

EFFECTIVENESS OF DROUGHT MITIGATION MEASURES TAKEN BY NATIONAL DROUGHT MANAGEMENT AUTHORITY IN ISIOLO COUNTY, KENYA

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ABSTRACT

Drought is a climate variability that happens seasonally, maybe multilayer or multi-decade, that causes variation in precipitation and temperature rise, hence causing droughts across the world. Drought remains one of the leading courses of conflict in ASAL counties such as Isiolo, even as agencies such as the National Drought Management Authority (NDMA) seek to impact and reduce the risks associated with drought. This study sought to evaluate the effectiveness of mitigation measures by NDMA in drought mitigation in Isiolo County, Kenya. Specifically, the study sought to identify the mitigation measures taken by NDMA in Isiolo County, Kenya and establish the effectiveness of the mitigation measures. The study employed a descriptive survey design and, through a census, sampled 20 respondents drawn from different technical staff at NDMA and other organizations supporting drought mitigation in the area. Through a structured questionnaire, the study collected primary data that were analyzed through descriptive statistics that included frequencies and percentages, while inferential statistics used multi-linear regression analysis. The study established that water harvesting, social protection programs, and early warning systems statistically contributed to effective mitigation of drought in Isiolo County, Kenya while soil conservation and afforestation did not statistically contribute to effective mitigation of drought in the county. Soil conservation and early warning systems were the most excellent NDMA drought mitigation measures, followed by afforestation and then water harvesting. There is a need for NDMA to identify how they can implement the most effective NDMA drought mitigation measures in order to reduce the impact of drought in the area. NDMA should work closely with other stakeholders to ensure that the drought measures are not only effective but also address the community's unique drought needs. Lastly, there is a need to evaluate reasons why afforestation and water harvesting are not significant in effective mitigation of drought and establish ways that they can be better implemented.

Key Words: Drought, Mitigation Measures, Isiolo, Kenya

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BACKGROUND OF THE STUDY

Drought is a climate variability that happens seasonally, maybe multilayer or multi-decade that causes variation in precipitation and temperature rise, hence causing droughts. In the United States of America, drought has caused damage, especially in the agricultural sector, particularly in the central and western regions, and is likely to worsen in the future (Stern, 2023). On the other hand, India's geographic area, about 16%, is arid, semi-arid, and sub-humid, and the regions are prone to drought, and currently, the country has put up several drought mitigation measures, such as all-year-round rainfall monitoring in different spatial scales covering the states, districts, and meteorological subdivisions every single day, week, month, and the different seasonal scales (Levine, Kusnierek, and Sida, 2017).

In Africa, Isabel (2021) also establishes that South Africa continues to implement drought operating rules, undertaking borehole drilling and/or rehabilitation, water tinkering from available sources, rainwater and fog harvesting, protection and use of springs, cloud seeding, evaporation suppression, desalination of brackish groundwater or sea water, and effluent treatment and re-use. On the other hand, Somalia is the hardest hit country by drought. According to the Relief Web (2023) and UNHR (2017), an estimated 739000 people have been displaced by drought since November 2016, most (84%) being women and children. To curb the impact of drought, the government of Somalia has resorted to prioritizing focus on resilience through better investment, development of climate-sensitive policies, assessment of drought damage, and development of plans that aid in the recovery and resilience (UNDP, 2017).

On the other hand, Kenya remains a drought-prone country, with 80% of its land size prone to drought due to its arid and semi-arid conditions. It also receives rainfall varying from 200 to 500 mm, and periodic droughts forming part of its normal climatic conditions (Mbogo, Ingamga, & Maina, 2014). The most hit communities in Kenya are those living in the arid and semi-arid lands with households in pastoral areas such as Turkana, Marsabit, and Mandera yet to recover from persistent drought and widespread flooding (Kiecol, 2021). OCHA (2024) highlights that the latest projection represents the highest magnitude and severity of acute food insecurity in the ASAL areas in years, and therefore urgent action continues to be required to reduce food gaps, protect their livelihoods, and prevent and treat acute malnutrition. There are both national and county government initiatives to enhance mitigation of drought. Moreover, the presence of diverse agencies at the national level, such as the National Disaster Management Unit (NDMU), the National Disaster Operations Centre (NDOC), the State Department of Special Programs, and the National Drought Management Authority (NDMA), In Isiolo, Kenya, the NDMA has continued its mitigation measures, which comprised the employment of several strategies such as collaboration, stakeholder involvement in the mitigation measures, and joint approaches to disaster and drought mitigation measures, among others.

Statement of the Problem

Isiolo County, Kenya, along with other 19 ASAL counties, had been reported to be having a normal phase of drought by August 2023. In 2021, about 80-90 percent of the population in Isiolo County, Kenya were affected by the drought. Noticeably, there is a severe vegetation deficit, with communities walking distances to access water and food for their livestock (Kiecol, 2021). Isiolo County, Kenya was recently affected by drought, attributed to four consecutive failed rainy seasons, which consequently caused the loss of thousands of livestock due to depletion of pasture and failed crop farming, hence a rise in conflicts amid the worst case of drought experienced in 40 years (ACDI/VOCA, 2023).

Drought remains one of the leading courses of conflict in the area. While the National Drought Management Authority (NDMA) under the Ministry of Devolution and ASALs has played a critical role in the in-drought mitigation in the 23 arid and semi-arid counties in Kenya since its inception, a lot needs to be done as drought continues to affect this area that covers almost 80 percent of Kenya's landmass (NDMA, 2018). Therefore, establishing the effectiveness of National Drought Management Authority (NDMA) measures in drought mitigation is crucial. Existing studies have not adequately covered the effectiveness of mitigation measures by

NDMA in drought mitigation in Isiolo County, Kenya. Therefore, this study seeks to evaluate the effectiveness of mitigation measures by NDMA in drought mitigation in Isiolo County, Kenya.

Objectives of the Study

The study sought to;

- Identify the mitigation measures taken by NDMA in Isiolo County, Kenya.
- Establish the effectiveness of Mitigation Measures taken by NDMA in Isiolo County, Kenya.

Theories of the Study

The study was anchored on **Protection Motivation Theory** and the **APFM model**.

The Protection Motivation Theory by Rogers (1983) is an additional psychological theory that has been employed to conceptualize adaptation behavior and highlights that an individual's inclination to adapt is contingent upon their assessment of the danger or risk, as well as their evaluation of coping strategies (Gebrehiwot and van der Veen, 2015). Therefore, the individuals who are impacted by drought are more likely to invest in relevant adaptation measures. This explains the creation of NDMA as a response to continued drought in Isiolo County, Kenya.

The APFM model is based on early warning as a measure of the effects of drought mitigation. This paradigm places significant emphasis on the necessity of comprehensive early warning systems involving active adolescent participation and the integration of gender perspectives. A collaborative effort between the World Meteorological Organization (WMO) and the Global Water Partnership (GWP) led to the establishment of the model in 2001. The concept of early warning and early action aligns with the United Nations Secretary-General's advocacy for early warnings as a strategy to mitigate potential damages and underscores the importance of comprehensive early warning systems, incorporating active involvement of stakeholders, hence enhancing their efficacy in reducing the impacts of drought.

METHODOLOGY

The study used a descriptive survey design because the study requires an in-depth understanding of the effectiveness of mitigation measures by NDMA in drought mitigation in Isiolo County, Kenya. The target populations for this study were all the 20 respondents, which include 11 NDMA Technical Team members (NDMA Office, Isiolo County, 2024) and 9 stakeholders. Census which included all the targeted respondents. Data was collected through the use of structured questionnaires. The analysis included both descriptive and inferential statistics. Descriptive analysis included frequencies and percentages, while inferential statistics that were based on linear regression were used to establish the relationship between NDMA draft mitigation measures and their effectiveness in draft mitigation in Isiolo County and helped in drawing a conclusion on the relations between variables and the nature of the relationship based on a 95% confidence level.

RESULTS AND DISCUSSION

The study had sampled 20 respondents that included NDMA and the stakeholders (NGOs and other players in the disaster management) and the response was as follows.

Table 1: Response Rate

	Sampled	Responded	Did not Responded	Response Rate (%)
NDMA and the stakeholders	20	18	2	90%

Source: NDMA, Isiolo County, Kenya 2024

The study achieved a 90% NDMA response rate, indicating a high response to assess the level of effectiveness of Mitigation Measures taken by NDMA in Isiolo County, Kenya. Arora, (2003), stated that a questionnaire and interview-based study that produces above 65% response, is rated as a well participated study.

NDMA Mitigation measures

The results had sought to establish the mitigation measures by NDMA in Isiolo County and the response was as follows.

Table 2: Mitigation Measures by NDM in Isiolo County

Response	Never		Sometimes		Excellent		Total	
	N	%	N	%	N	%	N	%
Water Harvesting	5	27.8	13	72.2	0	0.0	18	100.0
Soil Conservation	4	22.2	5	27.8	9	50.0	18	100.0
Afforestation	5	27.8	10	55.6	3	16.7	18	100.0
Social Protection Programs	3	16.7	4	22.2	11	61.1	18	100.0
Early Warning Systems	2	11.0	5	27.8	11	61.1	18	100.0

Source: Field Study (2024)

The study indicated that 27.8% of the respondents felt that water harvesting has never been effective as a mitigation measure taken by NDMA in Isiolo County, Kenya 72.2% of the respondents felt that water harvesting has sometimes been effective as a mitigation measure taken by NDMA in Isiolo County, Kenya and none of the respondents felt that water harvesting has been excellently effective as a mitigation measure taken by NDMA in Isiolo County, Kenya. The findings showed that 22.2% of the respondents felt that soil conservation has never been effective as a mitigation measure taken by NDMA in Isiolo County, 27.8% of the respondents felt that soil conservation has sometimes been effective as a mitigation measure taken by NDMA in Isiolo County, and 50.0% of the respondents felt that soil conservation has been excellently effective as a mitigation measure taken by NDMA in Isiolo County.

Results were also established. 27.8% of the respondents felt that afforestation has never been effective as a mitigation measure taken by NDMA in Isiolo County, 55.6% of the respondents felt that afforestation has sometimes been effective as a mitigation measure taken by NDMA in Isiolo County, Kenya, and 16.7% of the respondents felt that afforestation has been excellently effective as a mitigation measure taken by NDMA in Isiolo County. The study also indicated that 16.7% of the respondents felt that social protection programs have never been effective as a mitigation measure taken by NDMA in Isiolo County, 22.2% of the respondents felt that social protection programs have sometimes been effective as a mitigation measure taken by NDMA in Isiolo County, and 61.1% of the respondents felt that social protection programs and early warning systems have been excellently effective as a mitigation measure taken by NDMA in Isiolo County, Kenya. The findings of the study emphasized the need for afforestation, which has been excellently effective as a drought mitigation measure, as cited by ICRAF (2023), which encouraged afforestation as a mitigation measure.

NDMA measures and Effective Mitigation of Draught in Isiolo County, Kenya

The study had sought to establish the relationship between NDMA measures and Effective Mitigation of Draught in Isiolo County, Kenya and the response was as follows.

Table 3: NDMA measures and Effective Mitigation of Draught in Isiolo County, Kenya

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.894 ^a	.799	.715	.268

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.418	5	.684	119.535	.001 ^b
	Residual	.860	12	.072		
	Total	4.278	17			

a. Dependent Variable: Effective Mitigation of Draught
b. Predictors: (Constant), Early warning systems, Soil conservation, Afforestation, Water harvesting, Social Protection Programs

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta			
1	(Constant)	1.818	.507			3.585	.004
	Water harvesting	.228	.095	.349		2.412	.033
	Soil conservation	.135	.091	.217		1.473	.166
	Afforestation	.140	.107	.188		1.308	.216
	Social Protection Programs	.356	.096	.556		3.719	.003
	Early warning systems	.242	.089	.375		2.712	.019

The coefficient determinant (R squared) of .799 implies that 79.9% of the changes in effective mitigation of drought in Isiolo County are explained by NDMA measures (water harvesting, soil conservation, afforestation, social protection programs, and early warning systems). The other 20.1% is attributed to other factors not included in the study other than NDMA measures (water harvesting, soil conservation, afforestation, social protection programs, and early warning systems).

The study also utilized the Analysis of Variance (ANOVA) test to assess whether the regression model is statistically significant. The output from the ANOVA test indicates a p-value that is less than 0.05 (Sig=.000<.05), which shows that the model above is statistically significant in explaining the relationship between the NDMA measures (water harvesting, soil conservation, afforestation, social protection programs, and early warning systems) and Effective Mitigation of Draught in Isiolo County, Kenya in this study. The (F = 119.535; 5, 12) also showed that the model was statistically fit to measure the relationship between NDMA measures (water harvesting, soil conservation, afforestation, social protection programs, and early warning systems) and effective mitigation of drought in Isiolo County.

The resulting regression equation from the coefficients in Table 3 above is:

$$Y = 1.818 + .228X_1 + .135X_2 + .140X_3 + .356X_4 + .242X_5$$

The above equation can be interpreted as follows:

A unit change of .228 in water harvesting, .135 in soil conservation, .140 in afforestation, .356 in social protection programs, and .242 early warning systems will result in a unit change in the effective mitigation of drought in Isiolo County, Kenya. The findings also indicate that the regression model ($\beta = 1.818$) is statistically significant (sig < .000 < .05). Further, the findings show that water harvesting, social protection programs, and early warning systems (Sig = .000 < .05) were statistically significant, while soil conservation and afforestation (Sig = .000 < .05) were not statistically significant.

CONCLUSION AND RECOMMENDATION

The study established that water harvesting, social protection programs, and early warning systems statistically contributed to effective mitigation of drought in Isiolo County, Kenya, while soil conservation and afforestation did not statistically contribute to effective mitigation of drought in Isiolo County, Kenya. Soil conservation and early warning systems were the most excellent NDMA drought mitigation measures, followed by afforestation and then water harvesting.

There is a need for NDMA to identify how they can implement the most effective NDMA drought mitigation measures in order to reduce the impact of drought in the area. NDMA should work closely with other stakeholders to ensure that the drought measures are not only effective but also address the community's unique drought needs. Lastly, there is a need to evaluate reasons why afforestation and water harvesting are not significant in effective mitigation of drought and establish ways that they can be better implemented.

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