EVALUATING THE EFFECT OF CONSERVATION AGRICULTURE BASIN TILLAGE SYSTEM ON HOUSEHOLD FOOD SECURITY IN MUTASA

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EVALUATING THE EFFECT OF CONSERVATION AGRICULTURE BASIN TILLAGE SYSTEM ON HOUSEHOLD FOOD SECURITY IN MUTASA

By

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Submitted in partial fulfilment of the requirements of the degree Masters in Arts Development Studies at the Nelson Mandela Metropolitan University

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DECLARATION

I, Thomasina Muchakwana 209911026, hereby declare that the treatise for Students qualification to be awarded is my own work and that it has not previously been submitted for assessment or completion of any postgraduate qualification to another University or for another qualification.

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Dedication

I want to dedicate this research to my family and friends who helped and encouraged me to make this project a success. Thank you to my supervisor for guiding me through this project. The Lord bless you all!
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EXECUTIVE SUMMARY/ABSTRACT

The research was done with the aim of evaluating the effect of the basin tillage system as a method of conservation agriculture, on improving smallholder farmers’ food security in Mutasa, Manicaland Province in Zimbabwe. This research focused on the 2010/2011 agricultural season. The main objectives of this study were to determine the contribution of CA basin tillage system on increasing yields per hectare, to evaluate which CA principles are being practiced by smallholder farmers, and to determine how many months the harvested maize will last. The study compares smallholder farmers who practiced CA with farmers who practiced other tillage methods. The other tillage methods are ploughing and conventional hand hoe tillage systems.

On average the farmers who practiced CA used 0.47 hectares of land whilst farmers who practiced other tillage methods used an average of 0.43 hectares of land. The average amount of maize produced by smallholder farmers who practiced CA was 824 kg while who practiced other tillage methods produced an average of 498 kg. Farmers practicing CA produced yield with an average of 1175 kg/ha of maize grain while farmers who practiced other tillage methods produced an average of 946 kg/ha.

Food security in this research was measured by the amount of months the maize grain produced was lasting in relation with the household size. 57% of the farmers who practiced CA are food secure because they have maize grain to last them a full consumption year and moreover surplus. Only 27% of the farmers who practiced other tillage methods produced enough to last a full consumption year.
CHAPTER ONE RATIONALE/BACKGROUND TO THE STUDY

1.1 Introduction and background
It is estimated that more than a billion people, may be suffering from under-nourishment. The rise in food prices in 2007-08 as well as financial and economic crisis in 2009 increased awareness on poverty and hunger issues in the world. The international community has been mobilizing resources for eradication of hunger from the face of the earth (FAO Media, October, 2010). An estimated 44 million people have been pushed into poverty since June 2010 because of rising food prices in the world. (World Bank, 2011) In his 2009 speech at the World Food Day in Rome, Jaques Diouf, stated that from 2009 Sub-Saharan Africa has over 265 million people who are malnourished and 30 per cent of the population is suffering from hunger. The implementation of appropriate policies could lead to the attainment of a sustained increase in agricultural production, incomes and food security. In 2008, Africa produced 152.3 million tonnes of cereals, 12 per cent more than the previous year, while projections for 2009 indicate that the continent’s cereal production could reach 160 million tonnes. (FAO Media, May, 2010)

Maize is the staple food in Zimbabwe. For the past decade smallholder farmers have been unable to produce enough for their household consumption in Zimbabwe due to the prolonged dry spell, lack of inputs and poor land management practices among many other factors. Over the past decade, food security and income for many small holder farmers in sub-Saharan Africa has declined significantly. Agriculture is now becoming a priority due to the drastic increases in food and input prices.

In Zimbabwe, food production has been affected by the economic and political crises as well as natural disasters. The increased inflation between 2001 and 2009 and economic collapse affected the agricultural sector. The commercial supply chain and retail marketing systems were also affected, resulting in chronic shortages of food and agricultural commodities. The recurrent droughts, dry spells and poor harvests also affected agricultural production. The high levels of unemployment that is estimated at more than 80% and a high HIV/AIDS prevalence rate that is at 13.7% together with other factors mentioned above led to increasing levels of vulnerability and acute food insecurity in the past few years. This resulted in the need for humanitarian food assistance operations in the Zimbabwe. (WFP, 2011)

In February 2009 due to the formation of a new coalition government, there were political and economic changes which led to legislation been passed permitting foreign currency to be used for business transactions. The hyper-inflation ended and food became available in the marketplace. High levels of unemployment caused by the longer-term impact of hyperinflation also had negative effect on livelihoods and income-earning opportunities. (WFP, 2011).

Historically, agriculture was the backbone of the economy of Zimbabwe. According to the World Food Programme, this was the case until the 1998 to 2008 period, where there was a pronounced decline in agricultural production. Although food security in Zimbabwe improved significantly following government efforts there is still need for agricultural and food assistance for an estimated 1.68 million people. The area planted under maize increased by 20 percent in 2010 to the highest level in 30 years resulting in production rising by seven percent. In the 2008 marketing season less than 500,000 metric tons of maize was harvested, production has more than doubled in 2009 and
2010 to 1.27 and 1.35 million tons respectively. (WFP, August, 2010) According to Liliana Balbi, Team Leader, FAO Global Information and Early Warning System, there is a shortfall of 428,000 tonnes. Part of this will be covered by commercial imports, projected to total 317,000 tons of cereals, including 200,000 tons of maize. (FAO Media, August, 2010)

The Food and Agricultural Organization of the United Nations has been promoting conservation agriculture that has helped farmers to improve soil fertility. Conservation agriculture made use of techniques which include maintaining soil organic cover, reducing tillage and better crop rotation. Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. (World Food Summit, 1996) Food insecurity exists when people do not have adequate physical, social or economic access to food. (FAO, 2003) About 1.7 million people in Zimbabwe were estimated to be food insecure during the season running from October through to February. About 400,000 of the food insecure people were estimated to be in urban areas and those in the rural areas were outside of the central districts and are classified to be moderately food insecure. (FEWSNET, 2011)

Due to a complex combination of socio-economic and environmental factors, agricultural production in Zimbabwe has been declining rapidly over the past ten years. Hyperinflation, macroeconomic instability and high levels of unemployment have also increased levels of general poverty which are negatively affecting livelihoods and the ability of households to access sufficient levels of food. Although domestic staple cereals production has consistently fallen short of national requirements over the past nine years, national requirements were generally satisfied by Government, private sector and food aid imports (ZimVac, 2010). The projections made by Zimvac in May 2010 suggest that a total of 1.3 million rural people, at peak will not be able to meet their minimum cereal needs during the 2010/11 season. This represents about 15% of the total rural population; which is similar to last year’s total at the national level. In Manicaland province alone, there are an estimated 21,916 people that will be unable to meet their cereal needs during the 2010/11 season.

The measure of household food security over the years has been determined by comparing household estimated food entitlements to their minimum food requirements based on food consumption patterns in Zimbabwe. Household requirements measured in maize equivalence can be computed from the product of household size. When household food entitlements are equal or greater than household requirements then the household is food secure. (WFP, 2009)

Conventional farming has been the most commonly used farming method over the past decades. Farmers had to wait for the rains for them to hire cattle or tractors for ploughing. Conservation Agriculture is a way of farming that conserves, improves and makes more efficient use of natural resources through integrated management of the available resources combined with external inputs (FAO, 2002). The reasons for using conservation agriculture include the decline in soil fertility, the decline in crop production, inconsistency of rainfall patterns, low/non-usage of agricultural inputs and the use of unsustainable farming systems.
In 2004, there was an extensive promotion and introduction of Conservation Agriculture (CA) basin tillage system in Zimbabwe, with a view to assisting farmers with little or no access to draught power, to plant in time and produce the maximum yields possible.

CA is defined as a concept for resource-saving agricultural crop production that strives to achieve acceptable profits, high and sustained production levels while concurrently conserving the environment. (Zimbabwe CA Task Force 2009:1). In conservation agriculture, global food security, global environmental preservation as well as improved livelihoods are the main goals of a sustainable farming system. (Govaerts B, Sayre K, Verlhust N, Dendooven L, Limon-Ortega A, Patino-Zunega L, 2009:1)

CA is based on enhancing natural biological processes above and below the ground. Interventions such as mechanical soil tillage are reduced to an absolute minimum. The use of external inputs such as agrochemicals, mineral or organic nutrients is applied at an optimum level and in a way and quantity that does not disrupt the biological processes. Conservation farming using basin tillage is a proven technology which has been used in South America and is being used in sub-Saharan Africa. Basin tillage is farming using recommended basin with dimensions of is 15 cm (length), 15 cm (width), 15 cm (depth) and the basins. Manure is added as well as organic or inorganic fertilizers also to each basin which is then lightly covered with soil. (Twomlow S, Hove L, Mupangwa W, Masikati P and Mashingaidze N, 2008)

FAO also promoted conservation agriculture that helped farmers to improve soil fertility through the use of techniques such as maintaining soil organic cover, reducing tillage and better crop rotation. FAO received contributions from a number of donors, such as the European Union, the United States of America, the Netherlands, Sweden, Spain and Finland. The EU made the largest financial contribution under the European Union Food Facility for Zimbabwe to the amount of USD $20 million for the conservation farming project. (WFP/FAO, 2010)

Food insecurity has become a major issue globally especially with the rising food prices. Conservation agriculture using basin tillage is being promoted to help the smallholder farmers to become food secure and improve livelihoods. Thus the research question: Has the conservation agriculture basin tillage system, improved rural household food security and livelihoods in Zimbabwe?

1.2 The scope and scale of the Research

The period of the research was from January 2011 to August 2011. The survey was done with 90 smallholder farmers, 60 were farmers practicing CA and 30 were farmers who were practicing traditional methods. The study involved a survey of smallholder farmers in the Mutasa district. The area of study is in natural region 1 which is a high rainfall area with an annual rainfall of over 1000 mm.

The villagers practice semi-commercial agriculture. The farmers in Mutasa grow their crops mostly under irrigation systems. Each farmer has on average 0.5 hectares under irrigation. Since 2007 the
farmers have been practicing CA basin tillage. There has been contract farming for the past four years and many farmers have been using CA basing tillage system over these years. The terrain is characterized by mountains; therefore it is difficult to use animal drawn ploughs. The district has several plantations and estates which provide employment. Villagers raise cattle, goats and chicken and they grow maize, groundnuts and sugarcane. They also have plantations for fruit trees in the fields. Some of the villages are small holder growers of coffee, tea and banana plantations.

Conservation Agriculture is being promoted and practiced in Zimbabwe as a sustainable agricultural technology that increases crop productivity while at the same time preserves and conserves the environment. There have been very few documented studies in relation to CA in Mutasa. This gives an opportunity to document the effect of CA on food security focusing on production.

1.3 Research aims and objectives

1.3.1 Research aim:
To evaluate the effect of the basin tillage system as a method of conservation agriculture, on improving smallholder farmers’ food security in Mutasa, Manicaland Province in Zimbabwe

1.3.2 Main Research Question:
Has the basin tillage system method of conservation agriculture helped to improve smallholder farmers’ food security?

1.3.3 Research sub questions:
1. Has CA basin tillage system contributed to significant increase in yield?
2. Which CA principles are mostly practiced by smallholder farmers?
3. Are smallholder farmers producing enough cereals to last a full consumption year?

1.3.4 Specific Objectives:
- To determine the contribution of CA basin tillage system to increasing yields per hectare.
- To evaluate which CA principles are being practiced by smallholder farmers.
- To determine how many months the maize harvested will last

1.3.5 Hypothesis

1. CA basin tillage system contributes to significant yield increases per hectare under smallholder farming conditions.
2. Smallholder farmers are practicing at least one CA principle.
3. Smallholder farmers produce enough maize cereal to last 12 months after harvesting.
2 CHAPTER TWO – LITERATURE REVIEW

2.1 Overview of Zimbabwe CA Situation

Agriculture has been the backbone of Zimbabwe’s economy. The decline in agricultural production by smallholder farmers is due to multiple reasons which include economic decline, increase in input prices, unavailability of many agricultural inputs and unfavourable climatic condition. This has increased the vulnerability of smallholder farmers who rely heavily on rain-fed subsistence agriculture. This is further worsened by very low management and unsustainable land use. (Tekere M, Hurungo J and Rusare M, 1991:1)

During the past years Conservation Agriculture (CA) has been gaining popularity all over the world. It has been applied on about 95 million hectares (Dumanski J, Peiretti R, Benetis J, McGarry D ans Pieri C. 2006:58-64). Together with other organizations and stakeholders FAO has been promoting and introducing CA in several countries in Latin America, Africa and Asia. CA is characterized by three principles which are minimum mechanical soil disturbance, crop rotation and permanent organic soil cover. The application of these principles has been adapted to different climatic conditions and to different crops and cropping systems. CA is seen as a way to practice sustainable agriculture. It has become increasingly popular where conventional agriculture is facing serious problems due to land degradation and increasingly unreliable climatic conditions (Friedrich T and Kienzle, 2001).

Conservation agriculture relates directly to the United Nations Framework Convention on Climate Change, the International Convention on Biodiversity, the International Convention to Control Desertification, and the various agreements on international waters. The adoption of conservation agriculture practices by farmers often shows increased yields which can double or even triple sometimes, which can be realized by farmers. (Dumanski, J., R. Peiretti, J. Benetis, D. McGarry, and C. Pieri. 2006:60). Conservation Agriculture is generally defined as any tillage sequence with the objective of minimizing or reducing the loss of soil and water; operationally a tillage or tillage and planting combination which leaves at least 30% or more mulch or crop residue cover on the surface. In the dry lands of southern Africa,

CA has been loosely applied to any tillage system whose objective is to conserve or reduce soil, water and nutrient loss, or which reduces draft power and input requirements for crop production. (Twomlow S, Urolov JC, Jenrich M and Oldrieve B 2008:2). With the cropping period in most semi-arid regions being relatively short, the timing of field operations is critical. Previous studies have shown many cases where yields in conservation agriculture have been able to double or even sometimes triple yields as compared to farmers not practicing conservation agriculture. The purpose of this research is to assess if CA basin tillage system has increased yield resulting in food security.

Basin tillage system is done when a hoe is dug on the ground with 15cmX15cmX15cm measurements on ground that has not been tilled. CA provides an opportunity for all farmers in all natural regions of Zimbabwe to improve food security and livelihoods through optimizing land use based on timely
land preparations and improved crop management. Conservation agriculture basin tillage system is more beneficial to smallholder farmers who do not have access to animal or mechanical tillage because it enables farmers to carry out timely and precise farming operations. (Zimbabwe Conservation Agriculture Taskforce, 2009)

DATA Source: FAO Database, NGOs (2011)

The agricultural season in Zimbabwe begins in September and end the following year in May. Conservation agriculture practice has increased over the years. Of particular note is the previous season in Zimbabwe which more than doubled the number from 88,262 households to 260,000 supported by NGOs on CA. (FAO, 2010). The high increase in CA adoption has shown the importance of CA in agriculture. The field test for the basin tillage system was done in 2004/05 and 2005/06 seasons. Basins preparation requires time and effort however once a basin is prepared, the same planting position can be used repeatedly (Twomlow S, Hove L, Mupangwa W, Masikati P, Mashingaidze N 2008).

The central component of the basin tillage system is the planting basin. Seeds are sown in small basins dug with hand hoes without having to plough the whole field. The technology is particularly appropriate to majority of smallholder farmers who struggle to plant their fields on time because they lack draft animals. The basin tillage system was developed by Brian Oldrieve in 1993 in Zimbabwe. Basin tillage system spreads labour for land preparation over the dry seasons and encourages timely planting. This causes reduction in peak labour loads at planting. Planting occurs in November or December after the first effective rains. The smallholder farmers are encouraged to spread crop residues as mulch to prevent soil losses early in the season, to conserve moisture, and enrich the soil with nutrients and organic matter as the residues decompose. Crop response to basin tillage depends on the timely application of other management practices such as planting, weeding, fertilizer application, as well as the starting quality of soils and incidence of diseases and pests. Some farmers obtained significant yield gains from basin tillage resulting in positive yield increases. In the
2004/05 season in Mwenezi and Zvishavane the failure of basin tillage system was due to various logistical problems. The results showed that delays in training, the late arrival of inputs and lack of monitoring support visits can cause failure in the basin tillage system. (Twomlow S, Hove L, Mupangwa W, Masikati P, Mashingaidze N 2008:41-42)

Although some studies have been done in the drier parts of Zimbabwe, this research focussed on the wettest region in Zimbabwe. This research focused on Natural region I in Mutasa Manicaland Province which receives the highest amount of rainfall in Zimbabwe of above 1000ml per year.

2.2 Conservation Agriculture Principles and other management practices

The first principle of CA is minimum soil disturbance using planting basins. Planting basins are holes dug in a weed-free field where maize can be planted. The basins can prepare in the dry season from July to October. The recommended dimensions of the basin are 15cm width, 15 depth and 15 cm length. Spacing vary according to natural region, in Natural Region I and Natural Region II spacing recommendation is 75x60 cm, 75x75 cm or 90x60 cm for Natural Regions III, IV and V respectively. (CA Taskforce, 2009) The basins enable the farmer to plant the crop after the first effective rains if they are prepared between July and October. Seeds are placed in each basin at the appropriate seeding rate and covered with clod-free soil. The benefit of using basins is that they enhance the capture of water from the first rains of the wet season. In addition they enable precision application of both organic and inorganic fertilizer as it is applied directly into the pit and not broadcasted.

The second principle is application of crop residues that is mulching, is applied to the soil surface in the dry season, soon after harvesting. The minimum soil cover mulch must be 30%. The mulch protects the soil against extreme temperatures thereby preventing evaporation. Mulching also suppresses weeds through shading and improves soil fertility. The third principle is crop rotation. Rotations using cereal where a legume was once planted is desirable because the cereal benefits from nitrogen produced by the Rhizobium associated with the legume, and the legume benefits from the residues produced by the cereal. The advantages of crop rotation include improvement of soil fertility, controlling weeds, pests and diseases, and producing different types of outputs, which reduce the risk of total crop failure in cases of drought and disease outbreaks.

Other important management practices include winter weeding, application of manure, application of basal fertilizer, application of top dressing and timely weeding. Winter weeding is usually done in June/July soon after harvesting. It is important to winter weed because it ensures that the plot is weed-free at basin preparation and it also prevents dispersal of weed seeds. Manure is usually applied at a rate of least a handful per planting basin. For wetter areas more can be applied. Basal fertilizer is applied using one level beer bottle cap per basin. Topdressing nitrogen fertilizer is applied to crops at 5 to 6 leaf stage. Precision application ensures that the nutrients are available where they are needed. Application rates can be increased in wetter areas and may depend on crop types. Timely weeding in combination with mulch should eventually lead to effective weed control.

2.3 Food Security

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. (World Food Summit, 1996) To be food secure, a household or individual must have access to adequate food at all times. Whilst food insecurity in Zimbabwe is the result of complex
interlinked factors that are of man-made, political and economic nature, however there is extreme
vulnerability due to climatic shocks. The food insecurity causes is due to a combination of low
incomes, limited employment opportunities and high levels of underemployment, chronic illness,
and the burden associated with HIV and AIDS.

The Urban ZimVAC 2011 livelihoods assessment estimated about 10 percent of the 4 million urban
populations to be food insecure. This number is markedly lower than the 26 percent the consortium
found to be food insecure in 2009. In the past five years ZimVAC estimated an average of about
522,000 rural people to be food insecure in August. (FEWSNET and USAID August 2011) ZIMVAC
food security picture (figure2.2) for the May 2009/10 and May 2010/11 consumption year shows a
food security outcome that is not significantly improving for the two consumption years with an
estimate of 18% (1.6 million people) and 15% (1.3 million people) of the rural population being food
insecure during the peak hunger period (ZimVac, 2010).

Figure 2-2 Prevalence of food insecure population

![Figure 2-2](image)

(ZimVac report May 2010)

The measure of household food security over the years has being determined by comparing its
estimated food entitlements to its minimum food requirements based on food consumption
patterns in Zimbabwe. When household food entitlements are equal to or greater than household
requirements then the household is food secure. The relative decline of agricultural production for
domestic food and industrial requirements is a major concern in Africa. There has been increased
food insecurity and impoverishment because of the increasing cost of food for the majority of the
poor and the concentration of consumption among the relatively wealthier and better-endowed
countries, regions and social groups with access to land and incomes in and outside the agriculture
sector. (WFP, 2010)
3  CHAPTER THREE (METHODOLOGY)

3.1  Broad Approach

The research project was done as part of an FAO survey. My position was the researcher as well as the Field monitor and support officer for FAO. The questionnaire was constructed by FAO staff and implementing partners. As a researcher and member of the FAO staff, I was also involved in developing the questionnaires. The questionnaires were administered by agricultural extension workers. The enumerators were paid by FAO because they were stakeholders in the implementation of the input assistance project in the area.

This research was an exploratory research to provide in-depth information on conservation agriculture basin tillage system and its effect on improving food security. Exploratory research allows investigation of a phenomenon. This research seeks to understand and quantify the level of contribution of CA basin tillage system on food security of smallholder farmers in Mutasa district, Manicaland Province in Zimbabwe. The research was non-experimental quantitative research.

3.1.1  Quantitative research

Quantitative research aims at (causal) explanations. Quantitative research deals with facts and figures as well as observable measurements. It is used to test theories, on standardised instruments to predict and deduce a situation. (Gerber R, 2011) In quantitative research features were classified, counted and statistical models were constructed in an attempt to explain what was observed.

3.2  Research Tools

Survey research involves acquiring information about one or more groups of people. The information can be based on characteristics, opinions, attitudes, or previous experiences of the informants, by asking those questions and tabulating their answers. A survey is quite simple in design. The researcher poses a series of questions to willing participants, summarises their responses with percentages, frequency counts or more sophisticated statistical indexes and draws an inference about a particular population from the responses of the sample. The survey research was conducted primarily through face to face interviews.

The basis of the research is the idea that social phenomena can be quantified, measured and expressed numerically. The information about a social phenomenon is expressed in numeric terms that can be analyzed by statistical methods. The observations can be directly numeric information or can be classified into numeric variables. Observations are transformed into a data matrix in which each observation unit occupies one row and each variable one column. The data matrix is the starting point for the analysis. The measure of food security to be used is maize produced in relation with total number of people in the household. The type of research to be used will be co-relational research where a statistical investigation of the relationship between CA basin tillage system and other factors will be conducted.
3.3 Probability sampling
In probability sampling each segment of the population of the smallholder farmers will be represented in the sample. Systematic selection of smallholder farmers enabled choosing a sample in such a way that each member of the population had equal chance of being selected. (Leedy P.D and Ormod J.E 2005)

The farmers were selected from the wards where FAO had selected beneficiaries of the input assistance program. The data collection was done in 3 wards in Mutasa which are wards 3, 7 and 30, all these are in Natural region I. The average number of households per ward is 900 households. There were 20 households who were interviewed per ward who are practicing CA and 10 households per ward who are using other tillage methods. A total of 60 households were chosen among those practicing CA against a total of 30 who were not practicing CA but practiced other tillage methods. The farmers were chosen systematically by listing all the farmers in the ward practicing CA who were assisted in the FAO input assistance program. From the 202 farmers who practiced CA under the FAO project in wards 3, 7 and 30, 60 were chosen to participate in the survey. The other 30 farmers were chosen out of an estimated 280 farmers in ward 3, 7 and 30. (APT, 2011) The formula for selecting farmers practicing CA using systematic sampling is as follows:

\[
\text{Sampling Interval} = \frac{\text{number of CA farmers in the ward}}{10}
\]

In cases where a village had 202 farmers practicing CA it meant the sampling interval was 10, each 10\textsuperscript{th} farmer was therefore chosen systematically to be interviewed.

3.4 Face to face interviews to administer questionnaires

In survey research, interviews are fairly structured. Face-to-face interviews have the distinct advantage of enabling the researcher to establish a rapport with potential participants and therefore gain their co-operation. The individual farmer interview allows the farmers to express their views without fear. Interviews were conducted at the smallholder farmer’s homestead giving room for easier visualization of the area and any other information that can be easily accessed from the house.

Interview survey is an alternative way of collecting survey data. An enumerator is a person who conducted the interviews, asking questions orally and recording the responses provided. Instead of asking respondents to read questionnaires and enter their own answers, enumerators asked questions orally and recorded respondent’s answers. Interviewing was done in a face to face encounter. The enumerators were trained and supervised by the researcher during data collection. The training was done centrally in Mutare to ensure that enumerators have the same understanding and the same meaning of the questions to be asked.

The data collection was done for several wards under the Food and Agriculture Organization of the United Nations using a structured questionnaire. The survey gives us in-depth information on the general trend of the farming activities per smallholder farmer and the use of CA in the program. The survey made use of a questionnaire which was administered by enumerators who are Agricultural Extension workers based in each ward.
They enumerators were trained over two days by a qualified trainer in the monitoring and evaluation department. The training involved mock interviews. Therefore ensuring the correct interpretation of the questionnaires used. A practical exercise where the enumerators had to interview two farmers each during training, to familiarise themselves with the questionnaires, was done. The practical exercise helped to produce good quality data and that enumerators do not take too long to complete a questionnaire.

Advantages of having a questionnaire administered by an interviewer: (Babbie E, 2010:274-275)

1. Interview surveys attain higher response rates than mail surveys.
2. A properly designed and executed interview survey ought to achieve a completion rate of at least 80-85%.
3. Respondents seem more reluctant to turn down an interviewer standing on their doorstep than to throw away a mail questionnaire.
4. The presence of an interviewer reduces the number of don’t knows and no answers because the interviewer can probe for answers.
5. If a respondent clearly misunderstands the intent of the question or indicates that he or she does not understand, the interviewer can clarify thereby obtaining relevant responses.
6. The interviewer can observe the respondent as well as ask questions. Observations like the quality of the dwelling, and the various possessions can be made.
7. Questionnaires are also a good way of protecting the privacy of the respondent as this will be emphasised by the enumerator.

3.5 General guidelines to be observed for the survey:

- Appearance and demeanor – dressing in a fashion similar to that of the people they will interview.
- Familiarity with the questionnaire – to avoid taking too much time than necessary.
- Following the wording exactly.
- Recording responses exactly, especially for open ended questions.
- Probing responses – sometimes respondents in an interview may give inappropriate or incomplete answers. In such a case, a probe, or request for an elaboration, can be useful. A probe is a technique employed in interviewing to solicit a more complete answer to a question. It is a non-directive phrase or question used to encourage a respondent to elaborate on an answer. (Babbie E, 2010: 274-275)
Advantages and Disadvantages of using questionnaires in face to face interviews (Babbie, 2010:274-275)

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages (Milne J, 1999:54)</th>
</tr>
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<tr>
<td>The responses are gathered in a standardized way, so questionnaires are</td>
<td>Complex questionnaire formats and structures can be difficult for enumerators to complete</td>
</tr>
<tr>
<td>more objective. (Milne J, 1999: 54)</td>
<td>In some situations they can take a long time not only to design but also to apply and analyze.</td>
</tr>
<tr>
<td>Generally it is relatively quick to collect information using a</td>
<td>Questionnaires are standardized so it is not possible to explain any points in the questions that</td>
</tr>
<tr>
<td>questionnaire. (Babbie E, 2010: 274)</td>
<td>enumerators might misinterpret.</td>
</tr>
<tr>
<td>Potentially information can be collected from a large portion of a group.</td>
<td>Respondents may answer superficially especially if the questionnaire takes a long time to complete.</td>
</tr>
<tr>
<td>(Milne J, 1999)</td>
<td>Open-ended questions can generate large amounts of data that can take a long time to process and</td>
</tr>
<tr>
<td>Enumerators are able to explain the questions and record appropriate</td>
<td>analyze.</td>
</tr>
<tr>
<td>response. (Babbie E, 2010: 274)</td>
<td></td>
</tr>
</tbody>
</table>

3.6 Delimitation of the research population:
This research focuses on the Manicaland province, which is a high rainfall area in Zimbabwe falling in the Natural region I, II and III. The research focuses on farmer’s production in the 2010/11 season in relation to food securing. The number of smallholder farmers to be interviewed is 90 in total, 60 who practiced CA and 30 who did not practice CA.

3.7 Data collection
The data collection was done in Shona. The enumerators were trained for the data collection exercise. This enhanced understanding of terms and requirements for the research. Appendix 1 shows the instrument used for the data collection.
3.8 Problems and limitations
Food security is a complex issue to measure. There can be a lot of variables which can be incorporated in measuring food security which can include the contribution of livestock to the household food security.

3.9 Ethical considerations and privacy of respondents
For each smallholder farmer interviewed the information was confidential. No names were used in the final reporting of the data collected. The names were recorded for verification purposes only. The data collection exercise was monitored to ensure the information collected is true. Permission to utilise the Food and Agriculture Organization of the United Nations data set was granted by the Monitoring and Evaluation manager.
CHAPTER FOUR - FINDINGS

The findings compare farmers who practiced CA basin tillage system and those who practiced other tillage methods. The other tillage methods are ploughing and conventional hand hoe tillage systems.

4.1 Results

The number of household interviewed was 90; of these 60 were CA and 30 were non-CA farmers who used other tillage methods. From the farmers interviewed 30% of the households are headed by females and 70% are headed by males. This has been consistent with previous national surveys conducted which include the National Crop Assessments as well as the Zimbabwe Vulnerability Assessments.

Figure 4.1 Age category for household head Figure

Figure 4.2 shows that of the farmers interviewed 60.7% head of households are in the range of 18 to 59 years. This indicates that there was a high percentage of the economically active group who were head of households. Household headed by farmers who were 60 years and above were 39.3% households. However there were no child headed households on the sample.

Figure 4.2 Marital Status

Figure 4.2 above shows a graph of the marital status of the households interviewed. For the households interviewed, 70% of the heads of household were married, 4.4% of the heads of household were divorced or separated and 25.6% widowed. This trend seem to have become the norm for most rural households according to results from previous rural assessments.
Table 4-1 Average seed quantity, number of weeding times, area and % of household applying manure

<table>
<thead>
<tr>
<th></th>
<th>Practiced CA</th>
<th>Other tillage methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average maize seed quantity (KG)</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Average area (Hectares)</td>
<td>0.47</td>
<td>0.43</td>
</tr>
<tr>
<td>Average number of weeding times</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Manure application</td>
<td>54%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Figure 4.3 above shows that average quantity of maize seed used by the farmers practicing CA was 11kg over an average area of 0.47 hectares. The farmers practicing CA weeded three times on average. Farmers who practiced other tillage methods utilized an average of 10kg maize seed over an average of 0.43 hectares whilst weeding twice on average.

These figures indicate that those practicing CA had used on average more maize seed, on a slightly larger area and had weeded more times than farmers who practiced other tillage types. A larger number of those farmers who practiced CA, 54%, applied manure compared to 11% for those who practiced other tillage methods. This may be due to the reason that for farmers who practiced CA basin tillage are usually trained on precise application of manure as compared to broadcasting which is usually used in other tillaged methods.

Table 4-2 Overall sources of maize seed

<table>
<thead>
<tr>
<th>Seed sources</th>
<th>% of households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchases</td>
<td>44</td>
</tr>
<tr>
<td>NGO direct distribution</td>
<td>8</td>
</tr>
<tr>
<td>NGO voucher no extra payment</td>
<td>2</td>
</tr>
<tr>
<td>NGO distribution with loan repayment</td>
<td>28</td>
</tr>
<tr>
<td>NGO voucher (collected from NGO)</td>
<td>15</td>
</tr>
<tr>
<td>Government/GMB subsidized scheme</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 4-3 Maize seed source by tillage methods

<table>
<thead>
<tr>
<th>Seed source</th>
<th>Practicing CA (%)</th>
<th>Other tillage methods (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchases</td>
<td>38</td>
<td>74</td>
</tr>
<tr>
<td>NGO, direct distribution</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>NGO, voucher no extra payments</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>NGO, distribution, with loan repayment</td>
<td>29</td>
<td>26</td>
</tr>
<tr>
<td>NGO, voucher (collected from NGO)</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Government/GMB-subsidized scheme</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>
The major sources of maize seed for the 38% farmers who practiced CA was purchases. The farmers who practiced other tillage methods had a higher proportion of farmers who purchased amounting to 74% than those who practiced CA. The second most preferred option for both farmers who practiced CA and other tillage methods was NGO distribution with loan repayment with 39% and 26% using this method respectively for acquiring inputs. On the overall list of sources for maize seed, purchases still remain the main source of seed followed by the NGO distribution with loan repayment system through a project called Union Project where farmers are linked with suppliers to access loans for growing a crop to sell as well as the maize for food security.

**Table 4-4 Source of basal fertilizer and top dressing fertilizer**

<table>
<thead>
<tr>
<th>Source</th>
<th>Top Dressing</th>
<th>Basal fertilizer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Practiced CA</td>
<td>Other tillage methods</td>
</tr>
<tr>
<td>Purchases</td>
<td>39</td>
<td>72</td>
</tr>
<tr>
<td>NGO, direct distribution</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>NGO, voucher no extra payments (Collect from agro-dealer)</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>NGO, distribution, with loan repayment</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>NGO, voucher (collected from NGO)</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>Government/GMB-subsidized scheme</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Gifts and remittances</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

The two most popular sources for top dressing fertilizer as well as basal fertilizer amongst the population surveyed was purchases and NGO distribution with loan repayment for both farmers who practiced CA and those who used other tillage methods. 39% of farmers who practiced CA acquired top dressing from purchases while 72% of those who used other tillage methods sourced from purchases.

The second most popular source for basal fertilizer was NGO distribution with a loan repayment for those who practiced CA (28%) and other tillage methods (26%). The NGOs had different packages including NGO voucher (collected from NGO) 17%, NGO direct distribution (10%) as well as NGO voucher with no extra payments (3%) (collect from agro-dealer). However there was 1% who practiced CA and sourced top dressing from gifts and remittances. For basal fertilizer it was a similar trend with top dressing.

Basal fertilizer purchases proportion for farmers practicing CA was 38% while for farmers who practiced other tillage methods 74% purchased the basal fertilizer. NGO distribution with loan repayment was also common in both those who practiced CA with 29% and other tillage methods.
with 26%. The farmers mostly are using the NGO distribution with loan repayment because it has been provided as a market linkage through an NGO called Union Project.

Table 4-5 Average amount of basal and top dressing fertilizer applied

<table>
<thead>
<tr>
<th>Category</th>
<th>Basal Fertilizer (kg)</th>
<th>Top Dressing (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practiced CA</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Other tillage methods</td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>

The farmers who practiced CA and other tillage methods applied on average 50kg top dressing fertilizer on an average of 0.47 hectares and 0.43 hectares respectively. However farmers who practiced CA applied an average of 50kg basal fertilizer comparing with an average of 40kg applied by farmers who practiced other tillage types.

Figure 4-3 Seasons in which households practiced CA

The graph above shows the proportion of households sampled with the years when they practiced CA. The information contained on the graph is for the whole sample of 90 households. There was a very small proportion of farmers practicing CA in the years before 2006 as well as in the 2006/7 season both season had 2.2% of farmers practicing CA. In 2007/8 and 2008/9 season there was a slight increase in the proportion of farmers practicing CA having 4.4% and 10% respectively. There was a huge increase in 2009/10 and 2010/11 season in the proportion of farmers practicing CA, with 52.2% and 78.9% respectively. This has indicated the high increase in CA adoption. This has been largely due to an increase in projects implemented by NGOs with a focus on CA whilst providing free inputs.
From the households sampled 60 farmers were practicing minimum soil disturbance. Whilst 30 were not practicing minimum soil disturbance meaning the those who practiced other tillage methods.

Figure 4.4 Principles Practiced

![Bar chart showing % of households practicing mulching and crop rotation.]

Figure 4.5 above shows the principles of CA that farmers who practiced CA were practicing. Of the farmers who practiced CA 76.3% had applied mulch while 23.7% are had not mulched. This indicates that the higher percentage of farmers practiced mulching as a principle of CA. A proportion of 58.7% farmers practiced crop rotation. 41.3% did not practice crop rotation, this could be because 47.5% of the households started practicing CA in 2010/11 season therefore they will start to implement crop rotation in the following year. However some farmers may have been practicing crop rotation while they used other tillage methods and prior to adopting CA.

Table 4.6 Timely planting

<table>
<thead>
<tr>
<th>Effective rains</th>
<th>% of households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planted with first effective rains</td>
<td>98.7</td>
</tr>
<tr>
<td>Did not plant with first effective rains</td>
<td>1.3</td>
</tr>
</tbody>
</table>

From the table above, 98.7% of households planted with the first effective rains indicating that farmers are practicing timely planting. Only 1.3% of the farmers did not manage to plant on time. Timely planting for CA is critical and such large proportion who are planting on time reduces amount of harvest that can be lost due to delayed or late planting.

Table 4.7 Production by tillage type

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean(kg)</th>
<th>Mode(kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practiced CA</td>
<td>824</td>
<td>648</td>
</tr>
<tr>
<td>Other tillage method used</td>
<td>497</td>
<td>405</td>
</tr>
</tbody>
</table>
The average maize produced by farmers who practiced CA is 824kg while those who practiced other tillage methods produced an average of 498kg. Fifty percent of farmers who practiced CA produced 648kg whilst for those who practiced other tillage methods had a median of 405kg. This therefore proves that CA produced more grain than other tillage methods practiced.

Table 4-8 Average yield

<table>
<thead>
<tr>
<th></th>
<th>Average Yield (Kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practicing CA</td>
<td>1175</td>
</tr>
<tr>
<td>Other tillage methods</td>
<td>946</td>
</tr>
</tbody>
</table>

Farmers practicing CA produced an average of 1175kg/ha of maize grain while those who practiced other tillage methods produced an average of 946kg/ha. The farmers who practiced CA had yield 24% higher than those who practiced other tillage types. This indicates that CA is producing more yield than for any other tillage type practiced.

Figure 4-5 Cereal sufficiency of maize grain

The chart above indicates cereal sufficiency of maize grain for farmers who practiced CA and farmers who practiced other tillage methods. 57% of the farmers who practiced CA) are cereal sufficient, that is farmers who have produced maize grain to last a full consumption year (12months) and surplus. Only 27% who practiced other tillage methods have enough to last the same period. The farmers who produced enough to last 12months and have surplus are termed to be food secure. The graph above also shows various categories of food insecurity among farmers who practiced CA, with 11% lasting 9 to 11 months while 20% of those who practiced other tillage methods have to last the same period. Most notably the largest proportion, that is 34%, of those who practiced other tillage methods, had enough maize grain to last for only 3 to 5 months, compared to the 57% of those who practiced CA who were food secure.
A formal hypothesis test was done using the Chi-Square test to check if there is a significant association between months of cereal (maize grain) sufficiency of a household and the tillage method used. The Chi-square statistic 13.033 with an associated probability of 0.111 is not large enough to support a significant relationship between the two phenomenon; therefore there is no statistically significant relationship between tillage method and months of cereal sufficiency for maize grain.

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>13.033</td>
<td>8</td>
<td>.111</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>15.415</td>
<td>8</td>
<td>.052</td>
</tr>
<tr>
<td>Linear-by-Linear Association</td>
<td>2.270</td>
<td>1</td>
<td>.132</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5 CHAPTER FIVE – CONCLUSIONS & RECOMMENDATION

5.1 Conclusion and discussion
This chapter serves to present the conclusions made from data analysis through SPSS by evaluating the effect of the basin tillage system as a method of conservation agriculture, on improving smallholder farmers’ food security in Mutasa, Manicaland Province in Zimbabwe. This will be done through empirical evidence produced. Through the answering of research questions the objectives of the study are met from which conclusions and recommendations shall be drawn. The conclusion will be made in view of the effect of CA basin tillage system on yield increase, CA principles practiced and the ability of the smallholder farmer to produce maize cereal to last 12 months after harvesting.

The three main CA principles include minimum soil disturbance represented by the CA basin, mulching and crop rotation. Minimum soil disturbance was used for selecting farmers for the survey. Therefore 70% of farmers selected were practicing CA minimum soil disturbance and 30% practiced other tillage methods. However the farmers who practiced CA also practiced at least one other CA principle, 73.6% practiced mulching and 58.7% practiced crop rotation. This shows the importance of management practices of CA in producing high yields per hectare. It is therefore important to mulch because mulching has been proven to reduce moisture loss, reduce occurrence of weeds as well as reduce soil erosion. Moreover crop rotation using a legume has also being proven to be beneficial to the cereals including maize grain.

CA basin tillage system contributes to significant yield increases per hectare under smallholder farming conditions. After comparing the yields for smallholder CA farmers with those who practice other tillage methods, CA provided more yield per hectare that is 1175kg/ha as compared with other tillage methods which produced 946kg/ha. Also looking at production as per tillage system, CA basin tillage system had an average of 824kg maize produced while other tillage methods had 497kg. This is an indication that CA increases yields in comparison to other tillage methods as it almost doubles the amount produced per hectare. Due to the economic meltdown and high unemployment levels smallholder farmers have been unable to produce enough for years therefore they can maximally produce more harvest if they practice CA and make maximum use of the available inputs.

Over the previous year’s most smallholder farmers had failed to produce maize cereal to last a full consumption year. 50% of the farmers practicing CA produced enough maize to last for 12 months after harvesting, thus improving food security.

5.2 RECOMMENDATIONS

CA basin tillage method should be taught to smallholder farmers as it has proved to almost double production. This method is especially most useful to farmers who lack draught power as they will be
able to plant on time. However those who have draught power should be encouraged to use CA machinery which can be a ripper tine, jab planter or direct seeder.

The minimum soil disturbance has been practiced by farmers practicing CA. Increasing the knowledge and training on the advantages of minimum soil disturbance is imperative. It is therefore important to increase farmer training on mulching and its benefits to farming to enable greater understanding and application of this principle. Farmers need to be taught also the use of live mulch and practice it. There is need to follow up the farmers who are in their first year to check if they will be practicing crop rotation in the following years, after the training they have received.

From the results of the research, it can be concluded that food insecurity can be curbed by using CA basin tillage, because higher amounts of yield and production can be realised. The collapse of food production in Zimbabwe reduced the asset base of farmers. CA basin tillage system will increase food security without demanding the purchase of new machinery and cattle for draught power, enabling the farmer to make use of the available hoes to achieve food security.
6 APPENDIX 1

Conservation Agriculture Research Survey 2011

(The RESPONDENT should be some household member who is either the household head or someone sufficiently knowledgeable about the household’s agricultural activities.

First, ask the household representative(s) whether they are willing to participate in this survey interview. This discussion should encompass explaining a) the purpose of the survey, b) how long it will take, c) how this household was chosen for participation. It is important also to explain that this survey will have no impact on whether the household will or will not receive any assistance in the future. The information is purely for research purposes. Each household’s responses will be kept confidential, and will not be shared with relief and development programs operating in and around this community. If this household does not want to participate, this should be noted on the sample list, and a replacement household should be identified.
<table>
<thead>
<tr>
<th>Agro-ecological Region</th>
<th>Household Number</th>
<th>Beneficiary (tick)</th>
</tr>
</thead>
</table>

**Section A: Site and Location**

<table>
<thead>
<tr>
<th>A1 Province</th>
<th>A2 District</th>
<th>A3 Enumerator’s name</th>
<th>A4 Date dd/mm/yy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A5 Respondent Name</th>
<th>A6 Village Name</th>
<th>A7 Ward Name</th>
<th>A8 Ward Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Section B: Demographics (write in the space provided)**

<table>
<thead>
<tr>
<th>B1. Name of the household head</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B2. Sex of HH Head (1 = Male 2 = Female)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B3. Year of birth of HH Head (year of birth only e.g 1980)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B4. Marital Status of HH Head 1=Single/never married 2= Married 3= Divorced/Separated 4= Widowed</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B5. Number of people in the HH (at least three months, include newly married, children in boarding school)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B6. Land ownership (accessed and owned) Owned in Ha Accessed in Ha</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Section C: CROP PRODUCTION

<table>
<thead>
<tr>
<th>Code for 3: Crop in plot</th>
<th>Code for 5: Tillage type</th>
<th>Code for 6,8, 10: Sources of inputs</th>
<th>Code for 15: Main Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>1=Maize (OPV), 2=Maize (Hybrid)</td>
<td>1=Ploughing, 2=Conventional Hand hoe, 3=Ripper tine, 4=CA Planting Basins, 5=Ridging, 6=direct drilling, 7=Other - specify</td>
<td>1= Purchases, 2= Loan from private company, 3=NGO, direct distribution, 4=NGO, voucher no extra payment (collect from agro dealer), 5= NGO distribution, with loan repayment, 6=NGO, voucher but contributed some money towards inputs, 7=NGO, voucher (collected from NGO), 8= Govt/GMB – subsidized scheme, 9= Presidential input scheme, 10= Gifts/remittances, 11= Retained, 12= Carryover, 13 = Other specify</td>
<td>1=None, 2=Poor emergence, 3=Pests 4= diseases, 5=Eaten by animals,</td>
</tr>
</tbody>
</table>
### Section D: CROP SALES 2010/11 SEASON

**D1. Write down the quantities expected to sell from this season’s production for each crop in kg from 2010/11 season.**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Quantity (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td></td>
</tr>
<tr>
<td>Sorghum</td>
<td></td>
</tr>
<tr>
<td>Pearl millet</td>
<td></td>
</tr>
<tr>
<td>Finger millet</td>
<td></td>
</tr>
<tr>
<td>Groundnuts</td>
<td></td>
</tr>
<tr>
<td>Sugar beans</td>
<td></td>
</tr>
<tr>
<td>Cowpeas</td>
<td></td>
</tr>
<tr>
<td>Bambara nuts</td>
<td></td>
</tr>
<tr>
<td>Paprika</td>
<td></td>
</tr>
<tr>
<td>Cotton</td>
<td></td>
</tr>
<tr>
<td>Tobacco</td>
<td></td>
</tr>
<tr>
<td>Soya beans</td>
<td></td>
</tr>
</tbody>
</table>

### Section E: EXTENSION SUPPORT RECEIVED THIS SEASON

**E1. Has anyone in your household received agricultural extension support from this source since October 2010? See sources below**

- **Agritex**
  - 1 = Yes 2 = No
- **NGOs**
  - 1 = Yes 2 = No
- **NGOs & Agritex together**
  - 1 = Yes 2 = No
- **Other Farmers**
  - 1 = Yes 2 = No
- **GMB/Seed Companies**
  - 1 = Yes 2 = No
- **Other**
  - 1 = Yes 2 = No

**E2. If yes, what type of extension support was received? See types below**

1 = land preparation, planting, spacing dates  
2 = seed type or variety  
3 = fertilizer type usage  
4 = conservation farming  
5 = water usage  
6 = post harvest processing  
7 = pest, disease control, weeding  
8 = Other specify

### Section F: CA PRACTICES AND PRINCIPLES

**F1. Year started CA**

- 1 = Yes 2 = No

**F2. Who introduced CA?**

- If no, why not?

**F3. Is the household practicing minimum soil disturbance (planting basins, ripping, direct seeding)**

- 1 = Yes 2 = No

**F4. Is the household practicing crop rotations**

- 1 = Yes 2 = No

**F5. Is the household practicing mulching (crop residues)**

- 1 = Yes 2 = No

**OTHER MANAGEMENT ISSUES**

**F6. Did you plant with the 1st effective rains?**

- 1 = Yes 2 = No

- If no, why not?
1= Purchase  
2= Government Programmes,  
3 = Retained,  
4 = NGOs,  
5 = Gifts/Remittances  
6= Private company specify  
7= Other, specify | G4. How much of this crop do you usually harvest from each field? | G5. How much of this crop do you usually the household barter/ sell for cash? |
|---|---|---|---|---|
| Area | Unit | 1= acre  
2= hectare |  
Quantity | Units | Quantity | Units |
| Crop codes | Units Codes |
| 1= maize | 5= round nuts | 9= sunflower | 1= 90kg bag shelled | 5= kg |
| 2= sorghum | 6= beans (sugar, soya) | 10= coffee | 2= 50kg bag shelled | 6= tonnes |
| 3= millet | 7= cowpeas | 11= tea | 3= 20 lt tin | 7= bales |
| 4= groundnuts | 8= seed cotton | 12 = bananas | 4= 5 lt tin |

G6. How do you usually acquire fertilizers?
### G7. Crop Management Practices

#### G7.1 What is the main tillage method that the household usually use? (rank in terms of area tilled, 1 being the one used to till the most area) (Top 3)

<table>
<thead>
<tr>
<th>Tillage type</th>
<th>Rank</th>
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<th>Tillage type</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. conventional hand hoeing</td>
<td></td>
<td>4. ploughing</td>
<td></td>
<td>7. ripper tines</td>
<td></td>
</tr>
<tr>
<td>2. planting basins</td>
<td></td>
<td>5. hand hoe furrow</td>
<td></td>
<td>8. Other specify</td>
<td></td>
</tr>
<tr>
<td>3. zero tillage</td>
<td></td>
<td>6. ridging</td>
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<td></td>
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</tbody>
</table>

#### G7.2 In which seasons did the Household practice CA?

*Indicate 1=practice CA per season and record 0 if household did not practice CA*

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THANK YOU!!!!!!

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