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## Contribution of Water Harvesting towards Food Security, a Case of Segera, Laikipia County, Kenya

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### ABSTRACT

Food is an indispensable part of human experience. Despite the continuous efforts by various governments, more than twelve billion people do not have proper access to food and water. Life expectancy and mortality rates of a country are majorly dependent on its water supply and food system. The root cause of food insecurity in developing countries is the inability of people to gain access to food due to poverty (Inter Academy Council, 2004). Water harvesting has been identified as one of the appropriate method of increasing food security in the ASAL regions like Segera, Laikipia County. This region depends on only one river Ewaso Nyiro which is seasonal. During dry seasons individuals, crops, and livestock mortality increases due to lack of water. Different water harvesting methods are practiced in order to avoid dependence on rain fed agriculture and study involved 50 respondents. According to the data analysis the highest percentage of farmers are women, and most of them do not practise water harvesting due to low income levels. Educating and training the community on ways to conserve water and practice modern agriculture would go a long way in eradication food insecurity through modern water harvesting technologies that do not require large portions of land.

**Keywords:** food insecurity, water harvesting.

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### INTRODUCTION

The agricultural sector in Kenya is the mainstay of the Kenya's economy. The sector directly contributes 24% of the Gross Domestic Product (GDP) and 27% of GDP indirectly through linkages with manufacturing, distribution and other service related sectors. Approximately 45% of Government revenue is derived from agriculture and the sector contributes over 75% of industrial raw materials and more than 50% of the export earnings. The sector is the largest employer in the economy, accounting for 60 per cent of the total employment. Over 80% of the population, especially living in rural areas, derive their livelihoods mainly from agricultural related activities. Due to these reasons the Government of Kenya (GoK) has continued to give agriculture a high priority as an important tool for promoting national development.

Below average rains, increased food prices and conflicts, have contributed to a 15 percent increase in the number of people requiring food assistance. A Long Rains food security assessment recently released by the National Drought Management Authority (NDMA) estimates that 1.5 million people are acutely food insecure and will require immediate food assistance over the next six months (September 2014 – February 2015). This is almost double the 850,000 that were in need during the same period last year. With the peak of the lean season yet to set in, and the next rains expected in mid-October, the food and nutrition security situation will likely worsen, prompting the need for urgent response. (Van Koppen, B. 2004).

Rainwater harvesting is the accumulation and deposition of rainwater for reuse on-site, rather than allowing it to run off. Its uses include water for garden, water for livestock, water for irrigation, water for domestic use with proper treatment, and indoor heating for houses etc. (Seckler, D. 1996). In many places the water collected is just redirected to a deep pit with percolation. The harvested water can be used as drinking water as well as for storage and other purpose like irrigation. Rainwater harvesting provides an independent water supply during regional water restrictions and in developed countries is often used to supplement the main supply.

Sustainable agricultural intensification remains the most important challenge in Africa. The rising population, growing aridity of arable land, low fertility soils, and an under-developed agricultural sector are significant factors contributing to food insecurity. In addition, the vagaries of climate

change continue to affect and threaten agricultural production in large parts of this region. Water harvesting and storage is one of the measures that can be taken to help minimize the risks (Food Policy 2010) and impact brought about by water shortage. For this reason, it was important to investigate the methods of water harvesting that could improve food security as well as determine how land affects water harvesting.

## **METHODOLOGY**

This study followed a multiphase approach as explained by (Churchill 1991). Such an approach involved interview schedules, questionnaire survey and piloting which assisted to refine data collection instruments before they were administered. The population for the study were large scale and small scale farmers in Segera Sub-county since not many individuals in the area practiced farming due to lack of water, land and also lack complete knowledge on ways to harvest water. The sample size of the respondents in this study was identified by an approach based on precision rate and confidence level as recommended by (Kothari, C. R. (2004) in this study. The researcher sampled from finite population hence the formula to be used according to Kothari will be

$$n = \frac{Z^2 \cdot p \cdot q}{e^2}$$

$$n = \frac{Z^2 \cdot p \cdot q}{e^2 \cdot (N-1) + Z^2 \cdot p \cdot q}$$

Where;

Z= Standard variant at the required confidence level (c.i)

P= Sample proportion in the target population to have the characteristics being measured.

Q=1-p

N= size of the target population

e<sup>2</sup>= Acceptable error (precision)

In this study, the researcher will use a confidence level of 95%, p value of 0.05 (p=0.05) and acceptable error of e=0.05, Z=1.96 as per the table area under normal curve for the required c.i of 95% and N will be one hundred farmers. Questionnaires and interviews were used to collect primary data

The data collected from the respondents was processed and analyzed by calculating frequencies and percentages using SPSS 2014 software.

## **RESULTS AND DISCUSSION**

### **Crop Seasons**

Another factor the researcher considered useful during data collection was the crop season to indicate the no of times the farmers’ plant and harvest annually. According to the data collected it indicated that most individuals plant and harvest once in a year. The percentages were represented as 50% for once, 26.7% for twice and 23.3% for thrice a year.

This show that in most parts of the year most farms remain uncultivated which contributed to food shortage with the lack of employment and the large no of children depending on those crops. As indicated in table 4.

**Table4.** *Percentage distribution of crop seasons*

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	once a year	15	50.0	50.0	50.0
	twice a year	8	26.7	26.7	76.7
	thrice a year	7	23.3	23.3	100.0
	Total	30	100.0	100.0	

### **Crops Grown**

The researcher collected the data in the table below which indicated the highest percentage of individuals didn’t practice crop farming and the lowest was cash crop farming. Food crop presented 36.7%, cash crop 23.3% and no crop grown is 40%. The highest percentage not practicing crop

farming may be due to lack of water. This is a threat to the individuals since they may eventually suffer food shortage. The individuals practicing cash crop farming have adequate resources and also knowledge in farming. As indicated in table 5

**Table5.** *Percentage distribution on types of crops grown*

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	food crops	11	36.7	36.7	36.7
	cash crops	7	23.3	23.3	60.0
	no crops grown	12	40.0	40.0	100.0
	Total	30	100.0	100.0	

### **Farm Output Income per Annum**

Farm output of the individuals was another factor the researcher considered, and from the analysis of the data it shows that most of the farmers output per annum are below 100000 KSH per annum which is represented by 53% meaning it’s more than half of the total population suffering the same income problem per annum. 23% represented income between 100001-500000 and also 23% representing income 500000 and above

The individuals with the income above 500000 are few since to acquire such income the individual must have the knowledge, capital, skills other factors inclusive which most of the individuals in the region lack.

### **Dependence on the Output**

The data collected indicates that most of the individuals completely depend on farm output for their survival which is represented by 53.3% of the total individuals. 26.7% depend on output moderately meaning they have another source of survival which may be livestock farming which reduces dependence on crops. 20% of depend very little on crops for survival and these may be the cash crop farmers who farm for export not for household consumption and also the employed who depend on their occupation income if crop fails unlike the highest percentage which depends fully on the output. As shown in table 6.

**Table6.** *Individual dependency on farm output*

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	completely	16	53.3	53.3	53.3
	moderately	8	26.7	26.7	80.0
	Little	6	20.0	20.0	100.0
	Total	30	100.0	100.0	

### **Sustainability of the Output**

After analysis it is realized that the output acquired is not sustainable since the highest percentage of 56.7% indicated that it isn’t while 43.3% indicated it is. The lack of sustainability can be due to the high population and lack of employment which causes a threat since most of the high population is depending on the low output which is mostly produced in one season in a year. The dependence on the output since its high and its supply is low this makes the output not sustainable, since sustainability is about supply meeting the demand of the households. As shown in table 7.

**Table7.** *Sustainability of the output*

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	yes	13	43.3	43.3	43.3
	no	17	56.7	56.7	100.0
	Total	30	100.0	100.0	

### **Influence of Water Harvesting on Production**

Water harvesting is a main factor in improving food security. The data collected indicates that water harvesting greatly affects production of food indicated by 73.3% of the people who agreed to that and 26.7% disagreed. Water harvesting will enable farmers’ plant during dry seasons through irrigating of the land.

The individuals who disagreed may have a small piece of land which though they practice water harvesting the impact may not be felt and would just suffers the cost of harvesting unlike those with a larger piece of land. As shown in table 8.

**Table8.** *Impacts of water harvesting on production.*

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	yes	22	73.3	73.3	73.3
	No	8	26.7	26.7	100.0
	Total	30	100.0	100.0	

### Rate at Which Water Harvesting Influence Production

The analysis of the responses on the rate at which water harvesting influences production indicates that 40% agree that it affects production. 36.7% responded otherwise indicating no impact on productivity and 23.3% indicated the effect on production was moderate.

Water harvesting increase production through the practice of irrigation farming, to increase output during off season and also during the dry season. As indicated in figure 6.

### Percentage Increase in Output due to Water Harvesting

Percentage increase in output below 20 is represented by 20%, 50 is represented by 43% and 80 and above is represented by 36.7%. These results indicate that output level is increased half in most farms. This is a clear indication that water harvesting has a significant impact on production. As indicated in table 9.

**Table9.** *Percentage increase in output as a result of water harvesting*

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	below 20	6	20.0	20.0	20.0
	50%	13	43.3	43.3	63.3
	80 and above	11	36.7	36.7	100.0
	Total	30	100.0	100.0	

### Water Harvesting Practices

The results indicates that most people practice water harvesting methods either for household use or commercial use.66.7% responded a yes and those who didn't practice any water harvesting method were 33.3%.most of the individuals who responded a no is due to their living standards which makes them unable to harvest water i.e due to poverty and lack of resources. As indicated in table 10.

**Table10.** *Percentages indicating those practicing and not practicing water harvesting*

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	yes	20	66.7	66.7	66.7
	No	10	33.3	33.3	100.0
	Total	30	100.0	100.0	

### Which Water Harvesting Methods Are Practiced

Water harvesting methods are highly practiced in this region, and also as said earlier it is in small scale. The data indicated that most of the household practiced traditional water harvesting methods represented by 46.7% of the total population.

### Scale of Water Harvesting

The scale of water harvesting methods from the research shows that most of the respondents harvest water in small scale which is represented by 46.7%, those who collect at the middle range is 30% while the large scale is represented by 23.3%.

### Relationship between Land and Water Harvesting

From the research most of the respondents agreed that there is a relationship between land and water harvesting since the larger the land the more possibilities of harvesting large quantities of water. This is represented by 60% whereas the respondents who did not agree with the relationship between land and water harvesting is represented by 40% as illustrated in the table 11.

**Table11.** *Is there any relationship between land and water harvesting methods*

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Yes	18	60.0	60.0	60.0
	No	12	40.0	40.0	100.0
	Total	30	100.0	100.0	

### **Effect of Scarcity of Land on Water Harvesting**

From the research most of the respondents agreed that the scarcity of land has a direct impact on the harvesting of water which is represented by 60% and those that showed that scarcity of land does not affect water harvesting is represented by 40% which is as illustrated in the table 12.

**Table12.** Percentages indicating whether land affect water harvesting

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Yes	18	60.0	60.0	60.0
	No	12	40.0	40.0	100.0
	Total	30	100.0	100.0	

### **CONCLUSION AND RECOMMENDATION**

Water harvesting has a great impact to food security especially a case of ASAL regions facing water shortages. Water increases the productivity through irrigation and also ensures there is constant production of food during off seasons or dry seasons. The government should help the people in this region acquire at least a tank for water harvesting and storage during the rainy season for use during the dry season. The water projects should be made secure to avoid risks such as death of animals, human being. The water harvested should be economically used in order to increase agricultural output in these ASAL regions.

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