

**ASSESSMENT OF THE IMPACT OF THE SEED POLICY IN  
RESEARCH AND TRAINING IN SEED SYSTEMS AMONG  
PRIVATE SECTOR INSTITUTIONS**

A Research Report Presented To The Department Of Agricultural Economics And  
Extension Education Of The University Of Zambia

By

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## **DEDICATION**

This report is dedicated to my mother Mrs Alberta Simukondo Siachalinga for her continued support in my life.

*To you Mum!! I say thank you for you have made me be what I am today.*

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**LIST OF ABBREVIATION**

|              |   |
|--------------|---|
| ACF.....     | Agricultural Consultative Forum               |
| ASTI.....    | Agricultural Science and Technology Indicator |
| CDT.....     | Cotton Development Trust                      |
| GART.....    | Golden Valley Agricultural Research Trust     |
| GDP.....     | Gross Domestic Product                        |
| IFPRI.....   | International Food Policy Research Institute  |
| IMF.....     | International Monetary Fund                   |
| LINTICO..... | Lint Company of Zambia                        |
| Mt.....      | Metric tones                                  |
| NGO.....     | Non Governmental Organization                 |
| NSIPZ.....   | National Seed Industrial Policy of Zambia     |
| QDS.....     | Quality Declared Seed                         |
| SAP.....     | Structural Adjustment Programme               |
| SCCI.....    | Seed Control and Certification Institute      |
| SCRB.....    | Soils and Crops Research Branch               |
| SEEDCO.....  | Seed Company International                    |
| TAZ.....     | Tobacco Association of Zambia                 |
| TBZ.....     | Tobacco Board of Zambia                       |
| UNZA.....    | University of Zambia                          |
| ZAMSEED..... | Zambia Seed Company                           |
| ZARI.....    | Zambia Agricultural Research Institute        |
| ZASTA.....   | Zambia Seed Traders Association               |
| ZNFU.....    | Zambia National Farmers' Union                |



## **ABSTRACT**

### **ASSESMENT OF THE IMPACT OF THE SEED POLICY IN RESEARCH AND TRAINING IN SEED SYSTEMS AMONG PRIVATE SECTOR INSTITUTIONS**

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In 1991, the Zambian government embarked on the liberalization of the economy including the agricultural sector. This meant that Zambia also shifted from the reliance of the public enterprises in the seed business and directed more interest towards private sector participation in both seed processing, marketing and variety development. By the year 2000, quite a number of private seed companies were operating in the country. However, these changes were taking place without a coherent policy to guide the performance and interests of players in the seed business. It is for this reason the National Seed Industrial policy and the National Agricultural policy were formulated in 1999 and 2004 respectively. To date, there hasn't been an impact assessment of private sector participation in research and training in seed systems. Therefore, this study was carried out to specifically establish the number of private companies currently involved in research in seed systems (that is in plant breeding and variety development) and also assess the policy environment.

In the study, both primary and secondary data were collected. Primary data was collected by way of questionnaires and open interviews from both private, NGOs and Public sector institutions that included SCCI, (ZARI secondary data), SEEDCO, ZAMSEED, MRI, Kamano, Pannar, Hygrotech, Crop Serve, (ZASTA secondary data), ACF, Caritas Zambia and ZNFU.

In the study Seven (7) private companies were captured of which Three (3) were involved in seed processing, multiplication and marketing and Four (4) were actively involved in plant breeding and variety development plus seed processing, multiplication and marketing. In terms of training breeders, Four (4) indicated that they were not involved in any training of plant breeders and this represented 57% and the remaining Three (3) said they did train their own breeders representing 43%. All the seed companies have trained seed quality certifier personnel with SCCI who can carry out various seed quality control tests. The production of certified seed was found to have increased in the 2005/06 season, from 8512 metric tones of maize seed produced in 2000/01 season to 30587 metric tones representing an increase of 260%.

A review of the varieties developed/released by the private sector from 1992 to 2007 showed an increase in the total number of varieties released by the private sector to 96 varieties developed. The number of private seed companies involved in research and variety development has increased from three in 1998 to five as of 2008, representing a 66% increase. This has been necessitated by the coherent seed policy framework that was put in place to provide the environment necessary for both private and public sector initiatives. The policy has seen changes where the government's role is not only in monitoring and regulating the seed industry, but also encouraging private sector participation in quality control and certification through licensing.

## CHAPTER ONE

### 1.0 INTRODUCTION

Seed is a key input for the development of the agricultural sector in general and crop production in particular. It is both the means of establishing a new crop each season and determines the genetic potential of the crop that is grown. It provides the vehicle to transfer genotypes (varieties) from research institutions into the farming community (Cromwell et al; 1992). Despite this fundamental role in crop production, seed has some special attributes arising from its biological properties, which makes it a difficult product to handle. This is not only a result of physiology and genetics, which are of general application, but there are also strong economic, institutional and policy dimension that are specific to crops and ecological regions. Because of this, seed has normally received special attention in most countries world over (NSIPZ; 1999).

Improving farmers' access to new improved seed varieties of crops has always been recognized as critical for increasing agricultural productivity globally. It is for this reason that plant breeding programs have also received substantial resources both at international and national research centers in the past 30 years (Howard and Maredia; 1997).

In Zambia however, Agriculture research investment in general declined in real terms during the period of late 80s and early 90s. This was due to the financial problems that were being faced by the nation. This meant that even the aspects of plant breeding and training in seed systems were affected. During this same period, most research activities were funded by the government as there was 'no' private sector involvement at all in the seed industry. As a way of improving and revamping research in the agricultural sector (plant breeding), the government called for the active involvement of private sector in research and training in plant breeding and seed systems during the liberalization period. This came after the realization that the private sector could play a larger role in the sector given a more favorable policy environment. With this in mind, two research trusts as the first attempt of increasing private sector involvement in the area of plant breeding were

created: these were the Golden Valley Agricultural Research Trust (GART, established in 1997), the Cotton Development Trust (CDT, established in 1999) ( Beintema,et al: 2001). The primary rationale for the trusts is to increase flexibility in financing and management of both physical assets and human resources, ultimately promoting efficiency and cost-effectiveness while developing public-private partnerships.

In the same period of late 1980s and early 90s, the reduction on agriculture research investment was not the only problem; there was also a decrease in the number of plant breeders and increased gap between first degree and PhD holders. This therefore meant that there was also a decline in the number of plant breeders in the country. With that, the University of Zambia through the School of Agricultural Sciences with the assistance of donor funding started a post graduate training programme in plant breeding and seed systems. This was to help increase the numbers of plant breeders given the main crops that are important in the country and help increase the number of researchers/ breeders per crop.

All these changes in seed industry and agricultural sector in general were taking place without a coherent national policy. Therefore, in view of the main changes that were taking place in the seed industry, government recognized the need to put in a specific policy framework that would guide and provide a conducive environment necessary for both private and public sector initiatives to thrive in the seed industry (NSIPZ) ; 1999) and the seed policy was later formulated in 1999.

However, from the time the national seed industry policy was formulated in 1999, it is not known as to what extent the private sector companies are involved in research and training in plant breeding and seed systems and how they are fairing. To this effect, there is therefore need to conduct research that focuses on assessing the performance of the private sector institutions in research and training in seed systems as this will help determine if the seed policy has achieved its intended purposes of facilitating research and training in seed systems.

## **1.1 Statement of the Problem**

In Zambia, before the liberalization of the economy, the aspect of research and training in the seed systems were in the hands of the government. However, the liberalization of the economy in 1991 saw a shift which brought about private sector involvement. Before this, there was little or no private sector involvement in training and research in seed systems and crop research at all. In 1997 and 1999, the government created Golden Valley Agricultural Research Trust and the Cotton Development Trust respectively as the first attempt of creating opportunities for private sector participation in research and creating sustainability of existing research facilities (NSIPZ).

In 1999, the national seed policy was also formulated that was to guide and harmonize the operations of the various institutions in the seed industry. The seed policy was formulated to give a more favorable environment for the private sector institutions to operate in. Some of the strategies included in the policy were;

- To have a clear regulatory framework in the seed industry,
- Provide full access of germplasm from national (public) research centers to private sector,
- Support of private research by maintaining variety purity on cost recovery basis on behalf of private companies that don't have the capacity to do so,
- Support by government to private sector institutions in terms of applied research, crop improvement and variety development and,
- Strengthen the area of information gathering and dissemination through publications so that relevant scientific information and technology is made available to researchers in both public and private institutions.

However, from the time seed policy was formulated, it is not clear as to how the private sector is fairing or performing in research and training in plant breeding and seed systems. Therefore, there is need to establish how well the private sector is performing in this area. This therefore brings the need to carry out a study on the assessment of the

impact of the national seed policy in research and training in seed systems among the private sector institutions.

## **1.2 Objectives**

### **1.2.1 General Objective**

To undertake an assessment of the national seed policy with a view to gauging the extent it has contributed to training and research in plant breeding and seed system among the private sector institutions.

### **1.2.2 Specific Objectives**

- To determine the number of private sector institutions involved in research and training in plant breeding and seed systems.
- To assess the policy environment and its effectiveness in promoting research and training in plant breeding and seed systems.
- To establish the extent to which the private sector is involved in the running of the post graduate Programme in plant breeding and seed systems at UNZA School of Agricultural Sciences.

## **1.3 Rational of study**

Conducting an assessment of the impact of national seed policy in facilitating training and research in seed systems among private sector institutions will shed some light on the impact of the policy options and help design realistic strategies for future development of training and research in the seed systems of the country. The study will explore alternative strategies for policy makers that can be used according to the prevailing conditions in various research institutes and in turn help build capacity. The findings of this study will therefore be of help to policy makers in their future tasks pertaining to

seed industry policy formulation. Various stakeholders such as farmers, plant breeders, NGOs, seed market firms, extension agents should find the study findings useful.

## **CHAPTER TWO**

### **2.0 LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter reviews the relevance of the study on private sector involvement in training and research plant breeding and seed system. It will also review the transformation of seed industry, previous studies done, the successes and existing gaps. It will then highlight how this particular study will fill those gaps.

#### **2.2 Definition of Terminology**

**Quality Declared Seed (QDS);** is seed propagated under less stringent quality control mechanisms of Seed Certification and Control Institute (SCCI). During the multiplication of seed, SCCI officials have to make inspections to the seed multiplication site and also monitor the multiplication process from planting up to the time of processing the seed. What matters therefore is the frequency of inspections made to the seed multiplication site by SCCI officials. Since field inspections are normally borne by the seed producer, and not SCCI, it would be too costly for small seed companies and NGOs to fulfil all the number of required inspections, which would in the end, make the seed too expensive for the poor rural farmers.

**Certified seed:** this refers to the seed propagated under all stringent quality control mechanisms of SCCI.

**Quality seed:** refers to certified seed and also includes attributes such as physical quality as measured by physical purity and freedom from undesirable materials, physiological purity as measured by germination and vigor. Genetic purity as measured by varietal purity, and health quality as measured by freedom from insects, pests and diseases.

**Formal Seed Sector:** refer to legal of physical entities engaged in any aspect of production, handling, distribution and marketing of seed as a business. All formal seed sector and operations are subject to the provisions of the laws of Zambia under the seed act, and are eligible for all guidance and support provided by the government.

**Informal Seed Sector:** includes NGOs, farmers or any group of farmers who produce seed for their own use or for use by neighbors or others in their immediate area. Such seed and operations are exempt from government controls on seed are eligible for all government guidance and support, so as to improve the quality of their seed and operations.

**Seed System:** refers to the complete mix of formal and informal channels by which farmers satisfy their total seed requirement each year. It is composed of organizations, individuals and institutions involved in different seed system functions, i.e., the development, multiplication, processing, storage, distribution and marketing of seed.

**Seed Industry:** refers to the organized formal sector, which has local, national, and-in some crops-global dimensions.

## **2.3 Overview of Training and Research in Seed Systems in Zambia**

Agricultural research in Zambia began way back in 1922 and has involved in scale, scope, and focus since then. The system began with the concern to serve European commercial farmers producing for the mining - sector labor force and a relatively urbanized population. It functioned essentially with expatriate staff. The first Zambian-national scientist was appointed only in 1967 (Elliott and Perrault; 2003)

From the period 1964 to 1991, the government controlled seed supply system in which research, training and variety release were done by public agricultural institutes set up by the government. These included soil and crop branch (SCRB) which was principally involved in research, the Zambia seed company (ZAMSEED) which was formed in 1981



and used to be wholly responsible for the production and marketing of all types of seed with the exception of cotton and tobacco which were handled by Lint Company of Zambia (LINTCO), Tobacco Association of Zambia (TAZ) and Tobacco Board Of Zambia (TBZ) (Kalinda and Sikwibele; 2006). The Seed Control and Certification Institute (SCCI) was established in 1985 to be responsible for seed quality control.

During the period before 1991, Zambia had an extensive research infrastructure, which was only later reduced through structural adjustment in the 1990s (Elliott and Perraut; 2003). In 1991, things changed as the newly formed government started liberalizing the economy. The liberalization process was part of Structural Adjustment Programmes (SAPs) imposed by the World Bank, IMF and other development partners. The liberalization process led to the transformation the Zambia seed industry from a government monopolized seed system into one in which both public and private sector has a role to play. The Zambian seed industry has expanded since the liberalization of the Zambian economy in 1991. Several seed companies have entered the seed market, breaking the monopoly enjoyed by ZAMSEED since its formation in 1981. All these changes, however were taking place without a clear, consistent and coherent national seed policy (NSIPZ; 1999). The current perception is that the role of government is to create a favorable 'policy environment' within which other players in the seed industry can develop. This concept therefore provides the justification for developing a national seed policy framework that will guide the operation of the private sector and ensure efficient and effective research, training and distribution of quality seeds.

## **2.4 The Current Picture of Zambia's Seed System**

Currently the seed industry is partitioned between formal and informal channels. The formal channel includes both private and public sector.

The public sector includes; soils and crop research branch (SCRB) which is involved in strategic, applied and adaptive research, crop variety development and improvement, genetic resource management and breeder seed supply, Seed Control and Certificate

Institute(SCCI) involved in independent variety testing, seed testing, seed inspection, training and variety registration, National Plant Genetic Resource Center responsible for the collection and preservation of genetic resources, University of Zambia (UNZA) involved in training and crop variety development and improvement, Golden Valley Agricultural Research Trust (GART) and Cotton Development Trust (CDT) all of which are responsible for variety development and improvement.

The private sector includes; Zambia Seed Company (ZAMSEED), Maize Research Institute (MRI), Seed Company International Limited (SEEDCO), Kamano Seed Company and Pannar Seeds Limited. These are mostly involved in Variety development, seed production, distribution and marketing.

The informal sector is composed of the government and non- governmental organizations (NGOs). Major NGOs in the informal sector includes programme against malnutrition, Africare, Care International and World Vision, Caritas Zambia etc. The role of the NGOs is to fill in the gaps left by the formal seed sector. The activities performed by NGOs include seed distribution, seed training, promotion of local seed banks and seed production at community level.

## **2.5 Importance of Research and Training in Seed Systems**

Research and training in seed system plays an important role if quality seeds are to be guaranteed to farmers. Research in seed system ranges from breeding of improved seed varieties to marketing of seed. Training involves training of seed breeders, farmers and those involved in the marketing of seed.

Jonathan Chizuni (1994) in his journal on food policies and food security in Zambia reports that in order to meet the changed policy environment and increase food security, agricultural research programmes should be geared towards developing seed crop varieties which are stable and high yielding according to the requirements of the three ecological regions of high medium and low rainfall areas in the country. He singles out

research as a key to the development of high yielding crop varieties and improving food security.

Another report by Monty Jones (2004) from the international policy research institute writes that the current decline in per capita production in Africa can only be revitalized through agricultural research in seed. Accomplishing such a task will require addressing many issues on the seed system including demand-led approaches, accountability and building of critical mass, avoidance of duplication, sustainable financing, and capacity strengthening. Monty Jones identifies the benefits associated with research as being the development of varieties that are high yielding and good processing characteristics.

Mtenga and Mattee (1998) analyzed the importance of Bean/Cowpea collaborative research in Tanzania. They concluded that small -scale farmers who were involved in the program recorded an increase in production by 15 to 20 percent. The increase in production resulted from development of high yielding seed and the increased farmer skill due to training. The farmers who under went some skill training on seed production programmes were reported to be better off in terms of maintaining varietal purity than those who never did. Appropriate training is therefore necessary in seed systems in order to enhance productivity among small holder farmers.

## **2.6. Role of Private Sector in Research and Training in Seed Systems**

Given a favorable policy environment, the private sector can play a pivotal role in research and training in seed systems. The private sector can help bridge the gap in research intensity that has been left by the government supported research activities (Umali, 1992). However, private sector's participation in research and training depends upon the scope for appropriability of technologies. The rate of appropriability would be high in those goods and services which have high excludability (exclusion of non-authorized users) and high subtractability or rivalry (extent to which a product can be used by one person). If we look at the characteristics of research products, embodied technologies developed through applied research are classified as toll or private goods as

these have moderate to high degree of excludability and subtractability. Therefore, embodied technologies can be provided efficiently by the private sector. But new knowledge generated through basic research is classified as public good having low excludability and subtractability and therefore can be provided by the public sector. Since agricultural research by definition is applied research, participation of private sector is justified on economic grounds. Some applied research like crop and resource management research generating information based disembodied technologies having low appropriability in short term, may not attract private research investment. Therefore, presence of the public sector is essential to provide disembodied technologies.

## **2.7. Public-Private Sector Linkages**

Private sector institutions which can participate in research are of two types. First are the private companies (input, processing, etc.) who appropriate research benefits and generate profits for the owner. In the second category are the non-profit private organizations like research foundations, cooperatives, farmers' organizations and non-governmental organizations. Resources, if any, raised by these organizations are reinvested in research. Participation of these two types of private organizations in research can be in the form of funding and/or execution of research. Depending upon the nature of research (basic, applied or adaptive), public and private sectors can participate in several ways in the funding and execution of research. The public sector should share the responsibility of basic research, applied crop and resource management research, training of manpower and enforcement of regulatory policies. A significant part of applied and adaptive research should be in the private sector. However, this compartmentalization may not be so simple in real world situation and research programmes in both the sectors can interact at different stages of research.

## **2.8. Determinants of private research investment**

As noted above, main determinant of private research investment is the ability of private firms to appropriate research benefits which, in turn, is affected by technology demand and supply factors, nature of technology and government regulatory policies (Pray and Echeverria, 1991 and Umali, 1992). These factors are discussed below.

**Demand for new technologies:** The demand for new technologies is determined by size of the market and price and income levels. Given the size of agricultural sector, commercialization of agriculture and growing demand for agricultural products, there is continuous expansion in the demand for new technologies in the country. Product prices, including research products, are influenced by sectoral (input and output prices) and macroeconomic policies (fiscal policy, trade policy, exchange rate, etc.). Greater reliance on market forces and integration of the economy with rest of the world would ensure competition and efficient functioning of markets. Relative market prices would decide direction of research by allocating more resources to those commodities which are in high demand. New economic policies aimed to accelerate the pace of economic development would further increase the demand for new technologies in two ways. First, higher agricultural income would directly increase the demand for new technologies, and secondly through higher demand for agricultural products due to increased non-agricultural income. Thus, assured, expanding market for new technologies is conducive to attract private research investment in the country.

**Supply-side factors:** Private research investment is significantly influenced by the supply side factors like cost of research, scientific opportunities and basic research support. Research cost consists of cost of inputs (capital, stock of knowledge, manpower) and technical efficiency of the system (Umali, 1992). Furthermore, quality of scientific manpower, developments in science, particularly in biotechnology, and accumulating stock of knowledge can improve the technical efficiency and reduce research lag and cost of research in the private sector. Apart from these supply-side factors, nature of technology also affects the private investment. For example study by Singh et al., 1995

demonstrated that development of double cross hybrids attracts more investment as these hybrids inherently exclude non-authorized commercialization of technology

**Policies:** The role of policy environment in facilitating research among the private sector forms the core of this research. Private research investment is also mainly determined by macroeconomic, agricultural and research regulatory policies. Macroeconomic and agricultural policies affect private research investment as these policies have significant effect on the prices of commodities and inputs and research cost. The economy-wide reforms initiated in 1991 strengthened the private sector participation in the economy. Similarly, research regulatory policies included in the national seed policy and national agricultural policy of 1999 and 2004 respectively are reformed to attract the private investment in research in seed systems. These reforms include lifting restrictions on the entry of new companies into seed industry, liberalizing import of seed/germplasm under, and increasing access of private research programmes to public research material, Support of private research by maintaining variety purity on cost recovery basis on behalf of private companies that don't have the capacity to do so, Support by government to private sector institutions in terms of applied research, crop improvement and variety development and, strengthen the area of information gathering and dissemination through publications so that relevant scientific information and technology is made available to researchers in both public and private institutions. This research will concentrate on the analyzing the policy on how it has affected the performance of the private sector in research and training in seed systems among the private sector institutions.

## **2.9 Hindrance to Research and Training in Seed Systems**

Despite the important role that research and training plays in seed systems in Zambia, its performance has not been impressive especially after the structural adjustment programmes in 1991 (Elliott and Perrault; 2003). Elliott and Perrault described the erosion of the current research in Zambia as the "quiet crisis" in the sense that it takes place against positive chorus of achievement in liberalization and privatization while ignoring the simultaneous serious and perhaps permanent loss of institutional and human

capacity.

A recent survey by IFPRI (ASTI 2001) reports on the institutional infrastructure for the agricultural and related research. The survey reviewed that many positions remain unfilled after staff departures, largely because of informal and formal hiring constraints making shortage of human resource as one of the major constraints.

Another constraint to research and training as noted by Elliott and Perrault has been the decline in real expenditures per researcher and decline in commitment by the government. The decline in commitment by the government reflects the lack of political pressure by farmers and other stakeholders in favor of research and training in seed systems. This is evidence as seen in the fiscal policies and budgetary practices that have been biased against agriculture (World Bank 2001). Despite the obvious importance of agriculture in employment and agriculturally based share of manufacturing, the share of agriculture in public expenditure has been low, fluctuating between 2.5 and 10 percent but averaging only 4 percent between 1994 and 2000. Within the agricultural budget, the share of research has been equally modest, at only 5.3 percent (World Bank 2001).

The aspect of lack of coordination in research and training in Zambia by the major stakeholders was also identified as a constraint by Elliott and Perrault. Zambia's national agricultural research system has grown in complexity but not in full-time equivalent scientist numbers or research capacity. Meanwhile, there are more research partners: the University, the Semipublic Research Trusts, the Seed Industry, and Technology service providers such as extension and NGOs. Pluralism is generally a positive thing. However, the increase in the number of part-time research providers with primary mandates for education or development at the expense of the main research body SCRB weakens the research system.

In 1991, gray leaf spot of maize appeared in the country; probably via seed imported from other countries of the region; the arrival of fungus had grave consequences for national maize production because Zambian hybrids were found to be highly susceptible

to it. Not only did some time elapse before the impact of this unregulated and untested technology importation was brought to the attention of research, but SCRB had few resources to respond to the threat. A strengthened Seed Control and Certificate Institute (SCCI) with better control measures could have prevented the problem, and better conditions between SCRB and ZAMSEED could have brought it under control much sooner. Finally, SCRB is hampered in its efforts to involve farmers in its technology development efforts by practice of some NGOs that pay sitting fees, missed lunch allowances, and other allowances to attract farmers to their technology diffusion sessions. Because this practice is not uniform among donor projects, some donors who do not pay such allowances also complain about their inability to compete with those that do.

The importance of research and training can not be over emphasized as outlined in the above cited literature. All these studies conducted just review the importance of research, role of private sector in research and factors that determine private sector involvement in research. This study will specifically address the performance of private sector institutions in research and training in the seed systems after the formation of the national industry seed policy.



## **CHAPTER THREE**

### **3.0 STUDY METHODOLOGY**

#### **3.1. Introduction**

This chapter outlines the methods and procedures that were used in the study. It will also highlight the methods of data collection that were used.

#### **3.2 Study Area**

The study was conducted within Lusaka. Lusaka is the Capital city of Zambia and it was chosen because policy makers and most of the seed companies are located within Lusaka. The institutions where primary and secondary data was collected from included SCCI, ZARI (secondary data only), SEEDCO, ZAMSEED, MRI, Kamano, Pannar, Hygrotech, Crop Serve, ZASTA (secondary data), ACF, Caritas Zambia and ZNFU.

#### **3.3. Data Collection**

To achieve the objectives of the study, three methods of data collection were used. These involved use of structured questionnaires, open/informal interviews and collection of secondary data.

Primary data was collected using questionnaires and open interviews from the purposively selected respondents in the institutions involved in the seed industry. Open interviews were used to allow the respondent express their opinions on the subject under study. Secondary data was obtained from records of private and public sector organizations involved in variety development and research, seed production, supply and/ delivery.

### **3.3. Limitations of the Study**

One of the major limitations to the study was poor response to the questionnaires. This was compounded by the fact that the study targeted managers in the seed companies who were in most cases busy and could not find time for an interview/answering the questionnaires.

Secondly, time for data collection was limited and it was during the festive season when most managers were off for the industrial break. Time factor made it difficult to visit other seed companies located out side Lusaka. Because of time constraint, companies like Cargill and Dunavant, research trusts like GART and CDT were not captured.

There was also very little literature available on the phenomenon under study. Even the little that was available did not relate much to the present study. As a result, there were little prior insights into the study. Because of this lack of prior insight, it was difficult to come up with the appropriate methodology for the study.

### **3.4. Data Analysis**

The data codes from the questionnaire were entered into the Statistical Package for Social Sciences (SPSS) editor. The data was cleaned and checked for completeness. Descriptive statistics (frequencies) were generated and organized using SPSS. The trend curve was generated using Microsoft Excel. The strategies set in the national seed policy were analyzed by way of checking how they are influencing the private sector participation in analyzing the policy environment.

## CHAPTER FOUR

### 4.0. STUDY FINDINGS AND DISCUSSIONS

#### 4.1. Introduction

This chapter presents the findings of the study. It begins with the presentation of the description of the sample upon which the findings are based. It then discusses the policy environment and how it has affected performance of private sector in the seed industry. Lastly, the subject is concluded as well as recommendations made.

#### 4.2. Description of the Study Population

The study population comprised of all the private seed companies and other organizations involved in the seed industry that is both public and NGOs.

The mean age of the sample was 43.6years, median and modal ages of 45 and 49 years respectively from a distribution range of 24 (30years to 54years). This distribution consisted of ten (10) males and (3) females.

**Table1: Description of Respondent's level of Education**

|              | Frequency | Percent |
|--------------|-----------|---------|
| PhD          | 1         | 8       |
| Masters      | 6         | 46      |
| First Degree | 1         | 8       |
| Others       | 5         | 38      |
| Total        | 13        | 100.0   |

Source: Own Survey Data (2008)

Table 1 shows the levels of education of the respondents. A total of thirteen (13) respondents were interviewed from eleven (11) different institutions. The levels of education of respondents were distributed as follows; there was only one (1) PhD holder representing, six (6) masters degree holders representing, one (1) with a first degree

representing and the remaining five (5) had other qualifications such as ACCA (Association of Certified Chartered Accountants), Diplomas and CIM (chartered institute of marketing).

**Table 2: Distribution of Participating Organizations**

|                | Frequency | Percent |
|----------------|-----------|---------|
| Public Sector  | 2         | 15      |
| Private Sector | 7         | 54      |
| Others         | 4         | 31      |
| Total          | 13        | 100.0   |

Source: Own Survey Data (2008)

The institutions sampled were distributed in as follows; seven (7) were private seed companies and they included; SEEDCO, ZAMSEED, MRI, Kamano, Pannar, Hygrotech, Crop, two (2) were public sector institutions and these are SCCI and ZARI (of which only secondary data was collected) and the remaining four (4) were NGOs and other organizations and these are; ZASTA (only Secondary data), ACF, Caritas Zambia and ZNFU. This information is shown in table 2.

**4.3. Private sector Involvement**

**Table 3: Role played by Organization in Seed Industry**

|  | Frequency | Percent |
|--|-----------|---------|
| Distribution                                       | 3         | 23      |
| Multiplication, processing and marketing           | 3         | 23      |
| Certification and research                         | 3         | 23      |
| multiplication, processing, marketing and breeding | 4         | 31      |
| Total  | 13        | 100.0   |

Source: Own Survey Data (2008)

In terms of the roles played by these institutions in the seed industry, three (3) are involved in seed distribution and these were the NGOs, three (3) deal in seed multiplication packaging and marketing, (representing 42.9% of the private seed companies), four (4) are involved in seed multiplication, breeding and research, marketing and distribution of seed (which represented 57.1% of the private sector seed companies) and the remaining three (3) composed of Public sector institutions and ZNFU.

**4.5 Private Sector Involvement in Research and Training in Plant breeding**

**Table 4: Organization involvement in Training of plant breeders**

|       | Frequency | Percent |
|-------|-----------|---------|
| Yes   | 3         | 43      |
| No    | 4         | 57      |
| Total | 7         | 100.0   |

Source: Own Survey Data (2008)

The respondents from the seven (7) private companies were asked whether their companies were involved in training of plant breeders. Among the seven (7) private companies, four (4) indicated that they were not involved in any training of plant breeders and the remaining three (3) said they did train their own breeders. The training of breeders among the three (3) companies is done to the undergraduate students who graduate from the University of Zambia with a bachelor of agricultural science degree (Majors in crop science). In terms of training quality seed certifiers, all the seven (7) private companies have trained quality personnel with SCCI who can carry out various seed quality control tests. This has helped ensure that seed quality standards are up held. The quality control personnel in these private companies work hand in hand with the SCCI personnel. One of the notable attributes that can be seen is an increase in certified seed and QDS on the market. The increase in certified seed and QDS is due to increased personnel in quality control both at the SCCI and the private seed companies. Table 5 shows the quantities of certified seed and QDS produced in the periods 2000/01 and

2005/06 e.g. in the 2000/01 season, only 8512 metric tones of maize seed was produced while in 2005/06 season the certified seed produced had increased to 30587 metric tones representing an increase of 260% (see Table 5). The same trend applies across all the crops where, there has been an increase in both certified and quality declared seed produced as can be seen in table 5.

**Table 5: Seed Production Data**

| Crop       | 2000/01              |                           | 2005/06             |                           |
|------------|----------------------|---------------------------|---------------------|---------------------------|
|            | Certified Seed (MT)) | Quality Declared Seed(MT) | Certified Seed (MT) | Quality Declared Seed(MT) |
| Maize      | 8512                 | -                         | 30587               | 1311.1                    |
| Soybeans   | 156                  | -                         | 2385                | 101.1                     |
| Sorghum    | 68                   | 16                        | 710.1               | 257.24                    |
| Wheat      | -                    | -                         | 17450               | 0.12                      |
| Beans      | 9                    | 19                        | 114                 | 22.18                     |
| G/nuts     | 139                  | 68                        | 119                 | 179                       |
| Cow pea    | 18                   | 14                        | 1.6                 | 154.2                     |
| Cotton     | 4093                 | 1470                      | 12628               | 300                       |
| Millet     | -                    | -                         | 0                   | 104                       |
| Sun flower | -                    | -                         | 85                  | 20.3                      |
| Rice       | -                    | -                         | 0                   | 30.65                     |

Source: SCCI seed production data (2000/01, 2005/06)

In terms of research in plant breeding and seed systems, four (4) private companies representing said they were actively involved in developing their own varieties and the other three (3) said they where not at all involved in plant breeding and variety development. The four (4) private companies involved in research were among the established private seed companies. These included SEEDCO, ZAMSEED, Pannar and MRI. These are actively involved in research in plant breeding and variety development and have developed their own seed varieties. The other company involved in research and

variety development not captured in the sample is Dunavant Company which focuses in cotton research. In the research conducted by Beintema et al; 2004, there were only three (3) private companies that were doing research in plant breeding and seed systems. Therefore, from 2004, there has been increase from only three (3) private companies involved in research in plant breeding and seed systems to five (5) companies. The two companies that came into the system are Pannar and Seed Co. This represented a total of 66% overall increase in the number of private sector companies involved in research in plant breeding and seed systems. The private companies not involved in any kind of research are only involved in seed multiplication, processing and marketing. This group is composed of the emerging seed companies like Kamano and Hygrotech companies who indicated that they will start there own breeding programs in future as it was not possible currently because of the huge capital investment required.

The findings of the research also showed an increase in the level of private sector involvement in research. All the four (4) private seed companies involved in research in plant breeding and seed systems indicated that there has been an increase in research activities that is plant breeding and variety development by these companies. Three (3) of these companies attributed the increase in research activities to the good policy environment set by the seed policy. Only one (1) Company was skeptical in that the policy environment was far from being conducive.

Table 6 shows the selected crops and varieties developed from 1992 to 2006 by the private sector. One of the things that should be noted from the table is that number of actual varieties released is different from the number of active varieties in Zambia. Varieties can be released still not being produced and marketed. A review of the varieties developed/released by the private sector from 1992 to 2007 showed an increase in the number of varieties released by the private sector in certain crops like Maize and no increases at all in the traditional crops like Pearl millet as can be seen in table 6 e.g. for maize, the number of Maize varieties developed increased from three (3) varieties only in period 1992-1996 to twenty nine (29) in the period 2001-2004 while for Pearl Millet there is only one (1) variety that was developed in the whole time period. This supports the

assertion by the private companies that there was indeed an increase in plant breeding and variety development from time privatization was started. At the same time, there is a bias by the private sector to concentrate their breeding activities on only commercially viable crops.

**Table 6: Number of Seed varieties developed/released by private sector companies**

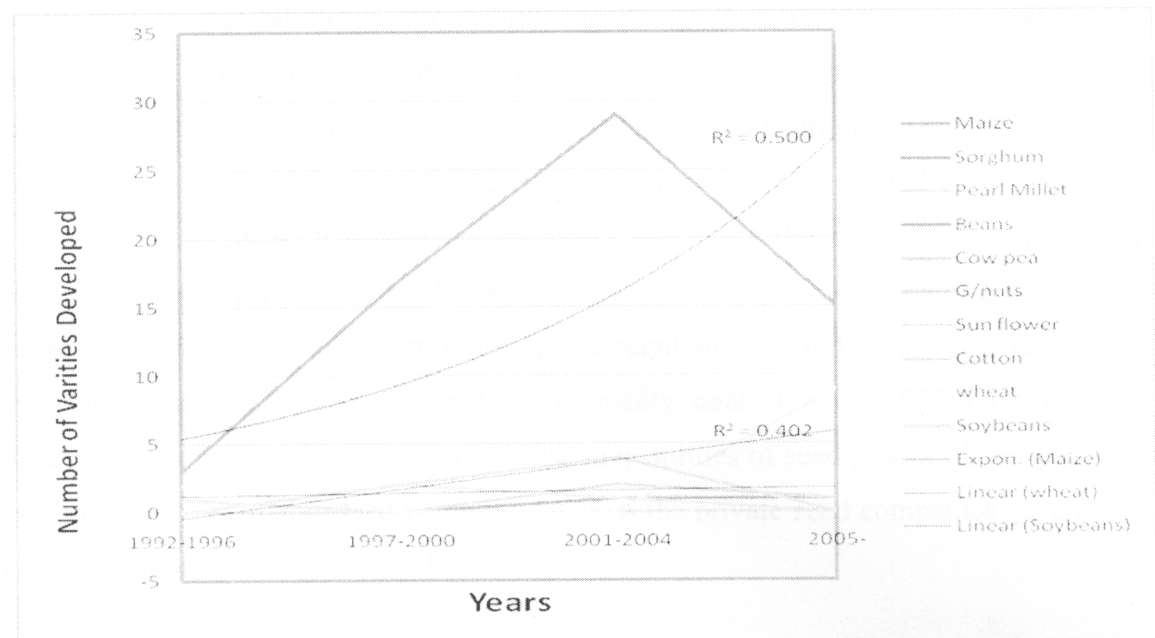
| Crop              | 1992-1996 | 1997-2000 | 2001-2004 | 2005- | Total/crop by private | Total/crop in Zambia | Active varieties /crop |
|-------------------|-----------|-----------|-----------|-------|-----------------------|----------------------|------------------------|
| Maize             | 3         | 17        | 29        | 15    | 64                    | 150                  | -                      |
| Sorghum           | 1         | -         | 1         | 1     | 3                     | 14                   | 4                      |
| Pearl Millet      | 1         | -         | -         | -     | 1                     | 7                    | 3                      |
| Beans             | -         | -         | 1         | 1     | 2                     | 15                   | 5                      |
| Cow pea           | 2         | -         | -         | -     | 2                     | 5                    | 2                      |
| G/nuts            | -         | -         | 2         | 1     | 3                     | 12                   | 5                      |
| Sun flower        | -         | 2         | 1         | -     | 3                     | 31                   | 4                      |
| Cotton            | 2         | -         | -         | -     | 2                     | 9                    | 2                      |
| Wheat             | 2         | -         | -         | 9     | 11                    | -                    | -                      |
| Soybeans          | -         | 2         | 4         | -     | 6                     | 23                   | 8                      |
| Total/time period | 11        | 21        | 38        | 26    | 96                    | 266                  | -                      |

Source: ZASTA, Active Variety List (2006)

The trend of increase in varieties developed is depicted by the trend graph (see figure 1) where the total number of varieties developed for each crop is plotted against time period in which variety was developed. From the trend graph, it can be seen that there is an increasing trend in maize varieties developed. The other notable increase is wheat with an adjusted value of R-Squared of 0.4027 while that of maize is 0.5009. The adjusted R-squared value for maize is a fit as it is above 0.50 while that of wheat is not a fit as it is below 0.50.



Figure 1: Number of Varieties developed Trend



Source: ZASTA, Active Variety List (2006)

The performance of the private sector institutions in research and training in seed systems and plant breeding was rated as good by eighty (8) respondents and average by the remaining five (5). The respondents' opinions in rating the performance of private sector institutions as good and average is supported by the increased private sector activities in the seed sector that is in both variety development and variety release as shown in table 6. In the study, ten (10) of the respondents indicated that an increased private sector participation in the seed industry has resulted from the good policy environment. However, the other three (3) were skeptical in that the policy environment was far from being conducive. According to them, penetration into the seed sector was only possible for the established companies with huge capital bases who are able to breed their own varieties as it is difficult to trade using public bred varieties.

The above study findings show that a lot of changes have taken place from the time of the call for liberalization and seed policy formulation. The pre liberalization period was composed of only government involvement in research and variety development. The study findings show that even if the government is still actively involved in research and variety development, there has also been an increase in the number of private seed

companies taking part in research and variety development in the seed industry. The private sector organizations are now taking a lead in matters of seed research and variety development, production and marketing. The number of private seed companies involved in research and variety development has increased from three (3) in 1998 to five (5) as of 2008, representing a 66% increase. This has been necessitated by the coherent seed policy framework that was put in place to provide the conducive environment necessary for both private and public sector initiatives. The policy has seen changes where the government's role is only in monitoring and regulating the industry, at the same time encouraging private sector participation in quality control and certification through licensing. Not only has this led to an increase in quantities of seed produced, but has also seen an increase in quality seed being produced as the private seed companies have their own seed quality control personnel.

There has also been a remarkable improvement in the seed quality control and certification system. Private seed companies are now given licenses under the Plant Varieties and Seeds Act to carry out various seed quality controls tests. Personnel in the seed companies are also involved in the routine quality controls. The policy has also seen the development of the variety release system that ensures that varieties released from both the public and private research systems have been adequately tested and is suitable to Zambian conditions. Plant Variety Protection Rights has also been introduced in the country to prevent piracy and stimulate investment in the area of variety development. This has on its own helped increase research activities in plant breeding by the private seed companies.

Even though there has been an increase in the number of private seed companies involved in seed variety development and research as well as the varieties developed by the private seed companies as shown by the findings of the research, a lot still needs to be done by the policy makers. Firstly, the increase in number varieties developed is biased towards the commercially viable crops like maize leaving out traditional crops like sorghum and pearl millet. This can be seen from the trend curves where only maize and wheat are the prominent crops with increases in varieties developed while crops like millet and

sorghum, the increase is negligible. As seen, the private sector responds to commercial incentives, and it is not surprising that private companies have concentrated on hybrids which are generally purchased every year. This therefore means that certain mechanisms should be put in place by the relevant authority that will encourage variety development for traditional crops as they still remain the mostly cultivated by the rural masses. Secondly, most of these varieties developed are hybrids, not 'open pollinated varieties', of which small scale farmers can not manage all the necessary production requirements for the hybrids, leading to poor harvest amidst the 'positive chorus' of increase in improved and high yielding varieties on the market.

Private sector participation in the traditional crops and non hybrid seed development has been more modest, and there are questions about the potential private role for such crops. In addition, the highest demand for formal sector seed comes from more commercially orientated farmers. Therefore, the concern is that, without proper incentives, the private seed sector may ignore the requirements of farmers in more marginal areas. The role of the public sector in this case should be to address the needs of those farmers who do not participate in the commercial sector.

#### **4.6. Policy Environment and Effectiveness in Promoting Private sector Participation**

As a way of trying to establish how effective the policy has been in terms of promoting private sector participation in the seed industry, the various strategies set out in the policy were analyzed.

In the policy the strategies set included; the government to offer crop improvement and support to emerging seed companies, government to provide support to private companies without capacity in variety purity maintenance, providing a clear regulatory framework in the seed industry, provide full access of germplasm from national (public) research centers to the private sector, support of private research by maintaining variety purity on cost recovery basis on behalf of private companies that don't have the capacity to do so, support by government to private sector institutions in terms of applied research,

crop improvement and variety development and, strengthen the area of information gathering and dissemination through publications so that relevant scientific information and technology is made available to researchers in both public and private institutions.

The findings showed that some of these strategies were put in place while others were not. The key strategy implemented is the regulatory frame work that has been put in place. Through this regulatory frame work, the operations of the private seed companies are monitored by SCCI who ensure that quality standards are upheld by the seed companies. Private sector companies are also given licenses under the provision of the plant varieties and Seeds Act to carry out various seed quality control tests. A variety release system has also been developed to ensure that varieties released from both the public and private research systems have been adequately tested and are suitable to Zambian conditions. Personnel in the seed companies are also involved in the routine quality controls. The Plant Variety Rights have also been introduced in the country to prevent piracy and stimulate investment in the area of plant breeding. The above strategies have helped increase the quantity and quality of seed produced by the private sector as shown in table 5. Further more, the regulatory frame work has made it possible for the private seed companies to acquire germplasm from international research organizations and have them tested in Zambia.

In the study, it was also found that private seed companies have access to germplasm accessions kept in public institutions though to a limited level. This was evident from the emerging seed companies that were relying on public developed varieties and those that have started their own variety development programs using germplasm from public institutions. The only notable constraints to this were the bureaucracy involved and the existing legal arrangement between ZAMSEED and the public research institutions. Further more support in terms of variety purity maintenance is offered to the private seed companies. For instance in seed multiplication, private companies are accessing parent (basic) seed from research trusts like GART that they give to the seed out growers for seed multiplication. Another important strategy in place is the Strengthened area of information gathering and dissemination through publications so that relevant scientific

information and technology is made available to researchers in both public and private institutions. Private companies also have access to scientific information and technology from public institutions. This information is shared through field days that are held in public research institutions and research trusts that are held at the end of each farming season. In addition, private companies work in collaboration with each other through ZASTA and also with public institutions like UNZA (School of Agricultural Sciences) and ZARI. It is in such collaboration that scientific information and technology is shared. The research trusts created by the government also makes it easy for the private seed companies to access basic seed materials.

However, the findings also showed that none of the private companies received support in applied research and crop improvement. There is no evidence of this form of support being offered by the government to the private institutions. It was found that it was actually difficult for a private company to access germplasm and the seed varieties from public institutions. The major constraint to this is the policy support and legal arrangement that was entered into with one of the seed companies (ZAMSEED) and the government in form of a memorandum of understanding which gave exclusive rights to the company over all varieties from the public research institutions. This memorandum of understanding is a legal arrangement that was put in place before the call for liberalization and later renewed in 2003 which stipulates that all the varieties developed by the public research institutions can be traded through ZAMSEED. The exclusive rights arrangement is now a threat as it contradicts the liberalized economy policy. The arrangement has made it difficult for the emerging private seed companies who do not have varieties under their name to thrive in the industry. Further more, it has also deprived the farming community of better improved varieties as these varieties can only be traded through one Seed Company and in areas where this seed company has no representation, also means no varieties bred by public institutions. Good materials from the public research institution are no longer accessible by other private companies. This in itself is a major blow to the emerging seed companies that rely mostly in public bred varieties.

Therefore, this existing memorandum of understanding between ZAMSEED and the public institutions should be revisited to make it possible for all the private seed companies have access to public bred varieties. This will make the seed industry competitive were the private seed companies can be made to bid for the public bred varieties and pay royalties. This will make the public institutions involved in variety development become self sustaining.

**4.7. Private Sector Involvement in the Msc Program in Plant Breeding**

**Table 7: Distribution of Private Sector Involved  
In Running Master of Science Programme at UNZA**

|       | Frequency | Percent |
|-------|-----------|---------|
| Yes   | 4         | 57      |
| No    | 3         | 43      |
| Total | 7         | 100.0   |

Source: Own Survey Data (2008)

The seven (7) private seed companies sampled were asked whether they participated in the running of the Master of Science programme in plant breeding and seed systems at the University of Zambia; four (4) indicated that they were involved to some what lesser extent. There areas of involvement were in offering research materials, participation at thesis and results presentations. However, none of these companies were sponsoring students in the same Programme. The remaining three (3) said they did not participate at all in the running of the Programme. Again, among the seven (7) Seed companies sampled, six (6) expressed willingness in directly wanting to be involved in the running of the same Programme especially in making it more practical oriented than the general trend were they said the program was more theoretical. The weaknesses of the Programme cited by the respondents included; content of courses in plant breeding as not being adequate, the program being too theoretical than practical and the non orientation of research topics to the relevant needs of the industry.

The area of training of the plant breeders is mostly still being done by the government. The private sector organizations have not done much as seen in the research findings where none of the private companies were sponsoring a student in the Master of Science Programme in plant breeding and seed systems.

## CHAPTER FIVE

### 5.0. CONCLUSIONS

Zambia's agricultural research sector has indeed undergone significant reform in the recent past from time of call for liberalization. One of the notable changes is the increased number of private sector companies in the seed industry. Many private sector companies have entered the industry and this has seen an increase in the number of varieties bred. The number of private seed companies involved in research and variety development has increased from three to five, representing a 66% increase.

From the time the call for liberalization was started, a total of 96 varieties have been developed by the private sector of which 64 of these were maize varieties, 3 were sorghum, 1 pearl millet, 2 beans, 3 sunflower, 2 cow peas, 3 ground nuts, 2 cotton, 6 soy beans and 11 wheat varieties respectively. This shows that increase in private sector activities in variety development is biased only towards the commercially viable crops like Maize and leaving out crops like Pearl Millet.

All this has been made possible due to the conducive environment set by the policy. The private sector companies have access to the germplasm kept in public institutions. Further more the, the training of quality seed certifiers by SCCI and licensing of private seed testing laboratories at Dunavant and ZAMSEED has helped increase the quantities of both certified seed and QDS produced. As noted in Table 5, e.g. for Maize, the quantities of certified seed produced in the periods 2000/01 and 2005/06 increased from 8512 metric tones to 30587 metric tones representing an increase of 260%.

However, there is little activity in terms of private sector participation in training of plant breeders. For instance at the time the study was being conducted, there was no private sector company that was sponsoring a student at the University of Zambia pursuing a Masters in Plant Breeding and Seed Systems.



## **5.1. Recommendations**

Firstly, the government should continue breeding programs for minor crops like millet and sorghum. This should be done because the private sector has only concentrated on commercially viable crops leaving out the minor crops. The government should continue with germplasm preservation and development to ensure indigenous breeds are preserved.

Secondly, the existing memorandum of understanding between ZAMSEED and the public institutions should be revisited to make it possible for all the private seed companies have access to public bred varieties. This will make the industry competitive where the private seed companies can be made to bid for the public bred varieties and pay royalties. This will make the public institutions involved in variety development become self sustaining.

Private sector companies should be encouraged to participate fully in the running of the Msc Programme in plant breeding and seed systems at UNZA as they are among the beneficiaries of this Programme. The private sector should be involved in setting the curriculum of this Programme as they are the employers and therefore knows the appropriate type of training that should be given to plant breeders.

Further research should be carried out that should involve all the stakeholders in the seed industry. This will help determine if the policy has indeed achieved the set target .i.e., in this study farmers were not interviewed hence one can't tell whether they are accessing the improved seed varieties or the improved seed varieties have helped increase their production. Officials from the ministry of agriculture were also not interviewed to get there perception hence the need to carry out more research that will insure all stakeholders are involved.

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7.0 APPENDICES

Appendix 1: Organization Survey Questionnaire

BIO DATA-PERSONAL BACKGROUND

| Question Description  | Response Category  | Code |
|---|--|------|
| Identification  |  |      |
| 1) First Name   | .....  |      |
| 2) Last Name  | .....  |      |
| 3) Age  | ..... Years.   |      |
| 4) Gender   | 1. M <input type="checkbox"/> 2. F <input type="checkbox"/>  |      |
| 5) Nationality  | 1. Zambian <input type="checkbox"/><br>2. Foreign <input type="checkbox"/>   |      |
| 6) Contact Tel. No:   | .....  |      |
| Email Address   | .....  |      |
| 7) Job Title  | .....  |      |
| 8) Qualification Level                                      | 1. PhD <input type="checkbox"/><br>2. Masters <input type="checkbox"/><br>3. First Degree <input type="checkbox"/><br>4. Others (specify)..... |      |
| 9) How long have been working in this organization/company? | ..... Years.   |      |

PRIMARY ORGANIZATION/COMPANY DATA

| Question Description                    | Response Category                         | Code |
|---|---|------|
| 10) Name of Company/Organization        | .....                                     |      |
| 11) To which sector of the economy does | 1. Public sector <input type="checkbox"/> |      |

|  |  |  |  |
|--|--|--|--|
| the company/organization belong?   | 2. Private sector<br>3. Others (specify).....  |  |  |
| 12) Which rôle does your organization/company play in the seed industry? | 1. Marketing and distribution<br>2. Breeding and Research<br>3. Seed Manufacturing<br>4. Others (specify)..... |  |  |

## DATA ON RESEARCH AND TRAINING

| Description  | Response Category  | Code |
|--|--|------|
| Your organization/company<br>involved in any kind of<br>research/training in seed systems?                                       | <div>1. Yes      2. No</div> <div>           a) Training..... <input type="text"/> <input type="text"/> </div> <div>           b) Research..... <input type="text"/> <input type="text"/> </div>                         |      |
| Please specify the type of training/<br>research that is carried out by your<br>organization/company.                            | .....<br>.....   |      |
| What is the total number of<br>personnel that has been trained by<br>your organization/company in the<br>following periods?      | <div>           (i) 1991 – 1999 ..... <input type="text"/> <input type="text"/> <input type="text"/> </div> <div>           (ii) 1999 – 2007 ..... <input type="text"/> <input type="text"/> <input type="text"/> </div> |      |
| What is the total number of new<br>varieties that have been<br>bred by your<br>organization/company in the<br>following periods? | <div>           (i) 1991 – 1999 ..... <input type="text"/> <input type="text"/> <input type="text"/> </div> <div>           (ii) 1999 – 2007..... <input type="text"/> <input type="text"/> <input type="text"/> </div>  |      |

|   |  |  |
|---|--|--|
| <p>If there has been an increase in the total number of graduates obtained/increase in the crop varieties developed by your organization/company, would you attribute this increase to the good environment set by the national seed policy?</p> <p>If there hasn't been an increase, would attribute it to the quality of the national seed on the aspects of training and</p> | <p>(i)      1. Yes                      2. No</p> <p style="text-align: center;"> <input type="checkbox"/>                      <input type="checkbox"/> </p> <p>(ii)      1. Yes                      2. No</p> <p style="text-align: center;"> <input type="checkbox"/>                      <input type="checkbox"/> </p> |  |
| <p>Are you aware of the Master of Degree Programme offered by A School of Agricultural Sciences?</p>  | <p>1. yes                      <input type="checkbox"/></p> <p>2. No                      <input type="checkbox"/></p>   |  |
| <p>Yes, Is your organization in any way involved in this programme? Please specify.</p>   | <p>.....</p> <p>.....</p> <p>.....</p>   |  |
| <p>No, your organization/ company is not involved in any way, why?</p>  | <p>.....</p> <p>.....</p> <p>.....</p>   |  |
| <p>Does the Programme satisfy the needs of your organization/company?</p>   | <p>1. yes                      <input type="checkbox"/></p> <p>2. No                      <input type="checkbox"/></p>   |  |
| <p>No, what are the shortcomings of the Programme?</p>  | <p>.....</p> <p>.....</p> <p>.....</p>   |  |
| <p>What do you think are the strengths and weaknesses of this programme</p>   | <p>a) Strengths.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>b) Weaknesses.....</p> <p>.....</p> <p>.....</p> <p>.....</p>   |  |
| <p>How would you want your organization involved in the running of the Programme?</p>   | <p>.....</p> <p>.....</p> <p>.....</p>   |  |

| <p>How effective do you think your organization/company is in developing strategies that facilitates research and training in seed systems in implementing the policy?</p> | <p>1. Very effective <input type="checkbox"/></p> <p>2. Effective <input type="checkbox"/></p> <p>3. Slightly Effective <input type="checkbox"/></p> <p>4. Not at all Effective <input type="checkbox"/></p>  |                          |     |    |                   |                          |                          |                   |                          |                          |                       |                          |                          |                       |                          |                          |
|--|---|--------------------------|-----|----|-------------------|--------------------------|--------------------------|-------------------|--------------------------|--------------------------|-----------------------|--------------------------|--------------------------|-----------------------|--------------------------|--------------------------|
| <p>What evidence can you give for answer given on Q. 26?</p>   | <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>  |                          |     |    |                   |                          |                          |                   |                          |                          |                       |                          |                          |                       |                          |                          |
| <p>Does your company or any organization work in collaboration with other companies/ organization in the area?</p>   | <p>1. yes <input type="checkbox"/></p> <p>2. No <input type="checkbox"/></p>  |                          |     |    |                   |                          |                          |                   |                          |                          |                       |                          |                          |                       |                          |                          |
| <p>If yes, What exactly does your organization do in such collaborations?</p>  | <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>   |                          |     |    |                   |                          |                          |                   |                          |                          |                       |                          |                          |                       |                          |                          |
| <p>If No, Why doesn't your organization/company work with others?</p>  | <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>   |                          |     |    |                   |                          |                          |                   |                          |                          |                       |                          |                          |                       |                          |                          |
| <p>Do you think your organization has enough capacity in terms of?</p>   | <table border="1"> <thead> <tr> <th></th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>a) Human Resource</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>b) Infrastructure</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>c) Financial Resource</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>d) Information System</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table> |                          | Yes | No | a) Human Resource | <input type="checkbox"/> | <input type="checkbox"/> | b) Infrastructure | <input type="checkbox"/> | <input type="checkbox"/> | c) Financial Resource | <input type="checkbox"/> | <input type="checkbox"/> | d) Information System | <input type="checkbox"/> | <input type="checkbox"/> |
|  | Yes   | No                       |     |    |                   |                          |                          |                   |                          |                          |                       |                          |                          |                       |                          |                          |
| a) Human Resource  | <input type="checkbox"/>  | <input type="checkbox"/> |     |    |                   |                          |                          |                   |                          |                          |                       |                          |                          |                       |                          |                          |
| b) Infrastructure  | <input type="checkbox"/>  | <input type="checkbox"/> |     |    |                   |                          |                          |                   |                          |                          |                       |                          |                          |                       |                          |                          |
| c) Financial Resource  | <input type="checkbox"/>  | <input type="checkbox"/> |     |    |                   |                          |                          |                   |                          |                          |                       |                          |                          |                       |                          |                          |
| d) Information System  | <input type="checkbox"/>  | <input type="checkbox"/> |     |    |                   |                          |                          |                   |                          |                          |                       |                          |                          |                       |                          |                          |

|   |  |
|---|--|
| No, what are the reasons for  | a).....<br>.....<br>.....<br>b).....<br>.....<br>.....<br>c).....<br>.....<br>.....<br>d).....<br>.....<br>..... |
| What other constraints are faced<br>by your organization/ company in<br>conducting research and training in seed<br>production? | .....<br>.....<br>.....<br>.....<br>.....  |
| How best do you think these<br>constraints should be addressed?   | .....<br>.....<br>.....<br>.....   |

**INFORMATION ON THE SEED POLICY**

| Question Description   | Response Category   | Code |
|--|---|------|
| Have you ever read the National Seed Policy of Zambia?                       | 1. Yes <input data-bbox="962 1284 1015 1328" type="checkbox"/><br>2. No <input data-bbox="962 1371 1015 1414" type="checkbox"/> |      |
| If No, what are the major reasons for  | .....<br>.....<br>.....   |      |
| Were you involved/ consulted in the formulation of the National Seed Policy? | 1. Yes <input data-bbox="962 1586 1015 1629" type="checkbox"/><br>2. No <input data-bbox="962 1673 1015 1716" type="checkbox"/> |      |



|  |   |  |
|--|---|--|
| <p>In your opinion, do you think the National Seed Policy promotes the participation of the private sector in research and training in seed systems?</p> | <p>1. Yes <input type="checkbox"/></p> <p>2. No <input type="checkbox"/></p>  |  |
| <p>If No, what do you think are the shortcomings of this document?</p>   | <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> |  |

|   |  |  |
|---|--|--|
| <p>10). How would you rate the performance of the private sector in terms of availing quality seed to small holder farmers from the time the National Seed Industry Policy was formulated</p> | <p>1. Very Good..... <input type="checkbox"/></p> <p>2. Good..... <input type="checkbox"/></p> <p>3. Average..... <input type="checkbox"/></p> <p>4. Bad..... <input type="checkbox"/></p> |  |
| <p>11) What do you think could be done to improve the performance of the private sector in availing quality seeds to small holder farmers?</p>  | <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>  |  |
| <p>12) What do you think are the weaknesses and strengths of the National Seed Policy</p>   | <p>a) Strengths.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>b) Weaknesses.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>                                 |  |

| Does your organization/<br>company receive any form of<br>support from the government<br>in terms of variety purity<br>maintenance?                    | 1. Yes,.....<br>.....<br>2. No,.....<br>.....   |                                       |  |        |       |                       |                          |                          |                        |                          |                          |                            |                          |                          |  |
|--|---|---------------------------------------|--|--------|-------|-----------------------|--------------------------|--------------------------|------------------------|--------------------------|--------------------------|----------------------------|--------------------------|--------------------------|--|
| Is information easily<br>passed from government<br>institutions regarding relevant<br>scientific information and<br>technology in the seed<br>systems? | 1. Yes, .....<br>.....<br>2. No, .....<br>.....   |                                       |  |        |       |                       |                          |                          |                        |                          |                          |                            |                          |                          |  |
| Does your<br>company/organization have<br>access to germplasm<br>collections for different crops<br>in government<br>institutions?                     | 1. Yes<br><br><input type="checkbox"/>  | 2. No<br><br><input type="checkbox"/> |  |        |       |                       |                          |                          |                        |                          |                          |                            |                          |                          |  |
| If no, what are the major<br>constraints to that?  | .....<br>.....<br>.....<br>.....  |                                       |  |        |       |                       |                          |                          |                        |                          |                          |                            |                          |                          |  |
| Does your<br>organization/company receive<br>government support in<br>applied research, crop<br>improvement and variety<br>development                 | <table border="0"> <thead> <tr> <th></th> <th>1. Yes</th> <th>2. No</th> </tr> </thead> <tbody> <tr> <td>(i). Applied research</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>(ii). Crop improvement</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>(iii). Variety development</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table> |                                       |  | 1. Yes | 2. No | (i). Applied research | <input type="checkbox"/> | <input type="checkbox"/> | (ii). Crop improvement | <input type="checkbox"/> | <input type="checkbox"/> | (iii). Variety development | <input type="checkbox"/> | <input type="checkbox"/> |  |
|  | 1. Yes  | 2. No                                 |  |        |       |                       |                          |                          |                        |                          |                          |                            |                          |                          |  |
| (i). Applied research  | <input type="checkbox"/>  | <input type="checkbox"/>              |  |        |       |                       |                          |                          |                        |                          |                          |                            |                          |                          |  |
| (ii). Crop improvement   | <input type="checkbox"/>  | <input type="checkbox"/>              |  |        |       |                       |                          |                          |                        |                          |                          |                            |                          |                          |  |
| (iii). Variety development   | <input type="checkbox"/>  | <input type="checkbox"/>              |  |        |       |                       |                          |                          |                        |                          |                          |                            |                          |                          |  |
| Do you have anything else<br>to say?   |   |                                       |  |        |       |                       |                          |                          |                        |                          |                          |                            |                          |                          |  |