HUMAN AND PHYSICAL VARIABLES IN THE ADOPTION OF CASH CROP FARMING IN GEM SUB COUNTY, SIAYA COUNTY, KENYA

By

Daniel Oduor Onyango, Department of Education Foundations, St. Augustine University.

Po Box 307, Mwanza, Tanzania. Email. d.juma@yahoo.com

Abstract

Poverty level in Gem sub-county is high yet the area has a high agricultural potential. However, there is low engagement in cash crop farming especially, growing of sugarcane. Involvement in sugarcane farming would assure the farmers of extra income from the sale of the crop. This would empower them economically, reduce poverty rates, spur industrialization and provide employment. Hence there is need to establish why a large number of farmers are not engaging in sugarcane farming in Gem-sub County. The objectives of the study were to: establish whether operations costs, marketing costs, land fragmentation and rainfall variability have influenced adoption of sugarcane as a cash crop. The study was conducted using descriptive survey design. It employed both quantitative and qualitative methods. A Conceptual Framework guided the study. The questionnaire was administered to 300 heads of households. Six Agricultural Extension workers were interviewed. Stratified Random Sampling was used to select the sample from the population. The unit of analysis was the farmers. Descriptive statistics was used to analyze the data. The study established that operations costs, marketing, land fragmentation and rainfall variability contributed to decline in sugarcane farming in Gem Sub County, Siaya County.

Key terms: Smallholder agriculture, sugarcane farming, land fragmentation and agriculture, climate change, operations costs.

Introduction

Participation of households in cash crop farming is very important to a developing country like Kenya. Smallholder cash crop farming can be used as means of developing the rural areas and as means of improving livelihoods. Majority of Kenya's population, 70% still live in the rural areas. Majority of this population depends on agriculture as a source of food and a source of income. According to Musambayi (2013), smallholder agriculture can contribute immensely to agricultural production of a country if it is well supported. This is possible if the smallholder farmers are assisted to overcome many obstacles in their way in cash crop farming. Musambayi further indicates that smallholder cash crop farming has the advantage of creating employment and reducing poverty.

Yayne and Muyanga (2012) Observes that there is poor investment in agriculture in some areas by farmers due to lack of physical infrastructure such as roads, electricity, irrigation, water, schools and health facilities. They also observe that in areas where land is under customary land tenure the households are facing emerging land constraints resulting from increased population growth since independence.

Literature Review

Kamruzzaman and Hassanuzzaman (2007) observe that profitability of cash crops grown by small holders such as sugarcane is decreasing because of poor utilisation of scientific knowledge. They also observe that many farmers were opting out of cash crop farming due to financial constraints and bureaucracy.

Despite its huge benefits to the economy of countries where it is grown such as Brazil, India Nigeria and Kenya, farmers who grow sugarcane face a lot of problems such as poor yields, diseases poor prices and shrinking land (Giro and Girei, 2010). According to Rice (2011),

sugarcane farmers in U.S.A are giving up sugarcane farming due to erosion for money they are paid by sugar companies. Babatunde, Omotesho & Sholatah (2007) indicates that sugarcane farmers in Nigeria whose farms are irrigated often complain of not receiving adequate water and other inputs such as fertilizers, which are necessary in sugarcane farming.

Chandakar (2012) explains that in 2005 sugar cane contracted farmers in Western Maharashtra, India, boycotted supplying the sugar companies with raw cane due to poor payments. The sugar mills had to increase their prices by 25% before farmers accepted to resume supplying the companies with sugarcane.

Kweyu (2013) conducted a study in Mumias Sugar Belt, he observed that the contracted sugarcane farmers were giving up sugar cane farming due to delayed payments, needed more land to grow food crops, low payments they were getting for their sugarcane and delayed payments by Mumias Sugar Company, the major sugar miller in Kenya. He found out that the contracted farmers were reducing cane acreage by 5% every year.

Statement of the Problem

Smallholder farmers' participation in cash crop farming is important towards rural development, poverty alleviation and enhancing food security in Kenya. Smallholder engagement in sugarcane farming can contribute towards improving livelihoods in rural communities. To enable small holders' farmers to take up sugarcane farming, obstacles which cash crop farmers face should be addressed. There is conspicuous absence of literature on influence of geographical variables such as: operations cost, marketing cost, land fragmentation and rainfall variability on adoption of sugarcane as a cash crop in Gem Sub County hence this study. Hence, there was an urgent need to conduct this study.

The objectives of the study were to:

1. Find out whether operations costs have influenced adoption of sugarcane as a cash crop in Gem sub county
2. Investigate whether marketing costs affect the adoption of sugarcane as a cash crop in Gem Sub County
3. Establish whether land fragmentation has influenced adoption of sugarcane as a cash crop in Gem Sub County
4. Determine whether rainfall variability has had an impact on adoption of sugarcane as a cash crop in Gem Sub County

Research Design and Methodology

The study was conducted in Kenya, Gem Sub County, and Siaya County. The main economic activity practiced in the area is subsistence farming. Subsistence farmers grow crops such as; maize, beans, cassava and millet. The main urban centres are Yala, Wagai and Nyangweso. The following communities; Luo, and Luhya inhabit Gem Sub County.

Research Design

Johnson and Onwuegbuze (2004), explains that the Mixed Methods Approach is the third strategy in Social Science Research. It is an approach to research where the researcher combines qualitative and quantitative methods. It draws strengths from qualitative and quantitative method and minimizes weaknesses of both in the study. The mixed methods approach bridges the gap between quantitative and qualitative studies. Many practitioners in geography research are of the view that research in geography has become complex, inter-disciplinary, and dynamic and there is need to compliment the methods (Allsop, et al. 2010). The mixed method approach has the

advantages of allowing the researcher to integrate the two designs in the development of instruments and data analysis. This eliminates unnecessary repetitions.

The design of the study was descriptive survey, which allowed large amounts of data to be collected over a short period. It also provided for numeric descriptions of the population. It also enabled the researcher to describe and explain relationships between dependent and independent variables. The researcher used it because it assisted the researcher to discover whether operation costs, marketing costs, land fragmentation and rainfall variability have contributed to adoption of sugarcane as cash crop in Gem Sub County, Siaya County (Johnson & Onwuegbuze, 2004).

The target population was heads of households engaged in farming and Agricultural extension officers in Gem Sub County. Unit of analysis in this study was farmers. Heads of households were selected as respondents because in the Luo and Luhya communities they are the heads of the family and are the ones mandated to provide required information about the household to any visitor such as the researcher.

Sampling Technique

The sampling techniques selected for the study was stratified and purposive sampling. These sampling techniques were used to select the heads of households from the target population. The samples were used in this study because of the issues of cost and need for speed in data collection (Oso & Onen, 2008).

The households in Gem Location were grouped into locations using the existing administrative locations/wards in the Sub County. This was done to ensure equitable and proportionate representation of the population in the sample. It was also used to allocate a sample of heads of households to each location in the Sub County ((Viser & Jones, 2010).

Thereafter purposive sampling technique was used to draw samples from each location. Table 1 shows how the samples as be allocated among the different locations.

Table 1: Sampling Frame of the Study

Location	Households		Extension Workers	
	No	Sample	No	Sample
Gem West	2875	43	1	1
Yala	2894	45	1	1
Gem North	4375	66	1	1
Gem Central	982	47	1	1
Gem North East	2500	40	1	1
Gem South	3802	59	1	1
TOTAL	**17428**	**300**	**6**	**6**

Source: Census Report 2009

The sample for the study as shown on table 1 was drawn using Krajcie and Morgan (1970).

Development of instruments

The study used a single household questionnaire and interview schedule as the tools for data collection. The instruments were self-made. The instruments were selected because the researcher required detailed information, which would necessitate the use of multiple instruments to collect data in order to find answers to research questions.

Data Analysis Procedures

The following section presents information on data analysis procedures especially how qualitative and quantitative data analysis was carried out.

Mixed Methods Research

The Mixed Methods Approach was used in data analysis; the researcher combined both qualitative and quantitative approaches in the analysis of data. This improved the accuracy and validity of the research findings (Johnson & Onwugubuzie, 2004).

Findings

Operations costs

The study investigated whether operations costs influenced adoption of sugarcane as a cash crop.

The results are as presented in table 2.

	Variable	Mean	Std deviation
1	Acquisition of inputs	4.18	.490
2	Cost of hiring labour is high	4.18	.626
3	Cost of hiring tractors is high	4.15	.584
	Overall Mean	4.17	.567

As shown on table 2, the heads of households rated the variable, acquisition of inputs highly. (Mean= 4.18, SD=.490). Secondly the table 2 shows that the second variable in the sub scale (Operations costs), cost of hiring labour was also rated highly by most of the farmers (Mean= 4.18, SD=.626). Further table 2 indicates that the variable, high cost of hiring tractors was also rated highly by most of the respondents (Mean= 4.15, SD=.584).

The high rating of the variable: acquisition of inputs (4.18) shows that farmers are facing the problem of lack of inputs which are necessary in the production of sugarcane. Agricultural inputs are very important in the production of sugarcane and without this inputs they may not do much. The standard deviation of .490 which is below one show that the scores were not far spread from the mean, this could be interpreted to mean that most of the farmers were in agreement about the

influence of inputs such as fertilizers on sugarcane farming. This is an opinion, which could suggest that the farmers perceive acquisition of inputs as a problem in sugarcane farming. Similarly the high rating of the variable acquisition of inputs, labour, hiring farm machinery by most of the heads of household shows that the heads of households perceived operations costs as impediments to adoption of sugarcane as a cash crop in the region.

Most of the field extension officers interviewed identified lack of inputs by farmers as major problem facing farming in general in the region. They blamed this problem on inability of households to raise sufficient funds for farm operations such buying fertilizers and other inputs. They argued that unless the farmers in the region are assisted to acquire this inputs at a subsidized rate or free, it would be difficult for the them to adopt any cash crop farming let alone sugarcane.

The findings in table 2 in this study agrees with observations made by Herbs and Columba (2010) who indicated that many contracted sugarcane farmers have given up sugarcane farming due to problems with supply of fertilizers and funds to procure herbicides.

Marketing Costs

The study also sought to investigate whether marketing costs influenced adoption of sugarcane as a cash crop. The results were as presented in Table 3

Table 3: Marketing Costs

	Variable	Mean	Std deviation

1	Local roads linking jaggeries/mills are impassable during rainy season.	4.21	.640
2	Local roads are narrow	3.75	1.271
3	Connection between local roads and main roads is poor due to lack of bridge culvert	3.73	1.081
4	Transport charges for lorries are high	4.31	.499
5	Farmers are paid late	4.16	.809
6	Delivery of sugarcane is never paid	4.36	.483
7	Sugarcane payments are	4.27	.642
8	Jaggeries are far from farms	3.87	1.166
	Overall mean	3.97	.823

Table 3 shows that the variables in the marketing sub scale were rated as follows : local roads(mean= 4.21, SD=.640), local narrow roads (mean=3.75, SD=1.271) and connection between local and main roads was rated (mean=3.73, SD=1.081), high transport charges (mean=4.31, SD=.499), late payments (mean=4.16, SD=.809). Lack of payments for sugar deliveries (mean=4.36, SD=.483), payments made are low (mean=4.27, SD= .642), and distance from farms to jaggeries/mills (mean=3.87, SD=1.166)

The result from table 3 further indicates that the eight variables had high and very high mean ratings. The highest rated variable was delivery of sugarcane is unpaid (mean=4.36). It was followed by transport charges (mean=4.31). The third highly rated variable, prices paid are low (mean=4.27). The fourth highly rated variable, linkage between local roads and main roads (mean=4.21). Late payment was rated fifth at (mean=4.16). Three variables: local roads are narrow (mean=3.75), Connection between local roads and main roads, mean=3.73), Distance from farmers homes to jaggeries was rated (mean=3.87). These ratings were high. Table 4.7 further shows that no variable was rated low.

Similarly table 3 indicates that lowest standard deviations were observed in the following variables; high transport charges (SD=.499), delivery of sugarcane is never paid (SD=.483) and prices paid for sugarcane are low (.642).

It can also be observed from table 3 that the highest standard deviation was observed in the following variables: local roads are narrow (1.271), jaggeries are far from farms (1.166) and connection between local roads and main roads (1.081). The overall mean standard deviation was (Mean=.823). This was a high mean.

Very high mean ratings of variables related to payment such as late payment for deliveries, deliveries are never paid and low payment, suggests that farmers could be experiencing a problem where they are not sure of being paid for what they have supplied to the jaggery/mills. In a case where a farmer has an incurred the cost of producing a product and has sold the product to the market and no payments are forthcoming this hurts the farmer. Delayed payments after the crop has been in the field for 16-24 months makes the situation very difficult for the farmers

The low standard deviations in most of the variables suggests that majority of farmers suffers from the problems of; non-payment after the delivery of sugarcane, low payments by millers and juggeries and high transport costs. The ratings were very close to the mean. This could suggest that the scores were almost normal. This could also suggest that the heads of household perceived the variables related to payment as major predictors of adoption of sugarcane as a cash crop in Gem Sub County. The overall mean (4.17) and standard deviation (.567) further attest to above suggestion.

It is difficult for the farmer to meet his/her basic needs if he/she is not getting payments after the sale of a crop. This particular farmer may not have capital to reinvest in the venture again. The

farmer can also be discouraged from engaging again in the farming completely. The same scenario is experienced if the farmer is paid late or the payments are low. It makes it difficult for the farmer to reinvest in the venture. It leads to a farmer abandoning the activity all-together even after the first or the second crops. High rating of the variables, transport costs suggests that charges by the jaggery/mills or private transport providers can have an impact on sugarcane farming in the area. This could imply that the transport service providers charge a lot of money for transporting sugarcane to the jaggeries/mills. High transport costs could leave farmers with low profit margin to reinvest in sugarcane farming.

Variables related to road network were also rated highly in the marketing subscale. This could suggest that the condition of roads in the area could be poor. Poor condition of roads could lead to high transport costs. In an area where roads are very poor, transport providers are likely to hike their rates leading to many farms not able to meet this expense. In a long run, it will discourage the farmers from engaging in cash crop farming, which will require them to bearing this kind of expense. The situation can be made better for the farmers if both national and county governments regularly maintain roads.

Lack of bridges/culverts to link various areas can lead to distances between a market and a producer longer. This makes the transport providers to charge more money per unit of the goods being transported. The cost would be less if the distance between the source of sugarcane and market is shorter. This would be possible, if areas are connected with bridges and culverts.

The high rating of the variable, narrow roads could also suggest that the roads in the region are narrow this makes it difficult for machinery which is used in land preparation, transportation of inputs, such as fertilizers and transportation of harvested sugarcane difficult. This is because the

roads/paths cannot allow a vehicle to access the farms. This could lead to the use of additional human labour to move the sugarcane from the farm to the nearest point where the tractors or Lorries can stop. This would cost additional money, which the farmer may not be able to afford.

High rating of the variable, low payments also shows that the amount of money paid by the Jaggeries could be so low to a point where farmers cannot break even. In long run since farming is a sort of business the farmers would not get enough money to re invest in farming. This makes them to abandon cash crop farming altogether. If the returns are high, it makes the farmers to re invest the income from the previous harvest in a new crop.

The findings as observed from table 3 agree with the observations made about impassable roads by Waitathu (2015) who indicated that farmers in Baringo County have urged Baringo County Government to improve roads so as to reduce the escalating cost of doing livestock business. These comments were made after the farmers complained about the high transportation cost they incur when transporting the livestock to the markets within and outside the district. Transportation system is the artery of agricultural development. Areas with good transport network such as all weather roads; it is easier for the farmers to move their farm produce to markets. Transporters will not charge a lot of money for their service in areas where the road network is superb.

The finding about the distance between farms and mills agrees with observations made by Gettis et al. (2008) who indicates that availability of cheap transport systems in high economic areas lowers cost of transporting goods. This allows farmers to break even. He suggested that industries should be located where transportation of materials to the market is low. Kenyatta (1967) further observed that to make sugarcane farming economical in Nyanza, there was need to put up modern roads in Miwani, Chemelil and Muhoroni sugar belt.

The observations about low and late payments for sugar delivery agree with the observations made by Leong and Morgan (1982), they observe that the government should protect farmers so that they can get good prices for their products. Similarly Kibor and Gitonga (2014) observed that farmers need to be helped by the Elgeyo Marakwet County Government to get good prices for their produce most of the time, farmers sell their products at a throw away price to middlemen.

Land Fragmentation

The study investigated whether Land Fragmentation influenced adoption of sugarcane as a cash crop. The results were as presented in Table 4

Table 4: Land Fragmentation

	Variable	Mean	Std deviation
1	Parcel of land not adequate for cash crop farming and homestead.	3.52	1.295
2	Distances between land parcels are huge.	3.16	1.452
3	Land parcels are inaccessible	3.04	1.512
4	Machines such as tractors cannot be used in small pieces of land.	3.09	1.485
5	Small pieces of land are not economical	3.40	1.371
	Overall mean	3.40	1.423

Results from table 4 reveals that the variable parcel of land not adequate, was rated (mean=3.52, SD=1.295,) while the variable distances between land parcels, was rated (mean=3.16, SD=1.452). The variable, land parcels are inaccessible was rated (mean=3.04, SD=1.512) while the variable machines such as tractors cannot be used was rated (mean=3.09, SD=1.485). Finally,

variable, small pieces of land are uneconomical was rated (mean=3.40, SD=1.371). The overall mean was 3.40 and mean standard deviation was 1.423.

Table 4 indicates that it is only one variable whose mean was rated high, parcel of land not adequate (mean=3.52, S.D=1.295. The rest of the variables were rated average. The table 4 also shows that the standard deviations were high. This shows that opinions of the respondents on different variables in this particular sub-scale were divergent and widely scattered. This suggests that some households could only be having a single parcel of land and therefore they rated the variable distances between the parcels low, others could be having more than one parcel and rated the same variable high. This could be the cause of the high standard deviation (SD=1.452). The same scenario could have been experienced in the variable, land parcels are inaccessible. This variable was applicable to farmers who had more than one parcel of land. They were to indicate whether these parcels are accessible or inaccessible, the (Mean=3.09) is an indicator that the rating was average; this could also suggest that there were divergent views about this particular variable.

It could also suggest that in some part of the population, it would be difficult to access some of the parcel of land from a neighbors' land if one has to use machinery in land preparation e.g. tractors, if the farmer is not in good terms with the neighbor then it may not work. The head of households also rated the variable, small pieces of land are not economical averagely (mean=3.40). This indicates that they did not get much yield from their small parcel of land in which they had planted sugarcane. It suggests that the small parcels of land were not productive.

These findings show that there are areas within the region where population growth is very high and land subdivision has been extensive leading to small, near uneconomical land pieces. It also

suggests that there could also be areas where there is still huge chunks of land where farmers could still put huge chunks of land under cash crop farming. Many parts of western Kenya have experienced high population growth rate. The cultural norms require the head of household to distribute his land among his children. This has decreased land available for cash crop farming. Much of the land is set aside for homesteads and food crop farming (Kweyu, 2013; 2013; Smokin, 2010). Kodowo (2012) suggests that land consolidation should be pursued aggressively in Siaya County. This would provide adequate land for cash crop farming.

These findings show the ways in which land fragmentation has influenced the adoption of sugarcane as a cash crop. This is through inadequate land and subdivided parcels of land, which are not economical. Inaccessibility of some parcels of land due to physical features such as rivers, hills and hostile neighbors' are also variables, which could have affected adoption of sugarcane as a cash crop.

Rainfall Variability

The study investigated whether rainfall variability influenced adoption of sugarcane as a cash crop. The results were as presented in Table 5 below.

Table 5: Rainfall Variability

	Variable	Mean	Std deviation
1	The dry season is prolonged	4.19	.941
2	The beginning and end of the short rains are unpredictable	4.27	.539

3	The unusual strong winds during the rainy season destroy mature crops	4.27	.617
4	The beginning and end of the long rains is unpredictable	4.15	.821
5	There are unusual changes in temperature during rainy season	4.22	.623
	Overall mean	4.22	.586

As shown on table 5 the respondents rated the variables as indicated below. The variable, dry season has been prolonged was rated (mean=4.19, SD=9.41), the beginning and the variable, end of the short rains were unpredictable was rated (mean=4.27, SD=.539), while mean and standard deviation of the variable, unusual strong winds was rated (mean=4.27, SD=.617). The rating for the remaining two variables were, the beginning and the end of long rains unpredictable (mean=4.15, SD=.821). and unusual changes in temperature during the rainy season was (mean=4.22, SD=.623). The overall mean and the standard deviation of rainfall variability sub-scales was (mean=4.22, SD=.586).

The results on table 5 shows that the highly rated variable was, the unpredictability of the onset and end of the strong rains and unusual strong winds destroys the crops (mean= 4.27). Secondly table 5 reveals that three variables were highly rated by the respondents with the means of above 4.2. The other two variables, dry season is prolonged (mean = 4.19) and the beginning –and the end of long rains is unpredictable, were highly rated but with means below 4.20. The standard deviation of all the five variables was below 1.0. This is an indication that views of the respondents were not divergent on the issue under investigation. The highest standard deviation was observed in the variable, dry season is prolonged (SD=0.941), followed by the variable, beginning and the end of long rain are unpredictable (mean=.821)

These findings reveal that the heads of the households were in agreement that the variables in the rainfall variability scale have affected the adoption of sugarcane as a cash crop in Gem Sub-County. The findings further suggest that the respondents quite understand the phenomena of climate change and they can show how it had affected adoption sugarcane farming. This is evident from high mean ratings (4.00 and above and a standard deviation below 1.0).

The findings in this study shows how global climate changes can interfere with geographical conditions, which favor production of sugar. Sugarcane in its growth cycle requires high temperature, which should be in the range of between 21° to 27°, this allows for high sucrose accumulation. However, if the temperatures are raised or lowered abruptly the crop is affected. Sugarcane also requires a dry season to allow harvesting. Prolonged dry season contributes to withering of the crops, which affects its tonnage. Rainfall beyond the recommended annual amount of 1200mm-1500mm can also lead to destruction as it leads to poor agronomic practices such as cultivating and harvesting. It can also contribute to situations of water logging which interferes with sugar plant growth. It can also lead to pests and diseases such as leaf spot, smut, white crabs and pests. This can easily attack the crop leading to low yields.

Conclusions

Basing on the findings, the study concluded that operation costs such as; acquisition of inputs such as fertilizers, labour costs, cost of land preparation hinders farmers from fully participating in sugarcane farming. Marketing costs such as: poor condition of roads, narrow roads, and poor

connection between local and main roads has contributed to low farmers inputting land fragmentation under sugarcane in Gem Sub-County. This is because transport providers/jaggery owners are forced to charge highly for transporting the cane to the jiggery due to poor road network. Land fragmemtation has also contributed to inadequate land which can be put under cash crop farming. Rainfall variability in form of unpredictable rainfall distribution has contributed to low adoption of sugarcane as a cash drop in Gem sub-county, Siaya County. The farmers perceive the rainfall patterns to be unclear. This could have affected activities within sugarcane crop cycle e.g. planting, weeding and harvesting.

Recommendations

It was recommended that farmers in Gem sub-county, Siaya County should be assisted to acquire inputs such as fertilizers, herbicides so as to put more land under sugarcane crop. The road network in Gem sub-county needs to be improved to allow smallholder farmers to easily transport the produce to the markets and to lower the cost of transportation. Roads should be widened enough to allow access to farms by the tractors/lorries. Subdivision of ancestral land according to culture should be discouraged. The subdivided land becomes uneconomical for cash crop farming such as sugarcane. Furthermore, some subdivided parcels of land cannot be accessed. There is need to introduce rainfall adaptation strategies in Gem sub-county to help farmers to make adjustments. This will enhance resilience instead of farmers decreasing land under cash crops (sugarcane).

REFERENCES

Allsop, D., Allen, H., Clare, H., Cook, I., Raxter., Upton, C. and Williams, A. (2010). Ethnography and Participant Observation. In, Research Methods in geography: A critical Introduction. Eds. Gomez, B. & Jones, J. P. Blackwell: Sussex.

Babatunde, R.O, Omotesho, O. A. & Sholatan, O.S. (2007). Socio_ economic and food security of farming households in Kwara State, Nigeria. Retrieved from www. iosrjournals.org, on 15th April 2015.

Chandavakar, R. (2012). Sugar mills to raise sugarcane price by almost 25% signals losing influenceof Sharad pawar, Retrieved from www.articles.economictimes on 11th march, 2015.

Getis, A. Getis, J. & Felimann, J. (2008). *Introduction to Geography*. Boston: Mc Graw Hill.

Girei, A. A. & Giroh, D. Y. (2012). Analysis of the Factors Affecting Sugarcane Production under the Out growers Scheme in Numan local government area Adamawa State, Nigeria. *Journal of Science Education*. 2(5), 158-164.

Harb, J. C. and Columba, C.H. (2010). Financial and Economic Feasibility of Sugarcane Production in Northern Lapaz. Retrieved from http; //Wikipedia.Org. Retrieved on 13/3/15.

Johnson, R. B. & Onwuegbuzie, A. J. (2004). Mixed Methods Research: A Research Paradigm whose time has come. *Educational Researcher*, 33(7). 14-26. Retrieved from www.edr.sagepub.com on 14th October, 2014.

Kamruzzaman, M. & Hassanuzzaman, M. (2007). Factors Affecting Profitability of Sugarcane Production As Monoculture And As Intercrop In Selected Areas of Bangladesh. *Bangladesh Journal of Agriculture Research,* 32(3),67-79.

Kelinger, T. N. (1983). *Foundations of Behavioral Research (5th ed.).* London: Pitman.

Kenyatta, J. (1967). *Suffering Without Bitterness*. Nairobi: East African Publishing.

Kodiwo, M. (2012). Social Economic Factors Influencing Agricultural Land use Intensity in Siaya *District,* Kenya. Retrieved from http;//library.ku.ack. Retrieved on April 15, 2015.

Krajcie, R. V. Morgan, D.W. (1970). Determining sample size for Research activities. Educational and psychological measurement. Retrieved from www.kenpro.org on 10th March, 2015.

Kweyu, W. W. (2013). Factors Influencing Withdrawal of Farmers from Sugarcane Farming, a case of Mumias District, Kakamega County. Unpublished Thesis University of Nairobi.

Leong, G. C. & Morgan, G. (1982). *Human and Economic Geography*. Oxford: Oxford.

Musambayi, N. J (2013). *The Impact of Land Fragmentation, Segmentation and Production and Food Security.* Elixir Agriculture 56(2013) 13493-13495.

Onen, D. & Oso, W. Y. (2005). *Writing Research Proposal*. Kisumu: Options.

Rice, R. W. (2011). Sugarcane plant Diagnosis. Retrieved from. www. edis.ifes.ufl.edu. on 10th October, 2014

Smokin, W. (2010). *Essays on Land Law* Nairobi; University of Nairobi.

Viser, S., & Jones, J.P. (2010). Descriptive Statistics. In, *Research Methods in geography: A Critical Introduction.* Eds. Gomez, B. & Jones, J. P. Blackwell: Sussex.

Waswa, F. (2012). Enhancing Household Food and Income Security through Crop Diversification in the Nzoia and Mumias Sugar Belts in Kenya.