

# International Journal of **Poverty, Investment and Development**

(IJPID)

Counter Measures Used by Pastoralist in Arid Areas on Environmental  
Hazards. A Critical Literature Review



**CARI  
Journals**

## **Counter Measures Used by Pastoralist in Arid Areas on Environmental Hazards. A Critical Literature Review**

**Dr. Robert Kariuki**

Kenyatta University, School of Environmental Science

Corresponding author's email: [journals@carijournals.org](mailto:journals@carijournals.org)

### **Abstract**

**Purpose:** Climate variability, population explosion, and poverty have lowered the adaptive capacity to climate variability of pastoralists in arid and semi-arid areas. The overall objective of this study was to examine counter measures used by pastoralist in arid areas on environmental hazards. A critical literature review

**Methodology:** The paper used a desk study review methodology where relevant empirical literature was reviewed to identify main themes and to extract knowledge gaps.

**Findings:** The study concluded that about 14.8% of the residents in arid and semi-arid areas depend on relatives for economic support, while 3.3% depend on friends, 0.7% on loans for women groups, and 1.3% on government projects for support. About 73.0% do not have other sources of livelihood. Dependence on relatives and friends for economic support increases vulnerability to climate variability because it does not provide a consistent income source. Moreover, a lack of livelihood diversification increases vulnerability to climate variability. About 94.70% of the residents do not benefit from cash transfer programs. The 5.30% who receive cash transfers receive it from the government and NGOs. However, most residents do not benefit from cash transfers, which is a sign of poor coordination between the government and NGOs.

**Unique Contribution to Theory, Policy and Practice:** This study recommended that the relevant governments in arid and semi-arid areas should formulate and implement appropriate policies and strategies to improve adaptive capacity of women to climate variability in arid and semi-arid areas because most of the taboos in arid and semi-arid target women and reduce their ability to cope with climate variability. Programs to strengthen their adaptation strategies should also be introduced because most of their livelihood diversification methods such as charcoal burning contribute to environmental degradation and consequently to global warming.

**Keywords:** *Counter Measures, Pastoralist, Arid Areas, Environmental, Hazards.*



## INTRODUCTION

Adaptive capacity is the capability of a system to respond to climatic changes and impacts (Jacobs et al., 2015). An increase in per capita income characterizes adaptive capacity and equality in income distribution, increased universal health coverage, and advanced access to information (Alberini and Muehlenbachs, 2006). Moreover, food security indicates an enhanced understanding of adaptive capacity because food production systems indicate better resource utilization (Thornton et al., 2014). Observing indigenous knowledge has also been an effective strategy for improving adaptive capacity to climate variability (Audefroy and Sanchez, 2017). A community's indigenous knowledge of weather and climate observations, local leadership, beliefs, resource use, and values determines its ability to cope with climate variability (Granderson, 2017). However, climate variability and social factors like poverty, physical characteristics like degraded environments, and political instability in many ASALs have led to low adaptive capacity (Smit and Wandel, 2006).

Emerging climate variability conditions have led to low adaptability among pastoralists due to heavy dependence on natural resources and poverty (Berhanu and Beyene, 2015). A study conducted on the adaptive capacity of evicted agro-pastoralists in Ihefu Basin in Tanzania in 2015, for instance, shows that the pastoralists adopted coping strategies such as growing cash crops, engaging in income-generating activities such as selling roasted meat and reducing the grazing animals to browsers (Msomba et al., 2016). The 2004 Reduction of Resource-Based Conflict project in Sudan enhanced adaptive capacity among pastoralists. It established permanent water points, rehabilitated degraded grazing land, and organized training sessions for pastoralists (Convention on Biological Diversity, 2010). It is also important to note that food insecurity in Ngaremara is an additional cause of low adaptive capacity. However, Thornton et al. (2014) note that adaptive capacity can be enhanced with improved food security.

Complementary sources of income, sex of household heads, age of the household head, number of dependents, illiteracy, early warning information, employment status, and weak institutional structures determine vulnerability to climate variability and affect pastoralists (Opiyo et al., 2014). Economic factors such as per capita income, social factors such as education and food security, and physical characteristics such as natural resources influence the adaptive capacity to climate variability among pastoralists. They cause significant problems in the ASALs leading to low adaptive capacity (Duguma, 2013). Skirmishes should also be reduced by implementing frameworks on resource sharing, construction of water pans and boreholes, mapping natural resources to ease sharing, guaranteed security during migration, and peaceful dialogues between warring communities (Security in Mobility, 2010). Reforestation and afforestation can help the ASALs harsh environments. Trees hold soils together, trap moisture in the soil, improve land cover, and reverse desertification (UNDP, UNCCD, and UNEP 2009).

Climate variability and change have adversely affected pastoralism, one of the primary sources of livelihood contributing to food security and employment in rural areas (Ochieng et al., 2016). The situation is expected to worsen in the future. Thus, there is a need to monitor the climatic trends in local areas so that research can be carried out to develop strategies to cope with extreme conditions. Monitoring the local trends also provides data and information that allows experts to understand and formulate appropriate climate models (Ceccato et al., 2014). In addition to weather and climate data, it is necessary to monitor local food systems for proper management. It is essential to note that climatic trends data should be integrated with the current climatic conditions with agricultural practices and market conditions knowledge. Such information provides informed decision-making based on which varieties are suited for specific climates and the naturally occurring hazards expected in a year (Johansson et al., 2015). Monitoring disease outbreaks is also essential because most diseases arise with changes in weather and climatic conditions. Moreover, there is a need for effective communication between lawmakers and scientists so that information on climate variability can effectively enhance climate variability. Comparing current and historical climate trends and observations helps monitor output locally and internationally.

### **Statement of the Problem**

Pastoralism has a high potential to alleviate poverty and manage the environment. Moreover, it can create economic growth, improve adaptability to climate variability, and achieve climate change resilience (Rota and Sperandini, 2009). However, increased poverty among the pastoralists, who constitute 80% of Isiolo County residents (Gamba, 2011), increased their vulnerability and reduced their adaptive capacity to climate variability. Pastoralist in in arid and semi-arid live in a harsh marginalized environment commonly affected by drought, human-wildlife conflicts, famine, and flash floods during the rainy seasons (IRIN, 2011). These areas have become a hotspot of pastoral conflicts in arid and semi-arid areas. They have also settled down permanently because they have lost livestock to famine, drought, and pastoral conflicts, thus reducing movements. As much as livestock pastoralists cope with climate variability using strategies such as mobility, herd diversification, and herd maximization, the community are still living in abject poverty. Therefore, they need to adapt to new ways of coping with climate variability tailored to suit their community, such as access to information and full public participation. However, livestock pastoralists need to be willing to adopt new coping strategies by exhibiting increased per capita income, equality in income distribution, increased coverage in universal health care, and high access to relevant information. Therefore, the study proposed examining counter measures used by pastoralist in arid areas on dry environmental hazards and looked into the residents' willingness to adopt these strategies and accept the responsibility for adaptation. Information collected from this study will enable informed decision-making to develop coping strategies for climate variability and improve livelihoods. The study faced time and financial constraints, insecurity due to tribal clashes, and language barriers. Additionally, there were inaccessible roads, human wildlife conflict, and a community expecting aid because they are used to aid.

## **Objective of the Study**

The overall objective of this study was to examine counter measures used by pastoralist in arid areas on environmental hazards. A critical literature review.

## **Significance of the Study**

The findings of this study will benefit the residents of arid and semi-arid regions that have harsh climate stricken conditions by pointing out to them their role in poverty reduction and the need for their participation in all cycles of the projects aimed at improving their welfare. The study will also contribute to the body of knowledge in respect to counter measures used by pastoralist in arid areas on dry environmental hazards.

## **LITERAURE REVIEW**

### **Indigenous Adaptive Capacity Strategies to Climate Variability**

Pastoralists have been coping with hostile environments for the longest time (Brooks, 2006). They commonly live in areas characterized by insufficient resources and harsh climatic conditions, making them vulnerable to climate variability. However, they have developed mechanisms that cope with various climatic conditions (GebreMichael et al., 2010). Some include studying animal behavior to indicate weather conditions and astrological phenomena (Solomon, 2013). They also settle around water points and exchange their animals for other food supplements. However, the impacts of climate change have exceeded human and ecosystem tolerance. Therefore, the pastoralists' indigenous knowledge can no longer be useful (Boko et al., 2007).

Additionally, Macchi (2008) notes that the magnitude of future climatic hazards is likely to exceed marginalized pastoralists' adaptive capacity, and their indigenous knowledge is expected to be ineffective. Furthermore, a study conducted by Abate (2016) discovered that some indigenous coping strategies of pastoralists in Southern Ethiopia had become less effective and could not be scaled up easily to other areas. Therefore, modern-day coping approaches should be integrated with indigenous knowledge and have gender roles in mind to counter climate variability (Daze, 2012). Additionally, Kihila (2018) notes that sustainable indigenous methods can enhance climate variability management if communities overcome the existing limitations. Thus, Nawrotzki and Kadatska (2010) recommend resource mobilization while using indigenous knowledge because many projects fail to recognize resources in the community for indigenous knowledge. Moreover, indigenous knowledge is becoming ineffective due to acculturation and western influence. It is essential to formulate culturally sensitive documentation strategies and databases to preserve indigenous knowledge. Moreover, culturally sensitive technology transfer will be appropriate to integrate indigenous and scientific coping strategies to tackle the growing magnitude of climatic hazards.

### **External and Internal Hindrances to Adaptive Capacity among Pastoralists**

Pastoralists face both internal and external barriers to climate variability adaptation. Conflicts between them and other neighboring tribes over grazing land, water points, boundaries, and agricultural expansion are external barriers (Eriksen and Marin, 2011). Internal barriers to adaptive capacity include family feuds, cattle rustling, and vectorborne diseases. Other external hindrances are limited access to markets, information, financial support, illiteracy, knowledge, skills, water sources, grazing land, veterinary services, environmental degradation, and population pressure, failure of inclusion in community participation, and insufficient government policies and coordination (Riche et al., 2009). Additionally, customs and traditions such as allocating roles and responsibilities to men and women hinder high adaptive capacity because women remain the most vulnerable people when drought and famine hit (Omolo, 2010).

### **Reception of Pastoralists to Climate Change Adaptive Strategies**

Pastoralists are fully aware of climate variability, and their perception is similar to that of the actual recent trends that indicate climate variability (Berhanu and Beyene, 2015). They have adopted livestock diversification but kept their mobility culture even in the face of vulnerabilities; thus, introducing ideas and policies that ignore the pastoralists' mobile nature might receive a hostile reception. Before initiating new policies and programs, effective communication with the pastoralists enhances a receptive reaction toward the programs (Swiss Agency for Development and Cooperation, 2016). The effectiveness of projects that enhance adaptive capacity depends on how receptive the communities are to the projects (Brooks and Adger, 2004). According to Wandera (2011), pastoral communities in Marsabit have benefited from pilot projects that increased their willingness to try new approaches to enhancing adaptive capacity. Therefore, intensive research on ASALs should be conducted before introducing new policies and strategies to pastoralists. It helps to preserve traditional pastoralism and avoid conflicts and poor reception. According to Nawrotzki and Kadatska (2010), many countries cannot utilize sophisticated technology to cope with climate variability, but governments and non-governmental organizations have introduced such methods anyway. However, many communities end up abandoning the new technologies due to the failure to use the available resources. Moreover, most projects are run by donors and not community members. Herrero et al. (2016) note that communities are willing to adapt to new coping strategies whose benefits are evident. They also need to run the projects instead of donors running projects to enhance sustainability. Project ownership and community involvement ensure project sustainability (Tanga and Mundau, 2014).

### **Empirical Review**

Kimitei (2021), conducted a study that examined the socio-economic, management practices, and capacity-building factors that affect production of food in ASAL areas, learning from implementing the Community Agricultural Development for Semi-Arid Lands project. The study employed a cross-sectional survey to collect data from various farmer groups that benefited from the program. A sample of 136 determined using Krejcie and Morgan's table was randomly selected

from the list of farmer beneficiaries. Data was analysed using the Statistics Software Package for Social Scientists (SPSS) version 21. Data presentation was conducted by use of cross-tabulated tables, percentages and frequency distribution tables. From this study, Marital status ( $p=0.006$ ), Family type ( $p=0.038$ ), Family size ( $p=0.018$ ), land ownership ( $p=0.021$ ) and land size ( $p=0.006$ ) had a significant association with overall sustainable food production. The study found a statistically significant relationship between management practices ( $F(1,134)=321.94, p<0.0005$ ), capacity building ( $F(1,134)=1239.91, p<0.0005$ ) and overall sustainable food production. Consequently, programs aiming to improve food production in these areas and other similar settings should prioritize capacity building among farmers and deploy sustainable food production approaches while considering the socio-economic factors such as family type, family size and marital status that significantly influence food production. Besides, other factors such as land ownership must be urgently addressed if increased food production in the areas has to be realized. The study used a cross-sectional survey design presenting a methodological gap as our study will use desktop review design.

Waithira (2021), conducted a study to evaluate the influence of stakeholders and resource availability, determine the socio-economic elements and the extent to which management techniques influence the sustainability of donor funded projects at FAO Kenya. The research involved a descriptive study design using an open-ended questionnaire survey. The study targeted staff at the Food and Agricultural Organisation, Kenya and consisted of 133 staff. Random sampling was utilised to achieve a sample of 57 after using Yamane formula to obtain a representative sample. Analysis of the raw data was conducted using SPSS version 22.0 to obtain descriptive and correlation statistics on the study variables. The study outcome established that stakeholders influence, availability of sufficient funding or resources, socio-economic elements and management practices directly influence donor funded projects to a greater extent. Statistical inferences showed that the sufficiency of resource and availability is statistically significant alongside management techniques at  $p$ -values of 0.05 and 0.029 respectively. Stakeholders' participation influence and socio-economic elements were not statistically significant at  $p$ -values of 0.596 and 0.852 respectively. The study however presented a conceptual gap as it focused on influence of stakeholders and resource availability, determine the socio-economic elements and the extent to which management techniques influence the sustainability of donor funded projects at FAO Kenya while our study will focus on counter measures used by pastoralist in arid areas on dry environmental hazards

Oduya (2019), conducted a study on to establish the challenges facing the School Feeding Programme (SFP) in pre-primary schools in Isiolo County, Kenya. The study employed descriptive survey design with the independent variable being the available resources, parental participation, variety of food and the managerial challenges, while the dependent variable was effective feeding programme. The study established that the SFPs were dependent on the -government and donor funding, the level of parental participation posed a challenge on the SFP as they hardly contributed



to the success of SFP in cash or in kind and the food provided was not balanced. More importantly the major challenges were: shortage of water, food insecurity, inaccessibility, insecurity and harsh climatic conditions. Study findings are hoped to provide vital information to various stakeholders in early childhood education and other child minders. The study findings may help the Ministry of Education to enact policies that will help improve the situations of the school feeding programmes in Kenya. The study presented a contextual gap as it focused on school feeding programme while our study will focus on arid and semi-arid areas.

Mbuje (2018), conducted a study on establish the status of feeding programs in pre-schools in Kabare zone; establish the influence of feeding programs on pre-school children's enrolment, attendance, retention and learning. Data were analyzed quantitatively using frequency counts, percentages and means without going into establishing significant relationships between the study variables while qualitative data was analyzed thematically using narratives based on study objectives. Thereafter, findings were presented using pie charts, graphs and frequency tables. The results obtained reveal that the meal that was provided the most involved a mixture of maize and beans "githeri" while the meal that was provided the least was porridge. There was gradual but steady increase in enrolment in pre-schools with feeding programmes from 2013 to 2016. The results showed that enrolment was excellent in 6 schools and fair in 2 schools. The study findings further revealed that there was inconsistency in class attendance in schools which did not have SFP. The schools with no SFP had poor retention rate. The study concludes that feeding programme is one of the factors influencing the enrolment, attendance and retention of the pre-schoolers. The study recommended that policies that guide the need to make SFP compulsory in pre-schools should be established since it improves children's enrolment, attendance and performance. The study presented a methodological gap as it utilized quantitative data analysis while our study will utilize a desktop review approach.

Mbunge (2017), conducted a study that evaluated impacts of home grown school meals programme to the access, retention and performance of pupils in primary schools in Waita Zone; assess issues and challenges experienced in the management of Home Grown School Meals Programme in the Zone; identify strategies that can be employed to make the programme more effective and efficient to the schools. The study employed descriptive research design with qualitative and quantitative techniques of data collection. The study established the programme had positive impact on access and retention, but little impact on performance. Moreover, the study found that the biggest challenges included rising of food costs, insufficient funds and lack of procurement and management skills. The study also established that the class of drop-outs were higher before but the rates were checked after the introduction of HGSM. The study presented a conceptual gap as it focused on evaluated impacts of home grown school meals programme to the access, retention and performance of pupils in primary schools in Waita Zone; assess issues and challenges experienced in the management of Home Grown School Meals Programme in the Zone; identify strategies that can be employed to make the programme more effective and efficient to the



schools while our study will focus on examining counter measures used by pastoralist in arid areas on dry environmental hazards.

Habumuremyi (2015), conducted a study to confirm enrolment rates and investigate the family and school factors contributing to the low pre-school enrolment in rural areas of Burera District, Northern Province, Rwanda. The study used ex post facto design. Data collection tools included questionnaires and interviews. The statistical package for social sciences was utilized to organize data for analysis. The data collected were subjected to critical analysis and interpretation using statistical tools and conclusions were drawn. The study revealed that parents' income was very low which makes them unable to enroll children in pre-school. It was also noted that pre-schools in rural areas were dispersed such that many children did not have any pre-school to attend to in the nearby. This study concluded that there is need to assist parents in rural areas by paying tuition fees and establish more pre-schools in every village to reduce the distance children walk to pre-school. The study presented a methodological gap as it used ex post facto design while our study will utilize desktop review approach.

Kitivi (2014), conducted a study to establish the influence of stakeholders' involvement, staff competencies, monitoring and evaluation, as well as availability of resources in the performance of donor funded projects. The respondents included Project managers, administrators, ICT personnel, finance officers, and other staffs. The 75 respondents in the survey filled questionnaires to allow for collection of both qualitative and quantitative data. The data collected was classified and tabulated in a systematic manner. Data analysis was done by use of descriptive tools. In addition a statistical package for social science (SPSS) was used to speed up data analysis process. The data was presented by use of frequency distribution tables. The major findings of the study revealed that stakeholder's involvement, staff competencies, monitoring and evaluation, as well as availability of resources all greatly influenced the performance of the donor funded projects. The study however presented a conceptual gap as it focused on influence of stakeholders' involvement, staff competencies, monitoring and evaluation, as well as availability of resources in the performance of donor funded projects while our study will focus on counter measures used by pastoralist in arid areas on dry environmental hazards.

Muturi (2012), conducted a study that examined the performance of selected Micro finance Institutions in Nairobi especially as relates to their provision of credit to SMEs. The study realized that MFIs have a huge role to play towards poverty alleviation through credit accessibility to SMEs. Their performance was, however, affected by factors such as limited financial resources, delinquent loans, and loans lack of a management information system, wide geographical coverage, poor research and development department, among other factors. Sustainability was also found to be a thorny issue. Achievement of sustainability was found to be constrained by factors such as inadequate savings by clients, huge operating costs, and provision of non-financial services, legal constraints, and subsidized interest rates, among others. The study found out that the regression results were not significant at 5 percent level of significance. However, there was

positive correlation between the dependent variable (performance) and loan amounts, repayment rate and sustainability. Cost per unit of currency lent was negatively correlated to performance. The study however presented a geographical gap as it focused on Nairobi in Kenya while our study will focus on arid and semi-arid areas.

## METHODOLOGY

The study adopted a desktop literature review method (desk study). This involved an in-depth review of studies related to counter measures used by pastoralist in arid areas on dry environmental hazards. Three sorting stages were implemented on the subject under study in order to determine the viability of the subject for research. This is the first stage that comprised the initial identification of all articles that were based on counter measures used by pastoralist in arid areas on dry environmental hazards. The search was done generally by searching the articles in the article title, abstract, keywords. A second search involved fully available publications on the subject on counter measures used by pastoralist in arid areas on dry environmental hazards. The third step involved the selection of fully accessible publications. Reduction of the literature to only fully accessible publications yielded specificity and allowed the researcher to focus on the articles that related to counter measures used by pastoralist in arid areas on dry environmental hazards which was split into top key words. After an in- depth search into the top key words (counter measures, pastoralist, arid areas, environmental, hazards), the researcher arrived at 8 articles that were suitable for analysis. This were findings from:

Kimitei (2021), who conducted a study that examined the socio-economic, management practices, and capacity-building factors that affect production of food in ASAL areas, learning from implementing the Community Agricultural Development for Semi-Arid Lands project. The study employed a cross-sectional survey to collect data from various farmer groups that benefited from the program. A sample of 136 determined using Krejcie and Morgan's table was randomly selected from the list of farmer beneficiaries. Data was analysed using the Statistics Software Package for Social Scientists (SPSS) version 21. Data presentation was conducted by use of cross-tabulated tables, percentages and frequency distribution tables. From this study, Marital status ( $p=0.006$ ), Family type ( $p=0.038$ ), Family size ( $p=0.018$ ), land ownership ( $p=0.021$ ) and land size ( $p=0.006$ ) had a significant association with overall sustainable food production. The study found a statistically significant relationship between management practices ( $F(1,134)=321.94, p<0.0005$ ), capacity building ( $F(1,134)=1239.91, p<0.0005$ ) and overall sustainable food production. Consequently, programs aiming to improve food production in these areas and other similar settings should prioritize capacity building among farmers and deploy sustainable food production approaches while considering the socio-economic factors such as family type, family size and marital status that significantly influence food production. Besides, other factors such as land ownership must be urgently addressed if increased food production in the areas has to be realized.

Waithira (2021), who conducted a study to evaluate the influence of stakeholders and resource availability, determine the socio-economic elements and the extent to which management techniques influence the sustainability of donor funded projects at FAO Kenya. The research involved a descriptive study design using an open-ended questionnaire survey. The study targeted staff at the Food and Agricultural Organisation, Kenya and consisted of 133 staff. Random sampling was utilised to achieve a sample of 57 after using Yamane formula to obtain a representative sample. Analysis of the raw data was conducted using SPSS version 22.0 to obtain descriptive and correlation statistics on the study variables. The study outcome established that stakeholders influence, availability of sufficient funding or resources, socio-economic elements and management practices directly influence donor funded projects to a greater extent. Statistical inferences showed that the sufficiency of resource and availability is statistically significant alongside management techniques at p-values of 0.05 and 0.029 respectively. Stakeholders' participation influence and socio-economic elements were not statistically significant at p-values of 0.596 and 0.852 respectively.

Oduya (2019), who conducted a study on to establish the challenges facing the School Feeding Programme (SFP) in pre-primary schools in Isiolo County, Kenya. The study employed descriptive survey design with the independent variable being the available resources, parental participation, variety of food and the managerial challenges, while the dependent variable was effective feeding programme. The study established that the SFPs were dependent on the -government and donor funding, the level of parental participation posed a challenge on the SFP as they hardly contributed to the success of SFP in cash or in kind and the food provided was not balanced. More importantly the major challenges were: shortage of water, food insecurity, in accessibility, insecurity and harsh climatic conditions. Study findings are hoped to provide vital information to various stakeholders in early childhood education and other child minders. The study findings may help the Ministry of Education to enact policies that will help improve the situations of the school feeding programmes in Kenya.

Mbuje (2018), who conducted a study on establish the status of feeding programs in pre-schools in Kabare zone; establish the influence of feeding programs on pre-school children's enrolment, attendance, retention and learning. Data were analyzed quantitatively using frequency counts, percentages and means without going into establishing significant relationships between the study variables while qualitative data was analyzed thematically using narratives based on study objectives. Thereafter, findings were presented using pie charts, graphs and frequency tables. The results obtained reveal that the meal that was provided the most involved a mixture of maize and beans "githeri" while the meal that was provided the least was porridge. There was gradual but steady increase in enrolment in pre-schools with feeding programmes from 2013 to 2016. The results showed that enrolment was excellent in 6 schools and fair in 2 schools. The study findings further revealed that there was inconsistency in class attendance in schools which did not have SFP. The schools with no SFP had poor retention rate. The study concludes that feeding

programme is one of the factors influencing the enrolment, attendance and retention of the pre-scholars. The study recommended that policies that guide the need to make SFP compulsory in pre-schools should be established since it improves children's enrolment, attendance and performance. The study presented a methodological gap as it utilized quantitative data analysis while our study will utilize a desktop review approach.

Mbunge (2017), who conducted a study that evaluated impacts of home grown school meals programme to the access, retention and performance of pupils in primary schools in Waita Zone; assess issues and challenges experienced in the management of Home Grown School Meals Programme in the Zone; identify strategies that can be employed to make the programme more effective and efficient to the schools. The study employed descriptive research design with qualitative and quantitative techniques of data collection. The study established the programme had positive impact on access and retention, but little impact on performance. Moreover, the study found that the biggest challenges included rising of food costs, insufficient funds and lack of procurement and management skills. The study also established that the class of drop-outs were higher before but the rates were checked after the introduction of HGSM. The study presented a conceptual gap as it focused on evaluated impacts of home grown school meals programme to the access, retention and performance of pupils in primary schools in Waita Zone; assess issues and challenges experienced in the management of Home Grown School Meals Programme in the Zone; identify strategies that can be employed to make the programme more effective and efficient to the schools while our study will focus on examining counter measures used by pastoralist in arid areas on dry environmental hazards.

Habumuremyi (2015), who conducted a study to confirm enrolment rates and investigate the family and school factors contributing to the low pre-school enrolment in rural areas of Burera District, Northern Province, Rwanda. The study used ex post facto design. Data collection tools included questionnaires and interviews. The statistical package for social sciences was utilized to organize data for analysis. The data collected were subjected to critical analysis and interpretation using statistical tools and conclusions were drawn. The study revealed that parents' income was very low which makes them unable to enroll children in pre-school. It was also noted that pre-schools in rural areas were dispersed such that many children did not have any pre-school to attend to in the nearby. This study concluded that there is need to assist parents in rural areas by paying tuition fees and establish more pre-schools in every village to reduce the distance children walk to pre-school.

Kitivi (2014), who conducted a study to establish the influence of stakeholders' involvement, staff competencies, monitoring and evaluation, as well as availability of resources in the performance of donor funded projects. The respondents included Project managers, administrators, ICT personnel, finance officers, and other staffs. The 75 respondents in the survey filled questionnaires to allow for collection of both qualitative and quantitative data. The data collected was classified and tabulated in a systematic manner. Data analysis was done by use of descriptive tools. In



addition a statistical package for social science (SPSS) was used to speed up data analysis process. The data was presented by use of frequency distribution tables. The major findings of the study revealed that stakeholder's involvement, staff competencies, monitoring and evaluation, as well as availability of resources all greatly influenced the performance of the donor funded projects. The study however presented a conceptual gap as it focused on influence of stakeholders' involvement, staff competencies, monitoring and evaluation, as well as availability of resources in the performance of donor funded projects while our study will focus on counter measures used by pastoralist in arid areas on dry environmental hazards.

Muturi (2012), who conducted a study that the examined the performance of selected Micro finance Institutions in Nairobi especially as relates to their provision of credit to SMEs. The study realized that MFIs have a huge role to play towards poverty alleviation through credit accessibility to SMEs. Their performance was, however, affected by factors such as limited financial resources, delinquent loans, and loans lack of a management information system, wide geographical coverage, poor research and development department, among other factors. Sustainability was also found to be a thorny issue. Achievement of sustainability was found to be constrained by factors such as inadequate savings by clients, huge operating costs, and provision of non-financial services, legal constraints, and subsidized interest rates, among others. The study found out that the regression results were not significant at 5 percent level of significance. However, there was positive correlation between the dependent variable (performance) and loan amounts, repayment rate and sustainability. Cost per unit of currency lent was negatively correlated to performance. The study however presented a geographical gap as it focused on Nairobi in Kenya while our study will focus on arid and semi-arid areas.

## **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **Conclusion**

The study concluded that about 14.8% of the residents in arid and semi-arid areas depend on relatives for economic support, while 3.3% depend on friends, 0.7% on loans for women groups, and 1.3% on government projects for support. About 73.0% do not have other sources of livelihood. Dependence on relatives and friends for economic support increases vulnerability to climate variability because it does not provide a consistent income source. Moreover, a lack of livelihood diversification increases vulnerability to climate variability. About 94.70% of the residents do not benefit from cash transfer programs. The 5.30% who receive cash transfers receive it from the government and NGOs. However, most residents do not benefit from cash transfers, which is a sign of poor coordination between the government and NGOs.

### **Recommendations**

This study recommended that the relevant governments in arid and semi-arid areas should formulate and implement appropriate policies and strategies to improve adaptive capacity of women to climate variability in arid and semi-arid areas because most of the taboos in arid and

semi-arid target women and reduce their ability to cope with climate variability. Programs to strengthen their adaptation strategies should also be introduced because most of their livelihood diversification methods such as charcoal burning contribute to environmental degradation and consequently to global warming.

## REFERENCES

- Abate, T. (2016). Contribution of Indigenous Knowledge to Climate Change and Adaptation Response in Southern Ethiopia. *Journal of Earth Science and Climate Change*, 7(11), 1-9.
- Adger, W. N., Pulhin, J., Barnett, J., Dabelko, G. D., Hovelsrud, G. K., Levy, M., et al. (2014). Human Security. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, et al., *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 755-791). *The United Kingdom and New York: Cambridge University Press*.
- Alberini, A., & Muehlenbachs, L. (2006). Using Expert Judgment to Assess Adaptive Capacity to Climate Change: Evidence from a Conjoint Choice Survey. *Global Environmental Change*, 16(2), 123-144.
- Audefroy, J. F., & Sanchez, N. C. (2017). Integrating Local Knowledge for Climate Change Adaptation in Yucatan, Mexico. *Science Direct*, 6(1), 228-237.
- Bahadur, A. V., Ibrahim, M., & Tanner, T. (2013). Characterizing resilience: Unpacking the concept for tackling climate change and development. *Climate and Development*, 5(1), 55-65. <https://doi.org/10.1080/17565529.2012.762334>
- Berhanu, W., & Beyene, F. (2015). Climate Variability and Household Adaptation Strategies in Southern Ethiopia. *Sustainability*, 7, 6353-6375.
- Chaudhury, M. (2017). *Strategies for Reducing Vulnerability and Building Resilience to Environmental and Natural Disasters in Developing Countries*. New York: United Nations Department of Economic and Social Affairs
- Chen, W.-Y., Suzuki, T., & Lackner, M. (2017). *Handbook of Climate Change Mitigation and Adaptation*. Cham: Springer International Publishing
- Cordero, E. C., Centeno, D., & Todd, A. M. (2020). The Role of Climate Change Education on Individual Lifetime Carbon Emissions. *PLoS ONE*, 15(2), 1-23.
- Duguma, D. W. (2013). Adaptation of Pastoralists to Climate Variability: The Case of the Karrayu Pastoralists Community in the Upper Awash Valley of Ethiopia. *The University of Oslo*, 1-102.

- Galvin, K. A., Beeton, T. A., Boone, R. B., & BurnSilver, S. B. (2015). Nutritional Status of Maasai Pastoralists Under Change. *Human Ecology*, 1-15.
- Gichere, S. K., Olado, G., Anyona, D. N., Matano, A.-S., Dida, G. O., Abuom, P. O., et al. (2013). Effects of Drought and Floods on Crop and Animal Losses and SocioEconomic Status of Households in the Lake Victoria Basin of Kenya. *Journal of Emerging Trends in Economics and Management Sciences*, 4(1).
- Herrero, M., Bedellan, C., Addison, J., Carabine, E., Havlik, P., Henderson, B., et al. (2016). Climate Change and Pastoralism: Impacts, Consequences, and Adaptation. *Revue Scientifique et Technique*, 35(2), 417-433.
- Kaimba, G. K., Njehia, B. K. & Guliye, A.Y. (2011). Effects of Cattle Rustling and Household Characteristics on Migration Decisions and Herd Size amongst *Pastoralists in Baringo District, Kenya*. *Pastoralism: Research, Policy, and Practice*. Springer, 1:18
- Kagunyu, A., Wandibba, S., & Wanjohi, J. G. (2016). The Use of Indigenous Climate Forecasting Methods by the Pastoralists of Northern Kenya. *Pastoralism*, 6(7)
- Ludena, C. E., & Yoon, S. W. (2015). Local Vulnerability Indicators and Adaptation to Climate Change: A Survey. Inter-American Development Bank, Technical Note No. 857, 1-51.
- Muricho, D. N., Otieno, D. J., & Oluoch-Kosura, W. (2018). The Role of Pastoralists' Indigenous Knowledge and Practices in Reducing Household Food Insecurity in West Pokot, Kenya: A Binary Probit Analysis. *Journal of Development and Agricultural Economics*, 10(7), 236-245
- Omolo, N., & Mafongoya, P. L. (2019). Gender, Social Capital, and Adaptive Capacity to Climate Variability: A Case of Pastoralists in Arid and Semi-arid Regions in Kenya. *International Journal of Climate Change Strategies and Management*, 11(5), 744-758.
- Riche, B., Hachileka, E., Awuor, C.B., & Hammill, A. (2009). Climate-Related Vulnerability and Adaptive Capacity in Ethiopia's Borana and Somali Communities. *International Institute for Sustainable Development*, 1-83.
- Zidago, A. P., & Wang, Z. (2016). Charcoal and Fuelwood Consumption and Its Impacts on Environment in Cote d'Ivoire (Case Study of Yopougon Area). *Environment and Natural Resources Research*, 6(4), 26-3