An Assessment of Constraints Farmers encounter in implementing Conservation farming. Case Study of Lusaka District.

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NOVEMBER 2004

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A research report submitted to the Department of Adult Education, and Extension studies in partial fulfilment for the award of a Diploma in Adult Education of the University of Zambia.

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Acknowledgement

I would like to acknowledge the office of Senior Agricultural Officer Lusaka District, for having been so cooperative by allowing me to do the research in their organization. My greatest gratitude goes to Finny Chono who assisted me in data collection in the North East Block. I further wish to thank Mrs Kayukwa for having provided me with reading materials and I pass my great gratitude to Mr LH Moonga for the guidance in the production of this report.

Dedication

This is dedicated to my dearest husband Shadreck and family for having been so supportive and for the patience shown during the term of work.

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CHAPTER ONE

INTRODUCTION

There is ample evidence that the methods farmers use to grow crops are destroying land and undermine the soil fertility. Haggard (2003) argues that conservation farming destroys the land we depend on to grow crops.

The practices of conventional tillage destroy the soil structure because they expose the soil to agents of erosion such as wind, rains and accelerate soil erosion and pan formation.

There is need to restore soil fertility, moisture and soil structure in order to improve soil productivity. Conservation farming have been used as a tool to restore the soil fertility by correcting the soil ph (acidity or alkaline), structure and organic composition (Mwale, 2003).

There has been hunger among Lusaka farming community due to low yields attained in the past seasonal years. Therefore, in 1999/2000 seasons, experts recommended conservation farming as a solution for soil degradation and hence improve the soil productivity.

Fast truck conservation project was introduced in Lusaka District and eight camps started as pilot areas. In these camps there was an aggressive training of farmers to prepare them in the implementation of the innovation to improve yields per hecterage.

Despite the aggressive training and support given to the farmers, the yields were not improving. It had been noticed that farmers encountered constraints which were not known and the researcher was prompted to assess what constraints farmers encountered in implementing conservation farming innovation.

STATEMENT OF THE PROBLEM

Although conservation farming has been practiced in Lusaka District for the past five seasonal years, the constraints that farmers encounter in the implementation of conservation farming were not known. This study established the constraints farmers encounter in implementing conservation farming.

PURPOSE OF THE STUDY

The purpose of the study was to assess the constraints Farmers encounter in implementing conservation farming in Lusaka district.

OBJECTIVES OF THE STUDY

The objective of the study were to:

(a) Identify constraints farmers encounter in implementing conservation farming practices and methods;

(b) Determine the farmers' knowledge about conservation farming practices and methods and,

(c) Determine the attitude of farmers towards conservation farming techniques and methods.

ASSUMPTIONS

The study assumed that there were no known factors leading to constraints farmers were facing in implementing conservation farming and that the attitude of farmers towards conservation farming was negative. It further assumed that the knowledge of conservation farming among farmers was minimal.

SIGNIFICANCE OF THE STUDY

Through the findings of this study, there will be a better understanding of the constraints the farmers face in implementing conservation farming (C/F) the results of the study will influence the policy makers in making the necessary adjustments to suit the farmer's farming environment. This exercise gave a learning experience to the researcher and the audience of the report.

LIMITATION OF THE STUDY

Although the study was very important, the area of coverage was reduced from four blocks to two blocks under study. It could have been more representative to have had taken all the four blocks, but the time available for the research was not enough to cover all the blocks in the district.

The area understudy was vast and wide, therefore the researcher could not afford to meet the demands of transport costs and given the limited time available.

DEFINITION OF TERMS

Block: A farming area of coverage with a radius of eighty kilometres with agriculture camps in it.

Camp: An operational area of twenty kilometres radius with farming activities

Convention farming: This is a traditional method of cultivation of land. Involving loosening and turning the soil upside down (Aaarard, 2003).

Conservation farming: This is a farming method whose practices are there to restore or maintain soil fertility and structure, it is preservation of nature (MACO, 2003).

Hectare: An area of $10{,}000m^2$

Soil Ph: The amount of alkaline or acidity present in the soil.

CHAPTER TWO

LITERATURE REVIEW

Most of Zambian soils have low inherent fertility. When cultivated under conventional farming systems the soils are affected by increasing acidity, nutrient mining, decline in organic content, structural deterioration, including crusting, hard pan and water induced erosion.

Virgin soils may have enough nitrogen, phosphorous and potassium for the first year of cropping and there after, these must be added to get good yields. Soils may be naturally low in nutrients or may become low because of removal by crops. Some soils have high levels of aluminium which is not a plant food. Alluminium in its high levels is toxic to plant growth and affects the presence of other nutrients. The injurious affects set in when the ph is below 4.5 which is more common in Zambian soils. Lime application is recommended to reduce the problem of aluminium saturation (Zimba, 2000).

Low soil fertility is a result of either inherently poor soils or continuous cropping. Low fertility is a major constraint to food and cash crop production. In Zambia farmers used to take care of the problem of declining soil fertility by leaving the land under natural vegetation fallow for several years. The litter and roots gradually decompose, then the natural vegetation would be slashed and burned at the beginning of new crop cycle. In this way, the fertility of the soil was restored.

Improving and maintaining the soil's productive capacity, the biophysical and chemical status of the soil has to be serviced. The soils productive capacity can be

maintained and improved through the use of inorganic fertilisers. Inorganic fertilisers are plant food. They are used to supplement the soil with essential plant nutrients. Fertilizers can be used to supply one or more elements essential for plant growth (Zimba, 2000).

With the stress on food production in Zambia, there is need to educate the farmers on the need for a conducive farming environment. Farmers have to be introduced to conservative farming practices that will keep the soil alive and productive. Conservation farming programme was put in place to support practices that avoid soil degradation by using the soil in accordance with its capacities; to apply measures to heal the land where erosion has taken place and to employ a combination of different approaches with modern soil management techniques to improve the productivity of the land. Erosion affords further loss in productive capacity of the soil and therefore many practices have developed application to crop land, rangeland and forest land (Kelly, 1983).

The aim of doing practically all conservation systems is to permit a satisfactory level of production while keeping soil erosion as low as possible (ibid).

Erosion is the washing away of the top soils. This is usually accelerated by human activities such as bad farming habits of farmers on the crop land, while some erosion takes place without the influence of man. What keeps soil in a natural state from degradation, is the vegetation undisturbed by man.

Conventional tillage or the traditional methods of cultivation destroy the soil structure and texture because the farmer cuts down all the tree and burn all the crop residues and expose the soil to wind, rain splashes, surface temperature which accelerates erosion. The loss of protective layer are highly conducive to soil erosion and destruction of the soil structure.

Ploughing facilitates pan formation leading to eventual water logging which causes suffocation of the crop due to poor aeration. The rate of organic matter decomposition promoted by soil cultivation, and wide spread practice of the burning of crop residue accelerates nutrient release that lead to quick impoverishment of the soil, especially in tropical climatic zones (Allison, 1999).

Conventional tillage has been blamed for worsening soil erosion and soils degradation because it overworks the soil on the surface by burning crop residues. Intensive tillage facilitates soil compaction leading to eventual water logging which causes suffocation of crops due to poor aeration.

Monoculture or the growing of one crop on the same field year after year, encourages the undermining of minerals from the soils and makes the soil lacks in those particular elements of minerals.

There are several methods of farming which includes conservation tillage. Conservation tillage in Zambia is promoted by the Zambia National Farmers' Union(ZNFU) conservation unit as a way to fight low yields. The aim of

conservation farming is to make the soil alive and productive by putting in place curative measures to maintain and improve soil fertility and structure (Mwale, 2003).

Zambia around 1995/96 farming season was affected by continuous droughts which led to low production levels in the regions one (valley) and two (semi valley) of Zambia. Therefore to harvest water on cropland, minimum tillage, crop rotation, residue retention, using permanent planting hole year after year. Weeding was done early and continuously. All these practices were put in place as curative measures to answer the problems of soil fertility and soil moisture (Landless, 1999).

Minimum Tillage

For a long time farmers in Asia, Africa and America used minimum tillage where planting holes are dug with a hoe, one pace apart and planted seeds in each hole without any form of seed bed preparation. The crop residue is put in between the rows. This system is well suited to many tropical soils in which intensive tillage leads to rapid breakdown of the soil structure and the loss of moisture.

Land Preparation

Tools required to prepare land under minimum tillage using hand hoe.

1. Tren rope: this is used to ensure accurate space and straight lines of the basins
2. hoe: is used for digging the planting holes
3. pegs: these are used to hold the rope when stretched across the field

you will need a stick measuring 90cm to measure row spacing and you also need fertilizer cup number 8 and a coca cola tin (500ml) for measuring the fertiliser/manure.

The procedure of land preparation starts with the clearing of land. A farmer has to cut all the shrubs and the crop remains and put them in between the space. Make sure that you dig the hole in the same position of the previous crop station. The measurements should be 90cm x 60cm inter crop space and the dimension of the hole should be 30cm in length x 15cm in depth x 15cm in width.

The tren rope is an essential tool for conservation farming because it ensures accurate spacing of the basin. The rope consists strings with bottle tops squeezed onto it at 70cm centres. It is used to mark out the planting basins at the correct spacing. Each bottle top marks the end of a basin. It is worth marking accurately because the basins will be permanent all seasons.

The basin should be dug well before the onset of the rains. Conservation farming (C/F) means doing the work in advance, so that you are ready rather than being overwhelmed when the rains come. Making basins when rains come means you have missed one of the main benefits of timely planting. Therefore minimum tillage requires a farmer who starts land preparation at the right time, say around August or after harvesting.

Crop Residues

Crop residues are the crop remains such as maize stover, which are organic matter whose contribution is vital. Crop residues are used as the preservative tool to harvest water from the rains. Organic matter in the soil can absorb and store much more water than inorganic fraction. It acts like a sponge, taking up water and releasing it as required by plants. It helps bind soil particles into larger aggregates to crumb. Soils will be able to hold enough moisture to supply the needs of crops in between rains, yet permit water to pass through the soil. A good soil will stay not too wet nor too dry.

The useful function of soil organic matter is the improving of the physical condition of water holding capacity of the soil. It conserves nutrients against leaching, increasing availability of fixed nutrients and the stimulation of beneficial microbes and their action in the soil are well accepted (Mathai, 1983).

Manure is another source of organic matter, these manures are mainly livestock origin and or either their execrations. Manure in conservation farming is put direct on to the planting station. To get all the benefit one kilogram of manure can be added per hole using the coca cola tin. Put fertilizer in the hole using the NO.8 cup which is five grams, broadcast or drill the fertilizer. This can be done at the same time with lime application. This should be done around August to allow for chemical reaction to take place so that by the time you plant the seeds the nutrients are already available in the soil.

Organic manure plays a big role in conversation farming and is a practice that is not worth ignoring. Every farmer practicing conservation farming should never burn the crop residue. The loss of organic matter increase soil acidity, reduces moisture holding capacity, reduction in crop yields and leads to soil compaction (Moono, 2003).

Planting

Allison (2003) advises that farmers should plant crops when there is enough moisture to have a good germination. He further highlights that seeds should be planted immediately after heavy rain. Never plant several days after heavy rains when the soil is beginning to dry up. When the rain stop, plant for the next 48 hours and then stop until the next rains. If the seeds are planted where moisture is not sufficient the seeds may end up rotting and you will have low germination percentage.

Sowing Crop Seeds

Sowing seeds should be done correctly. If the seeds are not sown directly, the efforts put in land preparation will be wasted. Place the seeds in the holes, cover the seeds and compact lightly to ensure good contact between seeds and soil so that there is quick water absorption. Plant seeds along the side of the basin and cover with the right size of the soils put 5cm depth not more than this because plants may have problems to germinate (Landless 2003).

Weeding

Migoch (1980) argues that weeding is a critical element of farming which is supposed to be done early in the field to provide a free environment. Weeding accelerates plant

growth because it gives and creates good soil capacity to allow for root penetration and provides aeration. Weeds compete for nutrients, light and water and therefore they are a nuisance to crop growth. Weeding must be done continuously each time need arises. Farmers often stop weeding after the crop matures, believing that weeds cannot affect the crop at this stage. Farmers must be educated that weed will shed thousands of seeds which will germinate the following season and many other years to come. To have a healthy crop you need a healthy and clean environment. In a clean field there is a less pest and disease prevalence and weeds are one of the most important factor, which may affect and reduce yields.

Crop Rotation

Moono (2000) defines crop rotation as a systematic way of farming where different crops are planted in a regular order of preference. For example you can have a three course rotation of sunflower, maize and cowpeas. All these crops have different root establishment, food nutrient uptake disease and pest that affect them. It is very important that you include legumes in a rotation because apart from being deep rotted; their root system is very strong. Therefore it helps in the penetration to deeper levels and breaks the pan hence helps in improving the soil structure. It also helps to recycle phosphorous from deeper layers and make it available to shallow rooted crops that follow in the rotation.

In conversation farming, a farmer who does not practice rotation is not a conservation farmer. (Moono 2003). The use of crop rotation on the same permanent planting hole or furrow benefits more the crop following in the next season because that crop will be able to benefit from the residual fertiliser of the previous crop, especially if a cereal

follow a legume, it will benefit from the nitrogen that will be fixed to soils by the root nodules of the legume.

Every farmer who is practicing conservation farming should practice crop rotation in full capacity so that the soils are not depleted but improved to a capacity where there can be good yields in every crop cultivated. Crop rotation calls for diversification where a number of different crops are grown hence reducing the risk of total crop failure (Aaagard 2003).

Conservation farming has many benefits if the farmer adopts a number of husbandry practices that together comprise a complete farming benefit. If a farmer follows these practices correctly, a number of important benefits arise: -

Farmers can, plant a large area because they are not moving or turning over the soil before they plant. This saves money and time. For example conservation ploughing or ridging 1 hectare of land to 10cm depth involves moving 1000 tons of soil.

Farmers can begin to prepare their land as soon as they have harvested. This allows for early planting at the onset of the rains. Early land preparation and rapid planting permit early weeding (Glean 1999).

Labour requirement for land preparation is spread over several months rather than being done at once. It is therefore more suitable for women. Fertilisers and seeds are costly. Accurate placement of fertilisers and seeds can reduce wastage and allows for optimal use by the crop. Therefore Conservation Farming (CF) is very economical.

Retaining residues reduce surface temperature and in time improves soil fertility. Conservation farming minimise crop loss in drought years and improves food security. Planting holes or basins concentrate early rainfall around the seeds accelerating emergence and improving crop stands.

Because seeds are planted in the same place each year residual fertiliser from cereal crops can be taken up efficiently by subsequent crops. Deep-rooting crops can be used in rotation to break pans by making root channels which shallow rooting crops can follow.

The residue which is put in between the rows suppress weed growth and the weed population is reduced over a time as long as weeds are not allowed to seed.

The soil conservation programme originally begun as an agency in the USA in the department of interior in 1935 under the terms of the soil conservation bill that was passed in that year. It was transferred to the United States Department of Agriculture (USDA). Since then it became one of the fastest growing government agricultural agencies in the USA and one of the most successful in securing funds. Conservation practices are practices that encourage high production and hence add to the problem of food surpluses in America (Rogers, 1960) because farmers produce excess food which cannot be consumed by the market and the population in the area.

Arthur Laible was the first man to sign up with Durand soil conservation service in conservation programme in 1935. His farm was badly rundown, his soil was eroded.

This man put up a complete conservation plan on his farm and within a few years he had made such a remarkable change in the place that people were impressed. Laible's lead in adoption of conservation practices in turn were demonstrations for others (Ibid).

America today is leading in the world with highest adoption rates of tillage conservation farming, the USA with 19.3 million hectares followed by Brazil 11.2 hectares with 7.2 tons per hector. Argentina, 7.3 million hectares, Canada with 4.1 million hectare of maize production in the year 1996 (Landless, 1999). Conservation Farming is workable and beneficial if only a complete conservation plan is put in place (Landless, 1999). A full plan means that the farmer is doing crop rotation, minimum tillage, residue retention, use of permanent planting holes, weeding early and continuously when need arises. A full plan consists of putting in place the conservative measures that will protect the soil fertility.

Attitudes

The attitude of the farmers play a big role in the practice of conservation. The farmer must be motivated and practice positively with understanding of what he is doing. Securing popular support for conservation farming is not an easy matter. It should be given first priority, even in programmes to improve agriculture. A farmer should be convinced that soil erosion leads to low crop yields and higher food prices, while steadily eroding a country's self sufficiency (Kelly, 1983).

The interest in the practice give courage of implementation and where there is no interest a farmer can not agree with an extension worker that a certain conservation

practice is needed and useful. He resolves to adopt it the following season and then do nothing about it year after year. Conservation farming is a systematic way of planned practices which do not encourage reluctance inconsistency and behaving primitively. It instead calls for someone who is proud of his/her preservative position compared to conventional tillage. There should be a high esteem in which conservation is held by prestige by the farmer (Kelley, 1983). These attitudes must be turned around through the conscious of the farmer before he implements the innovation.

Educational knowledge of conservation farming

Conservation farming needs rudimentary training to build up the farmer's capacity to undertake the innovation. Knowledge is the power to do things logically and gain the appreciation of contributions of conservation practices. The conservation plan must be fully understood by the farmer undertaking it, so that he is able to relate it to his environment and use the necessary local resource to build the soil fertility hence improving on the crop yields (Rodgers, 1960).

Education is necessary to launch a worldwide effort to arrest soil degradation. Clearly it is urgent to reverse the accelerated destruction of resources through comprehensive soil and water conservation programmes which increase and sustain crop yields, such programmes are within reach today in every country. There is no work more needed today than projects that help the land live (Kelly, 1983).

This study implies that if the farmers practicing CF are able to put up a complete conservation plan in place and follow all the recommendations, they are able to cure

the soils and produce surplus. In implementing this innovation, the farmers must be knowledgeable of every practice and understand why these practices are done. The fact that their attitude to the practice influence their activities, it is important for farmers to have a positive attitude only then can CF work.

CHAPTER THREE

METHODOLOGY

Research Design

For data collection, questionnaires and interview schedule were used to gather information in assessing the constraints that farmers encountered in implementing conservation farming.

Population

The population consisted of all the farmers involved in implementing conservation farming in Lusaka district. There are four farming blocks and eight (8) camps in the pilot area.

Sample Population

The sample population comprised of forty (40) farmers drawn from Northwest block and East block. Included in the sample were twelve farmers from Kabanana camp Northwest block, thirteen farmers from Ibex camp East block.

Sampling procedure

The forty farmers were randomly selected using lotteries random sampling. The representative of every block picked pieces of paper. Those who picked the numbers required in the sample were included in the sample and hence the farmer groups in those areas were participated in the interview.

Data Collection

Qualitative and quantitative data was collected by using questionnaires and an interview schedule. The interviews were conducted individually during farmer individual visits and twenty five (25) questionnaires were administered to every

individual involved in the sample and fifteen farmers responded to the interview schedule.

Data analysis

Data was based on the objectives of the study which determined the attitudes of the farmers toward conservation farming, the farmer's knowledge about conservation farming. It also determined constraints that farmers encounter in the implementation of conservation farming.

Quantitative data was analysed by use of frequency distribution and qualitative data was analysed by describing and interplating the collected data direct from the farmers views. Data was analysed manually due to small number of he population which was covered in the survey.

CHAPTER FOUR

FINDINGS

Quantitative data presented in frequency distribution and percentages.

SECTION A: Personal details

1. Table 1: Sex/ Gender

Sex	Frequency	Percentage
Male Female	12 13	48 52
	25	100

According to the data collected there were 25 respondents with ratio of 48% to 52% male to female. The composition of the sample was well balanced and well represented by all sexes.

2. Table 2: What range is your age

Age in yrs	Frequency	Percentage
20 – 30 years 31 - 40 years 41 – 50 years 51 & above	0 0 3 22	0 0 12 88
	25	100

According to the above table the composition of farmers participating had 12% of ages ranging from 41 years to 50 years of age and 88% had ages ranging from 51 years and above. The representative were all mature and responsible citizens.

3. Table 3.: Indicate your marital status

Marital status	Frequency	Percentage
Married Single Divorced Widowed	18 - - 7	72 - - 28
	25	100

In the table above, the sample population consisted of 72% married 28% of farmer were widowed.

4. Table 4: Indicate the number of children.

Number of Children Category	**Frequency**	**Percentage**
0-10 years	0	
11 – 20 years	5	20
21 – 30 years	9	36
31 – 40 years	6	24
40 and above	5	20
TOTAL	25	100

According to the data collected, all the respondents had children and ages were ranging as specified below.

a) 0 – 10 years 0%

b) 11 – 20 years 20%

c) 21 – 30 years 36%

d) 31 – 40 years 24%

e) 40 and above 20%

5. Table 5: Indicate your residential area.

Residential Area Category	**Frequency**	**Percentage**
Kabanana Camp	12	48
Chainda Camp	7	28
Ibex Camp	6	24
TOTAL	25	100

According to the table of frequency and percentage, the composition of respondents were from different camps of which 48% came from Kabanana, 28% from Chainda Camp and 24% from Ibex Camp. The composition was fairly distributed, to represent the (2) blocks and was fit for generalisation.

6. The total Area of farm size for all the 25 respondents is 55 ha .

7. The total hectares under conservation farming is 25 hectare which means out of the available 55 hectares only 25 hectares are under conservation farming therefore 44% of land is used for conservation farming. 55% of land is used for conservational village.

8. TABLE 8: Do you burn crop residues on your farm?

Do you burn crop residues on your farm?		**Frequency**	**Percentage**
Category	Yes	4	16
	No	21	84
TOTAL		25	100

According to the data collected 16% of the farmers burn crop residues on their farms only when there is a disease break out. 84% do not burn crop residues on their farms. There is a gap of 16% to stop burning crop residues, and be able to use other methods like crop rotation to protect their crops against disease infection.

9. Table 9: Do you practice crop rotation at your farm?

Do you practice crop rotation on your farm?		**Frequency**	**Percentage**
Category	Yes	6	24
	No	19	76
TOTAL		25	100

The table indicates that 24% Practice crop rotation

78% do not practice crop rotation on their farms and there is a need of 78% for farmers to start practising crop rotation.

10. Table 10: What crops are involved in the crop rotation ?

What crops are involved in the rotation cycle of crop rotation on your farm?	**Frequency**	**Percentage**
Maize, groundnuts	2	33.5%
Maize, groundnuts/beans and sweet potatoes	3	50%
Maize sweet potatoes	1	16.5
	6	100

In the table above 50% of farmers practicing of involve maize, groundnuts/beans and sweet potatoes and 16.5 grow maize and cassava in their rotation cycle.

11. Table 11: Indicate the rotation cycle on your conservation

Indicate the rotation cycle on your conservation farming plot	**Frequency**	**Percentage**
Category		
Maize - groundnuts	2	33.5
Maize – groundnuts – Sweet Potatoes	3	50
Maize - Sweet potatoes	1	16.5
TOTAL	6	100

The data collected in table indicates that 33.5% of those practicing crop rotation has two crop rotation cycle of maize following groundnuts. Fifty percent (50%) of the farmers practicing rotation have a three crop rotation cycle which includes maize – sweet potatoes – groundnuts/beans and 16% do not involve a legume in their rotation of crops. There is a need of 16% to involve a legume in their rotation of crops.

12. Table 12: When do you start land preparation on your farm?

When do you start land preparation on your farm (CF plot)?	**Frequency**	**Percentage**
Before rain onset	6	24
Shortly after rain onset	4	16
Just after harvesting	15	60
TOTAL	25	100

According to the table 24% Farmers practicing conservation farming start land preparation before rain onset. 16% start land preparation shortly after rain onset 60% start land preparation just after harvesting their crops.

13. Table 13: When do you start land preparation on your farm?

What are your views about land preparation?	**Frequency**	**Percentage**
It is expensive	7	28
It is primitive way of cultivating		
It is economical	18	72
TOTAL	25	100

In the table above 28% view land preparation as an expensive venture 72% view land preparation as an economical venture or practice. There is a need of 28% of farmers to improve their negative attitude towards land preparation.

14. Table 14: Do you maintain permanent planting holes every seasonal year?

Do you maintain permanent planting holes every seasonal year?	**Frequency**	**Percentage**
Yes	21	84
No	4	16
TOTAL	25	100

According to the data collected 72% Maintain permanent planting holes very seasonal year and 28% do not maintain permanent planting holes. There is need of 28% to start maintaining permanent hole.

15. Table 15: Do you measure spacing when digging planting holes

Do you measure the spacing when digging planting holes?	**Frequency**	**Percentage**
Category		
Yes	21	84
No.	4	16
TOTAL	25	100

According to the table 84% measure the spacing when digging planting holes and 16% do not maintain planting holes. There is need of 16% to start maintaining permanent planting holes

16. Table 16: What tools do you use to prepare planting holes?

What tools do you use to prepare planting holes?	Frequency	Percentage
A. Hoe	15	60
B. Terren rope, pegs, hoe	10	40
TOTAL	25	100

In the table above 60% measure the spacing when digging planting holes and 40% use terren rope, pegs and hoe to prepare a planting holes.

17. Table 17: When do you plant your seeds

When do you plant your seeds?	Frequency	Percentage
When soil moisture is enough After heavy rains Fort eight hours after heavy rains	9 15 1	36 60 4
TOTAL	25	100

According to this table above 36% plant seeds when the soil moisture is enough.

60% plant seeds after heavy rains

4% plant seeds after forty eight hours of heavy rains

There is need of 40% of farmers to plant seeds after heavy rains.

18. Table 18: When do you apply basal dressing fertiliser or manure?

When do you apply basal dressing fertilizers or manure?	**Frequency**	**Percentage**
After digging planting holes After plant germination At knee high	23 1 1	4 2 4
TOTAL	25	100

According to the data above 4% of the farmers apply basal dressing fertilizer and manure, 2% of farmers apply basal fertilizer after plant germination and another 4% apply fertilizers and manure when the crop is at knee high.

19 . Table 19: Do you weed your fields?

Do you weed your fields?	**Frequency**	**Percentage**
Yes No	25 0	100 0
TOTAL	25	100

In the table above 100% of the respondents weed their fields. There is no discrepancy in the practice of weeding.

B. Table 19b: How regular do you weed your fields?

How regular do you weed the fields?	Frequency	Percentage
When need arises Continuously Once	17 4 4	68 16 16
TOTAL	25	100

According to data collected 68% of the farmers wed their fields when need arises. 16% of farmers weed continuously. 16% weed only once.

20. Table 20: What are your comments on weeding?

What are comments on weeding?	Frequency	Percentage
It is involving and hectic It is expensive It is economical It is easy	16 7 1 1	64 28 4 4
TOTAL	25	100

According to the table above 64% of farmers say weeding is hectic and involving 16% say weeding is expensive. 4% say it is economical and another 4% say weeding is easy.

Table 21: How long have you been practicing conservation farming?

How long have you been practicing conservation farming (CF)?	Frequency	Percentage
1 year 2 years 3 years 4 years	0 2 10 13	 8 40 52
TOTAL	25	100

According to the data collected 8% of the farmers have been practicing conservation farming for the past 2 years. 40% have been practicing CF for 3 years and 52% have been practicing the innovation for the past 4 years.

22. Table 22: Do you face any constraints in implementing conservation farming?

Do you face any constraints in implementing conservation farming?	**Frequency**	**Percentage**
Yes No	15 10	60 40
TOTAL	25	100

According to this table above 60% say that they face constraints in implementing conservation . 40% do not face any constraints in implementing conservation.

2.3 60% identified the following constraints

- weeding and land preparation, labour intensity
- manure scarcity
- inadequate information on the importance of liming
- lime availability and soil testing services

24. Table 24: Do you think there is a benefit in practicing conservation farming?

Do you think there are benefits in conservation farming?	**Frequency**	**Percentage**
Yes No	25 0	100 0
TOTAL	25	100

According to the data collected, 100% of farmers see benefits in implementing conservation farming with the following as started below;

1. Reduce labour compared to conventional hand hoe farming
2. Early planting
3. Reduces the cost of hiring animal or tractor draught power
4. It is a solution for alleviation poverty among peasant farmers because it is affordable since there is use of tools that are available locally.

25. What are your views about conservation farming?

Conservation farming is affordable and cheap. Every farmer can manage to use the innovation because it doesn't need a lot of money but it demands for physical input which anybody can offer.

26. Table 26: Do you think the knowledge got from your training was enough to enable you practice conservation farming fully?

Do you think the knowledge got from your training was enough to enable you practice conservation farming fully?	**Frequency**	**Percentage**
Yes	25	100
No	0	0
TOTAL	25	100

100% of the farmers think that the knowledge they got from training was enough to enable them practice conservation farming fully.

27. Table 27: Is it necessary for you to be retrained in conservation farming?

Is it necessary for you to be retrained in conservation farming?	**Frequency**	**Percentage**
Yes	25	100
No	0	0
TOTAL	25	100

The table indicates that 100% of the farmers feel that it is necessary to be retrained in conservation farming

Quantitative Data Findings

There were fifteen respondents involved in answering the interview schedule, seven male and eight females.

During the interview there was full participation and farmers were able to express their views through their experiences they have acquired.

Farmers in the area had learnt conservation farming through a field school where a demonstration plot was put in place for farmers to physically learn and practice the innovation. From that time they stuck to what they learnt or adopted from others. It was highlighted that they have not developed any other skills other than from that they learnt during farmer field school.

The following are the Farmers' Practice which were highlighted

Land Preparation

Land selection; Farmers select which part of the farm they will utilize. In the selection they consider the field history and from that they are able to allocate the type of crop to be grown.

Land Clearing

After harvesting, one hundred percent of farmers begin to gather crop residues and heap them in windrows in between the inter row space of the previous crop.

Ninety six percent of the farmers do not burn crop residues in Lusaka District, burning of the crop residues can only be done if there was a disease breakout on the

previous crop. This is done as preventive measure of disease break out on the next crop.

Digging Permanent Holes

After the farmers has stumped the shrubs and stumps on the field with well organized windrows of crop residues, digging of holes is done. The tools used include measuring stick, pegs, terren rope and a hoe.

the farmers highlighted that it becomes easy to dig planting holes after the first year because they just follow the previous crop stations which are identified by the crop stock and therefore they do not continue to use the terren rope, pegs and measuring sticks because by then the planting stations will have been established.

Manuring

Farmers, apply manure only when they have it available, but only 16% of farmers are able to apply manure in the area. Manure is not available in large quantities and therefore it is difficult to source manure for the whole field. In most cases only a small portion is applied because it is difficult to find manure which can cover the whole area under cultivation.

Liming

Liming the planting hole is not done because the farmer has no access to lime. It was highlighted that farmers had not taken their soil samples for testing because many farmers were not informed of soil test.

Fertilizer

Application of fertilizer was supposed to be done after digging the planting hoes, but this was not done because the cooperative had not received the fertiliser and farmers are forced to apply their basal and top dressing late because of untimely input distribution. Application of basal fertiliser is done after crop germination.

Planting

Farmers practice early planting with the first rains. They plant their crops immediately after the first heavy rains in the area. This is usually around late November and early December.

Sowing Crop Seed

Seeds are sown directly into the holes. The number of seeds planted in the hole depends on the seed type or crop type. The seed is not planted too deep

Weeding

Weeding was highlighted as a very expensive and hectic exercise carried out by every farmer. Farmers indicated that weeding is labour intensive and time consuming because they start weeding as early as possible, since weeds seeds germinates at the same time as that of crop seed. Before finishing weeding the whole field, areas where they had begun weeding will have been already infested; therefore it requires them to repeat the weeding. It therefore becomes hectic, involving and expensive so much that sometimes weeds grow to maturity since the farmer lacks the capacity to eradicate them. Weeds have a bad effect on the crops because a weed infested field tends to have low yields.

Crop Rotation

In the interview farmers stated that land is a limiting factor to crop rotation. Farmers are forced to practice monoculture in order for them to grow enough food for survival.

Some farmers said that because of the limiting draught power the land tilled is always small and are forced to grow the staple food not cash crops which may have no market readily available.

Among the farmers practicing crop rotation, it was observed that not the whole cropland is used. Maybe, a quarter of the plot would be rotated while three quarters of it is strictly under monoculture and also there is no consistency of rotation practices.

It was observed during interviews that the farmers in good faith would want to practice crop rotation but the rotational cycle is wrong. For instance many farmers rotate maize interchangeably with sweet potatoes without a legume.

Farmers expressed their views about conservation farming as a solution to people who do not have the capacity to hire tractor drawn implements or ox drawn implements.

The method was recommended as a substitute for draught power because it affords even poor people to be able to grow crops using local materials. Because of this, many farmers are able to grow food to sustain their house holds.

Farmers preferred conservation farming because it helped them sustain their household food security.

Conservation farming is viewed as a small scale farmer's farming method which is adopted by those who cannot afford to hire draught power. Many farmers feel that conservation farming is a hectic operation during the phase of digging holes and weeding.

CHAPTER FIVE

Discussion

Ninety six percent of farmers in the area do not burn crop residues on their fields, there views and practice are in agreement with recommendations that were made by Moono (2003). He urged farmers to retain the crop Stover to add to the benefit of soil improvement. Though Ninety six don't burn crop residues, four percent of farmers should not burn crop residues when there is a disease outbreak. All they need to do is to rotate the crops, which is a natural cure of diseases and pests. The farmers highlighted that they were aware of the importance of crop rotation but they are failing to practice crop rotation because of limited land to grow staple food, they are forced to practice monoculture and hence crop diversification is out of question. Their practice and the views landless (1999) are not in agreement because he argues farmers to avoid monoculture, which encourages erosion of soils.

There is need for farmers to practice crop rotation at any cost for the benefit of building up the soil, because crops grown on a small fertile piece of land will grow favourably with good yields than crops grown on vast area but low soil fertility. The findings of this research are that crop rotation is not fully practiced and those who do it, are not consistent. On the contrary, Aaagard (2000) emphasizes on the consistency of crop rotation in full capacity so that the soils are not depleted but improved to an extent where there can be good yields in every crop cultivated.

The finding of this research indicates that the farmers were planting after a heavy downpour. This practice is in conjunction with the views of Allison (2003) who

advised that farmers should plant crops when there is enough moisture. He adds that seed should be planted immediately after heavy rains.

Conservation farming as argued by (Rodgers, 1960) needs rudimentary training to build up the farmer's capacity to undertake the innovation. Farmers in Lusaka District felt that knowledge is the power to do things logically and gain the appreciation of contributions to conservation practices. The farmers agreed with the views of Rodgers that they need to fully understand the undertaking of conservation farming to be able to use local resources to build the soil fertility and improve on their crop yields. 100% of the farmers agreed to be given an educational treatment despite having learnt the basic requirements of the innovation.

The observations in the research indicated that the farmers in the area are not able to put up a full conservation-farming plan due to so many constraints they encountered. The constraints includes land scarcity to allow them grow different crops, high weeding cost, manure and lime unavailability, lack of adequate information on conservation farming and negative attitudes that some farmers have towards the innovation of digging planting holes.

Land Preparation

It was observed that, farmers have a negative attitude towards digging of holes. Many feel that digging-planting holes is an inferior approach to conventional farming and therefore only those people who cannot afford draught power can practice hand hoe conservation farming. There is a general notion that digging planting holes is a solution to the problem of draught power, the focus of conserving the soil is not

emphasized and they dig hole for the sake of opening the soil to plants, they feel it's a means to an end. This notion by farmers conflicts with the technical recommendation or principles of conservation farming. Allison (1999), as highlighted in the literature review, argues farmers to dig planting hoes in order not to disturb the soil structure and avoid soil degradation. Principally digging of planting holes is not aimed at solving the problem of drought power but as a conservation measure, which farmers have to do in order to give back to the soil.

Manure

Sixty percent of farmers do not apply manure on their conservation farming fields despite being aware. This is as a result of having no dependable source as it is always in short supply. The fact that manure is scarce, the prices are high so that one cannot afford enough manure to apply into the whole field. Among those who apply manure, the supply is limited and don't consistently apply, therefore the soil does not get adequate supply which leads to erosion hence lower yields.

Liming

Lime is not a common item on the Zambian market and therefore farmers are not able to get it on their door steps. It was observed that no farmers had taken soils for testing because they have not received adequate information on soil testing and liming.

The farmer's practice of not applying or under applying manure leaves much to be desired in the views of (Moono 2003) who say organic manure plays a big role in conservation farming and it is a practice that is not worth ignoring them, since loss of organic matter increases soil acidity, loss of moisture holding capacity, reduction in

yields and soil compaction. While liming plays a big role in neutralizing soil PH, its imperative that where there is not organic matter applied, lime takes an upper hand to neutralize acidity. Therefore in this case the farmer practice and technicians is conflicting because they do not match, because farmers are doing something else which does not promote soil capacity building.

Fertilizers

Inorganic fertilizers are very expensive so much that very few farmers are able to buy on cash. But despite the importance of fertilizers, the Government distributes fertilizer so late to the farmers hence the untimely application. Maize growth goes along with the right nutrient value, therefore it is important to be timely in providing nutrients (Mathai). The farmers were complaining that fertilizer is not timely and very expensive hence the failure to be timely. This is a problem which may affect the plant growth hence reduced yields.

Weeding

The observations made in the research highlighted the fact that farmers understand the importance of weeding and they in strong terms agree with the recommendations made by (Mingochil 1980) that weeding is a critical element of farming which is done to provide a free environment. Therefore farmers in the area find weeding critical and labour intensive 84% of the farmers fail to weed continuously due to the high cost of weeding.

Conclusion

The major findings of this study has satisfied the objective of the study which established the unknown factors or constraints farmers are facing in implementing conservation farming. The study determined the attitude of farmers toward conservation farming and it further determined the knowledge of conservation farmers.

The study indicates the constraints of implementing conservation farming as those of failing to put up a full plan of conservation farming in practice.

Weeding

Weeding was identified as the major constraint of practicing conservation farming. The study indicates that there is a need of putting up a strategy to help farmers fight the cost of weeding because they were failing to weed to the maximum.

Land Preparation

Farmers complain of the intensive labour involved in land preparation and this leads to the negative attitude of many farmers which make them feel that conservation farming is an inferior approach. Some farmers use pot holing as a solution to escape the cost of hiring tractors or oxen drawn implements meaning that given a chance to tractors or ox-drawn implements they would revert back to conventional farming.

Manure Scarcity

Many farmers do not apply manure in their fields because of its unavailability and therefore they continue using the land without manual and keep on mining the available nutrients and deplete the soil to the level where the yields drop.

The constraints which were determined include:

a. land preparation and weeding as labour intensity
b. Inconsistency in putting up a full plan of conservation farming particularly crop rotation
c. Luck of understanding of why certain practices are done
d. Manure and lime scarcity
e. Lack of soil testing services
f. Late fertilizer distribution

Liming and Soil Testing

Soil testing services are not available on farm level and many farmers do not lime their fields. It was observed that farmers have not made efforts in securing lime and soil testing services because they don't have the knowledge about the importance at liming and testing the soils.

Late Fertilizer Distribution

The untimely fertilizer distribution affects the conservation farming practice because fertilizer is procured late hence its late application affects the growth rate of crops.

Rotation

Seventy six percent of the farmers do not practice crop rotation. Among those practicing it, only 16% use the correct rotation cycle and 8% use a wrong crop rotation cycle. In many cases the cycle does not include a legume. There is a need for the 24% farmers to practice meaningful conservation farming in order to maximize productivity.

The response showed that 100% of respondents were positive to upgrade conservational farming Educational Standards.

There is inefficiency in practicing agronomical cultural practices, which needs educational treatment.

CHAPTER SIX

Recommendations

Weeding: In order to fight the constraints of labour intensity in weeding, the government should design a programme whereby herbicides are supplied on credit terms to farmers practising conservation farming. In this programme farmers should jointly use mechanical and chemical weeding to reduce on labour costs. In this way weeds will be reduced because they will not multiply vastly as when they are left to mature and shed seeds.

Mukutu (1985) recommends a combination of cultural practices with chemical and mechanical weed control as a good approach to weed eradication. He further advises farmers to pre-plant and incorporate herbicides to control a wide range of weed species which may occur in a field and compete with the crops for limited moisture and nutrients.

Crop Rotation: there should be a deliberate programme to sensitise farmers on the importance of crop rotation. A compulsory campaign to all those farmers involved should be put in place, in this process farmers should be introduced to high value crops which may occur in a field and compete with the crops for limited moisture and nutrients.

Availability: In order to fight the problem of manure scarcity, there should be put in place a campaign of composite making on every farmyard. Farmers should be encouraged to utilise every organic material in composite heaps which they can use to apply in the permanent planting holes.

The researcher recommends that since farmers fail to put up a full plan of conservation farming, there is need to educate the farmers on why every practice counts. There is need to make the concept fully understood, so that the attitudes of the people should be focused to the objective of conservation farming. There should be deliberate programmes to ensure that farmers are getting educational treatment to attain high productivity through efficient output of putting a full and consistent conservation plan which include all the practical agronomical practices.

From the findings established in the study, the researcher recommends early distribution of fertilisers by the government.

Soil Testing facilities should be introduced closer to farmer and they should be given adequate information on the importance of liming their soils, through mobile workshops.

There should be a deliberate programme to ensure that farmers are getting Educational Treatment to attain high productivity through the efficient use of putting up a full conservation farming plan, which includes all the practical agronomical practices.

Training workshops should be held regularly to help farmers get adequate information and knowledge on conservation farming. There should be a deliberate programme to make farmers understand objectives of the conservation farming primary objectives and the importance of every agronomical practice of conservation farming.

In order to fight the constraint of labour intensity in weeding, the government should design a programme to supply soft loans of herbicides to farmers practicing conservation farming for a period of three years. The farmers should jointly use mechanical and chemical weeding to reduce labour. In this way weeds will be reduced because they will not multiply vastly as when they are left to mature and shed seeds.

(Mukutu 1985) recommends a combination of cultural practices with mechanical and chemical weed control as a good approach to weed control. He further advises farmers to pre-plant and incorporate herbicides control a wide range of weed spices which may occur in a field and compete with the crops for limited moisture and nutrients resulting in poor growth, hence reduction of yields.

The research recommends a composite manure campaign to be enhanced in the area. Farmers must be sensitized to utilize every farm yard (refuse) organic matter to make composite heap. Every farm stead should put up a manure composite to use in order to conserve the soils to maximize sustainable soil fertility. This campaign will help to improve the manure source which is scarce in the area.

Crop Rotation should be a compulsory practice to every farmer practicing conservation farming. A deliberate programme to sensitize farmers to maximize production on the available land should be put in place. Farmers must be able to use the land to the maximum with protection against erosion.

From the findings established in the study, the researcher recommends early distribution of fertilizers by the government. The co-operatives benefiting from the National fertilizer programme should budget and buy the fertilizers for its members in good time so that fertilizer is applied at the right time.

Soil testing facilities should be deliberately be introduced closer to farmers reach and farmers should be given adequate information on the importance of liming their soils.

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APPENDIX I

BUDGET

No	Item	Cost	Quantity/ Requirement	Amount
1.	Plain papers	25,000.00	2 reams; 25,000 x 2	50,000.00
2.	Pens	500.00	4 pens; 500 x 4	2,000.00
3.	Pencils	500.00	2 pencils; 500 x 2	1,000.00
4.	Rubber	2,000.00	2 rubbers; 2,000 x 2	4,000.00
5.	Tipex & Thinner set	10,000.00	1 set; 10,000 x 1	10,000.00
6.	Typing the proposal	2,500.00	40pages x 2,500	100,000.00
7	Binding the proposal	10,000.00	4 copies; 10,000 x 4	40,000.00
			Sub total	**205,200.00**
	Transport			
1.	Chainda	4 trips	20l diesel x 4 x 5,000	400,000.00
2.	Ibex hills	4 trips	20l diesel x 4 x 5,000	400,000.00
3.	Lilayi	4 trips	40l diesel x 4 x 5,000	800,000.00
4.	Mwalilanda	4 trips	50l diesel x 4 x 5,000	1,000,000.00
			Sub total	**2,600,000.00**
	Lunch	10,000.00 per meal	16 meals x 10,000	160,000.00
	10% contingency			2,965,200.00 +296,520.00
	GRAND TOTAL			**3,261,720.00**

APPENDIX II

TIME PLAN

2004 proposal time schedule

Activity	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.
Topic Identification and topic formation	→					
Literature Review questionnaire writing the research proposal	→					
Submission of the final research proposal		→				
Data collection and analysis			→			
Drafting the report and submission				→		
Typing and binding Submission of final report to supervisor						→

QUESTIONNAIRE FOR CONSERVATION FARMERS IN LUSAKA DISTRICT

Instructions

1. Do not write your name on this questionnaire
2. Kindly answer all questions as freely and honestly as possible. All answers will be treated with confidentiality.
3. Put a tick [√] against your answer and kindly explain briefly where you are requested to do so.

SECTION A

Personal Details

1. Sex/gender

   Male [ ]
   Female [ ]

2. Age 20–30 [ ]
   31- 40 [ ]
   41- 50 [ ]
   51- 60 [ ]

3. Marital status

   (a) Married [ ]
   (b) Single [ ]
   (c) Divorced [ ]
   (d) Widowed [ ]

4. Number of children, specify .....

5. Residential area .....

SECTION B: Substantive Issues

6. What is your farm size? .....

7. How many hectares are under Conservative farming? [ ]

8. Do you burn crop residues on your farm?

   (a) Yes [ ]
   (b) No [ ]

9. Do you practice crop rotation on your farm?

(a) Yes [ ]
(b) No [ ]

10 What crops are included in your rotation?

11 Indicate the rotation cycle on your conservation Farming plot.

12. When do you start land preparation on your conservation-farming plot?

(a) Before rain onset [ ]
(b) Shortly after rain onset [ ]
(c) Just after harvesting [ ]

13. What are your views about land preparation?

(a) It is expensive [ ]
(b) Primitive way of cultivating [ ]
© It is very economical [ ]

14. Do you maintain permanent planting holes every seasonal year?

(a) Yes [ ]
(b) No [ ]

If no, why, specify.....
If yes, specify .....

15. Do you measure the spacing when digging planting holes?

(a) Yes [ ]
(b) No [ ]

16. What tools do you use to prepare planting holes? Specify: ----------
---

17. When do you plant your seeds?

a. When the soil moisture is enough [ ]
b. After heavy rains [ ]
c. Forty eight hours after heavy rains [ ]

18. When do you apply basal fertiliser or manure?

(a) After digging planting holes [ ]
(b) After plant germination [ ]
(c) At knee high [ ]

19. Do you weed your fields

(a) Yes [ ]
(b) No [ ]

If you do weed, how regular do you weed?

(a) Once [ ] (b) Continuously [ ]
(c) When need arises [ ]

20. What are your comments on weeding?

a. It is hectic and involving [ ]
b. Its expensive [ ]
c. Its economical [ ]
d. Its easy [ ]

21. How long have you been practicing conservation farming on your farm?

a. 1 year
b. 2 years
c. 3 years
d. 4 years

22. Do you face any constraints in implementing (CF) conservation farming?

(a) Yes [ ]
(b) No [ ]

23. If you encounter any constraints, please list those constraints:

---

24. Do you think there are any benefits in conservation farming?

(a) Yes [ ]
(b) No [ ]

If yes, state the major ones. ---
---

25. What are your views about conservation farming?

---

26. Do you think the knowledge you got from your training was enough to enable you practice conservation farming fully?

(a) Yes [ ]
(b) No [ ]

27. Is it necessary for you to be retrained in conservation farming?

(a) Yes [ ]
(b) No [ ]

INTERVIEW SCHEDULE

1. From the time you started practicing conservation farming, have you developed skills that enable you to practice the innovation fully?

2. What agronomical practices do you put into practice on conservation farming plot?

3. Do you face any problems in practicing the identified agronomical practices?

4. What do you think about conservation farming?

5. What do you like about conservation farming?

6. What don't you like about conservation farming?

7. What do you think about crop rotation?

8. Are there possibilities for you to use permanent planting hole year after year?

9. Do you see any importance in retaining crop remains?

THE UNIVERSITY OF ZAMBIA

SCHOOL OF EDUCATION

DEPARTMENT OF ADULT EDUCATION AND EXTENSION STUDIES

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P O BOX 32379
Lusaka, Zambia

Your Ref:

....., 2004

NAME: .....

TO WHOM IT MAY CONCERN

RE: RESEARCH UNDERTAKING

The bearer(s) of this letter is a student in the Diploma/Degree in Adult Education. He/she has been requested to undertake research in your organization as part of his/her learning experience. Your help and cooperation in this regard will be highly appreciated by the department. as this will enable the student to link theory work, which is offered in the class, and practical work, which can only be obtained from organizations like yours.

I look forward very much to a favourable response in this regard.

Yours faithfully

for D.M. Sibalwa (Dr.)
ACTING HEAD OF DEPARTMENT
ADULT EDUCATION AND EXTENSION STUDIES.