (food aid) in Zambia: government officials, people from NGOs, and small scale farmers in Chongwe and Magoye villages. Chongwe was reported to have not received GM maize while Magoye had through illegal distribution.

Interviews were conducted with government officials and NGO personnel to obtain their views of GM foods used as Food Aid in Zambia. Interviews and focus groups were also conducted with small-scale farmers and officials in Chongwe and Magoye in order to assess their perceptions of the government action removing GM Maize as food aid in 2002 when they were hungry because of the prevailing drought.

6.1 Summary of Findings

The lack of information about GMO's, the technology, its effects on human health and the environment is a problem in Zambia. Most of the people of Zambia do not have good knowledge of GM foods and because of this, many people saw the government's position of rejecting the maize in 2002 as unfair. The position of the government was that it feared that

the distribution of GM maize could lead to plantings and subsequent contamination of the local maize varieties as well as germplasm. On the other hand the government could have milled the maize to prevent planting rather than denying the hungry people access to food. Another aspect was that the Zambian government was not satisfied with the information provided regarding safety of GM foods to human health, and therefore took the decision as a precaution, in the face of insufficient evidence available at the time. However, the Zambian government set a precedent in Africa by becoming the first country to reject genetically modified maize in both grain and milled form, whereas countries which were sharing in similar food struggles, like Lesotho, Malawi, Mozambique and Zimbabwe, accepted the GM maize even though they asked that the GM maize be milled (Michael, 2002:1).

Further, the governments' decision-making process in relation to hunger and genetically modified maize was characterised by a national consultative meeting which included experts and some members of the public. From the government perspective it was felt that the impact of GM maize would be greater on the Zambian people should something go wrong than the impact of starvation on affected communities. This view was supported by the officials that were interviewed. The researcher also observed that there were big gaps in information relating to GM technology risks between the government officials and the people at the grass-roots level.

In relation to the government's fears, the people of Chongwe seemed to have more (but often inaccurate) information about GMO diseases than the people of Magoye. The perceptions of the people in Chongwe were that people are likely to experience stomach upsets, headaches, and that boys may become impotent because of the chemicals found in genetically modified food. In the Magoye community however, where they had consumed GM maize earlier, they had seen no negative impact or experience in their area, or negative environmental impact and thus expressed ignorance about any possible impacts, either in their area or countrywide. Magoye was more interested in accessing the food, and had very little knowledge about what GM was.

The reality for the people in Magoye was that they were not concerned about the impact of GM maize. They wanted access to the GM maize because they were starving. Magoye people were among those communities that were anxious to get food aid and therefore they were unhappy with the government's action on rejecting genetically modified maize. Removing the GM maize from storage in all districts, including Chongwe and Magoye, was regarded by the people as violation of their right to food and a sign of government neglect (Njoroge 2002:1). See Section 5.14. Moreover, the Magoye community felt that there was nothing wrong in consuming the GM maize because they had no history of illness in their area as a .result of eating it. Not only did the rejection of GM maize affect the pipeline of food aid, but it also tempted the people to the point of stealing GM maize from the storage facilities, especially in the Southern Province.

By contrast, the study found that the Chongwe community demonstrated solidarity with the government when the decision to ban genetically modified maize (food aid) was made in 2002. Given the debate that is currently taking place in Zambia on genetically modified organisms, in addition to the lack of national bio-safety regulations and an inadequate ability to undertake reliable risk evaluation of GMO research, the government seemed justified in maintaining its position. However, the debate which culminated in the rejection of GM maize overlooked the socio–economic impacts on the communities, particularly on the security of food supplies to the people of Chongwe and Magoye as demonstrated in the research. In addition there was little or no communication by government to the people on why they had rejected the GM maize.

It was not ethical for the Zambian government to allow the people to starve to the extent where they had to resort to wild-roots and fruits, which resulted in deaths in Magoye (as reported in the findings). Although there were no reports of deaths in Chongwe, the researcher found that some of the small-scale farmers were supplied with food parcels by their relatives from Lusaka in order to survive. It is also evident from the research that some of the coping strategies included selling off valuable assets such as cows, goats, chickens, and radios in order to get money to buy food.

There are basically two reasons why Chongwe's views differed from Magoye. The first was that although the drought affected both areas, the former had some food harvested and received supplies from relatives in Lusaka as compared to the community in Magoye. The second point is that the normal response of the people to "questionable food" in this case GM maize, was that they were starving. They were desperate to eat food therefore arguing about the implications of consuming it could be considered in the future. Their understanding was that as long as food was edible, they could not reject it because that would be detrimental to their starving families. In other words GM maize and its availability were important for the Magoye community; for them this food was essential, everything else was not of vital value.

6.2 Discussion of the Findings

The claim made by Food and Agriculture Organisation and World Health Organisation that the consumption of GM crops does not pose immediate risks to human health and the environment, cannot go unchallenged because its position has been seriously questioned on general lack of conclusive research and safety grounds (Smith 2006). Potential environmental risks remain a challenge to the proponents of biotechnology in spite of the break-throughs in this field. One of the reasons being advanced is that GM technology is still in its formative years and that this issue is only now receiving the attention it deserves by the scientific community in view of the concerns raised about the risks involved.

Although Mackey and Santerre (2000) are proponents of biotechnology, and they are quick to note that the use of biotechnology in agriculture will have profound implications for agriculture, the environment, and global economy. As with any new technology that directly affects the wellbeing of the people at the grass-roots level, the import of GM maize in Zambia in 2002 generated a lot anxiety and debate both locally and internationally. This intense debate with regard to GM technology is rather confusing for an average person at grass-roots level. It is further complicated by ethical, moral, socio-economic, political, philosophical ideologies. The researcher's view is that there is a need to strike a balance between scientific advance and country's choice. There is no doubt that the introduction of GM technology may contribute to agricultural growth, but this may not automatically translate into food security.

The people of Zambia deserved to know not only the risks of GM maize but also the benefits so that they could make informed decisions regarding the consumption of the maize especially those communities in drought-prone areas. In the absence of accurate information regarding the GM technology, the community remains ignorant, as the case is in Zambia at present. In addition there is little coverage of GM issues and when there is, the language used is restricted to English since it involves interviewing government officials.

The difference between the Western and African farming is that small-scale farmers in the Sub-Saharan Africa farm for the people and not for industry. And that culturally speaking people may rather choose to go hungry than to consume food they do not feel comfortable with, for instance by food produced by using production practices that contradict their customs and or habits. This point is illustrated by Chongwe community that stood in solidarity with the government when it rejected GM maize as food aid citing health and environmental risks. It follows that the inappropriateness of GM technology is both technical and cultural. Another interesting aspect is that decisions that are made in the West (in this case biotechnology) can impact on the people at grass-roots level (either positively or negatively) because this would depend on how the government responds to given situations. This demonstrates very clearly how globalisation affects local people.

The effect of drought on the general food security of Zambia is reflected in the following information. IRIN news (2003) quoted a United Nations Resident Coordinator's report that food prices were "extraordinarily high with maize meal (prices) around double the usual levels for this time of the year". Further, Samatebele (2003) also asserted that:

> Because of the poor harvest, the market price of the little available maize and imported maize prices shot up drastically during the months from August to December 2002. The prices of maize grain in the rural areas had sharply risen, relative to the urban areas during the months of November and mid-December. Similarly the price of maize-meal followed a similar trend but the impact was evenly spread in urban and rural districts. The price increases varied from 6% to over 50% (Samatebele, 2003). Rural communities could not afford these prices,

After the Zambian government had rejected GM maize, the impression was it was doing nothing to provide non-GM maize for its citizens who were starving. However, the opposite was true. Li Lin (2002) reports that measures were being taken by the Zambian government to ensure that adequate food was available and accessible to through arrangements with the private sector and food reserves. Li Lin (2002) also adds that a number of countries including Tanzania, Kenya, Uganda, China and India had already offered to assistance to Zambia to supply non-GM maize (Li Lin, 2002:3). Another critical point worth noting is that the Zambia government made a very controversial decision to ban GM maize thus appearing as though it was not caring (like a parent) for its citizens.

The Chongwe community, who had no experience of GM maize, was quite content to comply with the government decision on the basis that that the government knew better and would protect them. It is the researcher's observation that the government had no intention of punishing its citizens nor gaining political mileage, but that it was in the greater public interest (in an environment of uncertainty) that such a decision was made. On the other hand, the Magoye community stated that government acted irresponsibly by distributing the GM maize and later withdrawing it from them at a time when they were starving. Because they were directly affected by this decision (to withdraw GM maize) they were not happy with the position of the government.

6.3 Recommendations to Government

- The fact-finding team appointed by the Zambian President in 2002 should arrange follow-ups in Lesotho, Malawi, Mozambique and Zimbabwe in order to determine the impact on people in these countries who have consumed GM food. These countries accepted GM maize on the condition that it was milled before being distributed to the people. The insights gained from this exercise would be beneficial not only to the team but also the general public of Zambia, as well.

- Given that there is no conclusive evidence on the effects of genetically organisms on human, health and the environment, the government of Zambia is obliged to inform the

public about the risks and benefits of biotechnology by producing literature in all nine official languages, in order to raise awareness among the people. It is evident that the rural population is very ignorant about biotechnology in general let alone GM maize as part of food aid. The Zambian government should bear the cost of publishing the literature.

- Biotechnology should be evaluated within the African environment. In this context, it is vital that the Zambian government develop its own capacity to regulate and test GM products without relying on scientific evidence that does apply to the Zambian environment.

- In order to determine if modern technology can benefit the poor in developing countries, policy makers need to analyse the problems that are currently constraining agricultural productivity or damaging the environment, in order to ascertain whether these problems may be solved by integrating modern biotechnology with conventional methods of farming or providing better support for existing farming endeavours.

- Self-sufficiency in food production would require reducing dependence on the food aid of donor countries, especially of GM maize that is being donated to countries like Zambia that have been experiencing drought. It is considered that the most sustainable solution for increasing the harvest yields of the small-scale farmers is investing in water provision and irrigation technology appropriate for them. The opportunities for irrigation posed in this paper need to be seriously considered by the government and other stakeholders. The government could improve household food security by better supporting the small-scale farmers with timely agricultural inputs, construction of dams to feed irrigation systems enabling the farmers to be less vulnerable to droughts.

- In view of re-occurrences of droughts in the country, the Zambian government should encourage small–scale farmers to grow alternative staple foods such as cassava which is drought resistant. This is one way of ensuring food security in the country.

6.4 Recommendations for Improving this study

In terms of the sample, used in this study it would have been preferable to have targeted more government officials, particularly in the Ministry of Science, Technology and Vocational Training, because this Ministry is responsible for publishing a draft copy of the National Biotechnology and Biosafety Strategic Plan 2003-2007. Questionnaires could have been administered to the officials so as to generate more data from the government's perspective.

Apart from targeting the WFP as the major donor of GM maize, other Non-Governmental Organisations such as the Zambia National Farmers Union could have been considered for interviews, so that their official stand on GM maize would have been obtained. This institution is a stakeholder on agricultural policies that pertain to the small-scale farmers in the country.

Interviewing commercial farmers who had actually used GM seed and kept adequate records would have added a more experienced perspective to the study.

Some of the alternatives offered in the questionnaires, which were provided from literature, were limiting. Open ended questions would have allowed the various respondents to provide their own creative, more complex suggestions as answers. The lists could then have been used for probing rather than limited the alternative answers.

6.5 Recommendations for Further Research

1. As discussed earlier in the study, the World Food Programme plays a vital role in ensuring that food is sourced on behalf of the needy especially in areas where people are affected by natural disasters, droughts and floods. A study in to the policies and reality of food aid distribution in WFP in view of the Zambian situation would be very relevant.

2. A study analysing the policies of food production and food aid in Zambia in the context of the droughts that lead to the food crises in the country should be pursued. Policies should also be exposed to the grass-roots people who may need education on issues of biotechnology and GM foods.

3. Following the GM debate, it would also be prudent to carry out a study, either in Malawi, Mozambique or Zimbabwe, to assess whether the people have suffered from illnesses as a result of consuming genetically modified maize in 2002, since these countries accepted the GM maize on the condition that it was milled before being was distributed.

4. This study found that small-scale farmers may not benefit from terminator technology given that it would not be financially viable for them to cultivate genetically modified seeds without paying more to seed cooperatives. Therefore, a study to investigate the benefits of small-scale farmers from the genetically modified seeds should be undertaken.

5. Investigations into how small-scale farmers can overcome the effects of the cyclical droughts; for example, would irrigation be the answer or would change in crops grown (instead of maize) produce more secure outcomes? Are cash crops like cotton that are supported by commercial organisations a way of increasing household incomes and ultimately food

6.6 Conclusion

The issue of GM foods is a complex subject which needs to be addressed with the involvement of all both the stakeholders and the grass roots who are in most cases the direct consumers of these GM foods. The Zambian government needs to disseminate information appropriately through radio programmmes, seminars and any other means suitable for the people in their local languages. The stand of the researcher is that as much as genetically engineered crops could improve pest control, soil conservation, increased yields, resistance to

pests, tolerance to drought conditions, as well as reducing on dependence and herbicides, there is no conclusive evidence that GM maize is safe for consumption or does not influence the germplasm of plants.

Therefore, the Zambian government should be commended for taking a precautionary approach because of insufficient information regarding the safety of GM foods to human health and the environment. It is the researcher's observation that the government had no intention of gaining political mileage, but that it was in the public interest to take the stance that it did. The government should however investigate ways of communicating better with its citizens on such important issues.

The government should also take responsibility for improving policies and agricultural support so that farmers become less dependent on food aid and more productive in their production, harvesting and marketing systems (whether using GM technology or not).

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APPENDIX A: INTERVIEW RESULTS (Raw data) WITH THE PRINCIPAL RESEARCH OFFICER, MINISTRY OF AGRICULTURE AND CO-OPERATIVES, LUSAKA, ZAMBIA

1. Sir, how do you view the Zambian government's rejecting of Genetically Modified maize (food aid) imported by World Food Programme in 2002?
2. Following your explanation what was the government's decision in relation to hunger and genetically modified foods?
3. What was the response from the public following the decision the government made?
4. How will the ministry determine that GM maize is no longer posing a danger to human health and environment?
5. It has been reported that Zambia needs 200, 000 tonnes of maize to avert a crisis this year. How does your government hope to avert this crisis?
6. What measures has your ministry put in place to ensure food security in the country in view of persistent droughts experienced in especially in southern province?
7. Has the government recorded any illnesses in health centres following the consumption of GM maize?

.....

Response

1. The WFP did not inform the Zambian Government before importation that what they were bringing was GM maize. In other words did not seek prior consent of the government for importation of GM maize. It was feared that distribution of GM maize as grain could lead to accidental plantings and subsequent contamination of the local maize varieties and germplasm. Was not satisfied with information regarding safety of GM foods human health thus decided to take precautionary approach

2. It was felt that the impact of GM maize should something go wrong would be greater on the Zambian people than the impact of starvation on affected communities.

3. The response was mixed up with the majority however supporting government's position. The affected communities were however anxious to get food and therefore not happy with this position.

4. Embarked on the process of putting in place a biosafety legislation to regulate the use and environmental release of GMO's. Embarked on the development of technical capacity in terms of human resources and facilities to among other things be able to detect GMO's.

5. Possibly look for non-GMO food imports and mobilise other food sources produced in other parts of the country such as cassava

6. Diversification in the production and use of other food crops other than maize.
Provision of support to smallholder farmers through partial subsidy of fertiliser and seed to selected farmers.
Embark on the promotion of irrigated crop production as a long term measure.

7. It is difficult to answer this question as you may be aware, illnesses these days are a function of many factors.

APPENDIX B: QUESTIONNAIRES FOR THE MINISTRY OF AGRICULTURE AND CO-OPERATIVES OFFICIALS

Name _____

Age

30-35	
36-41	
42- 47	
48-53	

(Tick in the appropriate box)

Gender

Male		Female	

(Tick in the appropriate box)

Name of the Organisation

Private	1
United Nations Agency	2
Government Institution	3

(Tick in the appropriate box)

Position held in the organization

Chief Executive	1
Senior Manager	2
Middle management	3
Spokes person	4

(Tick *in the appropriate box*)

1. What is your view on genetically modified maize? (*Tick in the appropriate box*)

Safe for human consumption	1
Harmful for human health	2
Fit for animals	3
None of the above	4

2. The Zambian government rejected genetically modified maize in 2002.

What do you think could have led to this decision?

(Tick in the appropriate box)

Consensus of Zambian people	1
Pleasing the donors	2
Concern for future consequences (health)	3
Economic ties with EU exports at stake	4

3. Why do you think it has taken a long time (7 years) for the Zambian government to make such a decision?

(Tick in the appropriate box)

Political mileage	1
Evidence of allergies in GMs	2
Ignorance	3
Lack of information	4
Other reasons	5

4. What should be the role of e government in ensuring that its citizens are enlightened about genetically modified maize?

(Tick in the appropriate box)

Hold seminars	1
Through Radio	2
Through local newspapers	3
Others	4

5. How has the government's decision to burn GM maize impacted on the people of Zambia socially and economically?

(Tick in the appropriate box)

No access to maize	1
Inadequate stakes of maize	2
Threat to food security	3
Increment in the price of maize meal	4
None of the above	5

6. What do you think are the measures the government is taking to ensure food security in the country?

(Tick in the appropriate box)

Equip extension officers with more information on early warning systems	1
Increase funding in the Department of Extension work	2
Encourage irrigation among subsistence farmers	3
Make agricultural inputs available for the farmers	4
Encourage alternative crops in Provinces that are prone to drought	5

APPENDIX C: INTERVIEW WITH CHAIRPERSON OF BIOTECHNOLOGY OUTREACH SOCIETY OF ZAMBIA, UNIVERSITY OF ZAMBIA.

Questions for the interview

1. Sir, when was your organisation formed and what is its mission?
2. In 2002 the Zambian government rejected GM maize. In your view what factors led to this decision?
3. What was the response from the public following the government's rejection of GM maize?
4. What programme has your organisation embarked on to sensitise the public about Biotechnology?
5. What has been the impact of your outreach programme to the public so far

His response to the above questions

The Biotechnology outreach society of Zambia was established in May 2003. The mission of the organisation is to create an innovative enabling biotechnology environment in Zambia. Through education enhanced understanding and awareness creation in all aspects of biotechnology, bio safety and intellectual property rights.

The respondent went to state that the contributing factors that led to the government's rejection were both scientific and trade issues. Scientific in that Zambia has no capacity to monitor GM food's coupled with lack of qualified personnel with knowledge on biotechnology. Another factor was that the legislation has not been put in place to regulate the biotechnology. The other aspect was the fear of losing the European Union market for the products exported to Europe.

He observed that Zambia exports its agriculture products to Europe, and bringing in GM foods would mean contaminating the environment and then fearing that Europe may not accept Zambian produce. With regard the response from the public following the government's rejection of GM maize, the respondent observed that the general picture is that the majority supported the government according to rumour.

The respondent however, noted that though there was consensus regarding the rejection of GM maize in Zambia, the few communities represented at this gathering objected to the idea because their subjects were starving due to drought. Moreover, he added that scientifically speaking there is no empirical evidence of GM maize causing harm to either humankind or animals. He also pointed out that there are no records that have been reported since people started to consume GM maize from 1994 through 2002 in Zambia.

The respondent also observed that it was important to take precautions on the environment because it has not been determined scientifically to what extent the GM maize can contaminate the environment. Responding on whether there are any programmes put in place in order address the issue, he mentioned that his organisation has embarked on campaigns so as to sensitise the public about biotechnology. The target groups include:

- Members of Parliament
- Chiefs
- Editors representing both print and media
- Conducted programmes on both radio and television

Commenting on the impact of the outreach, he stated that between 200 and 300 members are currently on the mailing list of the Biotechnology Outreach Society of Zambia (BOSZ Newsletter).

The institution has also been conducting seminars with the University students at the campus. Finally, he mentioned that the public is slowly changing it's perception on biotechnology in the urban areas, though he regretted that the programme is restricted to town people due to insufficient funding in order to extend the campaign to the rural areas

APPENDIX D: INTERVIEW WITH THE PUBLIC RELATIONS OFFICER, WORLD FOOD PROGRAMME, LUSAKA, ZAMBIA

The questions for the interview were as follows:

1. In 2002 the Zambian government banned GM maize (food aid) citing human health and environmental concerns. What is your opinion?
2. Your organisation is on record as stating that GM maize is safe for consumption. What evidence do you have?
3. Sir/ Madam, your organisation has been importing GM maize from the United States, not only for Zambia, but, also for other countries in Southern Africa. Has your office received any reports of ill–health as a result of consuming GM food particularly in Zambia?
4. How else did your organisation respond in helping averting hunger in Zambia in 2002?
5. What are your organisation's future plans in assisting the Zambian government to avert hunger?
6. What advice would your organisation render to the government in view of the droughts that have persisted in Zambia?

.....

The appointment for the interview was with the organisation, but he assigned the Public Relations officer to take over the responsibility. The interviewee was connected to the researcher by telephone at the security gate. The researcher introduced himself and explained the purpose of the interview. The informant asked the researcher to read out all the questions relating to the interview.

Thereafter, the response of the informant was that her institution has had no stand on the Zambian government's rejection of GM maize in 2002 to date, and that the role of the organisation was to cooperate with the government of the day on issues of food aid.

She also mentioned that when the government rejected the GM maize, her institution brought non GM maize into the country. As for the rest of the questions she was not willing to comment. At this point, the researcher had to apply research ethics according to the university principles.

The researcher however, contacted the Regional Public Affairs Officer for WFP Southern Africa in Johannesburg to comment on GM maize which the Zambian government rejected in 2002. His response was that World Food Programme cannot be drawn in the debate as to whether GM maize is fit for human consumption or not. From his point of view Food and Agriculture Organisation and other United Nations agencies have endorsed that the maize is actually fit for both human and animal consumption.

The respondent regretted that the decision to reject GM maize affected food aid pipe line and it cost thousands of United States Dollars to bring non-GM maize into the country. He did not have time to respond to other questions. Moreover, he did not want to paint a picture that World Food Programme was acting as an advisory institution to the Zambian government in ensuring food security especially in the areas that are prone to drought. However, an article from the newsroom, written by respondent stated:

> "In 2005, the WFP aims to reach 66,000 people in drought–prone or vulnerable areas of Zambia through its food for assets activities, including conservation farming, fish farming, rehabilitation of roads and dams and agro forestry (WFP, 2005:1).

APPENDIX E: QUESTIONS FOR INTERVIEWS HELD WITH THE VILLAGE CO-ORDINATOR FOR KANAKANTAPA SETTLEMENT, CHONGWE AND HEADMAN OF NGWEZI SETTLEMENT, MAGOYE

1. What are some of the farming constraints among the small-scale farmers in your area?
2. What was the response from the community following the government's rejection of GM maize?
3. What are your views on diversification of crops in view of persistent drought in your area?
4. In your view what should the role of the government in ensuring food security in the country?

RESPONSE OF THE VILLAGE CO-ORDINATOR FOR VILLAGE IN KANAKANTAPA SETTLEMENT, CHONGWE

.....

The researcher was privileged to have an audience with, the Village Coordinator for Village C in Chongwe Southeast of the capital city of Lusaka. When asked to comment on the problems faced by the community. The respondent explained that there are 300 households in Village C sharing three boreholes that are not functioning well because the rods are broken and thus, requiring spare parts in order for them to supply water for both domestic use and gardening. According to the respondent, this situation has forced women to travel long distances to fetch water for domestic use. As a result their efforts to grow more food are been hindered.

Asked about the impact of the drought in the area in 2002 after the government burned the GM maize, he pointed out that the situation was very bad though no deaths were recorded because most of the small–scale farmers have relatives in Lusaka which is the nearest city who supplied them with food.

However, some members of the community resorted to food for work with people who brought maize, sugar and salt from Lusaka. For instance, 1 lima/hectare= 20 kg of maize, 1 kg sugar and 1 kg salt. He also referred to 2004/2005 farming season as having experienced low yields and crop failure in the area due to erratic rainfall. The respondent also stated that it only rained in November for about 2 weeks and late January thereby affecting crops (maize) at tasselling stage. This situation led to crop failure in the area.

Commenting on the people's knowledge on GM maize, the respondent stated that people were ignorant about GM maize and that the government has not given enough information to the public. He also added that it is only the negative side of this technology that has been demonstrated as harmful to both human and environment without explaining the benefits to the public so that they could make informed decisions about consuming GM maize or not.

As for the government's role in food security in the country, he asserted that the community is more than ready to cooperate with the government in enhancing food security as long as boreholes are repaired so as to facilitate farming activities in the area. He also revealed that the community is not only growing maize (though it is the staple food) but also groundnuts, and green vegetables which they sell to government and private institutions in Lusaka. In this respect, they need the support of the government by providing agro-inputs early as well as loans for seeds and other farming prerequisites that play an important role in boosting agricultural production in the area.

RESPONSE OF THE HEADMAN OF NGWEZI SETTLEMENT, VILLAGE B, MAGOYE

The researcher had an audience with the headman of the above village Magoye sub-district. When asked about the farming constraints in the area among the small –scale farmers, the headman said that the previous government of Dr Kenneth Kaunda, ensured that agro-inputs were readily available to the small –scale farmers prior to the farming season. This is no longer the case, small–scale farmers prepare their fields early in view of the on-set of the rains, but their plans are frustrated because basal fertilisers are distributed when the crop (maize) is almost tasselling. This affects the crop as well as yields among the small-scale farmers. Another aspect he mentioned is marketing of their produce (maize). Internal examiner

The Headman stated that Food Reserve Agency is the only recognised government institution that buys their produce. But he observed that the agency delays in processing the purchase of maize as a result private businessmen from Lusaka exploit them by trading their maize with clothes and wrappers for women (for example, 6 meters of wrappers = 50kg of maize) and sometimes they are forced to sell their produce cheaply because they are stranded and would like to sell it so that they can support their families financially. The respondent's response to the question of the community's reaction to government's rejection of GM maize was that, the people were actually opposed to burning GM maize because they have been consuming the maize for the several years without experiencing any illnesses as perceived by the government.

He added that people had found it difficult to take sides with the government because it has been distributing the same maize without raising any concerns. He went to say that the people's perception as of now is that condemning GM maize when they have been starving has not solved the problem, instead it has worsened the situation and made them resort to looking for wild fruit and roots which were a risk to their lives.

As regards the diversification of crops in view of persistent drought in the area, the headman said that the people have been used to growing maize as the only staple food traditionally speaking. However, he mentioned that people also grow sorghum and millet on plots of half a Lima /hectare.

He also consented that encouraging people to grow other foods such as sorghum and millet would be beneficial considering that they are drought resistant, but was quick to observe that it would take a lot of education for the community to begin to grow such crops because the mentality among them is that these crops are cultivated for the purpose of brewing beer. He also agreed that it is important that people weigh the advantages and disadvantages of growing these crops.

The headman also mentioned that apart from growing maize, the small-scale farmers grow groundnuts. sunflower and cotton. However, he observed that growing cotton has proved profitable because the Dunavant Company gives the farmers loans in the form of seed and chemicals to spray against the diseases and also delivers empty bags for the harvest of cotton. The other advantage he mentioned was that the same company also buys cotton from the farmers at reasonable prices thereby uplifting the lives of the farmers economically. The respondent's response to the question of government's role in ensuring food security in the country was that animal dipping plays an important role in agriculture in the sense that healthy oxen assist in tilling the land for farming purpose which helps to improve food security.

The other point he raised was that healthy animals are able to transport produce to deport (sales office) for sell. He expressed fears that dipping of animals costs K5, 000.00 (kwacha) = R6.00 rand per head which is not economically viable for the poor farmers. Another aspect he cited was that dipping of animals would also reduce the spreading of diseases such foot and mouth that has claimed thousands of animals in the area.

APPENDIX F: FOCUS GROUP DISCUSSIONS –KANAKANTAPA RESETTLEMENT VILLAGE C- CHONGWE AND NGWEZI SETTLEMENT VILLAGE B -MAGOYE

Discussion topics for small-scale farmers in Chongwe and Magoye

1. Describe your personal experience of

   Food aid?

   Genetically modified crops?

   Genetically food?

2. What is your view on the government's rejection of genetically modified maize?
3. How has the rejection of genetically modified maize affected your family and the community as a whole?
4. What do you think should be the government's role in ensuring food security in the country?

APPENDIX G: INTERPRETATION OF CHONGWE AND MAGOYE FOCUS GROUP DISCUSSIONS

The researcher's interpretation on focus group discussions is that the decision made by the government to reject the GM maize adversely affected the population economically, socially and health-wise. From the response above, there is evidence that people were engaged in distress coping strategies in order to survive. The most common ones included:

- Changing consumption patterns, this meant reducing from 3 meals to 1 per day.
- Starvation leading to death (the account of one recorded person who died in Chitongo area in Magoye region)
- Introduction of food for work programmes where people worked for food on different projects.
- Removing children from school: lower primary children were affected most. These are the young ones who were unable to cover long distances going to school on an empty stomach.
- Reduced expenditures on food and other essential commodities like sugar, cooking oil and washing powder.
- Sale of capital assets such as radios, cattle, ploughs and other valuable assets.
- Village –farm migration: the villages were deserted on account of searching for work on the farms as well as townships.

The following is data recorded from Focus Group Discussions

Kanakantapa, Chongwe

Group 1 mentioned that they had to work in people's fields for exchange for 10 kg of maize per day on half a hectare. This was how they survived until the government brought non-GM maize.

Group 2 said that meals were reduced from three to two and sometimes to one meal daily, thereby undermining the nutritional status of the families.

Group 3 mentioned that consequences were that they had to leave their families early in the morning in search of wild fruits, and food for work. Some went to the extent of selling some property in order for them to buy some food which could not even last long. It took several months before the government delivered non-GM maize to their area.

Ngwezi, Magoye

Group 1 and 2 participants stated that they resorted to picking wild- fruit and roots, which could be dangerous for children, but they had no option at all. Some members of the community said that about 8 families' accessed GM maize which was stolen from the warehouses in Monze, when the policemen were overcome by hungry people. This was how the GM maize found its way into the village, this is how they survived.

Group 3 members said that food production declined in the area because people paid their attention to food gathering. In terms of education, they mentioned that children in the lower primary were affected because there was insufficient food in the families to feed.

Conclusion

Having looked at the response from Chongwe and Magoye, it is important to note that these coping strategies sent households into a state that actually undermined their livelihoods during the time of drought and thereafter. It is very clear that Chongwe and Magoye and other parts of the country that were affected by hunger were not adequately addressed by the government.

The reasons for withdraw of the GM maize could not be well explained by the government to the grass root people. Furthermore, the delay in supplying non GM maize to the needy communities aggravated the hunger in these communities. Given the opportunity, the people in these communities would have chosen to consume GM maize rather than starve to death while anxiously waiting for the arrival of Non-GM maize. The other point is that it could have been safer for the members of the community to consume the GM maize than resort to poisonous wild fruit and roots which the people discovered for them.

Commenting on the issue of food security, the small-scale farmers in both areas showed concern on the government's response to issues of food security in the country where there has been a long spell of drought in most parts of the country. The small-scale farmers indicated that the government needs to seriously address the issue of agriculture in the country in order to promote food security which might prevent genetically modified maize which they see as a threat to the lives of their people.

APPENDIX H: QUESTIONNAIRE FOR THE SMALL-SCALE FARMERS IN CHONGWE AND MAGOYE

Name_____Age_____Gender_____

1. What crops do you farm? What are the staples?

What level of production? Harvest tonnage. How much is sold?

How much land is under cultivation?

Last year?

In 2002?

What are your staple farming constraints?

GM Maize

1. What is your understanding of genetically modified maize?

What was your experience? If any?

Topics? Health specifics

Agriculture specifics

Environment specifics

What do you know about importing GM maize?

Impacts?

Health?

Cropping/environment?

Diseases?

Attitudes towards government's decision, GM foods

1. What do you think of the government's actions towards GM food aid.

2. How has the rejection of genetically modified maize impacted your agricultural activities?

3. What do you think would be the future consequences of accepting biotechnology in agriculture especially with regard to food production?

4. What is the position of the other farmers in this province as regarding genetically modified maize

APPENDIX I: QUESTIONNAIRE IN CHITONGA LANGUAGE FOR SMALL-SCALE FARMERS IN MAGOYE (Not necessary for Chongwe)

Zina lyenu.....Mwyaka.....bakaintu/basankwa.....

1. Sena mplazi, na faamu yenu itwa buti zina.....

(a) Sena bulimi bwenu busika ali.....

(b) Zingi buti zisyango zyomulima.....

(c) Zingi buti zyomuulisha.....

(d) Sena nyika nimpati buti nj omulima? .....

Mwaka wamana.....

Sena mumwaka wa 2002.....

(e) Sena mbuyumuyumu nzi mbomujana mubulimu, kujatikizya ma giyemuwo (GMO)?

1. Nduzibo nzi ndomujisi kujatikizya mapopwe a magiyemuwo (GMO)?

(a) Amutwaambile na kuliluzibo lumwi ndomujisi kuzwanomwakatalika bulimi kwiinda mumagiyemuwo (GMO)

- Kuj atikizya zyabuumi
- Kuj atikizya zya bulimi
- Kujatikizya zyanyika, muuya abukkale bwabantu?
- Kuj atikizya muzeezo wa nfulumende wakukaka cakulya ca magiyemuwo(GMO)

(b) Muyeeya buti nywebo mbuli nfulumende mbuyaka kaka cakulya cama giyemuwo (GMO)?

3. Mbuyumuyumu nzi mbomwajana mubulimi bwenu kuzwa ciindi banfulumende nobaka kaka magiyemuwo(GMO)?
4. Mbuyumuyumu nzi na mbubotu nzi bukonzya kuba mubulimi kumbele a mazuba kuti na cisi caatambula nokuba kuzumina zisyango zyama giyemuwo (GMO) kapati kwiinda mubulimi bwazyakulya?
5. Sena bamwi basi mafaamu kuno kulubazu bayeeya buti antela bayinvwi ali kuj atikizya mapopwe a ma giyemuwo (GMO)?

APPENDIX J: DATA FROM GOVERNMENT OFFICIALS, MINISTRY OF AGRICULTURE AND COOPERATIVES, LUSAKA.

ENO	AGE	GENDER	ORGANIS	POSIT	VIEWGM	DECISONZ	LONGTIME	ROLEOFGO	GMIMPACT	FOODSECU
	1	0	3	3	4	3	4	1	5	1
2	1	0	3	3	1	4	4	1	5	4
3	1	1	3	3	4	3	4	1	5	4
4	3	1	3	3	4	3	4	1	5	3
5	2	0	3	2	4	3	5	1	5	1
6	2	0	3	3	2	5	4	1	3	1
7	1	0	3	3	1	1	4	1	2	3
RADIO	NEWSPAPER	CONCERN	EQUIPING	IRRIGATION	FUNDING	INPUTS	ALTERNAT	HOLDSEMI		
1	1	1	2	2	1	2	1	1		
2	2	2	1	1	1	1	2	1		
2	2	2	2	2	1	1	2	1		
1	1	1	2	2	1	1	1	1		
1	1	2	2	2	2	1	1	1		
1	1	1	0	2	1	1	1	1		
2	2	2	1	2	1	2	2	2		
Key to code										
Organi	Organisation	Government								
Posit	Position held	1=Chief Executive 2= Senior management 3= Middle Management 4=Spokes person								
ViewGM	View on GM maize Decision made by	1=Safe for human consumption 2=Harmful for human health 4=none of the above								

Decisio nz	Decision made by Zambian govt to reject GM maize	1=Consensus of Zambian people 2=Pleasing donors 3=Concern for future(health) 4=Economic ties with EU at Stake								
Longti me	Why Govt took long to make such a decision	1=Political mileage 2=Evidence of allergies in GM maize 3=Ignorance 4=Lack of information 5=other reasons								
Roleof go	The role of govt in enlightening its citizens about GM maize	1=Hold seminars 2=Through radio 3=Local newspapers 4=All apply								
Gmimp act	How Govt's ban of GMmaize impacted on Zambains socially & economically	1=No access to maize 2=Inadequate maize 3=Threat to food security 4=increment in the price of maize-meal 5=none of the								
Foodse cu	Govt measures in ensuring food security in the country	1=Equip extension officers with infor on early warning systems 2=Increase funding in Depart. Of extension work 3=Encourage irrigation among Small-scale farmers 4=make Agro-inputs available for farmers 5= Encourage alternative crops in provinces that are prone to drought								

Radio	Use radio to enlightening people on GM maize	1=yes 2=no								
Newspaper	Use newspaper to enlighten the people on GM maize	1=yes 2=no								
Concern	Concern for future consequence (health)	1=yes 2=no								
Equip	Equip extension officers in inifor on early warning systems	1=yes 2=no								
Irrigation	Encourage irrigation among small-scale farmers	1=yes 2=no								
Funding	Increase funding in the Depart of Extension work	1=yes 2=no								
Inputs	Make Agrio-inputs available for farmers	1=yes 2=no								
Alternat	Encourage alternative crops in provinces that are prone to drought	1=yes 2=no								
Holdsemi	Hold seminars	1=yes 2=no								

APPENDIX K: CHI–SQUARE ANALYSES BY VILLAGE

Table K.1 Chi-square results relating to maize land size by village.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.585(a)	2	.061
Likelihood Ratio	6.298	2	.043
Linear-by-Linear Association	4.897	1	.027
N of Valid Cases	44		

a 4 cells (66.7%) have expected count less than 5. The minimum expected count is 1.36.

Table K.2 Chi-square results relating to maize harvest size by village.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.155(a)	4	.057
Likelihood Ratio	10.927	4	.027
Linear-by-Linear Association	7.822	1	.005
N of Valid Cases	44		

a 8 cells (80.0%) have expected count less than 5. The minimum expected count is .45.

Table K.3 Chi-Square results relating maize produce sold for 2001/2 season by village.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.363(0)	5	.000
Likelihood Ratio	27.668	5	.000
Linear-by-Linear Association	.563	1	.453
N of Valid Cases	44		

a 8 cells (66.7%) have expected count less than 5. The minimum expected count is .91.

Table K. 4 Chi-Square results relating to groundnuts produce sold during 2001/2 season by village.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.327(a)	3	.062
Likelihood Ratio	8.822	3	.032
Linear-by-Linear Association	3.729	1	.053
N of Valid Cases	44		

a 6 cells (75.0%) have expected count less than 5. The minimum expected count is .45.

Table K.5 Chi-Square results relating to understanding of Genetically Modified maize by village.

	Value	**df**	**Asymp. Sig. (2sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	5.382(b)	1	.020		
Continuity Correction(a)	3.782	1	.052		
Likelihood Ratio	6.091	1	.014		
Fisher's Exact Test				.027	.023
Linear-by-Linear Association	5.260	1	.022		
N of Valid Cases	44				

a Computed only for a 2x2 tableb 2 cells (50.0%) have expected count less than 5. The minimum expected count is 4.09.

Table K. 6 Chi-Square results relating to experience of Genetically Modified Maize by village.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.863(b)	1	.049		
Continuity Correction(a)	1.863	1	.172		
Likelihood Ratio	4.996	1	.025		
Fisher's Exact Test				.086	.086
Linear-by-Linear Association	3.776	1	.052		
N of Valid Cases	44				

a Computed only for a 2x2 table b 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.36.

Table K. 7 Chi-Square results relating to Importing of Genetically Modified Organisms –health impacts by village.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.382(b)	1	.020		
Continuity Correction(a)	3.782	1	.052		
Likelihood Ratio	6.091	1	.014		
Fisher's Exact Test				.027	.023
Linear-by-Linear Association	5.260	1	.022		
N of Valid Cases	44				

a Computed only for a 2x2 table b 2 cells (50.0%) have expected count less than 5.

The minimum expected count is 4.09.

Table K. 8 Chi-Square results relating to Importing of Genetically Modified Organisms –diseases by village

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.262(b)	1	.071		
Continuity Correction(a)	1.938	1	.164		
Likelihood Ratio	3.625	1	.057		
Fisher's Exact Test				.106	.079
Linear-by-Linear Association	3.188	1	.074		
N of Valid Cases	44				

a Computed only for a 2x2 table b 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.18.

Table K.9 Chi-Square results relating to impact on agriculture activities by village.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.912(a)	3	.000
Likelihood Ratio	25.774	3	.000
Linear-by-Linear Association	17.824	1	.000
N of Valid Cases	44		

a 4 cells (50.0%) have expected count less than 5. The minimum expected count is 1.36.

Table K.10 Chi-Square results relating to future consequences of consuming genetically modified maize by village.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.284(a)	3	.000
Likelihood Ratio	20.722	3	.000
Linear-by-Linear Association	16.962	1	.000
N of Valid Cases	44		

2 cells (25.0%) have expected count less than 5. The minimum expected count is 45