

# The Role of Information Asymmetry in Monitoring Food Security Programme in Bar a Sub Location, Kisumu County, Second Season Harvest 2014

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## Abstract

This is a longitudinal research that monitored the same households for the second seasons and later on displays the information to the farmers on a noticeboard as a way of sensitizing them on good farm management practices. The indicators have been grouped into six variables which are arranged in a consequential order. These variables include land cultivation, irrigation, land value addition, crop protection, production and sales. The variable of production is our major concern in this MEFOSEP programme. Knowledge dissemination through noticeboard and training is used as an intervention put in place as independent variables to propel an increase on the four dependent variables which have a direct output to the resultant production. Key findings was analyzed and used to determine the role of the information on the notice board in increasing food production and also to determine the previous planned variables that are associated with production of food crops in 'Bar A' sub location, as a way of eradicating poverty and hunger in the sub location. Census was done for the 620 households. Frequency were run using SPSS and Chi square test to determine the associations of farm indicators, such as quantity of fertilizer and seeds application on the production of maize, beans, groundnuts and vegetables. Logistic regression analysis was used to determine the significant influence of the variables on the production of monitored food crops. Comparative analysis was used to test the null hypothesis on the statistic significant between first season and second season. The rates indicators used in the participatory planning, was used to set standard harvest indicators for each an every indicator. These standard harvest indicators formulated our discussion as we compare the findings with it together with the first season findings and the second season target plan.

## Keywords

Monitoring Food Security, Information Asymmetry, Food Production, Rate Indicators, Standard Harvest Indicators, Target Plan, Productivity Index Table

Received: November 26, 2015 / Accepted: December 25, 2015 / Published online: January 5, 2016

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## 1. Introduction

In this phase of second season 2015, our main focus is on monitoring food security. This phase continues to monitor

food security based on the previous indicators used in developing a logical frame work in the initial participatory planning. The indicators have been grouped into six variables which are arranged in a consequential order. These variables include land cultivation, irrigation, land value addition, crop

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protection, production and sales. The variable of production is our major concern in this MEFOSEP programme.

Due to change in our population study, the target indicators for this season have change based on the reduction of acreage of land ploughed and therefore, we have a new model for analyzing our findings

According to our methodology in our previous publication, monitoring is a proceeding activity after participatory planning, training and demonstration, which are the key activities/interventions used as independent variables to propel an increase on the four dependent variables which have a direct output to the resultant production. The increase of these variables is monitored based on the standard rate indicators that were used during participatory planning to come up with a target plan display on the notice board.

All the variables preceding production have a much bearing effect in leading into a greater output in production, and therefore, in the process of monitoring food security, more emphasis was put on the indicators under the four variables, that is:-land cultivation, irrigation, land value addition and crop protection through the use of independent variables:-trainings. In future, demonstration and TV talk show shall be incorporated as independent variables to propel the dependent variables.

Due to the fact that MEFOSEP food security monitoring tool have got an indicator measuring number of household members in each household, its therefore easy to assess the food security component of availability of food that meets the nutritious wellbeing of household throughout the year. This is done by getting the standard quantity needed by an individual to consume maize, beans and vegetables annually and multiply it by the number of household members. The sum attained in each crop is evaluated with the actual output. The validity of this assumption on food accessibility throughout the year based on this calculation is susceptible to challenging factors such as early selling of harvested food at a low price and poor preservation methods leading to food losses as a result of micro-organism and pest attack. For this reason, it is therefore necessary to conduct another survey on the availability of nutritious food in a household before and after harvest as a means of propping the monitoring of availability of nutritious food in a household.

Indicators monitored under each variable

1. Indicators under the variable of land cultivation
  - a) Acre to be ploughed
  - b) Acre to be planted
  - c) Quantity of seeds planted
2. Indicators under the variable of irrigation

- a) No of households using drip irrigation
3. Indicators under the variable of land value addition.
  - a) Quantity of fertilizers used.
  - b) Acre of land weeded.
4. Indicators under the variable of crop protection
  - a) Quantity of pesticides used
5. Indicators under the variable of production.
  - b) Quantity harvested.
6. Indicators under the variable of sales
  - a) Quantity to be sold.
  - b) Amount received

The monitoring approach used, is mandated on analysing and comparing the actual outcome of the indicators in the second season with the standard rate indicators in the participatory planning and in the target plan.

### *Objectives*

- 1 To undertake timely (early) warning through sequential disseminating information on the actual outcome of the second season on the noticeboard and providing intervention in the published articles and in the website blog for discussion.
- 2 To identify food security gaps through data analysis and participatory dialogue meeting with the farmers by comparing the second season findings with the first season findings and the standard rate indicators and identifying indicators that have an association with harvest for purpose of advocating for a change in these identified indicators by organizing trainings and demonstration farms to farmers.

## **2. Methodology**

### **2.1. Study Site**

Monitoring took place in 'Bar A' sub location. 'BarA' previously at the onset of the project, it had a population of 5835 people with households' count of 1268. Currently, it has a population of 6120 people.

### **2.2. Study Population**

This study population in the baseline survey previously consisted of 641 farmers practicing farming in the whole sub location but due to some farmers leaving their land furrow and some died, the number reduced to 620 farmers in this season. For this reason, the target plan/ model have change based on the reduction of household participating in the study, resulting to reduction of acreage ploughed which triggers the reduction

of others indicators based on the rate indicators. Below, is the new target plan for the second season.

### 2.3. Target Plan for the Second Season

Table 1. New target plan for the second season. Modified based on the reduction of acreage of land.

Crop	Acreage to be plough	Acreage to be planted	Qty of seeds to be used	No of Hhds Using drip irrigation	Qty of fertilizers to be used		Acre to be weeded
					DAP	Manure	
Maize	562	562	5620	562	28100		562
Beans	562	562	11240	562	56200		562
Groundnuts	116	111	2220	111	11,100		111
Veg	49	46	9.2	46	3680		46

Table 1. Continue.

Crop	Qty of pesticides to be used	Qty of CAN to be used	Qty to be harvested.	Qty to be sold	Amount Received	Qty stored		
						< 1 M	> 1M	>2M
Maize	843	67440	16860	60696000				
Beans	843	281	2810	28,100,000				
Groundnuts	167	56	288.6	3,694,080				
Veg	69	1886	690	966000				

Noticeboard for the second season with a modified target plan



Fig. 1. Upper table show the new target plan for the second season and the lower table shows the updated information for the second seasons.

### 2.4. Target Population

The target population for this study was, a farmer who is the head of a household i.e. either the wife or the husband. The unit of observation is the food being produced by these farmers.

### 2.5. Study Design

This shall be a longitudinal study that shall monitor the same households for a long period of time. Strategies put in place include the following.

#### 2.5.1. Monitoring

Monitoring was done frequently by use of household monitoring tool, and updating the notice board. Using household monitoring tool, the CHW walk house to house as they collect the data.

The use of smart phone has not yet been adopted yet.

#### 2.5.2. Updating the Bill Board

Because of the manual update, the noticeboard was updated after every four months. Chief barazas, churches and funerals were used to encouraged the community members to update themselves with the billboard so that they can monitor their

farming activities

### 2.5.3. Assessment

This was done through dialogue to identify the challenges and to come up with solutions that can help them to solve the foreseen food insecurity problem.

### 2.5.4. Training and Field Demonstration

Training was conducted, by facilitating on the challenges hindering them from achieving the target. Due to lack of fund to establish a demonstration farm, a demonstration farm has not yet been identified and less training to guarantee change was conducted.

### 2.5.5. Assessment/Dialogue

At the end of harvest, community members assembled together in a dialogue meeting, so that they can dialogue on the various issues that are hindering them from achieving the set target.

### 2.5.6. Training

The issues raised as challenges, formed part of the modules to be incorporated in the training curriculum so that they can be taught on the chosen modules. Due to limited of funds, less training was conducted.

### 2.6. Sample Size Determination

This was a census study in which all the farmers' in the sub location were included in the study.

### 2.7. Data Collection Tools and Quality Assurance

Data was collected by using the same structured and semi structured questionnaires which were used previously in the first season. The questionnaires are written in English. Pre-tests were done in the nearby community for clarity,

acceptability, flow and consistency of the study. The questionnaire was used to collect quantitative data from the households. Data collection was done by trained enumerators who had a minimum of certificates in Community Health and Development or above and at least two years experienced in surveys. They underwent retraining for one day for purpose of refreshing them on the standards of data collection. 620 households were interviewed. Quantitative data were collected through structured questions and were collected for period of five days. Each enumerator interviewed at least 40 households. By the end of the day, the supervisors reviewed the questionnaires for consistency and completeness of data. Finally, all the questionnaires were entered.

## 2.8. Inclusion Criteria

The study concentrated on the households that had formerly been included in the previous inclusion at the baseline stage.

## 2.9. Data Management

Immediately after field work, data were entered on daily basis by the data clerks. Consistency and completeness check was done and data cleaned. Information from the questionnaires was electronically entered in Statistical Package for Social Sciences (SPSS) version 16 programme.

All the hard copies of all questionnaires were used for counter checking the information electronically entered. Each tool was entered individually.

## 2.10. Data Analysis

This was an analytical study in which quantitative data was used. The analysis is purely descriptive and trend analysis.

Frequencies were run using SPSS; a computer based software for data analysis. Microsoft Excel was used to get the total summation displayed on the noticeboard.

Chi square test was used to determine an association for different variables with the quantity harvest. Logistic regression analysis was used by combining all the variables together in order to find the variable with more association than the other.

Comparative analysis was used to test the null hypothesis on the statistic significant between first season and second season.

## 2.11. Monitoring

This is done by use of a household monitoring tool inform of a pamphlet with one pamphlet having at least 40 households monitoring tools bound in it. One CHW is attached to at least 40 households that he or she monitors regularly using the pamphlet bound. Microsoft Excel was use to get the summation of the aggregates and then displayed it on the noticeboard.

## 2.12. Dissemination of Findings and Expected Application of the Study Results

The findings are updated after every four month on the notice board. It is updated on the Community Food Security monitoring tool, which is displayed on the notice board.

# 3. Findings

## 3.1. Maize

**Table 2.** Shows the quantity harvested based on the quantity of input inacreage ploughed, seed quantity, DAP, CAN and Manure used and their level of association. Range in standard harvest indicator is used in formulating our discussion.

MAIZE KG	RANGE FOR STANDARD HARVEST INDICATOR. (SHI)	Quantity harvested maize KG				P-value
		0-1120	1121-2250	2251-3380	3381-4500	
Acreage ploughed (acres)	SHI for acres, ie 2700kg harvest per acre					
0-4	0-10800	97(28.03)	62(17.92)	80(23.12)	107(30.92)	<0.001
4.1-8	11070-21600	57(28.64)	54(27.14)	39(19.60)	49(24.62)	
8.1-12	21870-32400	14(22.58)	17(27.42)	20(32.26)	11(17.74)	
Seed Quantity (kg)	SHI for seeds, ie 2700kg harvest per 10kg seed					
0-30.5	0-82350	48(23.19)	41(19.81)	54(26.09)	64(30.92)	0.0178
30.6-61	82620-164,700	122(30.58)	93(23.31)	80(20.05)	104(26.07)	
Dap fertilizer (kg)	SHI for DAP, ie 2700kg harvest per 50kg DAP per acre					
26.6-52.6	1404-2840.4	38(27.74)	24(17.52)	29(21.17)	46(33.58)	<0.001
52.7-78.6	2845.8-4244	74(35.41)	56(26.79)	32(15.31)	47(22.49)	
78.7-80	4249.8-4320	46(20.20)	51(22.17)	72(31.30)	61(26.52)	
CAN used (kg)	SHI for CAN, ie 2700kg harvest per 120kg CAN per acre					
0-50	0-1125	18(34.62)	10(19.23)	12(23.08)	12(23.08)	0.0341
51-100	1147.5-2250	21(20.79)	25(24.75)	31(30.69)	24(23.76)	
101-	2272.5	18(21.69)	20(24.10)	18(21.69)	27(32.33)	
MANURE used	SHI for manure, ie 2700kg maize per 120 w/barrows					
0-30 w/barrows		9(19.15)	9(19.15)	11(23.40)	18(38.30)	<0.001
31-60 w/barrows		6(17.14)	11(31.45)	10(28.57)	8(22.86)	

### 3.1.1. acreage Ploughed Maize and Quantity Harvested

In table 1, area of acreage ploughed, its p-value 0.001 is less than 0.05 and therefore, this signifies some level of association in the acreage ploughed and quantity harvested.

In acreage ploughed in a range of 0-4, quantity harvested in the range of 3381-4500kg recorded the highest at 30.92% followed by quantity harvested in the range of 0-1120kg recording a rate of 28.03%, quantity harvested in a range of 2251-3380kg recorded a rate of 23.12% and quantity harvested in the range of 1121-2250kg recorded a rate of 17.92% respectively.

In acreage ploughed 4.1- 8, quantity harvested in 0-1120kg recorded the highest rate of 28.64%, followed by quantity harvested in 1121-2250kg recording 27.14%, 3381-4500kg recording 24.62% and 2251-3380kg recording 19.60%.

In acreage ploughed 8.1- 12, quantity harvested in the range of 2251- 3380kg recorded a rate of 32.26% followed by 1121-2250kg recording a rate of 27.42%, 0-1120kg recording a rate of 22.58% and 3381-4500kg recording a rate of 17.74%.

### 3.1.2. Quantity Seeds Planted and Quantity Harvested

In the same table 1, quantity of seeds planted, its p-value 0.0178 is less than 0.05 and therefore, this signifies some level of association in quantity of seeds planted and quantity harvested.

Quantity of seeds planted in a range of 0-30.5kg recorded highest rate of 30.92% in a range of 3381-4500kg followed by 2251-3380kg recording a rate of 26.09%, 0-1120kg recording a rate of 23.19% and 1121-2250kg recording a rate of 19.81%.

In quantity of seeds planted in a range of 30.6-61kg, quantity harvested in a range of 0-1120kg recorded a high rate of 30.58%, followed by 3381-4500 recording a rate of 26.07%, 1121-2250kg recording a rate of 23.31% and 2251-3380kg recording a rate of 20.05%.

### 3.1.3. DAP Fertilizer and Quantity Harvested

In the same table 1, quantity of DAP fertilizer used, its p-value 0.001 is less than 0.05 and therefore, this signifies some level of association in quantity of DAP used and quantity harvested.

In DAP fertilizers used in a range of 26.6-52.6kg, quantity harvested in a range of 3381-4500 recorded a high rate of 33.58% followed by 0-1120kg recording a rate 27.74%,

2251-3380 recording a rate of 21.17% and 1121-2250kg recording a rate of 17.52%.

In DAP fertilizer used in a range of 52.7-78.6kg, recorded a high rate of 35.41% in a range of 0-1120kg followed by 1121-2250kg recording a rate of 26.79%, 3381-4500kg recording a rate of 22.49% and 2251-3380kg recording a rate of 15.31%.

In DAP fertilizers used in a range of 78.7-80kg, quantity harvested in 2251-3380kg recording a high rate of 31.30% followed by 3381-4500kg recording a rate of 26.52%, 1121-2250kg recording a rate of 22.17% and 0-1120kg recording a rate of 20.20%.

### 3.1.4. CAN and Quantity Harvested

In the same table 1, quantity of CAN fertilizer used, its p-value 0.0341 is less than 0.05 and therefore, this signifies some level of association in quantity of CAN used and quantity harvested.

In CAN used in a range of 0-50kg, quantity harvested in 0-1120 recorded a high rate of 34.62%, followed by 2251-3380kg and 3381-4500kg both recording a rate of 23.08% and 1121-2250kg recording a rate of 19.23%.

In CAN used in a range of 51-100kg, quantity harvested in a range of 2251-3380 recorded a high rate of 30.69%, followed by 1121-2250 recording a rate of 24.75%, 3381-4500 recording a rate of 23.76%. and 0-1120kg recording a rate of 20.79%.

In CAN used above 101kg, quantity harvested in a range of 3381-4500 recorded a high rate of 32.33%, followed by 1121-2250kg recording a rate of 24.10% and both range of 0-1120kg and 2251-3380kg recording the same rate at 21.69%.

### 3.1.5. Manure Used and Quantity Harvested

In the same table 1, quantity of manure used, its p-value 0.001 is less than 0.05 and therefore, this signifies some level of association in quantity of manure used and quantity harvested.

Quantity of manure used in a range of 0-30 wheel barrows, quantity harvested in a range of 3381-4500 recorded a high rate of 38.30%, followed by 2251-3380kg recording a rate of 23.40% and both range of 0-1120kg and 1121-2250kg recording the same rate at 19.15%.

Quantity of manure used in a rate of 31-60 wheel barrows, quantity harvested in a range of 1121-2250kg recorded a high rate of 31.45% followed by 2251-3380kg recording a rate of 28.57%, 3381-4500kg recording a rate of 22.86% and 0-1120kg recording a rate of 17.14%.

### 3.2. Beans

**Table 3.** It shows quantity harvested for beans based on the inputs and their level of association. The range in standard harvest indicator (SHI) is used in formulating our discussion.

BEANS	Quantity harvested beans (kg)			P-value	
	RANGE FOR STANDARD HARVEST INDICATOR. (SHI) KG	0-900	901-1800		1801-2700
Acreage ploughed (acres)	SHI for acres, ie 450kg harvest/acre.				
0-2	0-900	4(33.33)	1(8.33)	7(58.33)	0.037
2.1-4	945-1800	17(26.15)	12(18.46)	36(55.38)	
4.1-6	1845-2700	5(18.52)	4(16.81)	18(66.67)	
Seed Quantity (kg)	SHI for seeds, ie 450kg harvest per 20kg seed per acre				
0-25	0-562	10(17.86)	12(21.43)	34(60.71)	0.019
26-50	585-1125	62(29.11)	35(16.43)	116(54.46)	
Dap fertilizer (kg)	SHI for DAP, ie 450kg harvest per 100kg DAP per acre				
0-30	0-135	2(28.57)	1(14.29)	4(57.14)	0.028
31-53	139.5-238.5	3(42.86)	0(0.00)	4(57.14)	
54-80	243-360	1(16.67)	2(33.33)	3(50.00)	
CAN used (kg)	SHI for CAN, ie 450kg harvest per 0.5kg CAN per acre				
0-10	0-9000	1(20.00)	1(20.00)	3(60.00)	0.0402
11-20	9900-18000	3(50.00)	2(33.33)	1(16.67)	
21-30	18900-27000				
Manure used					
0-30 w/barrows		1(25.00)	3(75.00)	-	0.1263
31-60 w/barrows		1(50.00)	1(50.00)		

#### 3.2.1. acreage Ploughed Beans

In table 2, area of acreage ploughed for beans, its p-value is 0.037. This signifies some level of association in the acreage ploughed and quantity of beans harvested.

On the range of 0-2 acres, quantity harvested in the range of 1801-2700kg have recorded the highest number of household experiencing harvest at 58.33% followed by quantity harvested in the range of 0-900 recording at a rate of 33% and quantity harvested in 901-1800kg recording a rate of 8.33%.

On the range of 2.1-4 acres, quantity harvested in the range of 1801-2700 recorded the highest number of household experiencing harvest at 55.38%, followed by quantity harvested in the range of 0-900kg recording 26.15% and in the range of 901-1800kg recording 18.46%.

On the range of 4.1-6 acres, quantity harvested in the range of 1801-2700 recorded the highest number of household experiencing harvest at 66.67% followed by quantity harvested in the range of 0-900kg recording 18.52% and 901-1800 recording 16.81%.

#### 3.2.2. Seed Quantity

On the quantity of seeds used, the p-value 0.019 is less than 0.05. This signifies some level of association.

In the range of 0-25kg of seeds used, quantity harvested in the range of 1801-2700kg, recorded the highest number of household experiencing harvest at 60.71% followed by quantity harvested in the range of 901-1800kg recording a rate of 21.43% and in the range of 0-900kg recording a rate

of 17.86%.

#### 3.2.3. DAP Fertilizer Used

On quantity of DAP used, the p-value 0.028 is less than 0.05. This signifies some level of association.

Quantity of DAP fertilizers used in the range of 0-30kg, quantity harvested in the range of 1801-2700kg, recorded the highest number of household experiencing harvest at 57.14%, followed by quantity harvested in the range of 0-900kg recording a rate of 28.57% and quantity harvested in the range of 901-1800kg recorded 14.29%.

In the range of 31-53kg of DAP fertilizers used, quantity harvested in the range of 1801-2700kg, recorded the highest number of household experiencing harvest at 57.14% followed by quantity harvested in the range of 0-900kg recording a rate of 42.86%.

In the range of 54-80kg, quantity harvested in the range of 1801-2700kg, recorded the highest number of household experiencing harvest at 50% followed by 901-1800kg and 0-900kg recording a rate of 33.33% and 16.67% respectively.

#### 3.2.4. CAN Fertilizers Used

On the quantity of CAN used, the p-value 0.0402 is less than 0.05; this signifies some level of association.

In the range of 0-10kg of CAN fertilizers used, quantity harvested in the range of 1801-2700kg, recorded the highest rate of 60%, followed by 0-900kg and 901-1800kg recording the same rate of 20%.

In the range of 11-20kg of CAN used, quantity harvested in the range of 0-900kg recorded the highest number of

household experiencing harvest at 50% followed by 901-1800kg recording a rate of 33.33% and in the range of 1800-2700 recording a rate of 16.67%

### 3.2.5. Manure Used

On the quantity of manure used, the p-value 0.1263 is more than 0.05. This signifies no level of association.

In the quantity of manure used in the range of 0-30

w/barrows, quantity harvested in the range of 901-1800kg recorded 75% household experiencing harvest in it. Quantity harvested in the range of 0-900kg, recorded 25%.

In the wheel barrows, in the range of 31-60, quantity harvested in the range of 0-900kg and 901-1800kg recorded the same percentage of 50%.

### 3.3. Groundnuts

**Table 4.** It shows quantity harvested for groundnuts based on the inputs and their level of association. SHI is used in formulating our discussion.

GROUNDNUTS	Quantity harvested groundnuts (kg)			P-value	
	RANGE FOR STANDARD HARVEST INDICATOR. (SHI) KG	0.50-720	721-1440		1441-2160
Acreage ploughed	SHI for acres, ie 234kg harvest/acre.				
0-1	0-234	14(32.56)	15(34.88)	14(32.56)	0.0189
1.1-2	257.4-468	15(27.78)	19(35.19)	20(37.04)	
2.1-3	491.4-702	6(37.50)	5(31.25)	5(31.25)	
Seed Quantity (kg)	SHI for seed, ie 234kg harvest per 20kg seed per acre				
0-10	0-117	8(25.00)	13(40.63)	11(34.38)	0.051
11-20	128.7-234	11(34.38)	10(31.25)	11(34.38)	
21-30	245.7-351	25(26.60)	39(41.49)	30(31.91)	
Dap fertilizer (kg)	SHI for DAP, ie 234kg harvest per 100kg seed per acre				
0-8	0-18.72	0(0.00)	1(100.00)	0(0.00)	0.234
9-16	21.06-37.44	0(0.00)	0(0.00)	1(100.00)	
17-24	39.78-56.16	1(100.00)	0(0.00)	0(0.00)	
CAN used (kg)	SHI for CAN, ie 234kg harvest per 500g of foliar spray per acre				
2.5	1170			1(33.33)	
6	2808			1(33.33)	
8	3744			1(33.33)	

#### 3.3.1. acreage Ploughed

In acreage ploughed, the p-value 0.0189 is less than 0.05. This signifies some level of association.

In acreage ploughed in a range of 0-1, quantity harvested in the range of 721-1440kg recorded a high rate of 34.88%, while in a range of 0-50-720 and 1441-2160 recorded the same rate of 34.38% each.

In a range of acreage ploughed in a range of 1.1-2 acres, quantity harvested in a range of 1441-2160kg recorded a rate of 37.04%, followed by quantity harvested in a range of 721-1440kg recording a rate of 35.19%, quantity harvested in a range of 0.50-720kg recording a rate of 27.78%.

Acreage ploughed in a range of 2.1-3 acres, quantity harvested in a range of 0.50-720kg, recorded a rate of 37.50%, followed by quantity harvested in a range of 721-1440 and 1441-2160kg both recording the same rate at 31.25%.

#### 3.3.2. Seed Quantity

In the same table 2, quantity of seeds planted, its p-value 0.051 is more than 0.05 and therefore, this signifies no level of association in quantity of seeds planted and quantity harvested.

In seeds, quantity planted in a range of 0-10kg, quantity harvested in a range of 721-1440kg recorded a rate of

40.63%, followed by quantity harvested in a range of 1441-2160kg recording a rate of 34.38% and quantity harvested in a range of 0.50-720kg recording a rate of 25.00%.

In quantity of seeds planted in a range of 11-20kg, quantity harvested in a range of 0.50-720kg and 1441-2160kg recorded a high rate of 43.38% while quantity harvested in a range of 721-1440kg, recorded a rate of 31.25%.

In quantity of seeds planted in a range of 21-30kg, quantity harvested in a range 721-1440kg recorded a high rate of 41.49%, followed by quantity harvested in a range of 1441-2160kg recording a rate of 31.91% and quantity harvested in a range of 0.50-720kg recorded a rate of 26.60%.

#### 3.3.3. DAP Fertilizer

In the same table 2, quantity of DAP fertilizer used, its p-value 0.234 is more than 0.05 and therefore, this signifies no level of association in quantity of DAP used and quantity harvested.

In quantity of DAP fertilizer used in a range of 0-8kg, quantity harvested in a range of 721-1440kg recorded a rate of 100%, while others recorded zero.

In quantity of DAP fertilizer used in a range of 9-16kg, recorded a rate of 100% in a range of 1441-2160kg, while others recorded zero.

In quantity of DAP fertilizers used in a range of 17-24kg,

quantity harvested in a range of 0.50-720kg recorded a rate of 100%, while others recorded zero

### 3.3.4. CAN Fertilizer Used

In CAN fertilizer used, there was no record on level of

association. Quantity of CAN used in 2.5kg, 6kg and 8kg recorded same rate of 33.33% at a range of quantity harvested in a range of 1441-2160kg.

### 3.4. Vegetables

**Table 5.** It shows quantity harvested for vegetables based on the inputs and their level of association. SHI is used in formulating our discussion.

	Quantity harvested vegetables (kg)			P-value	
	RANGE FOR STANDARD HARVEST INDICATOR. (SHI) KG	2-900	901-1800		1801-2700
Acreage ploughed	SHI for aces, ie 1350kg harvest /acre				
0-1	0-1350	10(41.67)	5(20.83)	9(37.50)	<0.001
1.1-3	1485-4050	2(7.69)	7(26.92)	17(65.38)	
4-6	5400-8100	1(33.33)	2(66.67)	0(0.00)	
Seed Quantity (g)	SHI for seeds, ie 1350kg harvest per 200g seed per acre				
0-200	0-1350	5(35.71)	4(28.57)	5(35.71)	0.017
201-300	1356.8-2025	6(20.00)	9(30.00)	15(50.00)	
301-	2031-	2(16.67)	3(25.00)	7(58.33)	
Dap fertilizer (kg)	SHI for DAP, ie 1350kg harvest per 80kg DAP per acre				
0-10	0-168.75	1(12.50)	2(25.00)	5(62.50)	0.020
11-20	185.63-337.5	3(37.50)	2(25.00)	3(37.50)	
21-30	354.4-506.3	3(42.86)	3(42.86)	1(14.29)	
CAN used (kg)	SHI for CAN, ie 1350kg harvest per 41kg of CAN per acre				
0-20	0-658.5	4(57.14)	1(14.29)	2(28.57)	0.065
21-	691-	1(14.29)	4(57.14)	2(28.57)	
MANURE used	SHI for manure, ie 1350kg of veg				
0-30 w/barrows	harvest per 120 w/barrows per	3(37.50)	2(25.00)	3(37.50)	<0.001
31-60 w/barrows	acre	0(0.00)	0(0.00)	2(100.00)	

#### 3.4.1. acreage Ploughed

In table 3, the acreage ploughed, its p-value 0.001 is less than 0.05 and therefore, this signifies level of association in acreage ploughed and quantity of kales harvested.

Acreage ploughed in a range of 0-1kg, quantity harvested in a range of 2-900kg recorded a high rate of 41.67%, followed by quantity harvested in a rate of 1800-2700kg recording a rate of 37.50%

#### 3.4.2. Seeds Quantity

In the same table 2, quantity of seeds planted, its p-value 0.051 is more than 0.05 and therefore, this signifies no level

of association in quantity of seeds planted and quantity harvested.

In seeds, quantity planted in a range of 0-10, quantity harvested in a range of 721-1440kg recorded a rate of 40.63%, followed by quantity harvested in a range of 1441-2160kg recording a rate of 34.38% and quantity harvested in a range of 0.50-720kg recording a rate of 25.00%.

In quantity of seeds planted in a range of 11-20kg, quantity harvested in a range of 0.50-720kg and 1441-2160kg recorded a high rate of 43.38% while quantity harvested in a range of 721-1440kg, recorded a rate of 31.25%.

### 3.5. Regression Analysis

**Table 6.** Its shows the results of regression analysis for maize.

Harvest	Coeff	Std. Error	t	p> t	95% Conf. Interval	
Acreage	-294.1955	53.69	-5.28	<0.001	405.24170	-183.14940
Seed Qty	1767.292	700	2.52	0.014	371.21690	3163.36800
Manure	11905.42	1158.634	10.28	<0.001	9595.16400	14215.67000
CAN	23459.01	1167.883	17.9	0.00234	11467.12000	16.75366

#### 3.5.1. Maize

All the four factors i.e acreage, seed quantity, CAN and

manure have significant influence on the amount of maize harvest with p-values <0.001, 0.014, <0.001 and 0.00243 (All <0.005) respectively.

**Table 7.** It shows the results for regression analysis for beans.

Harvest	Coeff	Std. Error	t	p> t	95% Conf. Interval	
Acreage	389.166	66.0937	5.881	<0.001	23.23470	-56.34900
Seed Qty	2.125	1.2145	1.7495	0.092	3.21690	4.39800
DAP	5.318	0.9629	5.5232	<0.001	3545.16400	3875.67000
CAN	-24.132	1.8685	12.9153	<0.001	46.12000	66.73366



### 3.5.2. Beans

Three factors i.e acreage, CAN and DAP have significant influence on the amount of beans harvested with each having a p-value of  $<0.001$  ( $<0.005$ ).

However, there is no enough evidence to show that seed quantity has significant influence on the beans harvest.

We lack enough evidence to warrant the conclusion that seed quantity as a factor influence the amount of beans harvested.

## 3.6. Comparative Analysis

### 3.6.1. T-test: Paired Two Sample for Means

**Table 8.** It displays results from t-test on the significant difference between first season and second season.

	First season	Second Season
Mean	14430.43	4614.32
Variance	2.99E+09	2.37E+08
Observations	641	620
Pearson Correlation	0.991257	
Hypothesized Mean Difference	0	
df	24	
t Stat	1.242354	
P(T $\leq$ t) one-tail	0.113054	
t Critical one-tail	1.710882	
P(T $\leq$ t) two-tail	0.226109	
t Critical two-tail	2.063899	

P(T $\leq$ t) two-tail 0.226109

### 3.6.2. Z-test: Two Sample for Means

**Table 9.** It displays results from z-test on significant difference between first season and second season.

	First season	Second Season
Mean	14430.43	4614.32
Known Variance	2.99E+09	2.37E+08
Observations	641	620
Hypothesized Mean Difference	0	
z	0.863419	
P(Z $\leq$ z) one-tail	0.193954	
z Critical one-tail	1.644854	
P(Z $\leq$ z) two-tail	0.387907	
z Critical two-tail	1.959964	

P(Z $\leq$ z) two-tail 0.387907 This implies that there is no significant difference between the first season and the Second season results.

#### Hypothesis

H0: There is difference between the first season and the second season results.

H1: There is no difference between the first season and second season results.

## 4. Discussions

Discussion will revolve in comparing the output of this

season with the standard rate indicator used in the participatory planning, the target plan, the pervious publication and the output of first season harvest.

### 4.1. Maize

#### 4.1.1. acreage Ploughed/Maize Harvested

According to our standard rate indicator, an acre of maize is capable of producing 2700kg of maize if good farming practices are observed with enough rainfall amounts. Apparently, the production is still lower than the standard rate indicator.

In the range of 0-4 acre, the standard harvest indicator is in the range of 0-10,800kg of maize to be harvested. It's far noting that there is no range covering 10,800kg. The maximum range is 3381 -4500kg which is fairly below 10,800kg. It's in this maximum range that has recorded the highest number of household experiencing harvest.

In the range of acreage ploughed, 4.1-8 acre, the standard harvest indicator for its harvest is 11070-21600kg. From the findings, no household have recorded that range of harvest, the same applies in the acreage of 8.1-12, which have a standard harvest indicator of 21870-32400kg of maize to be harvested.

On the acreage ploughed, the baseline target indicator was 591 acres. In the first season, the acreage ploughed was 626 acre and 610 acres was planted, this decreased to 562 acre in the second season.

Baseline indicator is 17730 bags and the second season indicator is 16860 bags

Maize harvested in the second season is 1500 bags (8.9%) of the second season target indicator of 16860 bags, while in the first seasons 1557 bags (8.7%) of the baseline target indicator 17730 bags. This is an increase by 0.3%.

Comparing the maize harvested this season with the previous season, the maize has reduced by 57 bags and this could be attributed to the fact that, there is a reduction on the acreage of land ploughed. In percentage, this is an increase by 0.3%, as from 8.7% (1557 bags) to 8.9% (1500 bags) of the new target plan. The aggregate 1500 bags of maize harvested, is still below the target indicator of 16860 by 15360 bags.

#### 4.1.2. Seed Quantity

From our previous participatory discussion, the standard rate indicator for seed state that, 10kg of seeds is required per acreage of land to produce a harvest of 2700kg and therefore, its standard harvest indicator in the ranges of 0-30.5kg of seed planted, is 0-82350kg of maize to be harvested, assuming that the land acreage is 0-3.1 acres. This

standard harvest indicator is far above the set ranges of the actual harvest attained in Bar A sub location.

In the seed quantity used in the range of 30.6-61kg, its standard harvest indicator is in the range of 82620-164,700kg of maize to be harvested, assuming that, the landacreage is 3.2-6.1 acres, based on the standard rate indicator of 10kg of seed per acre produce 2700kg of maize. This standard harvest indicator is far above the set ranges of the actual harvest attained in Bar A sub location, that is, ranges of, 0-1120, 1121-2250, 2251-3380, 3381-4500 acres.

This signifies low harvest as a result of less seeds being used and poor varietal of seed selection for planting.

Using the standard rate of 10kg of maize for an acre, the standard range of seeds for each actual set ranges of 0-4, 4.1-8, 8.1-12 acre ploughed respectively should have been in the following ranges, 0-40kg, 41-80kg, 81-120kg of seeds to be used. These standard seeds indicators, are far below the actual ranges of seeds used, that is 0-30.5 and 30.6-61kg of seeds.

From the standard harvest indicator, that result from the actual ranges of seeds used, our assumption on the acreage use of land range from 0 to 6.1 acreage of land. This 1-6 acreage of land is fairly below the actual ranges of acreage used from the findings, which is the range of 0-4, 4.1-8, 8.1-12 acreage. This signifies inequitable usage of land by using less seeds in a big piece of land, hence under spacing of crops

On the quantity of seeds to be used, the second season target indicator is 5620kg and the baseline target indicator is 5910kg. The quantity of seeds used in the second season is 3034 (53.9%) of the new target indicator and in the first season, the total quantity is 3545 (59.9%) of the baseline indicator. There is a decrease of 6% on the usage of seeds. This is attributed by lack of awareness on the precise quantity of maize seeds to be used per acreage of land and lack of enough income from the previous harvest to purchase the required input.

The level of association on seeds usage is 0.0178, while for the previous season is 0.001. They all signify some level of association.

#### 4.1.3. In DAP

In the participatory planning, it was deliberated that, 50kg of DAP is required per acre to produce 2700kg of maize. For that reason, DAP used in the range of 26.6-52.6kg, its standard harvest indicator need to be 1404-2840.4kg of maize to be harvested, assuming that the acreage is 0.53-1.1 acre, based on the formula of 50kg of DAP/acre. From the actual harvest range, the standard harvest indicator, falls in between the range of 1121-2250kg and 2251-3380kg of maize

harvested and which have recorded 17.52% and 21.17% respectively. The harvest range of 3381-4500kg has recorded the highest number of household who experience harvest.

The standard harvest indicator in the range of 52.7-78.6kg of DAP used is 2845.8-4244kg of maize to be harvested, assuming that the acreage is 1.1-1.6 acres based on the formula of 50kg of DAP/acre produces 2700kg. This standard harvest indicator of 2845.8-4244kg of maize falls within the range of 2251-3380 and 3381-4500 which have recorded 15.31% and 22.49% of household experiencing harvest in these ranges.

DAP used in the range of 78.7-80kg, the standard harvest indicator is in the range of 4249.8-4320kg of maize to be harvested, assuming that the acreage of land is 1.6 acre. From our findings, this harvest falls within the range of 3381-4500kg which has recorded 22.49% of household who experienced harvest. The percentage of household experiencing harvest in this range is low.

From the standard harvest indicator, that results from the actual ranges of DAP used, our assumption on the acreage use of land range from 0.53 to 1.6 acreage of land. This 0.53-1.6 acreage of land is far below the actual set ranges of acreage used in the findings that is the range of 0-4, 4.1-8, 8.1-12 acreage. This signifies uneconomic usage of land by using less DAP in a bigger piece of land.

Based on the actual acreage of land used, that is in the set ranges of 0-4, 4.1-8, 8.1-12 acres, the range of DAP fertilizer which should have been used is 0-200kg, 205-400kg, 405-600kg of DAP fertilizers. These standard DAP indicators ranges are very high than the actual set ranges of DAP used, that is 26.6-52.6, 52.7-78.6, 78.7-80. This signifies less usage of DAP.

Despite the fact of less usage of DAP fertilizers in the whole farm, probably due to less usage of seeds, households could have used the required amount of DAP per each maize hole during planting. To determine this, using the formula of 50kg of DAP/10kg of maize seeds to work out the quantity of DAP ranges that was supposed to be used. The actual seed ranges in our findings were 0-30.5 and 30.6-61. From this seed ranges, the ranges of DAP which should have been used is 0-152.5kg and 153-305kg of DAP fertilizers. This standard ranges of DAP arising from the quantity of maize seeds used, are still far much above the actual ranges of DAP used (26.6-52.6, 52.7-78.6, 78.7-80). This probably could be as a result of lack of knowledge on the required amount of DAP needed per planting hole or due to financial constraint limiting the household members from purchasing the required amount of DAP fertilizers. Financial constraints could be as a result of chronic low harvest in every season not enabling them to get enough income to purchase inputs for the next seasons. From

our dialogue session, accessibility is also one major problem facing the community; due to the facts that fertilizers in most of the times are always in low supply within the local agro vets. Households need to be trained on the quantity of DAP fertilizers to be used, based on the quantity of maize seeds used.

Basing our argument on DAP contribution to this range of harvest, is not valid, based to the fact that some others contributing factor could have led to this range of actual harvest such as more than one acreage of land. Low percentage of household are experiencing harvest in this standard harvest indicator and this could be as a result of frequent use of DAP fertilizers could have lowered the soil PH and hence making the soil to be acidic as a result of too much of phosphorus in the soil.

On the quantity of DAP used, the second season target indicator is 28100kg and the baseline indicator is 29550kg.

From the notice board, the aggregate quantity of DAP usage in the second season is 13367kg (47.6%) of the new target indicator.

In the first season, the aggregate quantity of DAP used, was 14,167kg (47.9%).

There is a decrease of 0.3%. This is attributed by lack of awareness on the precise quantity of DAP fertilizers to be used per acreage of maize land and lack of enough income out of from the previous harvest to purchase the required input.

The level of association on DAP usage, is 0.001, while for previous season is 0.045. Both of them signify some level of association.

#### 4.1.4. CAN

In deliberation on the standard rate indicator during the participatory workshop, it was agreed that 120kg of CAN is needed per acre to produce 2700kg of maize. The standard harvest indicator for harvest in the range of 0-50kg CAN used is in the range of 0-1125kg of maize to be harvested assuming that the acreage is 0-0.42acre, based on the formula of 120kg/acre. This standard harvest indicator of 0-1125kg falls within the range of 0-1120kg of maize harvested. This range recorded a rate of 34.62% household experiencing harvest in it.

In the range of 51-100kg of CAN used, the standard harvest indicator is in the range of 1147.5-2250kg of maize to be harvested, assuming that the acreage of land is 0.43-0.83acres, based on the formula of 120kg/acre. This standard harvest indicator falls within the range of 1121-2250kg of maize harvested, which have recorded 24.75% of household experiencing harvest in it. The range of harvest in the range

of 2251-3380kg and 3381-4500kg are above the standard harvest indicator of 1147.5-2250kg and the household experiencing harvests in them are 30.69% and 23.76% respectively. The low percentage of household experiencing harvest could be as a result of inherent nutrition fertility, brought about as a result of frequent use of CAN without conducting a soil test to determine the right fertilizer to use. Others contributing facts such as ecological factors, ie erratic rainfall, weed management (Intraspecific/ inter specific), varietal selection of seeds. (seed segmentation), cultural practices, late provision of inputs. ie applying CAN late, time of planting. ie late planting and early planting, mixed farming plant population and lack of agronomic knowledge.

In the range of 101kg of CAN used, the standard harvest indicator for its harvest is 2272.5kg of maize to be harvested, assuming that the acreage of land is 0.84acres. This range falls within the actual range of harvest in the range of 2251-3380kg and 3381-4500kg of maize harvested.

Using the actual ranges of CAN used, that is 0-50, 51-100, 101kg of CAN, our assumption on the acreage use of land based on the standard rate of 120kg per acre, shall give ranges as from 0-0.42, 0.43-0.83 and 0.84acreage of land. This range of land is far below the actual ranges of acreage used in the findings, that is the range of 0-4, 4.1-8, 8.1-12acreage. This signifies inequitable usage of land by using less CAN in a big acreage of land

Based on the ranges of actual acreage of land used in maize, that is in the set ranges of 0-4, 4.1-8, 8.1-12acres of maize ploughed, the range of CAN fertilizer which should have been used is 0-480, 492-960, 972-1440 of CAN fertilizers. These standard CAN indicators ranges are very high than the actual set ranges of CAN used, that is 0-50, 51-100, 101kg of CAN. This signifies less usage of CAN fertilizers.

To determine the quantity of CAN fertilizers to be used per maize crop, the formula of 120kg of CAN/10kg of maize seeds is used. On the ranges of actual seeds quantity used, that is 0-30.5 and 30.6-61kg of seeds planted, the standard range of CAN expected to be used are 0-366kg, 367.2-732kg of CAN. This expected standard range is far above the actual range of CAN used, which is 0-50, 51-100, 101kg of CAN. This signifies lack of awareness on the quantity of CAN to be used per maize crop. The attainment of this required quantity of CAN is limited by financial constraints as a result of chronic low harvest in every season not enabling them to get enough income to purchase inputs for the next season. Inaccessibility of CAN by the households due to the fact that at times, CAN fertilizers are not available in the nearby agro vets. Households need to be trained on quantity of CAN fertilizers to be used, based on the quantity of maize seeds used.

On the quantity of CAN used, the second season target

indicator is 67440kg and the baseline indicator is 70920kg.

The aggregate quantity usage of CAN in the second season is 6244(9.3%) of the new target plan of 67440kg. In the first season, the quantity of CAN used is 34036kg (47.99%) of the baseline indicator.

There is a decrease by 38.69% between the two seasons. This is attributed by lack of awareness on the precise quantity of maize seeds to be used per acreage of land and lack of enough income out of from the previous harvest to purchase the required input.

**Table 10.** Productivity index table for maize. From the table below, despite the decrease in acreage ploughed, quantity of seeds planted, and quantity of DAP and CAN fertilizers, there is an increase of quantity harvested by 0.3%. In level of association, quantity of DAP used increases. This could be as a result of inherent soil fertility.

INDICATOR	FIRST SEASON 2014	SECOND SEASON 2014	PERCENTAGE BETWEEN TWO SEASON	LEVEL OF ASSOCIATION BETWEEN TWO SEASON
Quantity harvested	1557bags (8.7%)	1500bags (8.9%)	0.3% increase	
Acreage ploughed	610 acre (103.21%)	562 acre (95.09%)	8.12% decrease	The same
Quantity of seeds planted	3545kg (59.9%)	3034kg (53.9%)	6% decrease	Decreases
Quantity of DAP used	14167kg (47.9%)	13367kg (47.6%)	0.3% decrease	Increase
Quantity of CAN	34036kg (47.99%)	6244kg (9.3%)	38.69% decrease	Decrease

## 4.2. Beans

Out of 640 farmers, only 104 farmers practicing intercropping between beans and maize experience harvest in beans and this could be attributed by lack of correct spacing between maize and beans, infestation of pest, bacterial and fungal infection, due to the fact that spraying of beans against these infestations is still very low. Beans is very useful in fixing nitrogen into the soil and any crop intercropped with beans, benefit from this nitrogen. In most cases, beans are intercropped with maize.

### 4.2.1. acreage Ploughed/Harvest for Beans

In the participatory planning, it was deliberated that an acre of beans is capable of producing 450kg of beans if good farming practices are observed with enough rainfall amount.

In the first range of 0-2 acre of land planted with beans, its standard harvest indicator is in the range of 0-900kg of beans to be harvested. In this standard range of harvest, the actual range of harvest in the range of 0-900, 33% of household experiencing harvest falls in that range, while in the range of 1801-2700kg of beans harvested, 58.33% household experience harvest in this range. This range of 1801-2700kg is more than the standard rate indicator and this signifies a good harvest among this household members.

In the range of 2.1-4acre of land planted with beans, its standard harvest indicator for this range is in the range of 945-1800kg of beans to be harvested. In the range of harvest, the range of 901-1800kg of beans harvested falls in this parameter and it experience a low percentage of 18.46% compared to other range of harvest. In the range of harvest in

The level of association on CAN is 0.0341, while for pervious season is 0.001. Both of them signify some level of association.

### 4.1.5. Manure

Few farmers are applying manure and from the findings, there is level of association manure have with maize harvested.

### 4.1.6. Summary of the Discussion for Maize

the range of 0-900kg of beans, it experience 26.15%, then followed by the maximum range of 1801-2700kg of beans harvested, recording 55.38% of household experiencing harvest in it. This signifies a good harvest in beans.

In the range of acreage ploughed in the range of 4.1-6acreage, its standard harvest indicator is in the range of 1845-2700kg of beans to be harvested. The maximum range of 1801-2700kg of beans harvested, recorded the highest percentage of household experiencing harvest at 66.67%. This signifies good harvest of beans in this range compared to other range of harvest.

On the acreage ploughed, the baseline target indicator was 591acres. In the first season, the acreage ploughed was 626 acre and 610acres was planted, this decreased to 562 acre in the second season.

The second season target indicator is 2810bags and the baseline target indicator is 2955bags.

In the first season, the total amount of beans harvested, was 415bags which is 14.04% of the baseline indicator. In the second season, the total quantity harvested is 282bags which are 10.03% of the second season target indicator. There is a decrease by 4.01% of the quantity harvested.

This decrease could be as a result of reduction of acreage of land ploughed for beans. In the first season, the acreage ploughed for beans was 626acres and in the second season, the acreage ploughed for beans is 562acres.

In the first season, the level of association was 0.001 and in the second season, the level of association is 0.037. They both signify some level of association.

#### 4.2.2. Seed

In quantity of seeds used in the range of 0-25kg of beans planted, the range for its standard harvest indicator is 0-562kg of beans to be harvested, assuming that its acreage of land is 0-1.25 acres, based on the formulae of 20kg of seeds/acre. From the findings, the range of 0-900kg of beans harvested recorded the lowest percentage of 17.86% and being that it falls within the range of the indicator. The two ranges of harvest, which is 901-1800kg and 1801-2700kg, are above the standard rate indicator and they recorded a higher percentage at 21.43% and 60.71% respectively, of household experiencing harvest in those ranges.

In quantity of beans seeds planted in the range of 26-50kg, the range for its standard harvest indicator is 585-1125kg of beans to be harvested, assuming that its acreage of land is 1.3-2.5 acres. From the findings, the two ranges which fall within the standard harvest indicator, which is of 0-900kg and 901-1800kg recorded a lower percentage at 29.11% and 16.43% respectively of farmers experiencing harvest in those ranges.

This two ranges of seeds planted, signifies that apart from seeds, there are others important contributing factors towards a good harvest in beans. Poor quality of seeds, lack of good agronomic practices, poor rainfall amount, late provision of inputs and late planting could be some of the contributing factors to low harvest.

Being that 20kg of seeds are needed for a harvest of 450kg of beans in one acre, abundant of harvest could have been experienced if household ploughing in the range of 2.1-4 and 4.1-6 acres could have planted seeds in the range of 42-80kg and 82-120kg of seeds respectively. Comparing these expected standard ranges of seeds with the actual ranges of seeds used, the actual ranges used are still very low to the standard indicator.

From the standard harvest indicator, that result from the actual ranges of seeds used, our assumption on the acreage use of land based on the formulae that 20kg of seeds per acre, the acreage of land should have been in the following ranges, 0-1.25 and 1.3-2.5 acreage of land. These ranges of land acreage are far below the actual ranges of acreage used from the findings that is the range of 2.1-4 and 4.1-6 acreage. This signifies inequitable usage of land by using less seeds in a big acreage of land.

The baseline target indicator for seeds is 11820kg and for the second season target indicator is 11240.

In the first season, the total quantity of seeds planted were 4,898kg (41.4%) of the baseline target indicator, while in the second season, the total quantity of seeds planted are 1,942kg (17.3%) of the second season target indicator.

There is a decrease in quantity of seeds planted by

24.1%. This could be attributed by reduction in the acreage of land ploughed for beans. This is attributed by lack of awareness on the precise quantity of bean seeds to be used per acreage of land and lack of enough income out of from the previous harvest to purchase the required input.

From our previous study, the p value was 0.001, while in this second season, the p value is 0.019. They both signify association.

#### 4.2.3. DAP Fertilizers

In quantity of DAP used in the range 0-30kg, the range for its standard harvest indicator is 0-135kg of beans to be harvested, assuming that the acreage of land is at the range of 0-0.3 acre, based on the formula of 100kg/acre. In the findings on the ranges of harvest, only 0-900kg falls within this range and have recorded 28.57% household experiencing harvest in it. The range of harvest in the range of 901-1800 and 1801-2700 are far above the expected standard harvest range and yet they also recorded a percentage of household experiencing harvest at 14.29% and 57.14% respectively. The range of harvest in the range of 1801-2700kg is the maximum range and it recorded the highest percentage of household experiencing harvest in it.

The range of DAP in the range of 31-53kg of DAP used, its range for standard harvest indicator is 139.5-238.5kg of beans to be harvested, assuming that the acreage of land is at the range of 0.31-0.53 acres based on the formula of 100kg/acre. The range of harvest, 0-900kg falls within this standard harvest indicator, but yet it recorded a low percentage of 42.86% household experiencing harvest in it, while the range of 1801-2700kg is far above the standard harvest indicator and it recorded the highest percentage of household experiencing harvest in it. This signifies possibility of attaining good harvest if DAP is used.

The range of 54-80kg of DAP fertilizer used; its range for standard harvest indicator is 243-360kg of beans to be harvested, assuming that the acreage of land is at the range of 0.54-0.8 acres. The range of 0-900kg falls within this range and have recorded 16.67% household experiencing harvest in it followed by the range of 901-1800kg and 1801-2700kg recording 33.33% and 50% of household experiencing harvest in them respectively.

Using the standard rate indicator for 100kg of DAP for an acreage of land, the range of acreage of land ploughed in the range of 0-2, 2.1-4, 4.1-6, should have used the following ranges of DAP in the range of 0-200, 210-400, 410-600kg of DAP. Comparing the actual DAP used that is 0-30, 31-53, 54-80 and the standard DAP indicator ranges, the DAP used by household are still lower than the standard DAP indicator.

From the standard rate indicator, that result from the actual ranges of DAP used, our assumption on the acreage use of land based on the formulae that 100kg of seeds per acre, the acreage of land should have been in the following ranges, 0-0.3, 0.31-0.53, 0.54-0.8 acreage of land. This range of land acreage is far below the actual ranges of acreage used from the findings that is the range of 2.1-4 and 4.1-6 acreage. This signifies inequitable usage of land, by using less quantity of DAP in a big land

The baseline target indicator for DAP is 59100kg and the second season target indicator is 56200kg.

In the first season, the total quantity of DAP used is 901, 1.52% of the baseline target indicator and in the second season, the total quantity of DAP used is 491, 0.87% of the new target indicator. There is a decrease by 0.65%. This is attributed by lack of awareness on the precise quantity of maize seeds to be used per acreage of land and lack of enough income out of from the previous harvest to purchase the required input.

The p value for this season is 0.028 and this signifies some level of association between beans harvest and DAP used, while for the baseline, there was no P value.

#### 4.2.4. CAN Fertilizers Used

In CAN fertilizers used in the range of 0-10kg, its range for standard harvest indicator is 0-9000kg of beans to be harvested. The range of harvest in the range of 0-900, 901-1800 and 1801-2700kg recorded a low percentage of 20%, 20% and 60% respectively, with less household using CAN in this range. Its standard rate indicator 0-9000kg is far above the actual range of harvest.

The range of CAN used in the range of 11-20kg, its range for

standard harvest indicator is 9900-18000kg of beans to be harvested. The range of harvest in the range of 0-900, 901-1800 and 1801-2700kg recorded a low percentage of 50%, 33.33% and 16.67% respectively, with less household using CAN in this range. Its standard harvest indicator 9900-18000kg is far above the actual range of harvest.

Considering the acreage of land ploughed for beans, in the range of 0-2, 2.1-4, 4.1-6 acres, using the formula that 0.5 CAN per acre, the standard quantity of CAN to have been used was 0-1kg, 1.1-2kg, 2.1-3kg of foliar spray respectively.

For CAN, Baseline target indicator is 296kg and the second season target indicator is 281kg.

In the first season, the total quantity of CAN used was 404kg (136.5%) of the baseline indicator, while in the second season, the total quantity of CAN used is 112kg (39.9%) of the second season target indicator.

There is a decrease of 96.6%. This is attributed by lack of awareness on the precise quantity of CAN to be used per acreage of beans land and lack of enough income out of from the previous harvest to purchase the required input.

In the first season, the level of association is 0.051 and in the second season, the level of association is 0.0402. In the baseline, there is no level of association while in the second season; there is some level of association.

#### 4.2.5. Manure

Very few farmers used manure in beans and there is some level of association manure has with beans harvested

#### 4.2.6. Summary Between Two Seasons for Beans

**Table 11.** Productivity index table for beans. All the indicators have reduced, as harvest decrease.

INDICATOR	FIRST SEASON 2014	SECOND SEASON 2014	PERCENTAGE BETWEEN TWO SEASON	LEVEL OF ASSOCIATION BETWEEN TWO SEASON
Quantity harvested	415bags (14.04%)	282bags (10.03%)	4.01% Decrease	
Acreage ploughed	610acre (103.21%)	562acre (95.09%)	8.12% Decrease	Decreases
Quantity of seeds planted	4898kg (41.4%)	1942kg (17.3%)	24.1% Decrease	Decreases
Quantity of DAP used	901kg (1.52%)	491kg (0.87%)	0.65% Decrease	
Quantity of CAN	404kg (136.5%)	112kg (39.9%)	96.6% Decrease	Increases
Quantity of manure used				

#### 4.3. Groundnuts

According to the standard rate indicator discussed in the participatory planning, an acre of groundnuts is capable of producing 2.6bags of groundnuts if good farming practices are observed with enough rainfall amounts.

In the first range of 0-1 acre of land used, its standard harvest indicator is in the range of 0-234kg of groundnuts to be harvested. It's amazing that in this range of acreage, the

groundnuts harvested are more than the standard harvest indicator of 0-234, apart from the range of harvest in 0.50-720kg, which falls within the parameter of our standard harvest indicator. In harvest, the range of 721-1440kg recorded the highest percentage of 34.88% followed by the range of 1441-2160kg and 0.50-720kg which recorded the same percentage of 32.56%.

In the acreage of land used in the range of 1.1-2acre, the standard harvest indicator is in the range of 257.4-468kg of

groundnuts to be harvested. In this range of harvest, only the range of 0.50-720kg falls within the parameter of the standard harvest indicator and have recorded 27.78% household experiencing harvest in it, while the other range of harvest are more than the standard harvest indicator. The range of harvest 1441-2160 which is the maximum range, recorded the highest percentage of household experiencing harvest followed by the range of 721-1440kg.

In the acreage range of 2.1-3, the standard harvest indicator is in the range of 491.4-702kg of groundnuts to be harvested. According to our findings, only the ranges of 0.5-0-720kg are within the standard harvest indicator, while the range of 721-1440kg and 1441-2160kg are more than the standard harvest indicator.

On the acreage ploughed, the baseline target indicator was 140acres. In the first season, the acreage ploughed was 136 acre and 98acres was planted. In the second season, the acreage increased to 111acres (9.3%) planted.

On the quantity of groundnuts harvested, the second season target indicator is 288bags while baseline target indicator is 364bags.

In the first season, the total quantity of groundnuts harvested is 272bags (74.7%) of the baseline target indicator, while in the second season, the total quantity of groundnuts harvested is 207bags (71.9%) of the second season target indicator.

There is a decrease of 2.8%. This could be attributed by lack of control of pest and diseases.

#### 4.3.1. Seed Quantity

In the seed quantity used, in the range of 0-10kg, the standard harvest indicator is 0-117kg of groundnuts to be harvested, assuming that the acreage of land is 0-0.5 acre. Only the lowest range of harvest in the range of 0.50-720kg falls within the standard harvest indicator of 0-117kg and have recorded the lowest percentage of 25% household experiencing harvest in it. The other range of harvest, in the range of 721-1440kg and 1441-2160kg are more than the standard harvest indicator and the household experiencing harvest are more than household experiencing harvest in the range of 0.50-720kg, and the two ranges have recorded 40.63% and 34.38% respectively.

In the seed quantity used, in the range of 11-20kg, the standard harvest indicator is 128.7-234kg of groundnuts to be harvested, assuming that the acreage of land is 0.55-1 acre. Only the lowest range of harvest in the range of 0.50-720kg falls within the standard harvest indicator of 128.7-234kg of groundnuts to be harvested and have recorded 34.38% of household who experience harvest. The other range of harvest in the range of 721-1440kg and 1441-2160kg are more than the standard harvest indicator and they have

recorded 31.25% and 34.38% respectively.

In the seed quantity used, in the range of 21-30kg, the standard harvest indicator is 245.7-351kg of groundnuts to be harvested assuming that the acreage of land is 1.05-1.5acres. Only the lowest range of harvest of 0.50-720kg falls within this standard harvest indicator of 245.7-351 and it have recorded the lowest percentage of 26.60% household experiencing harvest in it. The other range of harvest in the range of 721-1440kg and 1441-2160kg are more than the standard harvest indicator and they have recorded 41.49% and 31.91% respectively.

Using the standard rate of 20kg of groundnuts for an acre, the standard range of seeds for each actual set ranges of 0-1, 1.1-2 and 2.1-3 acre ploughed respectively should have been in the following ranges, 0-20kg, 22-40kg and 42-60kg of seeds to be used. This standard seeds indicators, are far above the actual ranges of seeds used, that is 0-10, 11-20, 21-30kg of seeds. This signifies less usage of seeds.

From the standard harvest indicator, that result from the actual ranges of groundnuts seeds used, our assumption on the acreage use of land are in the ranges of 0-0.5, 0.55-1, 1.05-1.5acreage of land. These ranges of acreage of land are fairly below the actual ranges of acreage used from the findings, which is the range of 0-1, 1.1-2, 2.1-3acres. This signifies inequitable usage of land by using less seeds in a big piece of land, hence under spacing of crops

On the quantity of seeds, the baseline target indicator is 2800kg while for the second season, the target indicator is 2220kg.

In the first season, the total quantity of seeds used was 992 (35.43%) of the baseline target indicator while for the second season, the total quantity of seeds used was 1558 (70.2%) of the second season target indicator.

On the quantity of seeds used, there is an increase of 34.77%.

From the previous findings in the first season, the p value 0.026 signified some level of association in between the quantity of seeds used and the production. In this season, the p. value 0.051 signifies no level of association between the quantity of seeds and the quantity harvested. This difference in association could be attributed by change in weather and good farming practices such as crop rotation that was being practice by some other farmers.

#### 4.3.2. DAP Fertilizers

DAP fertilizers used in the range of 0-8kg, its standard harvest indicator is 0-18.72kg of groundnuts to be harvested assuming that the acreage of land is 1 acre. From the findings, only one household used DAP in that range and it experience harvest in the range of 721- 1440kg of groundnuts.

DAP fertilizers used in the range of 9-16kg, its standard

harvest indicator is 21.06-37.44 of groundnuts to be harvested assuming that the acreage of land is 1 acre. From the findings, only one household used DAP in that range and it experience harvest in the range of 1441-2160 of groundnuts.

DAP fertilizers used in the range of 17-24kg, its standard rate indicator is 39.78-56.16kg of groundnuts to be harvested assuming that the acreage of land is 1 acre. From the findings, only one household used DAP in that range and it experience harvest in the range of 0.50-720kg of groundnuts.

DAP fertilizers used in all ranges was very low compared to the standard harvest indicator. This could be attributed by the fact that there is no association DAP have with groundnuts harvest.

On DAP, the baseline target indicator is 14400kg while in the second season, the target indicator is 11,100kg.

In the first season, the total quantity of DAP used was 70kg (0.486%) of the baseline target indicator, while in the second season, the total quantity of DAP used is 103kg (0.93%) of the second season indicator.

There is an increase of 0.444%.

#### 4.3.3. CAN Fertilizers

2.5kg of CAN used, should produce a harvest of 1170kg, 6kg

**Table 12.** Productivity index table for groundnuts. From the table, all the indicators have increased as the quantity harvested reduces. This could be as a result of inherent soil fertility.

INDICATOR	FIST SEASON 2014	SECOND SEASON 2014	PERCENTAGE BETWEEN TWO SEASON	LEVEL OF ASSOCIATION BETWEEN TWO SEASON
Quantity harvested	272bags (74.7%)	207bags (71.9%)	2.8% decrease	
Acreage ploughed	98acre (70%)	111acre 79.3%)	9.3 increase	
Quantity of seeds planted	992kg (35.43%)	1558kg (70.2%)	34.77% increase	reduced
Quantity of DAP used	70kg (0.486%)	103kg (0.93%)	0.444% increase	Infinite
Quantity of CAN	74kg (105%)	233kg (416%)	311% increase	Infinite
Quantity of manure used				

## 4.4. Vegetables

### 4.4.1. acreage Ploughed

According to the standard rate indicator discussed in the participatory planning, an acre of vegetable is capable of producing 1350kg of vegetables if good farming practices are observed with enough rainfall.

In the first range of 0-1 acre of land used, its standard harvest indicator is 0-1350kg of vegetables to be harvested.

In this range of harvest, the range that falls within it is the range of 0-900 kg and 901-1800 kg which both have recorded 41.67% and 20.83% respectively.

Quantity harvested in the range of 1801-2700kg falls out of the expected standard harvest indicator of 0-1350kg of vegetables and yet it has recorded 37.50% of household experiencing harvest in it. This signifies that there is possibility of realizing more than the expected standard

should produce a harvest of 2808kg of groundnuts, 8kg, should produce a harvest of 3744kg. The standard indicator for 1170kg falls in the range of 721-1440kg of harvested groundnuts and no household experienced harvest in it. The standard indicator of 2808kg and 3744kg are above the harvested range of 1441-2160kg whereby only one household have recorded harvest in each of the harvest indicator.

Usage of CAN is low due to the fact that groundnuts fixed nitrogen into the soil.

From the findings, groundnut harvest in Bar A sub location is very good, since the range of harvest groundnuts exceed the standard rate indicators.

On CAN, the baseline target indicator is 70kg while in the second season, the target indicator is 56kg.

In the first season, the total quantity of CAN used was 74kg (105%) while in the second season; the total quantity of CAN used is 233kg (416%) of the second season target indicator.

There is an increase by 311%.

### 4.3.4. Summary Between Two Season on Groundnuts

harvest Indicator if good farming principles are observed.

In the second range of 1.1-3 acre of land used, its standard harvest indicator is 1485-4050kg of vegetables to be harvested. The range of 901-1800kg and 1801-2700kg falls within this range, but yet, 4050kg is more than the upper range of 2700kg. In this two ranges, household experiencing harvest in them have recorded 26.92% and 65.38% respectively. 2700kg is still below 4050kg and therefore, household ploughing in a 3 acre of land have not realized the full potential of their land production.

In the third range of 4-6 acre of land used, its standard harvest indicator is 5400-8100kg of vegetables to be harvested. There is poor usage of land in this range, due to the fact that in the low ranges of 0-900kg and 901-1800kg are the only ranges that have recorded percentage of household experiencing harvest in them.

The baseline target acreage of land was 111acres, in the first



season, this reduced to 75acreage of land and 46acres in the second season. 26% decrease.

On the quantity of vegetables harvested, the second season target indicator is 690kg of vegetables and the baseline indicator was 1665kg of vegetables to be harvested.

From the notice board for the second season, the aggregate quantity of vegetables harvested is 193bags, (27.97%) of the second season target indicator.

In the first season, the total quantity of vegetables harvested is 272kg, (16.34%) of the baseline target indicator.

There is an increase of 11.63% on the quantity harvested from the previous first season to this second season.

#### 4.4.2. Seed Quantity

Quantity of seeds used in the range of 0-200g, its standard harvest indicator is 0-1350kg of vegetables harvested; assuming that acreage of land is 1acre.

Vegetables harvested in the range of 0-900kg and 901-1800kg falls within the standard range of 0-1350kg and both have recorded 5(35.71) and 4(28.57) of household experiencing harvest in them respectively. The harvest range of 1801-2700kg is above the standard harvest indicator of 1350kg and the number of household experiencing harvest in this range have recorded 9(37.50). This signifies possibility of realizing abundant of harvest more than the standard harvest indicator if good farming practices are observed.

In the range of 201-300g of seeds used, its standard harvest indicator is 1356.8-2025kg of vegetables to be harvested assuming that the acreage of land is 1-1.5acres.

In the range of harvest, the quantities harvested that falls within the standard harvest indicator range are in the range of 901-1800kg and 1801-2700kg of maize harvested which have recorded 4(28.57) and 5(35.71) respectively.

The range of 1801-2700kg signifies the possibility of experiencing the standard harvest of 13500 per acre with 200g of seeds.

In the range of 301g of seeds used, the standard harvest indicator for its harvest is 2031kg of vegetables to be harvested, assuming that the acreage of land is 1.5acreage.

In the range of harvest, this standard harvest indicator falls within the range of 1801-2700kg and have recorded the highest than the other ranges at 7(58.33).

From the maximum quantity of seeds used, the actual maximum acreage of land used, 4-6acres, is more than the maximum 1.5acreage of land assumed to be used. This signifies inequitable used of land.

On the quantity of seeds used, the second season target

indicator is 9.2kg and the baseline indicator is 22.2kg.

Measuring the precise quantity of vegetables seeds is a challenge to most households; due to the fact that different vegetables seeds have different mass and some are sold locally in different quantify weight.

#### 4.4.3. DAP Fertilizers

In the range of 0-10kg, its standard harvest indicator is 0-168.75kg of vegetables to be harvested assuming that the acreage of land is 0.13 acre.

The standard harvest indicator falls within the range of 0-900kg, and this have recorded 1(12.50) household experiencing harvest in it.

DAP used in the range of 11-20kg, the standard harvest indicator is 185.63-337.5kg of vegetables to be harvested assuming that the acreage of land is 0.13-0.25acre. This falls within the harvest range of 0-900kg which have recorded 3(37.50) of household experiencing harvest in it.

In the acreage of 21-30acres, the standard harvest indicator is 354.4-506.3kg of vegetables to be harvested assuming the acreage of land is 0.263-0.38acres.

This standard harvest indicator of 354-506.3kg falls within the harvest range of 0-900kg which have recorded 3(42.86), same to the range of 901-1800kg.

From the maximum quantity of DAP used, the actual maximum acreage of land used, 4-6acres, is more than the maximum 0.38acreage of land assumed to be used. This signifies inequitable used of land.

From the standard harvest indicator, that results from the actual ranges of DAP used, our assumption on the acreage use of land range from 0 to 1.5acreage of land. This 0 to 1.5acreage of land is far below the actual set ranges of acreage used in the findings that is the range of 0-1, 1.1-3, 4-6acreage. This signifies inequitable usage of land by using less DAP in a bigger piece of land.

Based on the actual acreage of land used, that is in the set ranges of, 0-1, 1.1-3, 4-6acres, the range of DAP fertilizer which should have been used is 0-80kg, 88-240kg, 360-480kg of DAP fertilizers. These standard DAP range indicators ranges are very high than the actual set ranges of DAP used, that is, 0-10, 11-20, 21-30kg. This signifies less usage of DAP.

Despite the fact of less usage of DAP fertilizers in the whole farm, probably due to less usage of seeds, households could have used the required amount of DAP per each vegetable hole during planting. To determine this, using the formula of 80kg of DAP/200g of vegetable seeds to work out the quantity of DAP ranges that was supposed to be used. The

actual seed ranges in our findings were 0-200, 201-300, 301-g of seeds. From this seed ranges, the ranges of DAP which should have been used is 0-80kg and 80.4-120, and 120.4kg and above of DAP fertilizers. This standard ranges of DAP arising from the quantity of vegetables seeds used, are still far much below the actual ranges of DAP used, that is 0-10, 11-20, 21-30kg of DAP. This probably could be as a result of lack of knowledge on the required amount of DAP needed per planting hole or due to financial constraint limiting the household members from purchasing the required amount of DAP fertilizers.

On the quantity of DAP used, the second season target indicator is 3680kg and the baseline indicator is 8880kg.

From the notice board, the aggregate quantity of DAP usage in the second season is 225kg (6.11%) of the second season target indicator.

In the first season, the aggregate quantity of DAP used, was 321kg (3.61%) of the baseline target indicator.

There is an increase of 2.5%.

#### 4.4.4. CAN Used

CAN used in the range of 0-20kg, its standard harvest indicator is 0-658.5kg of vegetables to be harvested assuming that the acreage of land is 0.49acres.

This standard harvest indicator of 0-658.5kg falls within the range of 0-900kg, which have recorded 4(57.14)

CAN used in the range of 21kg and above, its standard harvest indicator is 691 assuming that its acreage is 0.511acres. This still falls within the harvest range of 0-900 which has recorded 1(14.29)

From the maximum quantity of CAN used, the actual maximum acreage of land used, 4-6acres, is more than the maximum 0.55acreage of land assumed to be used. This signifies inequitable use of land.

Based on the actual acreage of land used, that is in the set ranges of 0-1, 1.1-3, 4-6acres, the range of DAP fertilizer which should have been used is 0-41kg, 45.1-123kg, 164-246kg of CAN fertilizers. These standards CAN range indicators are very high than the actual set ranges of CAN used, that is 0-20, 21 kg of CAN. This signifies less usage of CAN.

Despite the fact of less usage of CAN fertilizers in the whole farm, probably due to less usage of seeds, households could have used the required amount of DAP per each vegetable hole during planting. To determine this, using the formula of 41kg of DAP/200g of vegetable seeds to work out the quantity of CAN ranges that was supposed to be used. The actual seed ranges in our findings were 0-200, 201-300, 301-g of seeds. From this seed ranges, the ranges of CAN which should have been used is 0-41kg and 41.21-61.5, and 61.71kg and above of CAN fertilizers. This standard ranges of CAN arising from the quantity of vegetables seeds used, are far much above the actual ranges of CAN used, that is 0-20, 21kg of CAN used. This probably could be as a result of lack of knowledge on the precise amount of CAN needed per planting hole or due to financial constraint limiting the household members from purchasing the required amount of CAN fertilizers.

On the quantity of CAN used, the second season target indicator is 1886kg and the baseline indicator is 4551kg.

From the notice board, the aggregate quantity of CAN usage in the second season is 428kg (22.69%) of the second season target indicator.

In the first season, the aggregate quantity of CAN used, was 321kg (7.05%) of the baseline target indicator.

There is an increase of 15.64%.

#### 4.4.5. Summary of the Discussion Between Two Seasons on Vegetables

**Table 13.** Productivity index table for vegetables. Harvest increases as others indicators also increase apart from acreage ploughed which have reduces.

INDICATOR	FIRST SEASON 2014	SECOND SEASON 2014	PERCENTAGE BETWEEN TWO SEASON	LEVEL OF ASSOCIATION BETWEEN TWO SEASON
Quantity harvested	272bags (16.34%)	193bags (27.97%)	11.63% increase	
Acreage ploughed	75acre (67.57%)	46acre (41.44%)	26% decrease	
Quantity of seeds planted			Infinite	Increases
Quantity of DAP used	321kg (3.61%)	225 kg (6.11%)	2.5 increase	Increases
Quantity of CAN	321kg (7.07%)	428kg (22.69%)	15.64 increase	Increases

#### 4.5. Comparative Analysis

From the comparative results, the p-value (0.226109) is above  $\alpha$  level (0.05), the effect is statistically not significant and so we reject the null hypothesis. We therefore uphold the alternative and conclude that there is no significant difference between first season and the second season's results. We

mean to say that there is just no credible evidence for now to prove that there exist some difference.

## 5. Conclusion

Despite use of CAN and DAP, less household are experiencing harvest within the standard harvest indicator

and this is a result of inherent nutrition fertility in the soil.

In Maize, acreage ploughed, seed quantity, DAP and CAN fertilizers and manure used, have got an association with the maize harvest.

In Beans, acreage ploughed, seed quantity, DAP and CAN fertilizers and manure used have got an association with beans harvest in this season. From our first season analysis, CAN did not have an association.

In groundnuts, only acreage ploughed has got an association. Seed quantity, DAP and CAN fertilizers does not have an association. On seed not having an association, could be attributed by many factor, it could be use of low quality seeds or predators feeding on the planted seeds. DAP and CAN fertilizers do not have association due to the fact that groundnuts have got a capability of fixing nitrogen in the soil.

In vegetables, acreage ploughed, seed quantity, DAP fertilizers and manure used have got an association with the harvest. CAN does not have an association. CAN does not have an association. This could be attributed by lack of knowledge on the frequent interval of applying CAN fertilizers in vegetables.

From the comparative analysis, there is no significant difference between the first season and the second season. This could be attributed by frequent use of CAN and DAP fertilizers leading to inherent soil infertility, hence, excessive too much of acidity in the soil.

Very few households are spraying their crops against pest and diseases.

No household is practicing irrigation.

The actual inputs used are less than the standard indicators and therefore this signifies inequitable use of resources resulting to low harvest.

## Recommendation

Too much and frequent application of DAP and CAN fertilizers could have led to excessive acidity to the soil, and therefore for purpose of sustainable food production, there could be a need of using another different fertilizers after conducting soil test to know the balance of minerals in the soil. May be lime could be more effective than DAP If soil test is done

Farmers need to be trained on the equitable usage of farm inputs based on the rate indicators. Trainings require more emphasis through demonstration farms, dialogue TV talk show and door to door training.

Need for more monitoring to be done, to validate the validity

of the set rate indicators, based on the fact that the rates indicators were set many years ago and there is possibility of them not being valid at this present time due to the depreciation in soil fertility. This might result to new rate indicators for each location.

The quality of fertilizers needs to be checked and approved before selling to farmers.

Need to train household on crop protection by use of pesticides.

Need to train farmers on sustainable irrigation by use of bottle to apply drip irrigation in their farms.

Need more monitoring on the use of farm yard manure so that to guarantee training on sustaining good harvest by use of available farm yard manure.

## Acknowledgement

First and foremost, is abundant appreciation to almighty God for so far he has brought us. We are grateful to the Jerrys family for their support. Appreciation to our mentor Dr Charles Wafula and Dr Margaret Kaseje and not to forget Mr Maxwel Oyoo our treasurer who has remained committed in facilitating activities in the ground. Not to forget appreciating MEFOSEP partners, that is ministry of agricutre and the Community Health Workers and MEFOSEP members, that is David Odero, Sam, Mojes, Jenifer, Rachael, Monica, Dickens, Pastor Veronica and Pastor Ken Odeny for their overwhelming contribution in MEFOSEP project. Appreciation to our web designer, Mr Vincent Ochieng for the good work in designing and maintaining our web. Thank you all and May God bless you abundantly.

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