Socio-Economic Determinants of Food Insecurity at Household Level in Makueni County, Kenya

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Abstract- Food insecurity remains a great threat to many countries especially in the low – income countries. Many studies blame the problem of food insecurity especially in the Arid and Semiarid Lands (ASALs) to the bio-physical factors such as climate, soil and altitude among others. However, Socio-economic determinants are important elements that influence food insecurity at household level. Thus, this study examined the socio-economic determinants of food insecurity at household level in Makueni County, Kenya. This region is one of the ASALs that face perpetual food insecurity in the Kenya. Guided by descriptive research design and based on a semi-structured questionnaire, data was gathered from households to examine the influence of socio-economic factors on food insecurity. Socio-economic factors were considered as independent variables and their relationships examined with food security as a dependent variable. From the 400 respondents selected in Makueni County, Kenya, the study revealed that the socio-economic factors such as lack of adequate capital, number of regular dependants, lack of extension services, gender, education level and lack of training among others tends to influence food insecurity situation and therefore influences the effectiveness of interventions of food insecurity at the household level. The study established that most of the farmers are robust and therefore the need to provide adequate support to the farmers so that they can be able to boost their food production. The study recommends the need to address the constraints that influence households' food insecurity such as building on their potential by giving them credit facilities, training, use of technology and explore ways of diversifying farmers' livelihood activities such as in setting up agro-based industries like food processing which would act as a fall back strategy during food insecurity situations among others.

Index Terms- Determinants, Food insecurity, Households, Kenya, Makueni, Socio-economic

I. Introduction

Large populations in many regions of the world remain food insecure in spite of the global development. FAO (2019) observes that the number of people suffering from hunger in the world has slowly increased for several years in a row, underscoring the immense challenge of ending hunger by the year 2030. Statistics show that almost a billion people live in extreme poverty (less than USD 1.25) per person per day and about 820 million suffer from hunger. Thus, much more must be done to achieve the Sustainable Development Goals (SDGs) on eradicating poverty and hunger by year 2030 (FAO, 2019 and FAO, 2015). The Government of Kenya in particular recognizes food security as one of the Big Four Agenda to be achieved as indicated in Kenya's Vision 2030 (GOK, 2007).

Despite the importance of agriculture, this sector has remained below its potential in Africa. This is apparent in agriculture's extreme undercapitalization and lack of competitiveness in world markets (IBRD, 2000; Fulginiti, et.al, 2004; GOK, 2007; Stanford, 2010). It is notable that while there is overproduction of food in the High Income Economies, most African countries experience a production shortfall, especially in per capita terms. Indeed, Africa as a whole has been a net agricultural importing region since 1980. The continent's agriculture has been volatile partly due to erratic rainfall (Maxwell, 2003; AU and NEPAD, 2003; GOK, 2007; Stanford, 2010). About 50% of Kenya's population is classified as poor and a third is estimated to be food insecure (GOK, 2002 and Barasa, 2010). About three quarters of the poor live in the rural areas most of them engaging in subsistence agriculture. Poverty and food insecurity levels are highest in Coast, North-eastern and Eastern Counties. Kenya's agricultural development has continued to rely heavily on rain. Overall rainfall distribution in the country is not reliable and the country has continued to experience food deficits necessitating importation of food as well as dependence on food aid (Nyangito et. Al., 2004 and GOK,2002).

Food insecurity therefore remains a key challenge especially in the low income countries and hence the need for more exploration into the inherent factors contributing to the problem at the household level. The general factors that are attributed to food insecurity include the bio-physical factors such as climate, soil infertility, diseases, slope and topography among others. The socio-economic factors that are also generally considered to have effect on food insecurity include population growth, weak infrastructure and markets (Waugh, 2002; Dyer, 2006; Pillarisetti *et.al*, 2007; Kasturi, 2009; Singh, 2009; Obayelu, 2011).

Some empirical studies have been conducted to establish determinants of food insecurity. For instance, Ramsey et al. (2016) conducted a study in Australia on food insecurity among Australian Children. The study established that the potential determinants of food insecurity include: parental age; ethnicity; educational level; employment and poverty levels/income. The study collected data from households with children aged 3-17 years in a socio-economically poor suburb using mail survey and data analysed using logistic regression. This study throws some light to the current study because it reveals that socio-economically disadvantaged households may be more prone to

food insecurity. Ramsey et al. (2016) also demonstrates that the problem of food insecurity is still a current problem not only in the low income countries but also in the developed countries. The current study however examined the socio-economic determinants of food insecurity with a focus in a low income country.

Foley (2009) carried out a study in South Australia which focused on analysis of factors associated with food insecurity. The results were based on data collected by South Australian Monitoring and Surveillance System (SAMSS). Based on logistic regression analysis, the study revealed that food insecurity was highest in households with low levels of education, limited capacity to save money, aboriginal households and households with three or more children.

Lê et al. (2015) examines the physical and financial access to food of the population of Dorset, a rural Municipality in North Eastern Tasmania (Australia). The study also focused on the impact that socio-economic factors have on food security and coping strategies they use when food shortage occurs. The study used both quantitative and qualitative research techniques focusing mainly on use of questionnaire method and focus group discussions. The study revealed that the community was vulnerable to food insecurity largely based on problems of food access, availability, affordability and knowledge issues.

Studies by Foley (2009) and Lê et al. (2015) informs the current study on some of the determinants of food insecurity such as financial ability to purchase food, level of education and number of children. Lê et al. (2015) also sheds light on the methodology to use such as use of questionnaires and focus group discussions that the current study also finds useful in the exploration of variables identified. However, the findings from these studies may not be generalized in the situation of Kenya in general and Makueni County in particular given that Australia is a high income country which is fairly food secure compared to Kenya.

Loopstra (2018) evaluated determinants of food insecurity and interventions to address food insecurity in high-income countries. The study is titled, "Interventions to address food insecurity in High-income countries" With regard to determinants of food insecurity, Loopstra (2018) reveals that household income is the most consistent and strongest predictor of risk of food insecurity. The study also indicated that populations who suffer from deep and persistent poverty have high rates of food insecurity. These include households with children, lone parents, adults with low levels of education and other vulnerable populations. Other factors that are linked to food insecurity include poor health, food inflation, poor financial management and lack of food availability (food desert). This study provides useful insight into the variables determining food insecurity but like Lê et al. (2015) its focused on the situation of high-income countries like USA, Canada and the United Kingdom.

Iheoma (2020) carried out a study on household food security and its determinants in agrarian communities in South Eastern Nigeria. Based on regression analysis, the study revealed that marital status, level of education, monthly income, dependency ratio and distance to market determined household food security status in the study area. The study emphasizes that households headed by unmarried persons with higher level of education and monthly income as well as with fewer number of dependents (< 5 persons) were more food secure, and food security decreased with increasing distance to market. The study recommends the need to address these determinants in order to enhance food security. Iheoma's (2020) study is relevant to the current research study as it addresses some aspects of one of the variables under investigation, i.e determinants to food insecurity.

In spite of the above, the socio-economic factors influencing food insecurity at the household level have not been properly addressed. Indeed, little has been done to examine how the dynamic nature of socio-economic factors such as technology, market and varying income levels have on food insecurity at the household level. Further, it is important to establish how education, employment status and imbalanced family expenditure on non-food items can have an impact on food insecurity at the household level.

It is against this backdrop that this study sought to establish the socio-economic determinants of food insecurity with the desire to establish pragmatic strategies that can make food insecurity a thing of the past. The objective of this study was to establish the socio-economic determinants of food insecurity at household level in Makueni County while the hypothesis that was tested was that there was no significant influence of socio-economic factors to food insecurity at household level in Makueni County.

II. METHODOLOGY

This research was undertaken in Makueni County, Kenya. The map of the region is as shown in appendix 1. This county was purposively selected because it falls within the ASAL regions of Kenya. The county is a representative case of low to medium potential areas and with many households involved in small-scale farming but most often faced with food insecurity. According to GOK (2013) and Government of Makueni County (2019), the region mainly lies within Agro-ecological zones 4 and 5 where crop failure is usually three times out of five seasons. Within these zones, communities are mainly agro pastoralists.

Makueni County receives very little and erratic precipitation that varies year to year making it difficult for farmers to plan their farming activities. The lower side which is very dry receives rainfall as little as 300 – 400 mm. The area experiences an increasing shift from sorghum and millet growing in preference for maize, which is the main staple crop. Aridity of this county has negatively affected agriculture which is the main economic activity (GOK, 2013).

Makueni County has two rain seasons: the long rain season (April to June) whose average is 329.3mm and the short rain season (October to December) whose average is 372.4mm. The highest temperatures are usually in February (24.6°C) while the lowest are in July (20.2°C). High temperatures of up to 35.8°C are experienced in the low lying areas causing high evaporation which worsens dry conditions. The region has also experienced climate change and variability as a result of human activities such as farming on the top hills and burning charcoal among others. This has contributed more to crop failure and thus increased problem of food insecurity (GOK, 2013).

Tin terms of research design, the study relied on descriptive research design. This design was used to collect data using a questionnaire that was administered to a sample of farmers in Makueni County. This helped to capture various variables that influence food insecurity among households in the county.

Considering food security as a dependent variable, its relationship was considered alongside various aspects of the independent variables, that is, socio-economic determinants of food insecurity. Food security was understood in terms of food production as well as ability to pay for available food stuff.

The target population was considered as the county's 144,320 households based on the 1999 population census. Therefore, a sample of farmers was drawn from the 144,320 households and provided information on the socio-economic variables contributing to food insecurity. The sample size for the (households) was determined by using Yamane (1967) formulae as shown below:

$n = N/ (1+Ne^2)$
Where n = Optimal size
N = Total number of respondents in the largest population
e = The probability error or significant level; in this study e = 0.05

Thus, since the total number of households is 144,320, then the sample size is:

$144,320/ 1+ 144,320\times(0.05^2) = 398.9$ households $\approx$ 400 households

Therefore, a sample of 400 farmers (households) was used to acquire the required information. A proportion of at least 66 households was selected in each of the six sub-counties in Makueni county.

Data was gathered using the semi-structured questionnaires. The questionnaire was administered by the Research Assistants who were recruited for this purpose. In addition, Photographs and Observation schedule were used to supplement the questionnaire in data collection and also to record the information.

After data collection, the responses were coded and entered for analysis using Statistical Package for Social Scientists (SPSS). Descriptive statistics such as the means, modes, percentages frequencies and correlations were derived to determine households' responses on socio-economic variables influencing food insecurity. Both Chi Square (χ^2) and regression/logit model were used to establish relationships between the various dependent and independent variables as stated in the hypothesis. The model was used to determine how food insecurity relates to a set of predictor variables, that is, the determinants to food insecurity.

III. FINDINGS AND DISCUSSIONS

The objective of the study was to establish the socio-economic determinants of food insecurity at household level in Makueni County. A number of aspects were examined and the findings indicate that there are many factors that influence food insecurity in Makueni county. These are discussed in the sub-headings that follow.

Respondents' Land Size in Acres

Land size is one of the variables that was examined to establish its influence on food insecurity. The respondents were asked to indicate their land sizes in terms of acre. The study revealed that, 123 (31%) respondents owned 1 acre of land, 69(17%) owned 1.5 acres, 57(14%) owned 2.5 acres, 36(9%) owned 2 acres, 33(8%) owned 3 acres, 26(7%) owned 4 acres, 18(5%) owned 6 acres, 13(3%) owned 10 acres of land, 12(3%) owned 0.5 acres, 8(2%) owned 7 acres and 5(1%) owned 5 acres of land. This implies that respondents who owned between 1.5-10 acres of land were more likely to engage in farming activities that would produce sufficient food to sustain their households and some to be sold in the market. However, those with less than 1.5 acres of land (about 34%) would not manage to significantly produce sufficient food due to the small size of the land.

Respondents' Land Tenure

With regard to the respondents' land tenure system, the findings are shown in Figure 1

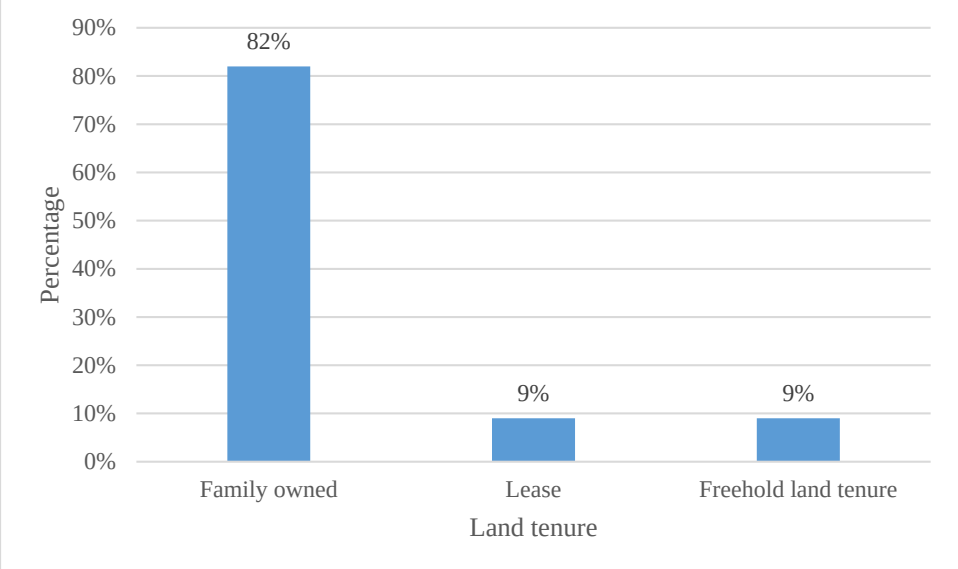


Figure 1: Respondents' Land Tenure

According to the study findings, 328 (82%) of the respondents indicated that the land they had was family owned, 35(9%) indicated they owned the land through leases while another 37(9%) indicated they owned it through freehold means. The results indicate that a bigger portion of the land was family owned and therefore the respondents did not incur leasing costs on land.

Main Activities Undertaken on Land

The main activities that were undertaken on the land by the respondents were examined, with 5 being the main activity while 1 was the least activity. The findings are shown in Table 1

Table 1: Main Activities Undertaken on Land

Main Activity	1		2		3		4		5	
	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc
Cash crops	229	57.3	96	24.0	37	9.3	25	6.3	13	3.3
Food crops	49	12.3	12	3.0	48	12.0	85	21.3	206	51.5
Grazing	49	12.3	217	54.3	85	21.3	49	12.3	0	0.0
Wood lot	296	74.0	39	9.8	13	3.3	39	9.8	12	3.0

The findings indicate that 296(74%) and 229(57.3%) of the respondents indicated that the land was least used for wood lot and cash crops respectively. Also majority of the respondents 206(51.5%) indicated that the land was used for the cultivation of food crops. Another 217(54.3%) of the respondents indicated that land was slightly used for grazing purposes. This means that the major activity on the land was food crop farming.

Proportion of Land set aside for Food crops

On the issue of the proportion of land that was set aside by the respondents for the cultivation of food crops, 65 (16%) of the respondents revealed that they had set aside 0.4 acres of land for production of food crops, 58(15%) set aside 0.125 acres, 51(13%) set aside 0.75 acres, 47(12%) set aside 0.5 acres, 38(10%) set aside 1.5 acres, 33(8%) did not set aside any land for food crops, 26(7%) set aside 0.25 acres, 17(4%) set aside 3.5 acres of land, 14(4%) set aside 3 acres, 8(2%) set aside 1 acre and 2(1%) set aside 4 acres of land for cultivation of food crops. The findings imply that very little land had been set aside for the cultivation of food crops with most respondents only setting aside land between 0-0.75acres for the food crops which may contribute to the food insecurity situation in Makueni County.

Proportion of Land set aside for cash crops

The respondents were asked to indicate the proportion of land that they set aside for the cultivation of cash crops. Based on the findings, 122 (31%) of the respondents revealed that they had set aside 0.2 acres of land for production of cash crops, 77(19%) set aside 0.25 acres, 68(17%) set aside 5 acres, 43(11%) set aside 1.5 acres, 39(10%) set aside 1 acre, 22(6%) set aside 0.5 acres of land for cash crops, 16(4%) set aside 4 acres, 7(2%) set aside 10 acres of land, and 6(4%) set aside 6 acres of land for the cultivation of cash crops. The findings imply that very little land had been set aside for the cultivation of cash crops which means that the respondents have not benefitted much from income generated from cash crop production and therefore they lack supplementary income for purchase of food. Using the observation schedule, the study established that some cash crops are grown in the region. From to the observations, majority of the farms, 351(88%) had mangoes, while 33(8%) had coffee as the cash crop grown in the farms. The findings therefore indicate that mangoes and coffee were the major cash crops in Makueni County.

Statements on socio-economic factors that mostly contributed to food insecurity at the household level

The respondents were asked to indicate and rank various statements on indicate and rank the socio-economic factors that mostly contributed to food insecurity at the household level with the ranks; Strongly Agree (S.A), Agree (A), Don't Know (D.K), Disagree (D) and Strongly Disagree (D.S). The findings are indicated in Table 2.

Table 2: Statements on socio-economic factors that mostly contributed to food insecurity at the household level

Statements	SA	A	DK	D	SD	N	Mean	Std. Dev
I do not have adequate land for food production to cater for my family	156	184	0	48	12	400	4.06	1.067
High cost of inputs limits adequate food production for my family	111	253	0	36	0	400	4.10	0.793
I do quick sale of my harvests to address other non-food family requirements such as paying school fees and medical care	48	255	0	37	60	400	3.49	1.256
Most of my food crops are destroyed by pests	36	144	24	136	60	400	2.90	1.286

I am not able to produce enough food for my family due to high cost of farm inputs	84	280	0	24	12	400	4.00	0.850
I am not able to produce enough food for my family due to lack of extension services on farming and grazing	180	171	0	13	36	400	4.12	1.175
I am not able to produce adequate food for my family as it is large in size	122	193	0	0	85	400	2.40	1.130
A lot of household income is wasted by my spouse in alcohol and/or tobacco consumption	36	62	0	73	229	400	2.01	1.417
I am not able to do good farming due to lack of credit facilities	126	238	0	12	24	400	4.17	0.748
I am not able to do good farming due to my old age	36	36	12	183	133	400	2.15	1.231
Lack of access for market for my farm products	12	243	12	85	48	400	3.22	1.174
Lack of information on weather and climate variability	86	266	0	24	24	400	3.92	0.995

From the findings, in Table 2 above, majority of the respondents strongly agreed with the statement that they were not able not able to produce enough food for their families due to lack of extension services on farming and grazing with a mean score of 4.12. Majority of the respondents agreed with the statements that they did not have adequate land for food production to cater for their families, the high cost of inputs limited adequate food production for their families, they quickly sold off their harvests to address other non-food family requirements such as paying school fees and medical care, most of their food crops are destroyed by pests, they were not able to produce enough food for their families due to high cost of farm inputs, they were not able to produce adequate food for their families as they were large in size, they were not able to do good farming due to lack of credit facilities, lack of access for market for their farm products and lack of information on weather and climate variability contributed to food insecurity at the household level with mean scores of 4.06, 4.10, 3.49, 4.00, 4.12, 2.40, 4.17, 3.22 and 3.92 respectively. Majority of the respondents strongly disagreed that a lot household income was wasted by their spouses in alcohol and/or tobacco consumption with a mean score of 2.01.

The hypothesis for the socio-economic determinants of food insecurity is: There is no significant influence of socio-economic factors to food insecurity at household level in Makueni County. This hypothesis was tested based on chi square. Data for the socio-economic variables were put in a contingency table as shown below in Table 3

Table 3: Contingency table for socio-economic factors & food insecurity

Contingency table for socio-economic factors & food insecurity				
		Effect		
		Present	Not present	Total
land size	Observed Outcome	26	18	44
	Expected Outcome	22	95	117
family size	Observed Outcome	12	61	73
	Expected Outcome	42	27	69
communication on weather and climate	Observed Outcome	34	22	56
	Expected Outcome	81	11	92
availability of markets	Observed Outcome	32	67	99
	Expected Outcome	7	74	81
Capital and technology	Observed Outcome	29	99	128
	Expected Outcome	7	34	41
Total	Observed Outcome	133	267	400
	Expected Outcome	159	241	400

X^2=15.001 d=5 $p=0.05$ Critical value=12.924

H_0: There is no significant influence of socio-economic factors to food in security at household level in Makueni County

The Chi square analysis for this variable $\{X^2=15.001\}$, revealed that there was a significant relationship between socio-economic factors and food insecurity at household level in Makueni County. This means that the more effective socio-economic factors, there exist a likelihood of food security. The null hypothesis that socio-economic factors was not significantly related to food insecurity was rejected. This statistical test was significant at $p<0.05$, meaning that the relationship observed was not likely to have been contributed by chance of random sample.

Relationship between Social Economic Determinants and Food Insecurity

Further analysis of the first objective of the study (to determine the influence of social economic determinants on food insecurity) was done through test of hypothesis using regression/logistic model. The hypothesis was:

Hypothesis 1:

H_0: There is no significant influence of socio-economic factors to food insecurity at household level in Makueni County.

H_1: There is a significant influence of socio-economic factors to food insecurity at household level in Makueni County.

For this regression model, food insecurity was the dependent variable while social economic determinants were the independent variable. The results of the analysis are as shown in tables 4 and 5.

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.607[a]	.565	.563	.89132

a. Predictors: (Constant), Socioeconomic

Table 5: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	62.703	1	62.703	78.926	.000[b]
	Residual	316.192	398	.794		
	Total	378.894	399			

a. Dependent Variable: Food Insecurity
b. Predictors: (Constant), Socioeconomic

From the results shown in the Table 4 above, the R square is indicated as 0.565 which is an indication that the independent variable (socio-economic determinants) explain 56.3% of food insecurity with 43.7 percent unexplained.

From the results shown in Table 5 above, the significant value (P=0.000) indicates the presence of a strong significant association between the predictor variable (socio economic determinants) and dependent variable (food insecurity). The P-value of 0.000 which is less than 0.05 signifies that the model of food insecurity is significant at the 5 percent significance level. Therefore, the alternative hypothesis is accepted, that is; there is a significant influence of socio-economic factors to food insecurity at household level in Makueni County

From the results of socio-economic determinants of food insecurity, it is clear that the elements of food insecurity at household level are numerous. Apart from the bio-physical variables such as rainfall, the results revealed that socio-economic factors that influence food insecurity in the region are many. These include the land size, income levels, availability of markets, technology, access to information on weather and climate, destruction by pests, and lack of extension services. The demographic variables that seemed to have a bearing on food insecurity in the region include family size, gender, marital status, income, number of dependents, age and education level among others. Some of these findings are upheld by studies such as Rose, (1999), Ramsey, et.al (2016), Loopstra, (2018) and Iheoma (2020). Wambogo, et.al (2018) in their study on, "validity of the food insecurity experience scale for use in Sub-Saharan Africa and characteristics of food insecure individuals" also adds points out to the fact that food insecure individuals tend to be characterized by lower incomes, high dependency levels indicated by having many children, lower education attainment, lived in rural areas, were women and were older adults. Although the results of these studies are not generalizable, they do in one way or the other validate some of the socio-economic variables influencing food insecurity that the current study found out.

IV. CONCLUSION

In conclusion, the study established that there are a number of socio-economic factors that influence food insecurity in the study are. These include land size, capital, family size, and education level among others. Whereas bio-physical factors cannot be ignored as determinants of food insecurity especially in the ASALs, effort should also be put to ensure that socio-economic constraints affecting food insecurity are fully addressed. With over 75% of the households engaged in farming but still remaining food insecure, it is important that a paradigm shift be embraced. Food security can be enhanced if the households are also well supported to engage in non-farm activities that can generate income and savings which they can in turn use to purchase food. With a stable source of income, households can manage to offset the impending consumption balance and therefore remain food secure.

V. RECOMMENDATIONS

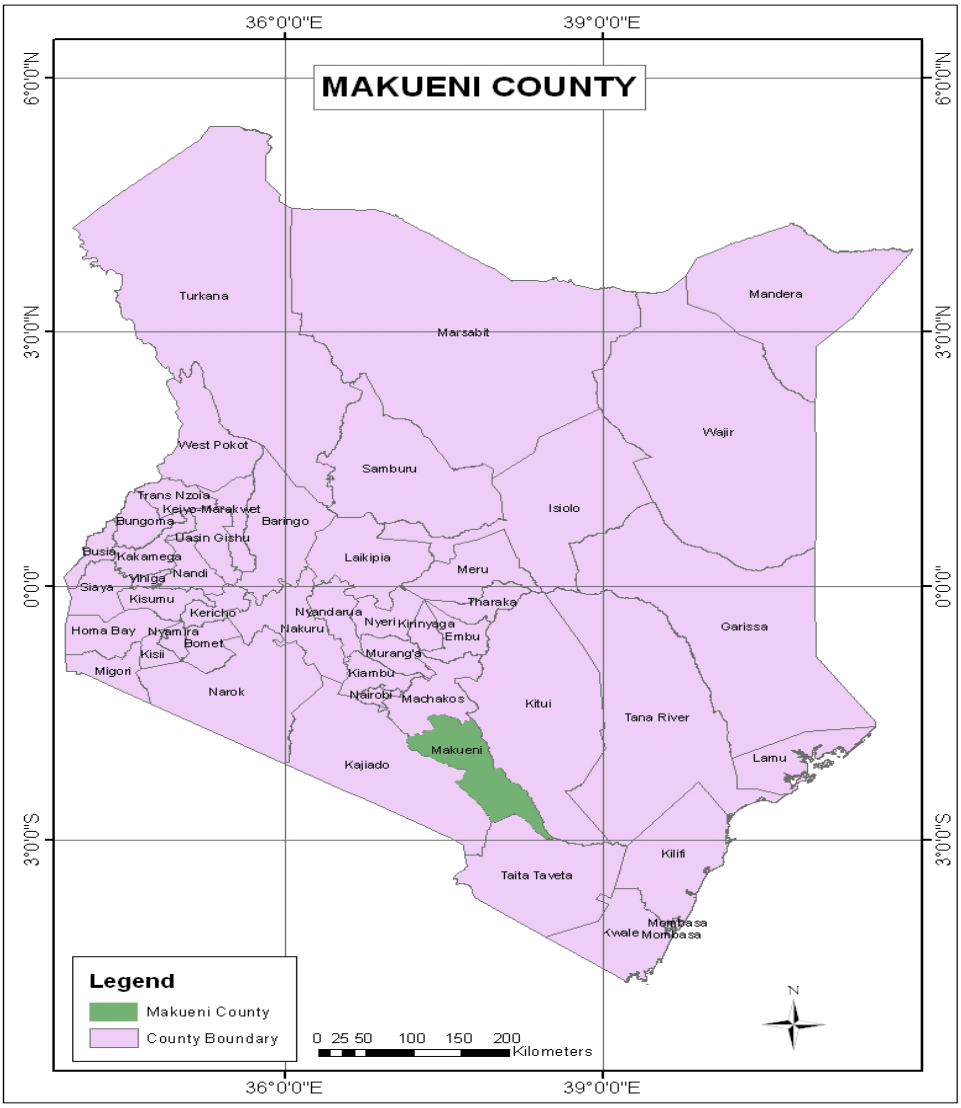
In the light of the findings from the study, it is clear that the socio-economic variables influence food insecurity in the region. Consequently, measures should be taken address the factors that influence food shortage in Makueni County. This study therefore recommends that efforts be put to improve access to credit and train farmers so that they can be able to do better investment in their farms. Policies that will make microcredit from government and nongovernmental agencies accessible to rural farmers will go a long way in addressing their resource acquisition constraints and eventually improving household food security in the county. It is also imperative to promote non-farm activities as alternative livelihood options for the households in the area. The study

recommends that Makueni County should endeavour to take into cognizance and put in place enhanced fruit factories so as to ensure that there is adequate storage of fruits even after fruit harvesting season. This will ensure that adequate food security is inculcated in the county's inceptions.

Institutions which foster agricultural research and extension and efficient land use, should also receive priority attention in policy making at both the national and the county governments so that their role of enhancing support to the households can be well integrated and enhanced.

Finally, the local government should be encouraged to partner with Information Technology experts to come up with techniques such as farmer to farmer Short Text Messages (SMSs), market prices for food crops, weather updates and harvest season. This will enable farmers to acquire up to date information that can enhance their food production, harvest and sale of their produce without incurring losses.

APPENDIX 1: Map Kenya highlighting Makueni County



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