

Characterization of the Variability in Rainfall and Temperature in A tropical Grazing Ecosystem in Kenya

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HYPOTHESIS

Recognizable environmental variables in tropical grasslands are characterized by fluctuations in the mean as well as high variability and changes that persisting for longer than normal periods

INTRODUCTION

- ❖ Climate change leads to alteration of environmental conditions directly or indirectly through anthropogenic activities.
- ❖ Grazing systems that are dependent on the natural cycle of climatic conditions are expected to be more seriously impacted by climate change.
- ❖ As livestock farmers in the tropics continue to bear the brunt of climate change, there is need to understand variability of identifiable environmental variables

Objective

- ✚ To evaluate the trends and variability of rainfall and temperature in a tropical grassland in Kenya



MATERIALS

Data

- ❖ Monthly rainfall and minimum and maximum temperature data were collected from the Dairy Research Institute (DRI) of Kenya.
- ❖ The DRI is located about 100km NW of Nairobi at 1,829-2,330m asl, in AEZ IV
- ❖ Experiences highly variable rainfall and temperature conditions (Ayugi et al., 2016).

METHODS

- ❖ Variability of the environmental variables was characterized by computing the coefficient of variation (CV), percentage departure from the mean (Anomalies), Precipitation Concentration Index (PCI) and moving average
- ❖ The Mann-Kendall (MK) trend test was used to detect trends while the Sen's Slope test was used to compute the slope using Sen's method.



RESULTS AND DISCUSSION

- ❖ The mean annual rainfall was 578.5± 151.3 mm and a CV of 24.2%.
- ❖ The mean temperature for the study area ranged from 10.4 to 26.5°C.
- ❖ The short season rain had higher CV (59.2%) than long season rain (49.2%) meaning more inter-annual variability of the short rains.

RESULTS AND DISCUSSION

Table 1: Descriptive statistics and Mann-Kendall trend analysis & Sen's slope test for rainfall and temperature

Month	Mean±SD	CV(%)	MK test	Sen's slope
Long rains, mm	191.9±94.5	49.2	-34.40***	-2.929
Short rains, mm	150.9±89.4	59.2	14.97**	0.148
Annual rains, mm	578.5±151.3	24.2	1.10	-0.144
Tmin, °C	10.4±0.5	4.8	0.036	0.002
Tmax, °C	26.5±0.9	3.4	-0.252	-0.014

- ❖ MK trend analysis test revealed found as statistically significant (P<0.05) decreasing trend for long and annual rainfall and increasing for short rains.
- ❖ The MK trend analysis also revealed non-significant (P>0.05) increase and decline for minimum and mean temperature, respectively.
- ❖ The rate of change of minimum and maximum temperature was found to be was 0.017°C and -0.156 °C per decade.
- ❖ Annual and long season rain decreased by 36.5 and 25.5 mm per decade while short season rain increased by 69 mm per decade.

Table 2: Precipitation concentration Index for Naivasha for the years 1981 to 2012

Index	Description	Number of years
<10	Low precipitation concentration (almost uniform)	0
11 to 15	Moderate concentration	21
16 to 20	High concentration	11
≥21	Very high concentration	0
Mean PCI (1980 to 2012)=14.6	Moderate concentration	

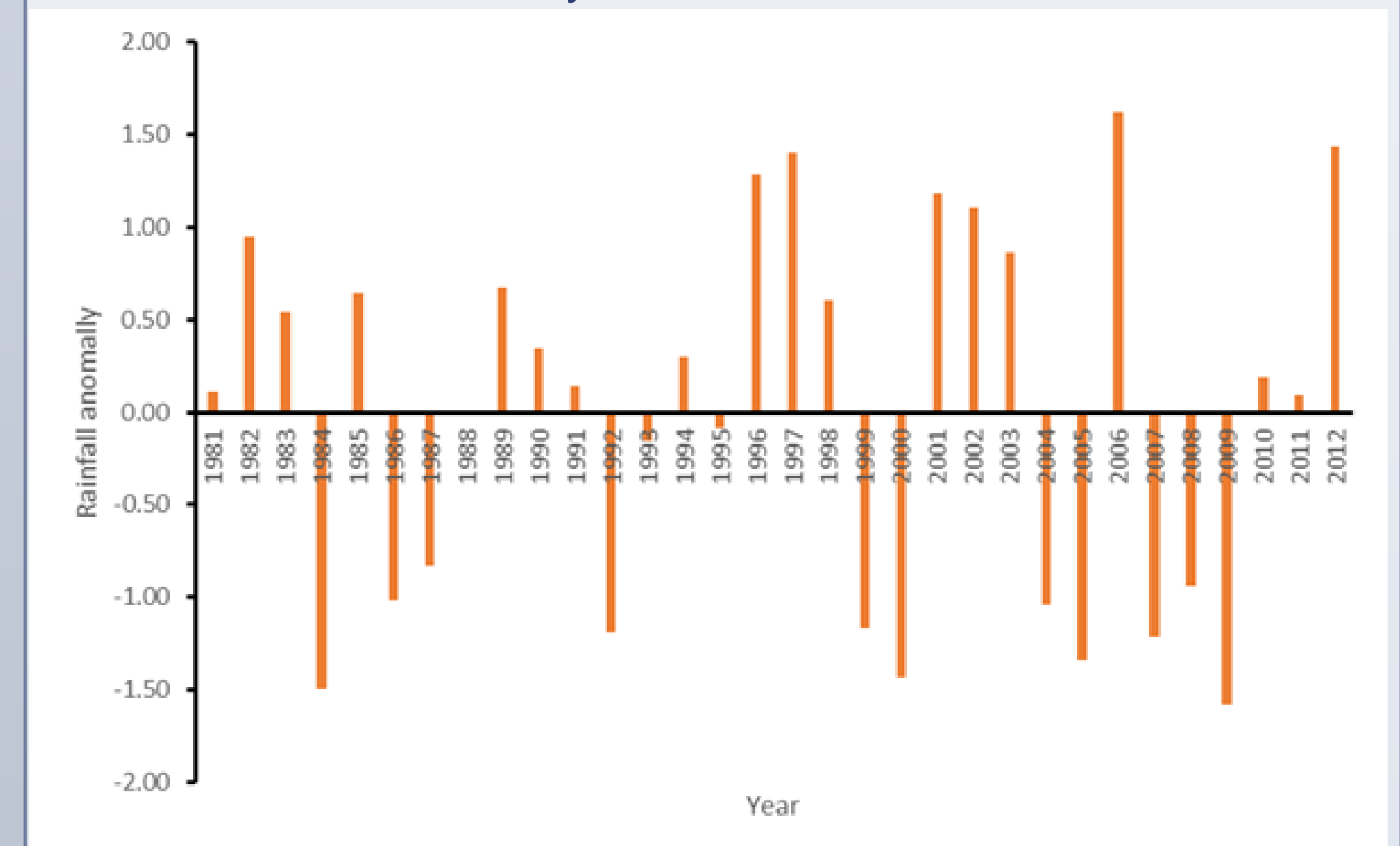
- ❖ The PCI revealed that the study area has had rainfall with moderate concentration over the years, with about 34% of the years having high rainfall concentration. .

CONCLUSION

- The PCI revealed that the study area has had rainfall with moderate concentration over the years
- MK trend analysis, Sen's slope test and overall anomalies revealed inter annual variability in rainfall and temperature in Naivasha, Kenya

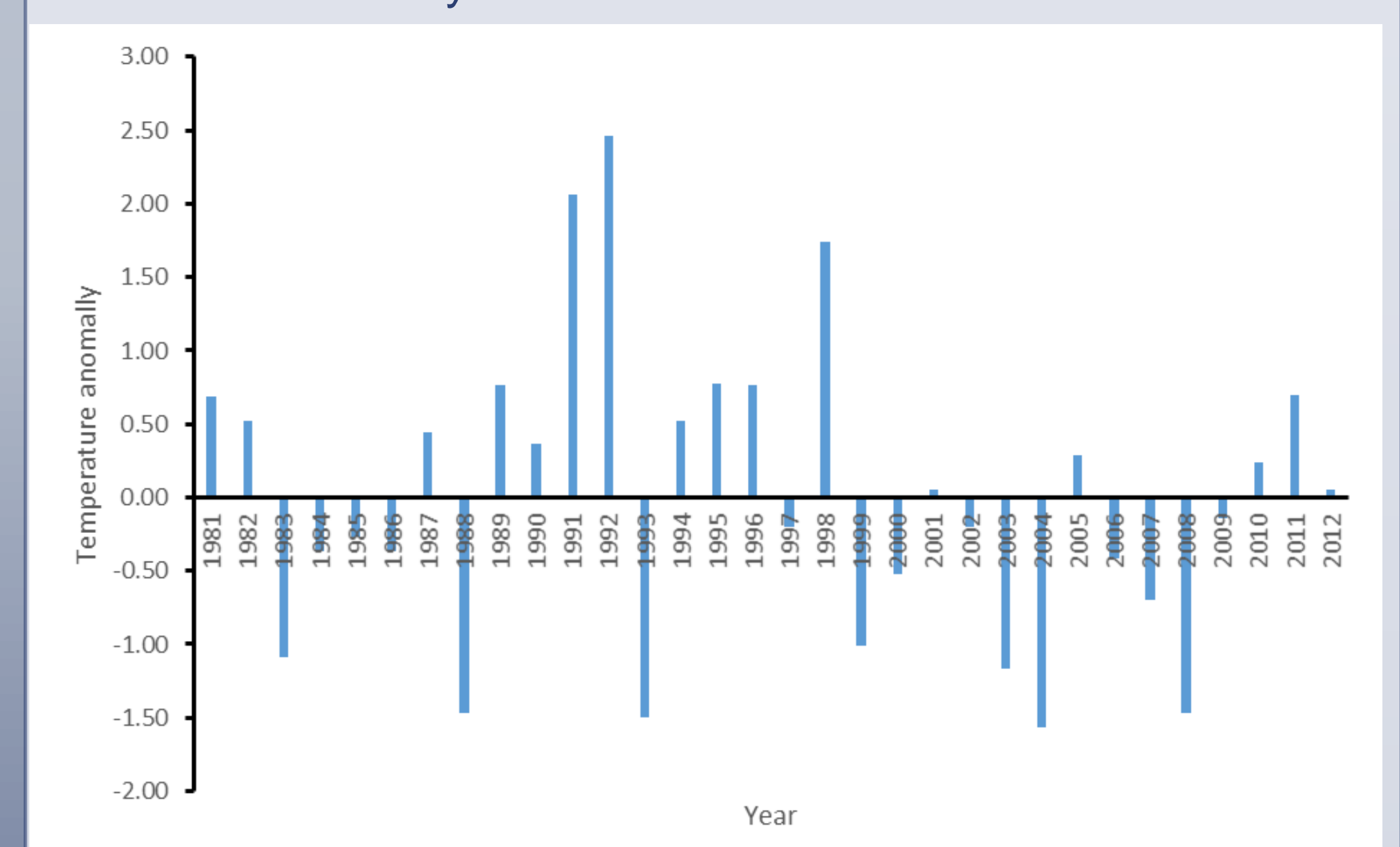
RESULTS AND DISCUSSION

- ❖ The rainfall anomalies found in the current study depict inter-annual variability with the trend in the anomalies being more varied in recent years.



Rainfall anomalies (mm) for Naivasha Sahiwal Stud relative to 1981 to 2012 period

- ❖ Anomalies for mean annual temperature showed inter annual variability.



Temperature anomalies (°C) for Naivasha Sahiwal Stud relative to 1981 to 2012 period

REFERENCES

- Ayugi, B.O., Wen, W., & Chepkemoi, D. 2016. Analysis of Spatial and Temporal Patterns of Rainfall Variations over Kenya, Journal of Environment and Earth Science Vol.6, No.11.

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