FOOD INSECURITY IN ARID AND SEMI- ARID LANDS (ASAL) IN AFRICA (PAID)

Emoit Peter O. Imatari
College of Biological and Physical Sciences
Institute of Climate Change and Adaptations (ICCA)
University of Nairobi, Nairobi, Kenya
pemoit79@gmail.com

&

KANU Ikechukwu Anthony
Department of Philosophy and Religious Studies
Tansian University, Umunya
Anambra State
ikee_mario@yahoo.com

Abstract

The purpose of this study was to establish the causes of perennial food insecurity in the households of Evurore Division. The study identified root causes of food insecurity and established the challenges experienced and how households cope with these challenges in Evurore Division, Mbeere North Sub County, Embu County. The study was guided by farmer first theory developed by Chambers et al and the theory of diffusion of innovations of Everett Rogers. Chambers theory is centered on participatory approach. To achieve its objectives, the study employed qualitative and quantitative methods of data collection. This gave the researcher an avenue for a deeper investigation into the causes of food insecurity and what can be done to alleviate it. The respondents of the study were 95 HHs while the stakeholders had 10 respondents. The data collection tools employed were, questionnaires, interviews, Focus Group Discussions and interview guide. Findings of the research are most of the HHs still use indigenous methods of farming as compared to the minority using modern. Still majority still use indigenous crops. The root causes of food insecurity in Evurore were identified. The study recommended participatory approach, linkages, adoption of new varieties of drought tolerant crops, irrigation and extension services.

Introduction

The history of ASAL development projects in Kenya has largely been engulfed by failure in most cases and a few success stories in some, yet the problem of food insecurity in the ASALs or dry lands has not been solved. This is because communities in ASAL areas experience famine every year as there is acute

shortage of food due to recurrent droughts in the dry lands. This takes place in the full glare of the International Non Governmental Organizations (INGOs), Faith Based Organizations (FBOs), the government (which has set up a ministry that is in charge of ASALs, research institutions and development partners that have intervention measures of making ASAL productive. With all these measures and considerable expenditure on humanitarian emergency response (Lappe, 1986, 12), research, policy formulation and development programs, famine and poverty still affect the people living in ASALs unabated. Communities in these areas are therefore prone to perennial poverty. The main objective of this study was to establish the causes of food insecurity in Evurore and how it can be improved. The specific objectives of this study are: to improve the agricultural methods of the people for generating better agricultural productivity; to promote conservation agriculture and agro-forestry for improved livelihoods; to improve post-harvest handling through good storage and to improve food preservation methods.

Background to the area of Study

Evurore is a division of Mbeere North Sub County, Embu County. The division is made up of three locations, that is, Ishiara, Kamarandi and Ndurumori and is classified as a mixed marginal forming zone. The area is surrounded by four rivers; that is, river Thuci on the North West part, rivers Tana and Mutonga on the East, and river Ena, a seasonal tributary on the Western part of the Division. The population of the community here is estimated to be approximately 45, 582 people (GOK, 2009).

The community is agro-pastoral. Its agricultural food production is dependent on the rain fed agriculture. The crops grown are cereals, that is: maize (*Zea mays*), sorghum (*Sorghum bicolor)* and pearl millet (*Pennisetum glaucum*), legumes, that is, cow peas (*Vignaun guiculata*), pigeon pea (*Cajanus cajan*) and green grams. When there is good rainfall, these crops do well and people do get good harvests. This is dependent on two rainy seasons, that is, *Muratho* (October-December) and *Ndikithi* (March- May). There is a lot of planting during the October-December rainy season. The only disadvantage is the cultivation method used. It is still traditional. The open fields are burnt and seeds broad cast unevenly. According to Oduol (2001), the people are close to nature and getting a living from nature; the people in ASALs therefore learn the habits of other creatures (animals, insects, birds) and relate them and their shapes, substance and colors of organic life to their own. They therefore, utilize these indicators to predict environmental

changes, monitor food production systems and plan subsequent activities for implementation (Oduol, 2001). Liwenga (2009) calls this coping mechanism amidst the challenges resulting not only from the consistent drought but also from other factors such as politics, government policies, social-economic uncertainties and ecological climate change.

Pastorally, the community rears livestock and people depend almost entirely on their livestock for subsistence food requirements, dowry, clothing and education (Field, 2005). This is done mainly by selling of livestock products in exchange for agricultural goods. Majority of the livestock kept, therefore, are indigenous breeds. The livestock found in Evurore are: cattle, sheep, goats (*Galla and East African goat)* and donkeys. The products traded for food include milk, ploughing for those who have bulls (during the planting season), manure, skins and hides and transport for those who have donkeys. The donkeys carry water and food, trade goods such as firewood and charcoal (Field, 2005). In Evurore, people rear goats because of their browsing nature, they are small in size and, require low initial investment, high reproductive rates and short generation interval, offering early maturity to early investment (Kilongozi et al., 2006) and above all almost every family can afford at least 5-10 goats. Capable HHs can have 50 and above. The goats are frequently taken to the market during dry period to generate cash for the purchase of cereals to supplement declining milk yields (Field, 2005) and other needs as pointed out above.

Presently, the livestock are an economic, socio-cultural entity on which most of the people depend. That is, they depend on livestock production including: meat, milk, skin and hides (Ronnie, 1993), that acts as an alternative livelihood. The livestock in turn, depend on the vegetation that is tied to the seasonal cycle (Denga, 2001).The performances of these breeds in terms of growth rate and milk production are very low (Egessa et al., 2006) due to overstocking and overgrazing. To improve productivity Egessa et al (2006) proposes that there is need for cross-breeding between the high performing exotic breeds with adapted indigenous tropical breeds. The breeds for cross-breeding include: Toggen Berg, Black Bedouin (ASAL) and German Alpine. The improvement will help in poverty alleviation and increased food security among poor farmers (Egessa et al., 2006), hence providing improved nutrition especially for children. The challenge is always lack of characterization and documentation (inventory that is up to date) of indigenous breeds. In addition there is also lack of information as far as policy and legal frame work are concerned.

Economically, there is a well established market (Ishiara) that is well linked to other districts (Meru South, Mwingi, Embu and TharakaNithi). It is in this market that the community sells and buys their commodities (sale of charcoal, agricultural products, livestock and casual labor and some receive remittances). The land ownership is private but for the grazing and browsing of the goats, one can take his or her animals anywhere for grazing, though this is changing. Environmentally, there is poor management as there is a lot of sand harvesting and felling down of trees for wood fuel and charcoal. This is also a major source of income for most of the HHs.

Agriculturally, Evurore is good for cereals and pulses. The people mostly prefer millet, green grams and cow peas. The yield depends on the amount of rainfall. When there is enough rains the yields are also good and HHs do harvest close to 3-9 sacks of 90kg of each crop. The agricultural products are both for subsistence and sale. The challenge faced normally is postharvest handling. Most of the HHs sell their products at a throw away price to middlemen who exploit them after two months by selling the same products at exorbitant prices. What make them sell the crops almost immediately after the harvest are the pressing needs: school fees, toiletries, paraffin, and salt and cooking fat.

The main factors affecting food security in Evurore are frequent drought that leads to poor crop yields and loss of livestock, inadequate water sources, land degradation due to poor farming methods and lack of good post harvest handling. Drought has been singled out as a significant recipe for food insecurity in ASALs. An effective approach should address availability, affordability of food at HH level among other factors. A good small scale farming approach should be progressive and based on good farming methods, technical inputs and agricultural innovation while good smallholder irrigation provides the HHs in Evurore with water. An effective conservation method provides for good production, while a good storage and preservation structures and knowledge provide a good safety net.

Research Methodology

This section gives the overall design and methodology that was used to meet the objectives of the study. These include research design, location of the study, target population and population sample. The instruments used to identify causes of food insecurity were structured questionnaires, focus group discussion

and semi structured interviews. This would also delve into validity and reliability and ethical considerations.

1. Research Design

This section describes the pattern that the research follows (Oso and Onen, 2009). The researcher chose to use the mixed method design to get qualitative and quantitative data. This method enabled the researcher to get an overview on the causes of food insecurity in Evurore division. The respondents were therefore questioned, observed and discussions on HH food production were held based on the farmer first theory. This was achieved in the Focus Group Discussions by the use of Participatory Rural Appraisal method (Chambers, 1983). With this method (participatory approach), the respondents participation was realized as they brought out the problems. In the FGDs, the researcher engaged the community in group evaluation of crops that do well in ASALs with their characteristics like: high yield, maturity, adaptability to different soil fertility conditions, tolerance to drought, resistance to storage pests and stability of yield (Chambers, 1983). This was done by the use of seasonal calendars and historical timeline.

2. Target Population

The target population comprised 100 HHs within the four zones and 15 stakeholders. These are different agencies (USAID, Child Fund, Compassion International, Trocaire, a d Nap Kenya) working in Evurore. They carry out different activities to improve the livelihoods of the people through their interventions. The HHs were targeted because they are the ones who are directly affected by the effects of drought and they are the ones involved in crop production. The stakeholders on the other hand were targeted due to the activities they carry out in Evurore.

3. Sampling Technique and Sample Type

Cluster sampling was used to select the four zones as the area was vast. The respondents for structured interviews were therefore selected randomly (Lucey, 2002) from these zones (Ishiara, Kyenire, Kigwambiti and Ciangera). The steps of cluster sampling were therefore employed: identification of the population and listing of the population according to the defined subgroups (Mugenda and Mugenda, 2003). A total of 100 HHs and 15 stakeholders working in Evurore were selected from the zones. The stakeholders were identified as project holders. Those from government line ministries were able to explain how they work with the HHs.

4. Data Collection Instruments

The researcher used structured interviews whereby key informants (opinion leaders) were identified and interviewed in groups and at individual level. This helped in group evaluation of crops that do well and those that perform dismally in ASALs. The farmers were therefore to characterize the preferred type of crop variety (Chambers, et al, 1983). The categorization was as follows: high yielding, maturity, adaptability to different soil fertility condition or fertilization, tolerance to drought, resistance to storage pests and stability of yield.

5. Validity and reliability of the research Instruments

According to Mugenda and Mugenda (2003), validity is the accuracy and meaningfulness of inferences based on the research results. The validity of the research was guaranteed by the data collected. Criterion-related validity was therefore used to measure the HHs practice of the new farming methods and new crop varieties introduced. Reliability on the other hand is a measure of the degree to which a research instrument yields consistent results or data after repeated trials (Mungenda & Mugenda, 2003). The instruments in this study proved reliable after a pilot interview done with the field assistants.

6. Data Collection Procedure

After being cleared by the administration of the college, the researcher was issued with a letter authorizing him to carry out the research in Evurore. He also sought the permission and assistance of the provincial administration to be allowed to move from village to village to collect data. The researcher sourced the help of field assistants who were taken through the objectives and questionnaires of the study and how to conduct the interview. Terms of reference between the researcher and the field assistants were made as they defined the scope of the research and give a detail of items required by the researcher (Mugenda and Mugenda, 2003). To gauge them, a pilot interview was done in two HHs and each took 30-40 minutes.

7. Data Analysis Procedures

This is the examination of the data collected from the field (Mugenda and Mugenda, 2003). It involves uncovering the underlying structures, getting important variables and discovering any underlying assumptions Kombo and Tromp (2006). Scientific Package for Social Scientists (SPSS) was used to analyze

the data collected from the questionnaires. The process of data analysis started in the field whereby at the end of everyday notes were looked and compared. Data from the open ended questions informed the interviews and the FGDs as they proffered much to the core of the problems. Data from the FGD were analyzed from the notes made while in the field. Careful interpretation was done to make qualitative data.

8. Presentation of the Findings

The findings of this study were presented in different forms after analysis: tabular form and pie charts. Both the tables and pie charts were drawn from the SPSS. This was done to provide the accuracy in data presentation. The researcher interpreted the data and presented it by the use of SPSS.

9. Data Analysis

Four questionnaires were issued to the participants: one was for direct HHs, the other for the stakeholders working in Evurore; last but not least, one was for FGDs for Ciangera, Kyenire and Kigwambiti Zones. Ishiara Zone had a different FGD questionnaire due to its access to water. It was therefore used as a control to treat the other zones. The questionnaire to the HHs had 8 parts: HH size, size of land owned and cultivated types of crops grown, farming methods used and new farming methods introduced, soil and water conservation methods, varieties of new crops grown and finally the method of post-harvest handling as far as storage is concerned. It also had a part on if the development agencies working in Evurore had brought change and lastly on faith. 100 questionnaires were therefore issued to 100 HHs and 95 questionnaires were filled appropriately and returned representing 95%. The second questionnaire was for the stakeholders and it had three parts: background information, activities and target groups and strategic approaches that they were using. A total 15 questionnaires were therefore issued to 15 stakeholders and 10 were returned constituting 67%. It is good to note that some of the open ended questions were used to back up in probing for more information from the closed ended questions. Different variables were compared during the data analysis so as to get the core of the matter on the subject studied.

The Interplay of Soil and Water Conservation

The two components are very important for successful farming. In ASALs, most of the soils are washed away when the rains come and trees have been cut for charcoal burning. This now leaves the soil to be burnt by the direct sun hence making it difficult for the infiltration of water to sustain the growth of the crops.

The sun also burns the nutrients and microorganisms which help break the organic matter that release nutrients, which the soil needs for plants to take up (TOF, No. 80, 2012). It is for this reason now that the researcher sought to find out if the farmers in Evurore were conserving soil and water.

Training on Soil and Water Conservation Methods

Table 6: Soil and water conservation methods

	Frequency	Percent (%)
No	15	15.8
Yes	80	84.2
Total	95	100.0

The purpose of this part was to find out if the farmers had knowledge on how to improve soil nutrients and water conservation and practiced the same for the purpose of retaining water when the rains are over. From the findings it was realized that 84.2% of the households confirmed that they were trained on soil and water conservation methods against 15.8% of them stated that they had not been trained. The households were trained on furrows, manure, miconjo (trenches), terraces, tree planting and digging trenches as the methods of soil conservation. After training 18.6% (a representation of Kyenire, Kigwambiti and Ciangera zones) of them introduced none of the new methods of soil conservation they were trained on, 4.3% of them introduced cover and stone lines new methods of soil conservation respectively, 1.4% of them introduced earth dams, gabions and use of stones methods of soil conservations respectively, 5.7% of them introduced planting trees methods, 2.9% of them introduced mulching method and 60% of them introduced terraces methods. In the literature review, we saw some proponents vouching for capacity building which is training. The researcher was not therefore able to establish why there was no improved food production in spite of the trainings as shown by the study. He therefore assumed that it could be because of the top- down approach used. If this is true then Chambers view that the knowledge of the people is normally ignored by the implementers is true (Chambers, 1983).

Crop Varieties

Many researchers agree that ASALs require crops that are tolerant to their harsh weather conditions. However, it is not sometimes easy to determine which crops and above all if the people in ASALs will accept them. It is therefore in this respect that the researcher sought to find out if the farmers in Evurore, which is classified as proper for mixed marginal have adopted the new crop varieties.

New crop varieties

Table 7: New Crop Varieties Compared to Indigenous

	Frequency	Percent
No	31	32.6
Yes	64	67.4
Total	95	100.0

The researcher sought to know if the new crops varieties were doing well in Evurore as compared to the indigenous. The results of the study indicated that 67.4% of the households confirmed that new crop varieties were performing better than the indigenous crop varieties against 32.6% of them who disagreed with this statement. The new crop varieties that were doing better than the indigenous species were as follows: cowpeas, green grams, maize, millet, sorghum, sweet potatoes and tomatoes.

Storage of Crops after Harvest

Storage of food after harvest is the biggest challenge not only facing farmers in Evurore, but in Kenya as a whole. When the rains are favorable, the farmers do get good harvest, but almost all of it is lost due to lack of storage facilities. Most of the farmers therefore lose their harvest to either middle business men who exploit them or pests. It is in the light of this that the research wanted to find out how the farmers in Evurore store and preserve their crops after harvest.

The study sought to identify if the HHs had introduced the new post harvest storage method. The study found out that 95.8% of those who preserved their food crops in an indigenous way did not use new post harvest storage methods introduced while 4.2% of them used sacks as a new post-harvest storage method introduced. The 46.5% of those who used modern (exotic) ways of preserving food crops after harvest did not used any new post-harvest storage methods introduced, 38% of them used pesticides, 7% of them used sacks while 8.5% of them used silos method. In total, 58.9% of them did not use any new post-harvest storage methods introduced, 28.4% of them used pesticides while 6.3% of them used sacks and silos methods respectively. This confirms the findings in the literature and the hypothesis that the lack of post- harvest handling contributes to food insecurity.

Change of Life through Food security based Projects

When the respondents were asked whether the intervention of the development agencies had brought change to their lives as far as food security is concerned, the majority77.9% of the households agreed that the FBO's, CBO's and NGO's working in Evurore had brought change through food security based projects against 22.1% of them who disagreed with this statement.

Table 9: Impact of the Projects

	Frequency	Percent (%)
No	21	22.1
Yes	74	77.9
Total	95	100.0

According to the study, 22.1% of the respondents said that the projects had no impact on their lives. This is because most of them were in the category of the better offs. In the FGD, it emerged that the agencies' works had brought change to the livelihood of different HHs. From the interventions their lives changed through the trainings they got on soil and conservation methods, better farming methods and agro-forestry. These trainings made them get good products that increased their wealth and made them move on. When they were in need, the emergency interventions saved them. But how did the development agencies achieve this? They did make changes through their interventions. 1.4% of the households mentioned BAC, Child Fund, DOE, Government and Nap K respectively as either the FBO's, CBO's or NGO's working in Evurore, 2.9% of them mentioned CDC, 7.2% of them mentioned Compassionate and JICA respectively while 75.4% majority mentioned Trocaire. When asked on the consequence of their departure majority said they will can on with the activities while a minimal number of HHs said they will stop from where they left as shown in the graph below.

Extension Services

Table 10 : Extension Services

	Frequency	Percent (%)
No	28	29.5
Yes	67	70.5
Total	95	100.0

The study found out that 70.5% of the HHs received extension services while 29.5% said did not receive the extension services. Even though 70.5% said they receive extension services, there is need to spread them to other zones as this appears to be concentrated in Ishiara zone to improve their capacity in farming production and agri-business. When asked what type and which organization carries them out, the respondents answered as shown in the pie chart below. The greatest challenge is that the extension model is impeded by bureaucracy and professional visits and pay (White, 2008). This now explains why extension services are concentrated in Ishiara zone as compared to other zones.

4.4.6 Climate Change

Table 11: **Climate Change**

	Frequency	Percent (%)
No	21	22.1
Yes	74	77.9
Total	95	100.0

Climate change according to Yengoh (2012) has an effect in agricultural production hence making food production an emergency that calls for a variety of policies and creative solutions at global, regional and local levels. The researcher, therefore, sought to know if the respondents had any knowledge on climate change. The study found out that 77.9% of the respondents knew something about climate change while 22.1% knew nothing. The knowledge was on the effects of climate change which they cited as: erratic patterns of rainfall, cold and humidity that used not to be there. They also pointed out that something was being done to mitigate the effect, that is; they were encouraged to plant early, plant drought tolerant crops, plant trees and advised not to fell down the trees for charcoal burning.

The Stakeholders working in Evurore

The study found out that 30% of the stakeholder organizations working in the area are INGOs, 50% are governmental organizations, while 20% are CBOs. The study also found out that 10% of the stakeholders were involved in humanitarian activities, 50% are involved in both humanitarian and development activities, and 10% were engaged in other activities like the advisory role and passing of government policies to the people. Majority (40%) of the stakeholders therefore

started their operation Evurore as early as 1963 while others (10%-20%) started their operations between 1986 and 2005.

In the stakeholders' areas of operations they always trained people on different things. The study found out that 90% trained on new agricultural or farming methods while 10% did not, but are mainstreaming the agricultural components in their operations. These stakeholders trained their target population on new farming methods (10%), capacity on soil conservation (20%), others (60%) while 10% said that they trained people on all the above as shown in the table below. The training was done through the *barazas* and public holidays, through field days, linking the people to the organization and post- harvest handling. In the provision of services, the study found out the following: the NGOs of which include Trocaire, Child Fund, Compassion International offered 40.1% services as per the HHs, the government and her line ministries (MOA, MOL) offered 24.3% services while the CBOs and CDF rating was at 1.1% respectively. The rest, that is KARI and JICA performed at 2.1% and 1.1%.

1. Trocaire

Trocaire is an Irish charitable organization of the Catholic Church. It works with local NGOs and CBOs on development and humanitarian work underpinned by social justice (Healy 2013). It started working in Ishiara in 1996, responding to famine emergencies. They therefore provided relief food whenever acute famine broke. The target groups were children, adults, persons with special needs, etc. However, in the year 2006 and 2007 they changed their approach to long term projects with the goal of improving the livelihoods of the people through their ARP program that is involved in the following activities: livestock improvement, NRM (water and environment), sustainable agriculture (provision of seeds of tolerant crops, irrigation and soil conservation) and lastly, they had mainstreamed hygiene, HIV and Aids, Youth and women empowerment. In sustainable agriculture, Trocaire successfully introduced the new crop varieties in the whole division which has led to high yield. The causal factors for the improvement in good yields from the new crop variety are attributed to training, sensitization on the importance of early planting, irrigation farming where so far Trocaire has targeted 300HHs for smallholder irrigation and finally working together with line ministries and the community. These 300HHs have also been trained on land and water use and taken through the policies. The only challenge is that some HHs still practiced indigenous farming.

2. Diocese of Embu Caritas

This has been working in Evurore since 1986. It has Integrated Rural Development Program (IRDP) for dry lands whereby they build the capacity of the farmers on sustainable agriculture and animal husbandry. They are majorly concerned with goat milk production through the introduction of hybrid goat species and cross-breeding them with the local breeds. Their projects are people oriented and with the community based approach (Ireri and Jurgener, 1988). They have successfully improved the milk production through the introduction of the dairy goats and dairy cows in Ishiara zone.

3. Child Fund

Child Fund started its operation in 1992. Its major area of operation is education through building of classrooms and footing of school fees of the needy children. This organization have also now mainstreamed the food security component especially agri-business and entrepreneurship.

4. Compassion International

In the community, Compassion International is commonly known as CDC. It has also made a lot of impact through their intervention in the education sector. From the study it was found out that it is also engaged in agricultural training. This means that it has also mainstreamed the food security component in their interventions.

5. Government of Kenya

The Government of Kenya is oldest stakeholder in the area. It started its operation since independence. The interventions of the government are implemented through the line ministries. We therefore have the Ministry of Agriculture, Livestock and Fisheries and Provincial Administration. The study indicated that MOA was closely working with the farmers of Ishiara zone as far as training on farming methods and soil and water conservation is concerned compared to other zones. This means that farmers do get extension services.

6. Afya Plus (USAID)

The operations of this stakeholder did not clearly come out in the study. However, it is good to note that they work and mostly their target group is those with special needs (OVCs). Their intervention involves footing of school fees, helping medical organizations and empowering the OVCs by buying them necessary items they need: uniforms, books and pens and paraffin for study. They have targeted 600HHs in Evurore. These include beneficiaries of different categories: those in ECD, primary school, secondary schools and the care givers

of the orphans. The caregivers were given one goat each to improve their livelihoods. Recently, they have also mainstreamed the food security component in their intervention

7. Japan International Cooperation Agency (JICA)

This is an international corporation of the Japanese government that deals with development. It funded the Kiambindu irrigation scheme in Ishiara zone where 400HHs are connected with irrigation water.

Strategic Approaches on How to Improve Food security

In this section we are going to see the approaches and arguments that have been made on the causes and how to improve food security.

1. Better Agricultural Methods to Improve Food Security

The study found out that stakeholders responded differently depending on the objectives of their organizations. On the question whether their organizations had better agricultural methods programs for target groups to improve food security, 10% of the stakeholders strongly disagreed, 10% disagreed while 30% agreed and 50% strongly agreed. This therefore means that a half of the stakeholders working in Evurore are involved in activities that are oriented in improving food production. The same question was asked differently whether in the last five years if there was any improvement as far as new farming methods were concerned. The study found out that 70% of the stakeholders agreed that in the last five years some change was seen while a minority of 30% strongly agreed. This could be the use of new crops varieties.

2. Capacity on Soil and Water Conservation

On the question if the stakeholders build the capacity of the people to improve better soil and water conservation practices, 60% of the stakeholders strongly agreed that their organizations builds the peoples capacity on soil and water conservation, 30% agreed while only 10% disagreed. This therefore means that the HHs farms should be well managed as far as soil and water conservation are concerned and consequently the farm production should be improving. However, this is not the case as it was found out in the study that in the last five years there was, but minimal change in agricultural production as it was revealed in the FGD. The reason for lack of good agricultural production could be what Chambers (1983) said, that farmers knowledge, innovations and relation to science is not used.

Mutiso (1991) argued that for success in food security to take place in ASALs there is need to discuss innovation with the locals in three dimensions; that is, physical, social and psychological development of the community. This is in tandem with the theoretical theory of diffusion of innovation afore mentioned in chapter one that states that innovation should be communicated through certain channels over time among the members of a social system. The study further found out that 10% of the stakeholders strongly disagreed if there was any change, 10% were undecided, and a whopping 60% agreed that there change in the last five years while 20% strongly agreed. The 60% could be attributed to the outcome from the HH study that pointed out strongly that they were trained on building terraces.

3. Sensitization on Agro-forestry

Evurore being an agro-pastoral community lacked the practice on agro-forestry that is for farms and the animals. The farms could have benefited from the cover crops and soil nutrient protection while the animals benefit from the fodder. The study therefore found that 70% of the stakeholders' organizations had programs (FFS) that sensitize people on the importance of agro-forestry to solve the problem of food insecurity in ASALs while 30% agreed. This means that the knowledge on agro-forestry has been imparted on the people. The practice of agro-forestry is where the gap is. This could be true because the study found out that the percentage of the stakeholders that agreed and strongly agreed was below 50%, which is below average. 10% of the stakeholders were therefore undecided, 10% strongly disagreed, 20% disagreed while 30% agreed and strongly agreed (30%).

4. Post Harvest Storage and Preservation

A lot of food is normally lost during and after harvest. This is due to lack of storage facilities and correct handling of crops. The researcher therefore sought to identify if the organizations were doing anything on post harvest handling (food storage and preservation). The study found out that 60% of the stakeholders strongly agreed that their organizations had some trainings or capacity building on post harvest storage and preservation, 30% agreed while 10% disagreed. The 30% that agreed could be those organizations whose line of operation is not food production or farming, but they were mainstreaming it in their interventions. On probing further to know whether there has been any change on food storage and preservation, the study found out the following; 10% of the stakeholders disagreed, 40% agreed while 50% strongly agreed. This could

be attributed to Trocaire and Caritas Embu pilot projects on the use of metallic silos to store the cereals.

5. Agricultural Research

In chapter two we saw that generally, agricultural research in Africa was not well funded and was void of the local knowledge. In this part, the researcher wanted to establish if the stakeholders in Evurore engaged the local knowledge in agricultural research. The study therefore had mixed responses. 10% of the stakeholders were undecided whether the people's knowledge was used in research, 10% strongly disagreed, 20% disagreed, 20% agreed while the majority 40% strongly agreed that they engaged people in agricultural research. The study also showed that not much had been done in research in the past five years as only 20% of the stakeholders agreed that research had taken place while 50% strongly agreed. The 50% could have been KARI's research in Ishiara zone. This means that there was no research in other zone even if there was it is minimal (20%).

Climate Change and Environmental Issues

One of the factors of food insecurity is climate change, which has affected the seasonal planting of the farmers in Africa that is dependent on rain fed agriculture. The researcher sought to establish from the stakeholders if they had any mainstreaming of climate change and environmental issues in their organizations interventions. The findings showed that most of the stakeholders had mainstreamed climate change and environmental issues in their interventions as 30% agreed while 70% strongly agreed. Surprisingly, the same trend was seen as far as improvement in the last five years was concerned. The study showed that 60% of the stakeholders agreed that something had happened differently while 40% strongly agreed on the same. This could be as almost close to 90% HH said that they were aware of climate change issues.

Major Challenges in Improving Agricultural Practices

This section is concerned with where the real challenge is. It therefore provides insights in the study in establishing where the gaps are. The researcher sought to establish the response of the stakeholders to enable him get a broader understanding of the major challenges in improving agricultural practices that are key to food security. When the respondents were asked, 40% said that it was climate change, 10% said that it was culture, 30% said it was both culture and climate change while 20% said it was all. The challenge here is that the HH respondents are aware of the climate change issues and the stakeholders have

also played there role in sensitizing the people on climate change. It therefore follows that climate change should not be a major problem. The problem could be the approach or the mitigation measures used.

Sustainability of activities

The study sought to identify the sustainability of the agricultural practices initiated by the stakeholders. The respondents were asked if their organizations prepared the small scale farmers on how to sustain the good agricultural practices. A majority of 90% said yes while 10% said no. On asked further how they do it, 95% said through capacity building where they train the HHs on livestock improvement, agronomy, food storage and value addition, use of seed that are drought tolerant and use of technology in farming (drip irrigation).

Gaps and Challenges

From the evaluation of the findings of the study from the questionnaires, FGD and observation, there are indications that food insecurity had a direct impact on the livelihoods of the HHs. Thus, many cannot meet their basic needs (education, clothing and feeding of their HHs). This now has led to a search for alternative livelihood sources such as, exodus to urban centers, massive sand harvesting and charcoal burning.

Gaps

The study found out that there is a lot that has happened and that is still taking place as far as reducing food insecurity in Evurore is concerned. However, it was crystal clear that food insecurity was imminent in spite of the interventions by the stakeholders. The study therefore found out the following gaps: there is still use of indigenous ways of farming methods, most HHs have enough land, but use small portions for food production, the technology and tools used cannot help in the increase of the agricultural output, finance is the biggest challenge for most of the HHs and is the hub on which their livelihoods depend. Lack of it has made the people left with no other option, other than using the available inputs (local tool). From the FGD, the following was said on zones as far as gaps and challenges are concerned:

Ishiara zone is recording good progress of success as far as being food secure is concerned. This is attributed to its proximity and access to irrigation water and the extension services it has received from KARI and MOA. On the other hand from the FGD, it was clear that the farmers have not been trained on marketing especially formation of cooperatives to cushion them from the exploitation of middlemen. It also emerged that the farmers have not been trained on

horticultural crops. From the HHs study it emerged that apart from growing food crops, they also grew horticulture like kales and tomatoes for sale. The farmers have not therefore been trained on handling of these products which are perishable.

Kyenire, Ciangera and Kigwambiti zones are not in the threshold of reducing food insecurity. The study found out that the main crops grown in these zones are: grains (millet) and pulses (cow peas and green grams). These crops are planted year in year out. There is therefore no good crop rotation to improve the soil nutrient content. The farm inputs (tools-*muro*) and methods of farming were still indigenous. The land cultivated also was very small to produce enough food to feed the HHs throughout the year.

Cultural practices: the study found out that people were well informed as far as climate change and environmental issues were concerned. However, they are still stuck to indigenous methods of farming, crops (*irio cia gitene*) and planting seasons. They are still burning the bushes, and using the broad cast method of planting.

Testing the Hypothesis

To test the hypothesis the researcher used the correlation method generated from the SPSS. It was found out that there is a connection between food insecurity as an independent variable and land ownership and use, types of crops, methods of farming and post harvest management as dependent variables in relationship to food security in the HHs. The independent sample test displayed in the table above shows that F-value of 3.49 with P value of 0.07. Since the P= 0.07 >.005 we use the equal variance assumed row to evaluate the t- value based upon degrees of freedom. In this row we can see that the t-value of 1.54 with a P- value of 0.13. Since the P= 0.13 > 0.05 we retain the null hypothesis that the number of both gender in the HHs were difference and conclude that that there was significance difference.

Case Study 1

Mary Mbura is 48 years old from Kangai village in Ishiara zone and is a single mother with a HH of 8 people of whom one is in secondary school while the rest are in primary. She is a small scale farmer with two acres of land. She farms on one and a half acre of land. Before the irrigation water came, she used to toil to eke a living to put food on the table and to take her children to school. Life was

difficult as she had to look for casual labor to earn a living. With the coming of water, life has changed. She has harvested maize twice and still more is in the farm. She has enough food and can now afford to sell some which earns her money that she remits to school as school fees for her daughter. In addition to this, she has made a kitchen farm where she has planted kales for domestic consumption and for sale. The first harvest was not good due to poor farming methods. But since they were trained on sustainable agriculture: garden preparation, planting, weeding, control of pests and diseases, harvesting and storage, she is hopeful that she is going to get a good harvest as she is following what she learnt from the training.

Figure: 7 Picture of case study 1

Farms without Irrigation

Mbura's farm with irrigation

The pictures above show the farms of the HHs in zones that have no irrigation water and the farm of one HH with irrigation water. This difference shows that with water, the problem of food insecurity can be improved.

Case Study 2

Mr. Francis Ireri 54 years old and has a HH size of 7. His farm is one and a half acre in size. He has been depending on it to feed his family, but it has not been enough. To meet the food demand, he used to hire land in Kanyuambora, 9 kilmetres away. But since he was connected with irrigation water in March this

year, he has stopped farming in the rented land as he is now farming on his own farm. He attended training on sustainable agriculture and agronomy organized by Trocaire and is now enjoying the fruits. He is practicing catch cropping. "I thank God for this water. Now I will not trek to Kanyuambora again as I have water. I have also decided to buy a dairy cow to make good use of the stalks of maize after harvest. I have also planted the kales which my wife will be selling in the market. My kids will now go to school as I will be able to pay their school fees from the maize I have just harvested", said Francis. Even though he follows well the farming methods and uses fertilizer to boost the yields, he has not handled well the pests that affect his kales.

Figure: 8 Pictures of case study 2

Mr. Ireri in his farm

Maize farm

Harvested Maize

These pictures show the advantage of having water and practicing the new farming methods. Francis uses practices "catch cropping." This is a process of having crops in the farm continuously.

Summary of the Findings

1. **Food Security in Arid and Semi Arid Lands**

According to the researcher, the root cause of food insecurity in ASALs is the use of indigenous farming methods and lack of modern agricultural production techniques and over independence on rain fed agriculture and political factors. Since the inception of the call and concern for improvement of food production, the UN's FAO, WB, INGOs, AU and agricultural research institutions, have mounted efforts and measure on how to reduce food insecurity in the world and

more specifically in the HHs of the most vulnerable people in the ASALs. The research showed that 53.7% of the HHs that cultivate 1-3 acres of land still uses indigenous farming methods. This now means that production will barely cover one- tenth of its needs (Lineamenta, 14). This is so because the elements of production (land and labor) are underutilized.

2. Sustainable Agricultural Method Approach

The study demonstrated that the method used to address food insecurity in Evurore was that of training on sustainable agriculture in the dry lands which was guided by the top-down approach. The outcome of the study was that there was no practices of what the HHs (84.2%) were trained on the new farming methods. This finding calls for an approach that has the human person at the center. This approach according to Nwaigbo (2012) involves first and foremost the analysis of the scope of development seen in the light of *Caritas in Veritate* No. 15 and then applies it to the human condition. He explains further that the reasons why failure in adoption of the new methods occurs is because people do not have food (2012, 21).

3. Alternative Solution

In view of the literature reviewed and the data findings, the researcher suggest, "*participatory and bottom up"* strategic approach in improving the production of food at HH level. This approach cultivates an ownership of the new agricultural and technological methods imparted by the stakeholders. Above all it should also be scientific. The scientific approach is to help us identify the scientific basis of indigenous farming and link it with their rationality (Chambers, et al, Eds., 1993).When both technology and science are transferred to the farmer, the new agricultural practice improves. This now makes them add value to their local knowledge and building their resilience to become productive by the use of the available resources. In addition to this, the researcher submits that there is need for scaling up of what the stakeholders have done in Ishiara zone to improve food production in other zones and other ASAL areas. This can also be shared with other areas with similar conditions through the dissemination of information about agriculture, ecosystems and markets (Beddington, 2012). In this way now, the lack of information on new agricultural methods and research done on crops that do well in ASALs will be reduced (TOF, April 2013).

This can only be achieved if there is a paradigm shift in the approach used by the stakeholders as far as interventions to unlock the problem of food security is concerned. They have to put the ordinary people in the driving seat (Uphoff, et

al., 1998) through participatory approach that is focused on needs assessment and participatory rural communication appraisal. The communication should be based on the principle of dialogue, using communication approaches, participatory activities, media and channels with all levels of people concerned as equal partners.

4. Strategy

According to researchers in the domain of food security, close to 25% of losses is caused by drought and can be eliminated by genetic improvement of seeds that are drought tolerant (TOF, July 2013). This now will act as alternative agriculture which brings finances hence adding value not only to the livelihood of the HHs, but also to the GDP. Collective marketing is vital as it makes the groups realize good saving as was the case with *Ukulu Matetani* self-help group in Ukambani. Ishiara as we saw in the study has the potential, but dependence on the interventions of the NGO's is the greatest challenge. The research therefore proposes the following strategies to ameliorate the food situation in Evurore.

5. Land Use

In the data findings it was crystal clear that most of the HHs did not use their land maximally. This confirmed the World Bank report in the literature review that most of the arable lands in ASALs remain untouched. The researcher suggests that in the participatory approach, the stakeholders should train and enhance the capacity of farmers on the importance of land and how it can be harnessed. Yengoh (2012) argues that this valuable resource should be harnessed through organization in terms of time management, division of labor, cooperation and deployment of technology in food production and use of equipment. Secondly, the use of organic nutrients (fertilizers) is not common due to the perception that the use of fertilizers drains the soil fertility. To improve food production in ASALs therefore, there is need for the government and development agencies to invest in ASALs that have large tracts of land that are fertile and not used productively. Lastly, the farming equipment used for cultivation in Evurore is *muro*. This makes a HH cultivate a very small portion of land. Right farming equipments should therefore be introduced. This will help the HHs transit from indigenous farming to modern farming.

6. Water and Soil Conservation

Water and soil conservation is a very important component in food production. According to FAO (2003, 27), the scope of bringing natural resources into agricultural production lies in the option of sustainable intensification, that is,

increasing the productivity of land and water. It means that when practiced well and especially in the dry lands, food production will be high. In the study, this component did not come out well as far as its practice is concerned. The researcher therefore suggests that HHs in Evurore should be taken through the techniques involved in water and soil conservation and be trained on soil fertility management. This is because research has shown that food insecurity in ASALs can be improved by 25% by application of water improvement practices and further 50% by smallholder irrigation (TOF, July 2013). They should also be taken through the process of conserving soil. This can be done through the encouragement of cover crops, inter-planting with trees which reduce the sun's heat and evaporation and retain moisture in the soil. Use of composite manure and mulches should also be improved and insisted on, not only to improve the soil fertility, but also increases rain water infiltration and preservation. Lastly, since the HHs in Evurore are agro-pastoralists, there is a need to exploit the potential for growing fodder crops to support continuous milk production (Szekely, 2013).

On the conservation of the environment, the culture should be built in schools where the pupils and students are inculcated with the culture of planting trees and horticulture farming to create green villages. This can be achieved if the pupils and students will be roped in for concerted efforts to conserve environment.

7. Extension Services

Extension services in dry lands are lacking. To improve food production in ASALs, the researcher suggests that the HHs farming activities should be guided closely by the technical back up of extension officers. This will inform them on how to plant, time, types of crops to plant, fertilizer application, how to treat diseases and pests, how to harvest and store them.

8. Drought Tolerant Crops

The only panacea to food security is the adoption of the drought tolerant crops varieties that have been developed to speed up and improve conventional plants (FAO, 2002). The use of these crops could become a practical way out of food insecurity. However, most of the time farmers fear failure of these crops if they try them. They should therefore be trained on the advantages of the drought tolerant crops as compared to the local crops.

9. Irrigation

Smallholder irrigation has been considered by many organizations as the only way of increasing food security. This can be achieved through drip irrigation that will assist the farming community in ASALs. The biggest challenge is ASALs are neglected by the official agriculture politics which usually concentrate on more productive zones. This takes place in spite of the MOA's rolled out plan and allocation of the 2013/14 budget to irrigate one million acres (Wahome, June 16, 2013). Focus should therefore be laid on smallholder irrigation that targets HHs. With this access of irrigation water at HH level, food production will be improved and consequently food insecurity reduced. In Evurore for instance, Trocaire and JICA have funded the irrigation scheme. To this effect, 300HHs (Trocaire funded) have been connected with irrigation water and they are already using it and their lives have changed. Further 400HHs were reached by JICA in Ishiara zone and in the study; they were the ones who had introduced the other crops (Tomatoes and kales) apart from the common food crops planted. The life of the people with irrigation water has improved. They now can produce more and sell some to foot the school fees of their children and the men in the FGDs said that they will no more go to towns to seek for jobs as they can now get money through agriculture.

For the women, their lives have improved as far as savings are concerned. They can now make savings from the sale of the farm products and save a little for the merry-go-round. Nineteen legally registered women groups have been linked to WEF for micro-credit loans to improve their livelihoods through SMEs.

10. Post-Harvest Management

According to Donders (1984), what aggravates hunger or lack of food is the lack of infrastructure (storage facilities). New grain storage should therefore be introduced to the farmers to cut losses. Such technology includes use of metal silos apart from the ordinary granary (*Ikumbi*). This will cushion farmers from losses of food products that are estimated to be at 4 billion US Dollars annually (Daily Nation, 2/7/2013). In Kenya and indeed in Evurore, food loss occurs mainly at early stages of the food value chain and can be traced back to financial, managerial and technical constraints in harvesting techniques as well as storage inadequacies. HHs should therefore be trained on harvesting crops when they are fully mature and dry. Those that need threshing before storage should be threshed and dried at the required moisture content. The harvested crops should be stored in a clean dry place to avoid infestation that can cause total grain loss

in storage. The application of chemicals should be done according to the recommendation and the produce inspected after six months.

11. Food and other Natural Resource Management Policies

Among the major reasons behind the decline of agricultural production in Sub-Saharan Africa were the flawed policies such as privatization and other structural adjustment that took away the direct role of the state in farm production (Padilla, 2011, 12). The food policies require a political will so that what is envisaged and proposed in them is implemented. In Kenya for instance, what happens mainly is that the food policies formed favor large scale farmers at the expense of small scale farmers at the grass root levels ignoring issues like infrastructure, storage, land and conservation policies (Oluoko-Odingo, 2009). For policies to work, their formulation and implementation should be based on a process that encourages participation by the poor and involves civil society organization and the private sector so as to broaden ownership of goals and strengthen consensus on action (FAO, 2003, 26). Lack of participation in policy formulation and implementation has led to the lack of food and perennial food insecurity. In the climate change sector for instance, the government has to come up with a policy that will act as a guide on the cost and mitigations of climate change (Sisay, DN, 2/7/2013). Another challenge to the realization of these policies is that government sectors do not allocate enough funds to agricultural sector. In addition to this, the policies do not foster participation of those living in the ASALs and the mainstream economy. Policies dealing with land ownership as far as women are concerned should therefore be fast tracked to increase agricultural production. Less discriminatory laws and policies must replace customs that constrain women's access to factors of production such as land, credit, inputs information and technology (FAO, 2002, 64). On the other hand the government should invest agricultural products (food) instead of cash crop development in order to initiate a reverse in the cycle of recurrent famine (Donders, 1984, 35)

12. Training and Capacity Building

Training and capacity building are important in injecting new development in agricultural farming to the HHs. The two are approaches used to build and enhance the skills, knowledge and abilities of the people as far as food production is concerned. This should therefore take hands on the job and participatory approach with farmers encouraged building on their local

knowledge and skills as they learn: new techniques of farming, water management, proper methods of planting, seed selection and storage, proper care and harvesting. The researcher suggests this strategic approach as it builds the people towards being self reliant.

13. Linkages and Networking

Linkages promote partnerships with other organizations that build HH resilience to food insecurity. HHs from one area can link with others from a different area for learning purposes. The HHs should therefore be linked to the extension officers, research institutions, government and development agencies. Above all, there is need to link with private and corporate organizations. They engage in CSR because they feel and see a sense of responsibility for the environment and communities in which they do business (Kimutai, 2013). This will benefit them as they will be able to exchange ideas and learn on what should be improved. Besides this, linking technological progress with institutional innovations and markets will add value to food production in the HH level (Scoones and Thompson, 2009).

Recommendations

1. The people in Evurore, should understand that they should make good use of the interventions they receive from the stakeholders. In this regard, they should be aware that they are the principal actors of improving food security. The role of the government and the stakeholders is to act as a stepping stone to help them attain food security by training and building their capacities and providing them with financial support to achieve food security.
2. The government of Kenya should in the spirit of devolution that is a requirement of the constitution devolve funds that will used to ameliorate the lives of people living in the ASALs. It should also keep the promises made and implement the policies on food security. What has been happening is that the government has never committed itself and this lack of commitment has made many states in Africa not to fight food insecurity. As such now the agricultural sector is underfunded and even if it is captured in the budgets it always remains as it is said- lip service. Lastly, the GOK should focus on smallholder irrigation to eradicate food insecurity at HH level and develop new partnerships with the private sector and communicate with the general public and all the stakeholders. It

should also dedicate at least 10% of its budget to agriculture (ECA and OECD, 2012, 12) as compared to the present where many African governments devote less than 1% of their budgets to agriculture (Padilla, 2011, 12).

3. The stakeholders should understand that the participatory approach strategy is critical in bringing change to the lives of the people. They therefore should use a bottom up approach that is people centered. When this approach is used, the people own and put into practice all that they have learnt.
4. The researcher will apply all that has been learnt in this study into practice. This will be in form of sensitization and site training.
5. Sensitization entails the raising of awareness on the new farming methods, new crop varieties, climate change mitigation strategies and linking of the farmers and the extension officers.
6. This will consist of building and strengthening of the people's skills through training, workshops, and field days. They will be trained on analytical skills that will help them to analyze and understand the weather patterns, crop diseases and pests. They will also be trained on leadership and coordination skills to establish and manage cooperative associations and CBOs. This will help in the coordination of the activities and strategies aimed at achieving food security. It will be done in conjunction with research institutions like KARI and KEPHIS.
7. The researcher will also establish a communication medium that the community will use to share their successes, challenges and new technology. This will be in the form of village theatre through songs and skit play that identify food issues that need local attention and action. This will be presented in the local gatherings. Secondly, through the community radio programs. This will be done through the existing radio stations (*Wimwaro)* to host programs on agricultural subjects of interest and establish the listening time.
8. Advocacy by definition is a process involving a set of organized and planned actions, to develop a consensus, obtain support or create a favorable environment for introducing, changing or abrogating or enforcing a policy (Mbugua and Kaara Ed., 2007). Its role will be to integrate the new farming methods to increase food production at the HH level. This will be achieved through capacity building on agricultural production and public education, awareness creation, building alliances and networking opinion forming through the *barazas* the media (local

radio- *Wimwaro FM)*. To achieve the goal, the WFP (2002, 29) advocacy method will be used, that is, use of consultations, publicity campaigns, exhibitions, joint projects with other organizations and training.

9. The purpose of monitoring and evaluation is to give indications on whether one is in the right direction towards achieving the objectives or not. The monitoring component's purpose will be to assess the progress as far as practicing best agricultural methods is concerned. Evaluation on the other hand is to see if the progress brings impact into the lives of the people.

Conclusion

This research has established the causes of perennial food insecurity in the households of Evurore Division. The study identified root causes of food insecurity and established the challenges experienced and how households cope with these challenges in Evurore Division, Mbeere North Sub County, Embu County. The study was guided by farmer first theory developed by Chambers et al and the theory of diffusion of innovations of Everett Rogers. Chambers theory is centered on participatory approach. To achieve its objectives, the study employed qualitative and quantitative methods of data collection. This gave the researcher an avenue for a deeper investigation into the causes of food insecurity and what can be done to alleviate it. The respondents of the study were 95 HHs while the stakeholders had 10 respondents. The data collection tools employed were, questionnaires, interviews, Focus Group Discussions and interview guide. Findings of the research are most of the HHs still use indigenous methods of farming as compared to the minority using modern. Still majority still use indigenous crops. The root causes of food insecurity in Evurore were identified. The study recommended participatory approach, linkages, adoption of new varieties of drought tolerant crops, irrigation and extension services.

The research has revealed that although the people had received mitigation strategies, the approach used did not realize the expected results. Secondly, the study also found out that in spite of the existence of new farming methods, there is still food insecurity due to the use of indigenous farming methods and the size of land cultivated for crop production. This, therefore, raises the question can food security be attained in ASALs? The only conduit to food security in ASALs is to involve all the development agencies, people, corporate and private sector and the government. All these must have a coordinated approach and

what Covey (2004) calls a "win to win" attitude. With the "win to win" attitude, there is no competition but complementation.

References

Barrow, E. G. C. (1996). *Semi Arid Lands*, Nairobi, Initiative Publishers.

Beddington, J. R., et al. The Role of Scientists in Tackling Food Security and Climat Change. *Agriculture and Food Security.*2012, 1:10

CARE, *Update*: Horn of Africa Food Security, July 2012

Chambers, R. (1983). *Rural Development: Putting the Last First,* Pearson Education Ltd, England.

Chambers, R., et al., Eds. (1993).*Farmer First: Farmer Innovation and Agricultural Research.* Intermediate Technology publications, England.

Conceicao, P., et al. (2011). Food Security and Human development in Africa: Strategic Consideration and Directions for Further Research. *African Development Review.*Vol. 23, No. 2. (207-246).

Covey, S. R., (2004), *The 7 Habits of Highly Effective People.* Simon and Schuster UK LTD.

Daily Nation. (2013). "Scientists Unveil New Grain Storage Technology to Cut Losses". 2/7/2013.

Denga, F. G. (2001). *Population Health and Development in Africa: Anthropological Perspectives* Population Studies Research Institute, Nairobi.

Donders, J., Ed. (1984). "An Action Report on Food Crisis in Africa".*Spearhead No 84. December.*

Eade, D., (1997), *Capacity Building: An Approach to People Centered development* Oxfam, UK.

ECA and OECD, (2012), *The Mutual Review of Development Effectiveness in Africa:Promise and Performance.*UNDP.

Egessa, J. O., et al.*The Success, Challenges and Opportunities in the Goat Industry in Kenya.* Proceedings of the 6th EAGODEN Biennial Conference, 6th-8th November 2006. Mbale, Uganda.

FAO, (2002), *The State of Food and Agriculture.* FAO, Rome.

FAO, (2002), *Biotechnology and Food Security,* FAO, Rome.

FAO, (2003), *Anti-Hunger Program, a Twin-Track Approach to Hunger Reduction: Priorities for National and International Action.*FAO, Rome.

FAO, (2005), *Voluntary Guidelines to Support the Progressive realization of the Right to Adequate Food in the Context of National Food Security (Adopted by the 127th Session of the FAO Council November, 2004),* Rome, Italy.

FAO, (2010), The State of Food Insecurity in the World.

FAO/WFP, Food Security Assessment Mission to the Democratic People's Republic of Korea- 25/11/11

FEG, (2012), *Livelihood Profile; Marginal Mixed Farming Livelihood Zone, KenyaReport*.Trocaire, Nairobi.

Field, C. R., (2005), *Where there is no Development Agency: A manual for Pastoralists And their Promoters*.NR International, Aylesford, Kent, UK.

Formicola, J.R., (2002), *Pope John Paul II: Prophetic Politician.* Georgetown University Press, Washington DC.

Freire, P., (2003), *Pedagogy of the Oppressed,* New York: Continuum.

Global Food Security Index, (2012), "An assessment of food affordability, availability and quality", A report from Economist Intelligence Unit.

Government of Kenya (2004), National Policy for Sustainable Development of ASALs of Kenya 4th Draft. Nairobi, Kenya.

Government of Kenya, (2009), Agricultural Sector Development Strategy (ASDS) 2009-2020. Nairobi

Government of Kenya, (2010), Agricultural Sector Development Strategy 2010-2020, Nairobi.

Government of Kenya, (2010), National Climate Change Response Strategy. Nairobi

Government of Kenya, (2011), National Food and Nutrition Security policy. Nairobi

Government of Kenya, (2012), "Mbeere District Livelihood zones and Drought Status", MbeereNDMA Drought Monthly Bulletin for June.

Government of Kenya, (2013), "Mbeere District Livelihood zones and Drought Status", MbeereNDMA Drought Monthly Bulletin for June.

Groot, De P., -Juma, F. A., -Hall, D. O., (1992), *Taking- Root Revegetation in Semi-Arid In Kenya,* Act Press, Nairobi

Havnevik, K. J., Harsmar M., (1999), *The Diversified Future: An Institutional Approach To Rural Development in Rural Tanzania.* Stockholm, Sweden.

IFAD, WFP, FAO, (2011), State of Food Insecurity in the World.

Ireri, V. G., Ursula, J., (1988), A Feasibility Study in Embu Diocese, Kenya.

Kamau, S., "Agriculture Allocation Reduced, Kenya Expands Irrigation". An article in *East African Standard* June 15-21, 2013

Kenya National Disaster Profile, (2008), United Nations Development Program, UN.

Kerber, M., Pierli, F., "Public Theology A Theology for Social Apostolate and Ministry" In *Tangaza Occasional Paper.*No. 10 Pauline Publication Africa2000.

Kilongozi, N. B., et al., *Strategies to Enhance Livelihoods through Sustainable Goat Improvement in Tanzania.* Proceedings of the 6th EAGODEN Bienn Conference, 6th-8th November 2006. Mbale, Uganda.

Kimutai, C., The Big CSR Debate: Is doing Good Really Good? *Management.* July, 2013

Kombo, D. K., Tromp D. L. A., (2006), *Proposal and Thesis Writing: An Introduction* Nairobi, Paulines Publications.

Lappe, M. F., (1986), *World Hunger: Twelve Myths,* Grove Press, NY USA.

Le Houerou, H. N., et al, (1993), *Agro-bioclimatic Classification of Africa. Agro Meteorology* Series Working Paper No. 6. FAO, Rome.

Lineamenta, *the New Evangelization for the Transmission of the Christian Faith,* Synod of Bishops, 23rd General Assembly. Pauline Publication, Nairobi2011.

Liwenga, T. E., Livelihoods Diversifications and Implications in Dry Lands Resources of Central Tanzania.*African Journal of Ecology,* Vol. 47, 142-146.

Lucey, T., (2002), *Quantitative Techniques,* 6th Edition, C&C Offset Printing, China.

Mbae, J. G., "Conference on Education as a Tool for Evangelization and development in the Modern World". *Afer*Vol. 54, Nos. 1&2 March/June 2012

Muga, W., "Do Kenyans Hope for Misplaced Miracles?" an Article in *the Star* 27/06/2013.

Mugenda, O. M., Mugenda, A. G., (2003) Revised Ed., *Research Methods: Quantitative and Qualitative Approaches,* Acts Press, Nairobi Kenya

Mumo, M., *Commenting on World Bank Report,* Daily Nation, 19/03/2013

Mutiso, G. C., (1991), *Gaining ground in Institutional Innovations in Land-use in Management in Kenya,* Acts Press Nairobi.

Mwale, S., 'Should the Spectre of Hunger Continue to Stalk Africa?' in WAJIBU, (Vol. 10) No. 3, (1995), 13-15.

Nwaigbo, F., The Church and the State in the Politics of Holistic Development. *Afer,* Vol. 53, Nos. 3&4, 2011.

Nyangilo, P., Good Business with Sukuma Wiki. *The Organic Farmer* No. 80, January 2012.

Oduol, W., (2001), *Population Health and Development in Africa, Anthropological Perspectives,*Population Research Institute, Nairobi.

Oduor, A., "How Schools can Conserve Environment". An Article in *Standard* 20/6/13.

Oluoko-Odingo, A. A., Vulnerability and adaptation to Food Insecurity and Poverty in Kenya. *Annals of the Association of American Geographers.*2009.

Oucho, J. O., 'Population and Prospects: Now and Beyond', in Population Association of Kenya, Occasional Publication, (No. 1), (2000).

Oucho, J. O.., (1996), *Population in Kenya,* Nairobi University Press.

Padilla, A., Agricultural Aid in Africa: Old Problems Remain Amid Renewed Focus. *Education for Development.*Vol. 10. No.1, February, 2011.

Price Water Coopers, (2005), Mbeere 2005-2015 strategic Plan.

Roling, N. G., Wagemakers, M. A. E., (1998), *Facilitating Sustainable Agriculture, Participatory Learning and Adaptive management in times Environmental Uncertainty.* Cambridge University Press

Sassion, A., Food for Africa: An Urgent Global Challenge. *Agriculture and Food,* 2012, 1:2

Scoones, I., Thompson, J., (1994) *Farmer First: Rural People's Knowledge, Agricultural Research and Extension Practice.*Intermediate Technology Publication, London, UK.

Scoones, I., Thompson, J., (2009), *Farmer First Revisited: Innovation for Agricultural Researchand Development.*Practical Action Publishing, UK.

Sisay, A., "Climate Experts Meet in Addis Ababa to Finalize Report". An Article in *Daily Nation*2/7/2012

Szekely, T., Keep Dairy Goats Well for Good Performance. *The Organic Famer*No.92 January, 2013.

Tansey, G., Tasmin, R., (2008), *the Future Control of Food. A guide to International Negotiations and rules on Intellectual Property, Biodiversity and Food Security.*Earth Scan, London

The Organic farmer, *Water Conservation is the Key to Dry Land Farming.* No. 95, April, 2013.

The Organic farmer, *What is Good in Ukambani Dry Lands*. No. 98, July 2013.

Tsubo, M., et al. The Role of Maize- bean intercropping in Semi-arid region of South Africa. *Water SA* Vol. 29. No. 4, 2003

Uphoff, N., et al., (1998), *Reasons for Success: Learning from Instructive ExperiencesIn Rural Development.* Kumarian Press USA.

Wahome, M., "Ministry Rolls Plans to Irrigate One Million Acres", an article in Sunday Nation". June 16th 2013.

WFP, Annual Report, 2002.

White, R. A., (2013), *Ecology and Development.* Class notes, Tangaza, Nairobi.

White, R. A., *Ten Major Lines of Research on Grassroots, Participatory Communication In Africa.* In Journal, African Communication Research.Vol. 1, No., 1. May 2008

Yengoh, G. T., Determinants of Yield Differences in Small Scale Food Crop Farming Systems in Cameroon. *Agriculture and Food Security* 2012, 1:19