Agricultural Drought Indices in the Greater Horn of Africa (GHA) Countries

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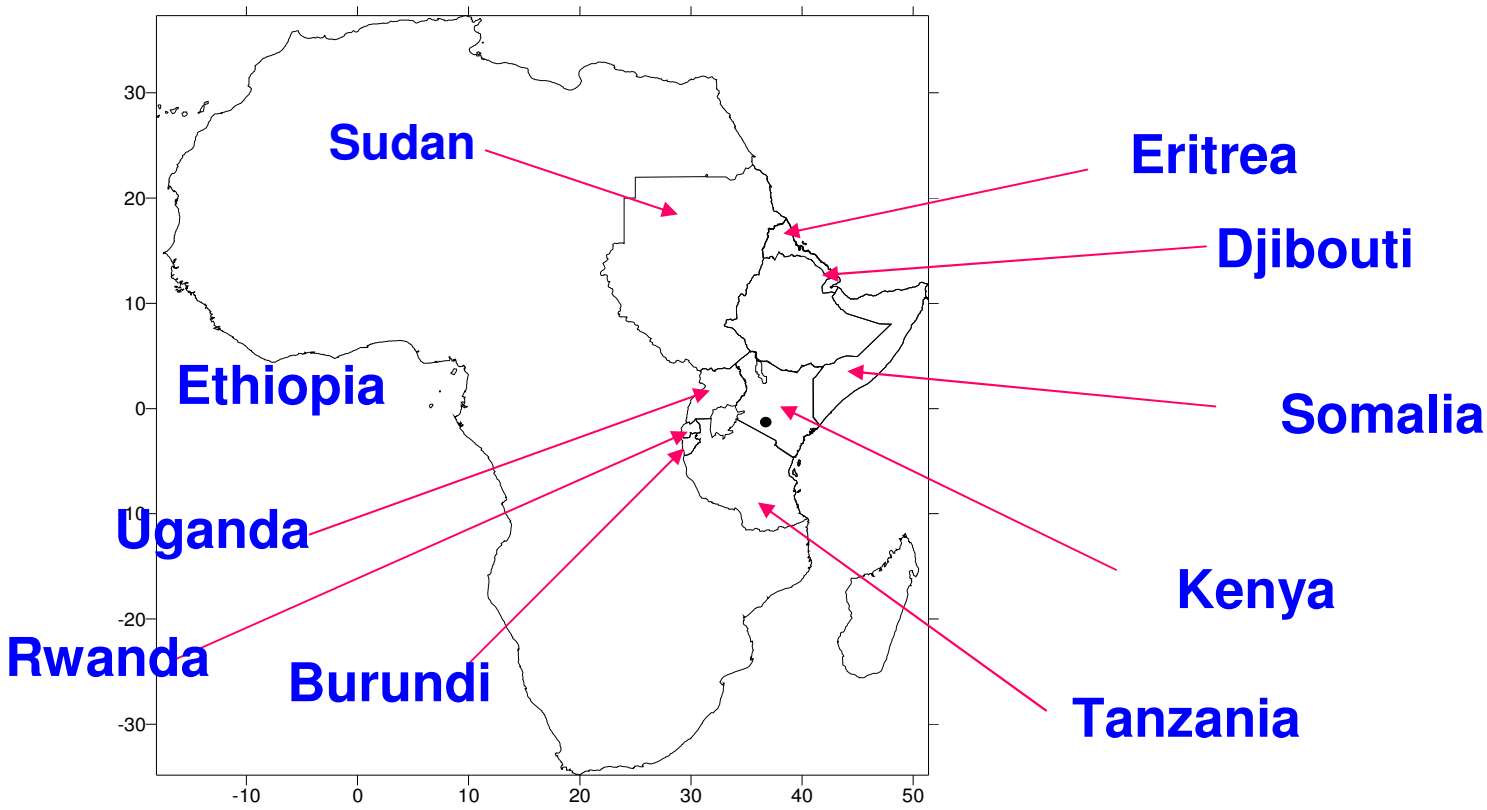
Outline

- Brief Background on ICPAC
- Impacts of drought on socio-economic sector of the GHA region
- Drought Severity Index based on Percentiles
- Strengths, Weaknesses and Limitations
- Summary and Conclusion

CURRENT ICPAC PARTICIPATING COUNTRIES



BACKGROUND

- The Greater Horn of Africa countries is prone to extreme climate events such as **droughts** and **floods** with **severe negative impacts** on key socio-economic sectors.
- Rainfall and temperature determine availability of natural resources such as water, vegetation, wildlife, general flora and fauna, biodiversity etc that determines the livelihood of communities.
- Thus climate variability has far reaching implications on the livelihood of most of the rural communities in the region
- The **I**GAD **C**limate **P**rediction and **A**pplications **C**entre **(ICPAC)** was established in order to address climate related challenges in the GHA sub-region

ROLE OF ICPAC

- To provide timely climate early warning information and sector specific products for the mitigation of the impacts of climate variability and change for poverty alleviation and sustainable development;
- To improve the technical capacity of producers and users of climatic information, in order to enhance the input to and use of climate monitoring and forecasting products;
- To develop an improved, proactive, timely, broad-based system of **information/product dissemination** and feedback, at **both sub-regional and national** scales through national partners;
- To expand the knowledge base within the sub-region in order to facilitate informed decision making on climate related issues; and
- To maintain quality controlled databases and information systems required for risk/vulnerability assessment, mapping and general support to the national and regional climate risk reduction strategies.

ICPAC PRODUCTS

- Monitor of past, present and prediction of future climate

✓ dekadal (ten day)

✓ monthly and

✓ seasonal time scales

- These are provided through dekadal, monthly and Seasonal summaries of **rainfall** and **drought severity**
- to detect the evolution of any significant anomalies that could impact negatively on the socio - economic activities of the region.

IMPACTS OF CLIMATE EXTREMES (DROUGHTS) IN THE HORN OF AFRICA

- Failure in Agricultural and Livestock Production
- Lack of water and pasture for livestock and domestic use
- Failure in hydro-power based industries
- Loss of human and animal lives
- Conflict among agro-pastoralists and between humans and wildlife

IMPACTS OF DROUGHT ON AGRICULTURAL PRODUCTION

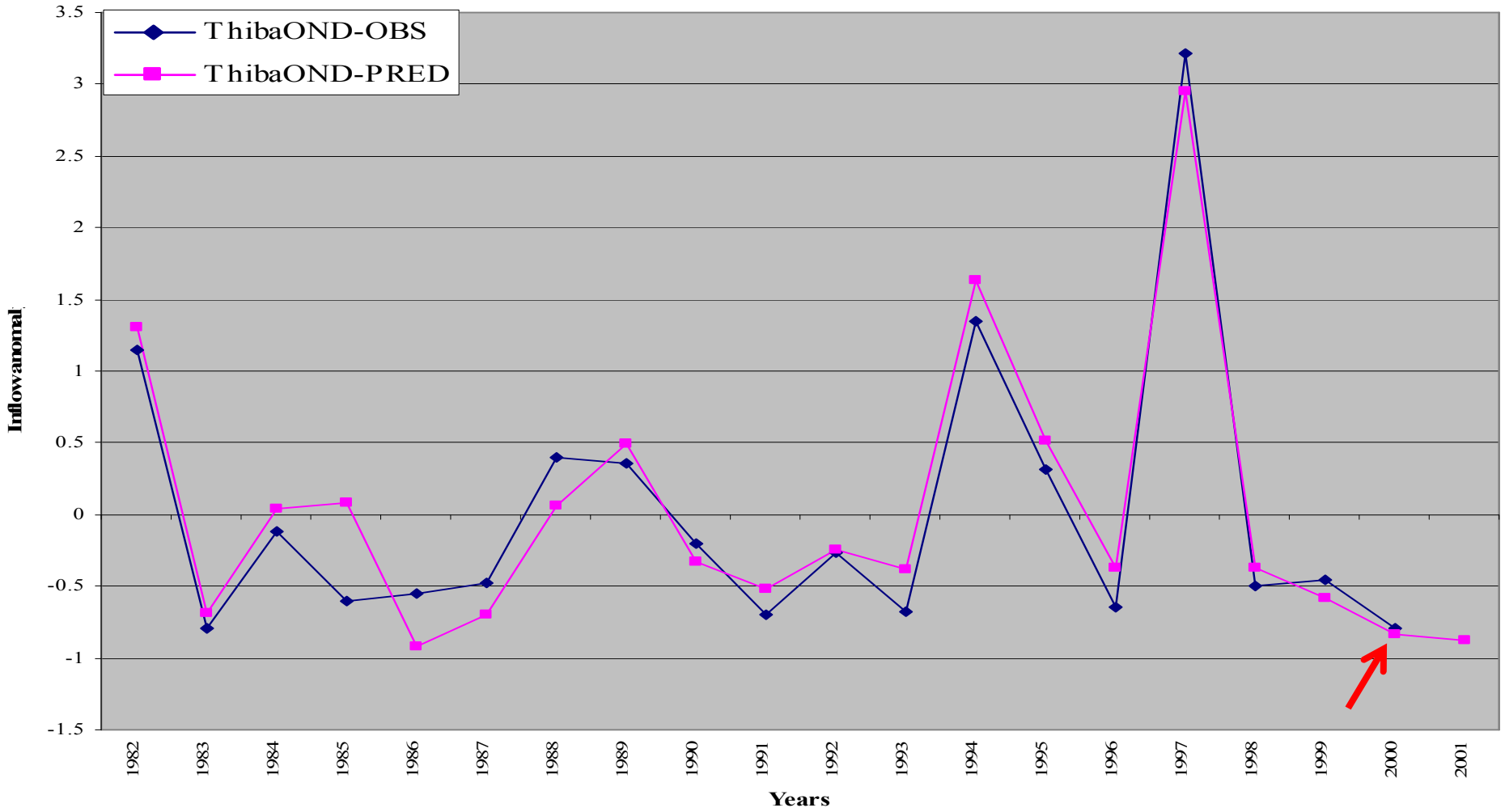
Grazing in the city centre due to severe drought

Loss of Livestock due to severe Drought

CONFLICT

A View of Masinga Dam during the 1999/2000 La-Nina Drought

Observed and Predicted October-December (OND) Thiba Inflow anomaly into Kamburu Dam



Water shortage due to prolonged drought in Kibera slum, Nairobi

DROUGHT - THE CONCEPT

- **Drought is a normal, recurring feature of climate; it occurs in virtually all climatic regimes.**
- **It is a temporary aberration, in contrast to aridity, which is a permanent feature of the climate.**
- **Drought is the consequence of a natural reduction in the amount of precipitation received over an extended period, usually a season or more in length. Other climatic factors are often associated with it.**
- **Drought is also related to the timing and the effectiveness of the rains.**

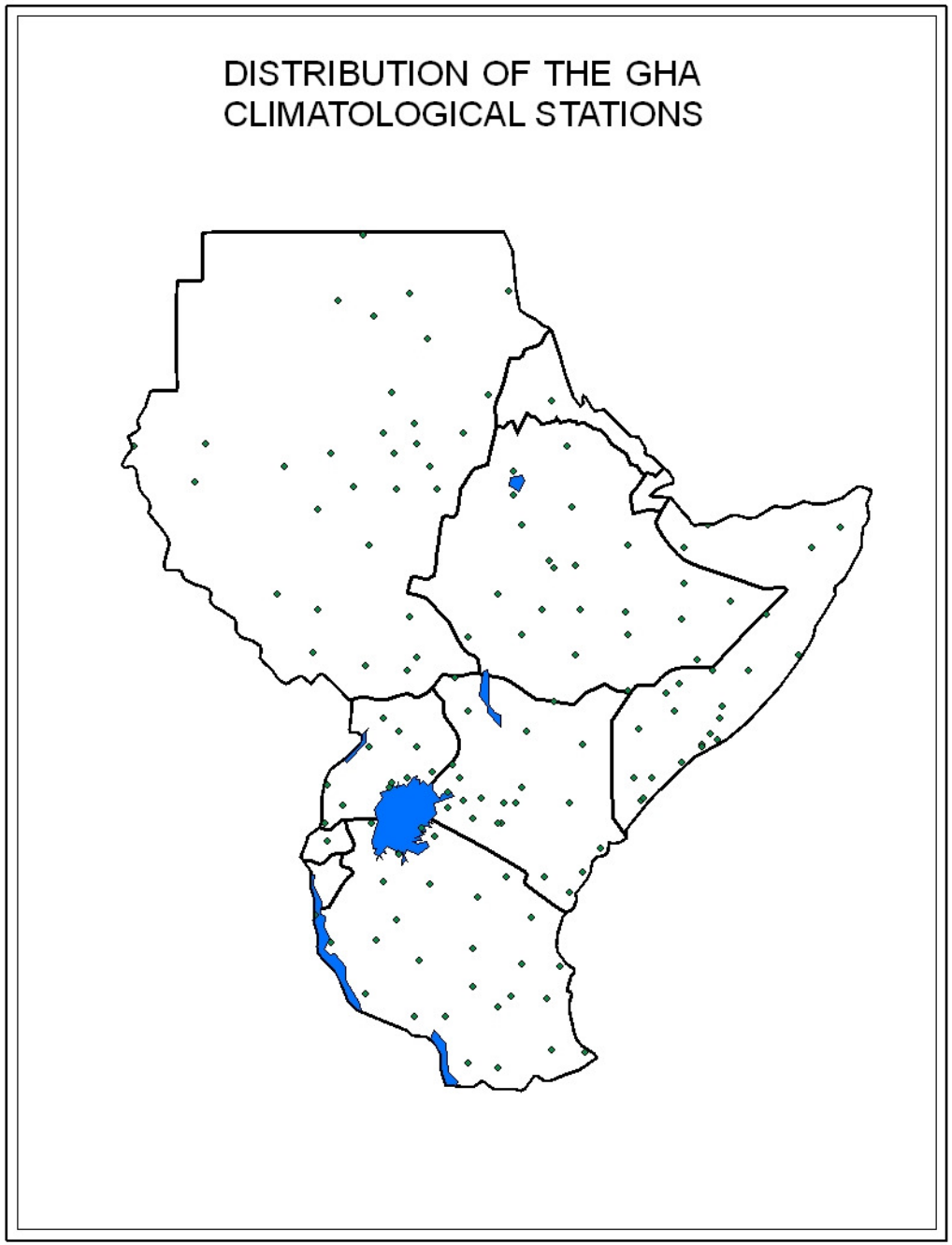
DROUGHT - THE CONCEPT (cont..,)

Drought differs from other natural hazards in several ways.

- **Effects of drought accumulate slowly.**
- **The onset and ending of drought are difficult to determine. Hence it is referred to as a creeping phenomenon.**
- **Absence of a precise and universally accepted definition of drought adds to the confusion as to whether it exists, and if it does, the degree of its severity.**
- **Definitions of drought here must be region and application (impact) specific.**

TYPES OF DROUGHT RELEVANT TO GHA

- Meteorological drought-deficiency of precipitation from expected or "normal" over an extended period of time.
- Hydrological drought- deficiencies in surface and subsurface water supplies leading to lack of water for meeting normal and specific water demands.
- Agricultural drought- Deficiency in the water availability for specific agricultural operations such as, deficiency of in soil moisture, which is one of the most critical factor in defining crop production potential.



CURRENTLY OBSERVED STATIONS DATA POINTS

Review: Ogallo et al 1998

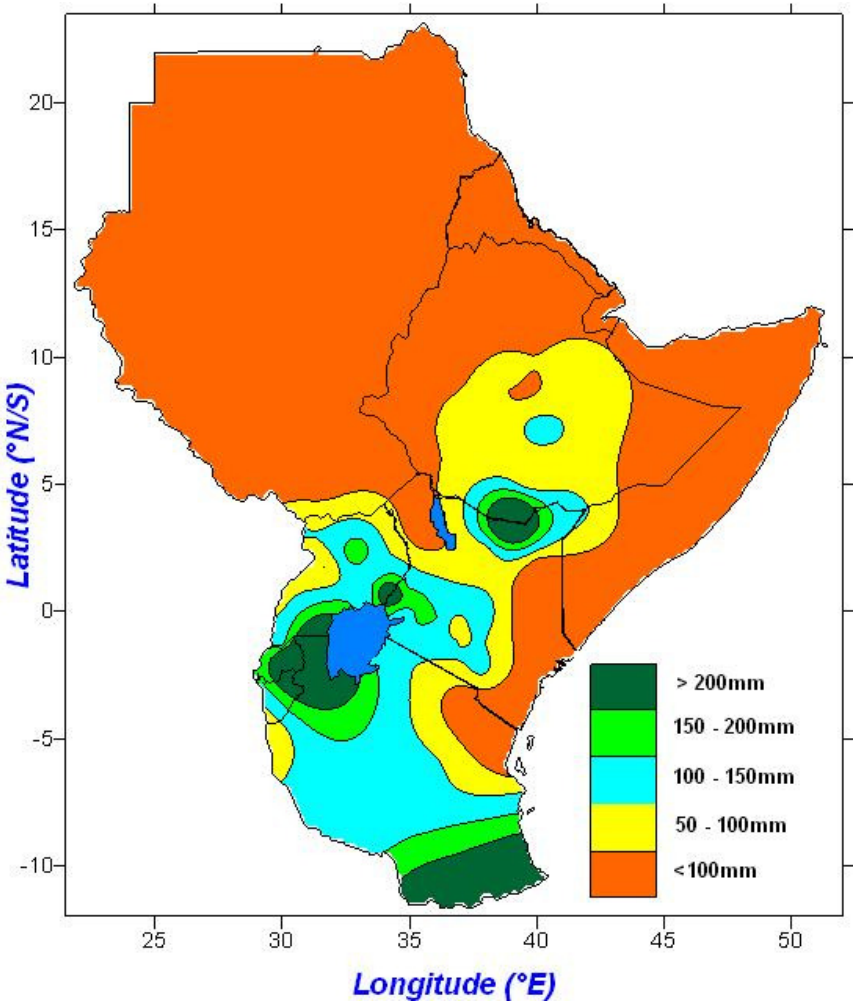
Drought Severity Index

Based on Percentiles

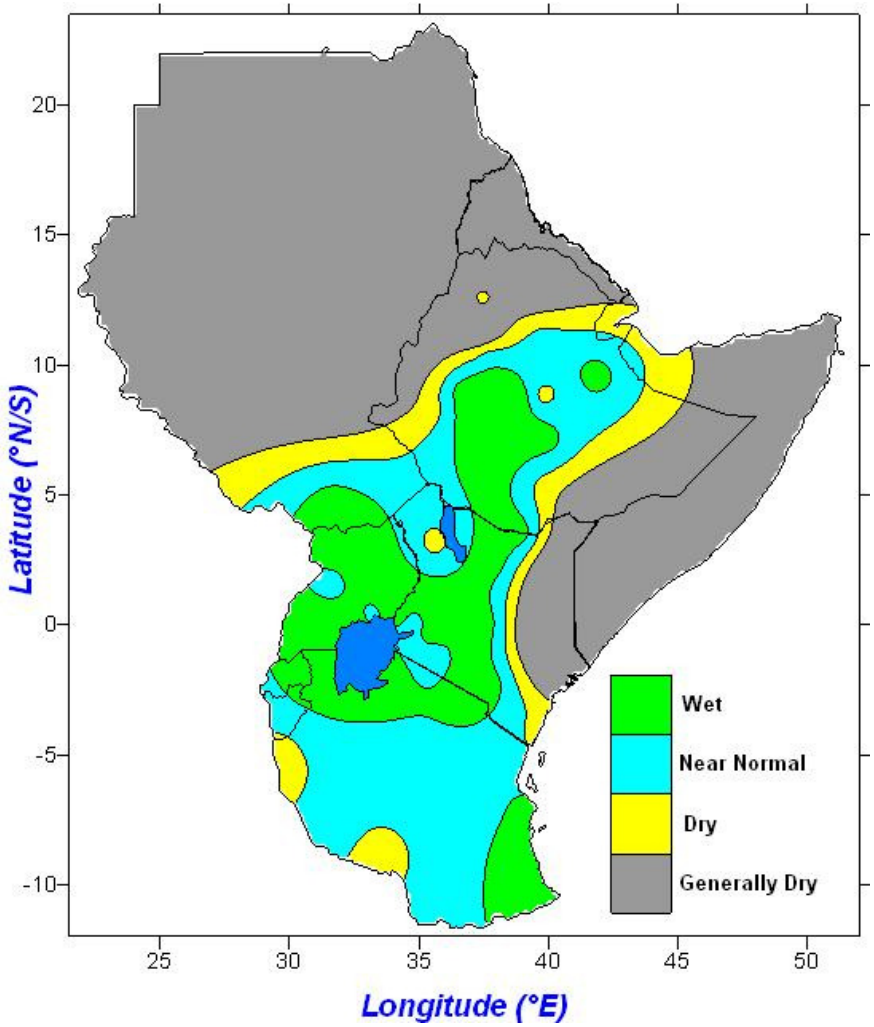
- Derived by ranking historical records
- based upon climatological mean
- 1st quartile: less than 25% ➡ Generally Dry
- Near Normal: ➡ 50%
- 3rd quartile: more than 75% are considered wet.

Cumulative Rainfall series for Kigoma in western Tanzania

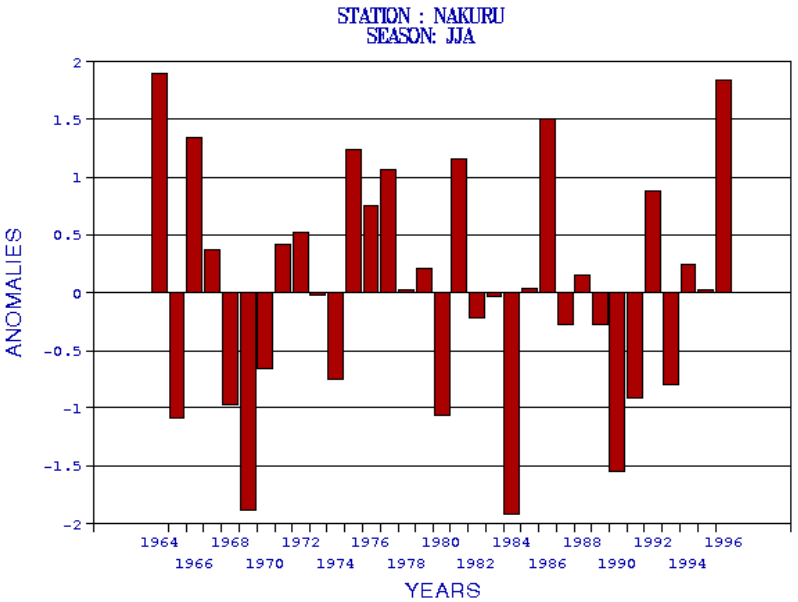
Distribution of rainfall during February 2010

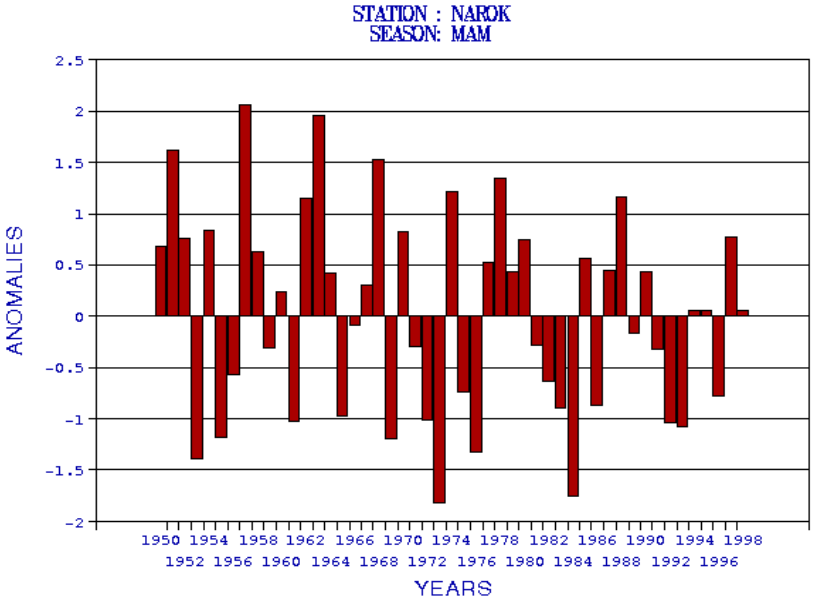


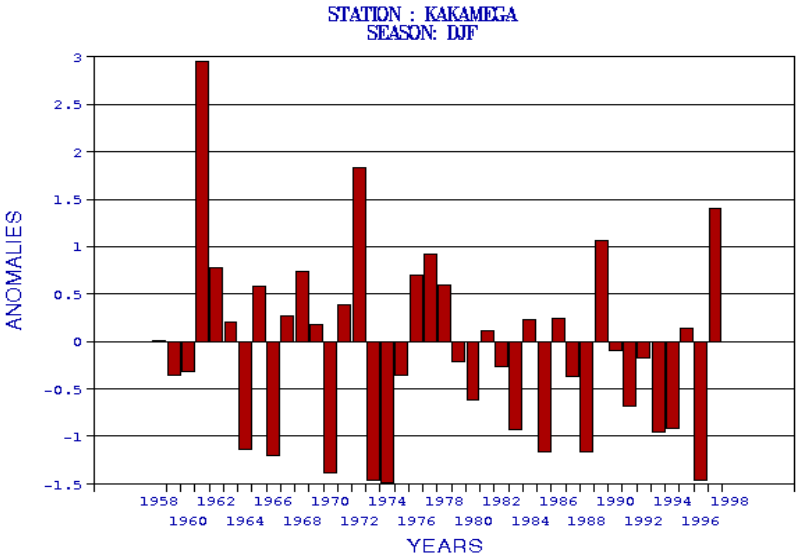
Rainfall severity index for February 2010

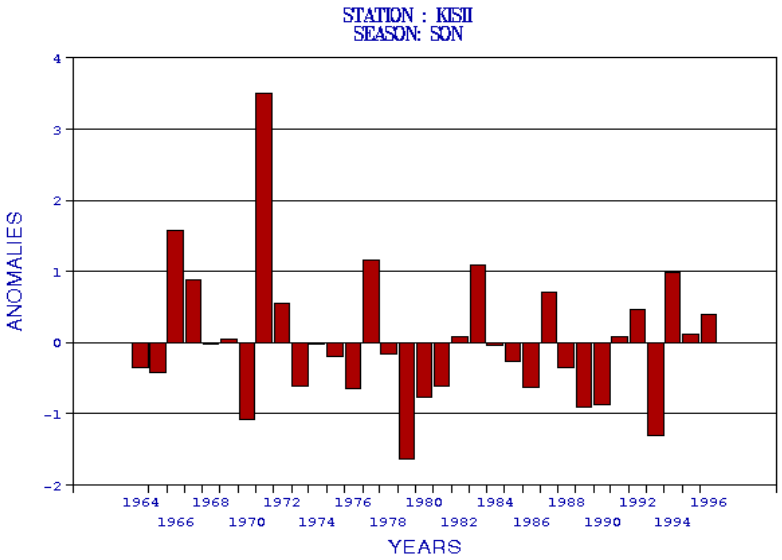


Time series of standardized seasonal anomalies

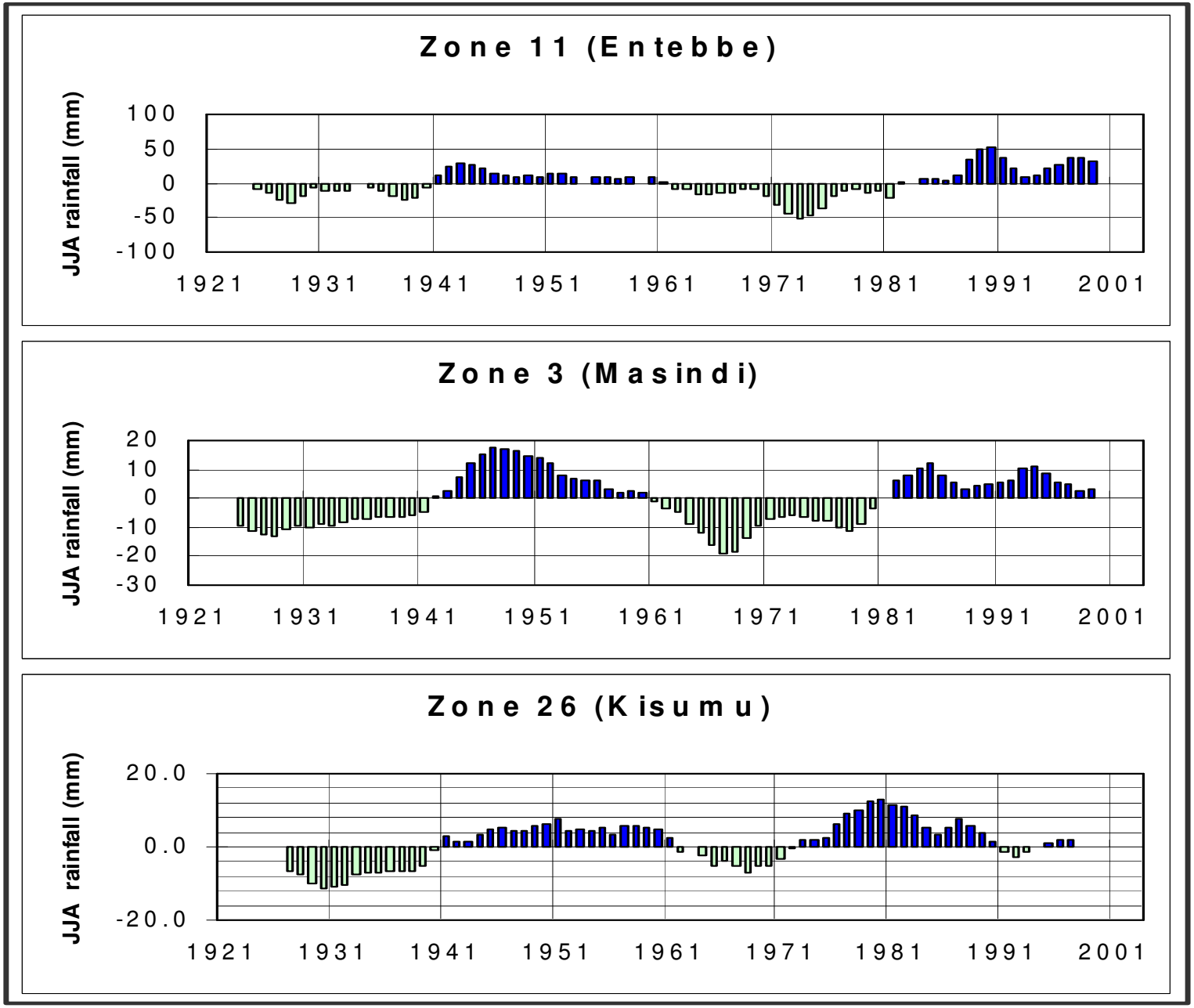








DECADAL RAINFALL VARIBILITY



•There is current effort to use satellite–based monitoring to supplement in situ observations in regional early warning system (AMESD project)

•European Union (EU) sponsored project on African Monitoring of the Environment for Sustainable Development (AMESD) Project (funded by the European Development Fund) to enhance monitoring for sustainable management of the environment

Strengths

- Accuracy in Spatial and temporal distribution over a fixed specific locality
- Useful in detection of change of rainfall climate regime

Weaknesses and Limitations

- The onset and withdrawal phases not easily detected
- The approach does not show Intensity and duration
- many times fail to detect agricultural droughts, their severity
- uses dekadal, monthly and seasonal based data hence cannot detect precisely the onset and withdrawal date of drought, the spatial distribution of drought severity, and the daily changes of drought severity
- Effective Drought Index (EDI; Byun and Whilhite, 1999) is developed as intensive measure on a daily indices
- Climatogical mean takes into account both rainny and dry periods

SUMMARY AND CONCLUSION

- **Mapping past patterns**
- **Monitoring current patterns**
- **Understanding causes**
- **Predicting and early warning of future expectations**

SUMMARY AND CONCLUSION CONT..,

- Development of standardized products / indicators for specific use, including hazards assessments.
- Communications, dissemination and feedback system.
- Improvement of the monitoring, modeling and prediction capacities
- Prediction and Early Warning System