

# **Space borne Technology for Drought Monitoring in Sudan**

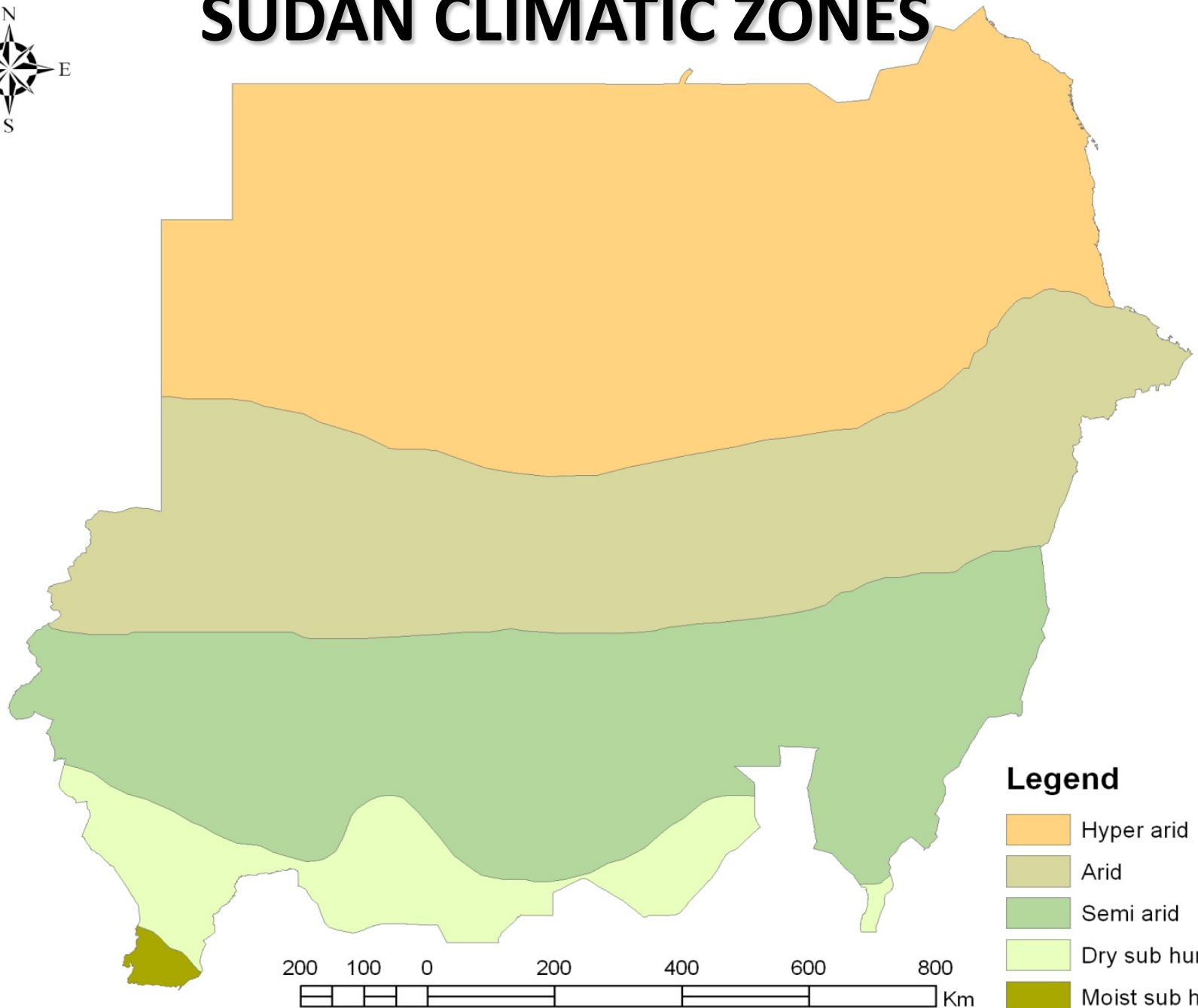
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# Sudan Location Map



# SUDAN CLIMATIC ZONES



## Legend

- Hyper arid
- Arid
- Semi arid
- Dry sub humid
- Moist sub humid

# Sudan Profile

- Sudan area is 1.9 million square kilometers.
- Sudan population is about 32 millions.
- Its annual rainfall amount exceeds 1,000 mm in the South and below 100 mm in the extreme north.
- Three major types of agricultural systems are practiced in Sudan: (1) irrigated agriculture, (2) mechanized rain-fed agriculture (frequently affected by drought), and (3) traditional rain-fed agriculture (frequently affected by drought).
- Sudan has one of the largest livestock population in Africa, including camels, cattle, sheep, and goats, which depends mostly on the natural rangelands.



# Slim Camels



# Introduction

- ✓ Most of disasters experienced by the Sudan are of ecological nature such as droughts, floods, desertification, pest and locust attacks...etc. Sudan has also been exposed to biological disasters such as disease outbreaks and other environmental health hazards.
- ✓ The second type of disasters experienced by the Sudan are man-made disasters. These include disasters associated with mismanagement of natural resources, wars and conflicts.



# Introduction....cont

**Drought is a frequent hazard in Sudan, it causes life threatening and brings a series of events and reactions that create a devastating cycle of environmental collapse, conflict and displacement.**

**Over 80% of the 32 million Sudan's population lives in rural areas, depending on agriculture and livestock. Sudan history of drought is so frequent. 1906 famine, 1984/5 famine and different droughts during 1989, 1990, 1997, 2000, and 2011.**

**There is an inadequate capacity to deal with disasters in Sudan. Space-based information is not fully utilized in the process of disaster management and risk reduction.**

# **Drought Hazard in Sudan**

**Drought is one of the important disasters that threatens Sudan.**

**The total area considered as drought prone is about 69,000 sq Km and this area produces 90% of the cultivated food crops and 85% fire wood.**

**Severe droughts affecting the country were in 1886, 1913, 1940, 1967-1973, and 1980-1984. Successive years of drought in certain parts of the country in 1985-1993 caused severe shortage of food, social disruption and widespread health and nutritional problems.**



# **Drought Hazard in Sudan**

**In the 1984 drought 8.5 million people were affected and 7.8 million livestock were lost.**

**Drought effect in Sudan differs in different parts: Widespread at the western part; Moderate at the eastern and southern part; lesser at central part.**

**Drought affects mainly human and livestock causing feed and water shortages and displacement.**

**Human and livestock displacement sometimes causes tribal conflicts.**



# Drought Impact Situation in Sudan

Year	Drought Coverage	Consequences
1886		
1906	Affecting all Sudan	Severe famine
1913	Localized (part of Sudan)	
1940	Localized (part of Sudan)	
1967	Localized (part of Sudan)	
1973	Localized (part of Sudan)	
1984/85	Localized (part of Sudan)	Severe famine
1989/90	Localized (part of Sudan)	
1997	Localized (part of Sudan)	
2000	Localized (part of Sudan)	
2003	Localized (part of Sudan)	food shortage in some areas
	Localized (part of Sudan)	
	Localized (part of Sudan)	
2008	Localized (part of Sudan)	
2009	Affecting part of South Sudan	Localized famine
2011	Affecting most of South Sudan	food shortage in some areas



# **Space- based information for drought impact assessment**

# 2003 - 2007

## Vegetation cover monitoring

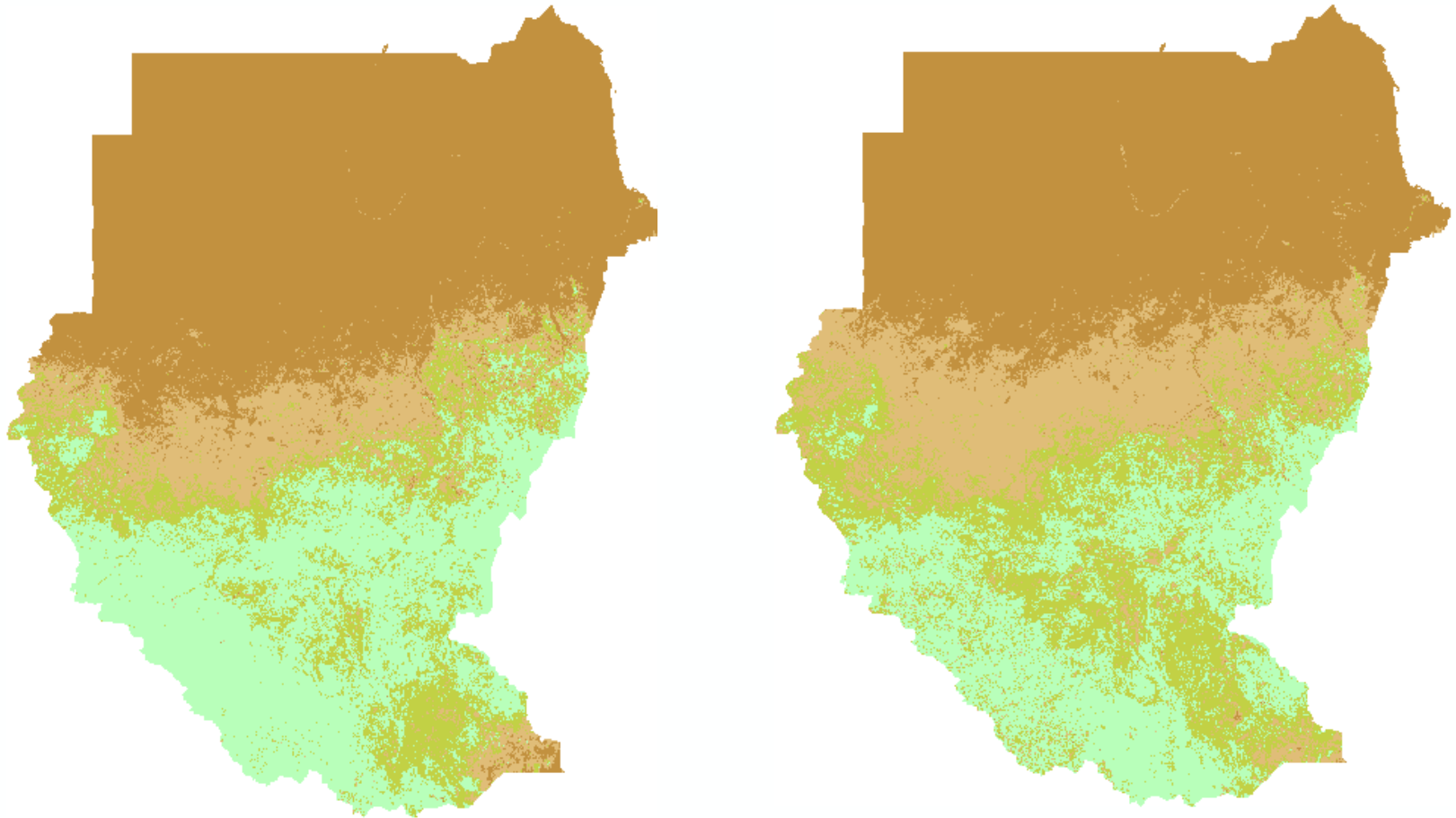


Fig 4.7 Vegetation Map Based on NDVI  
Kordofan State 1988

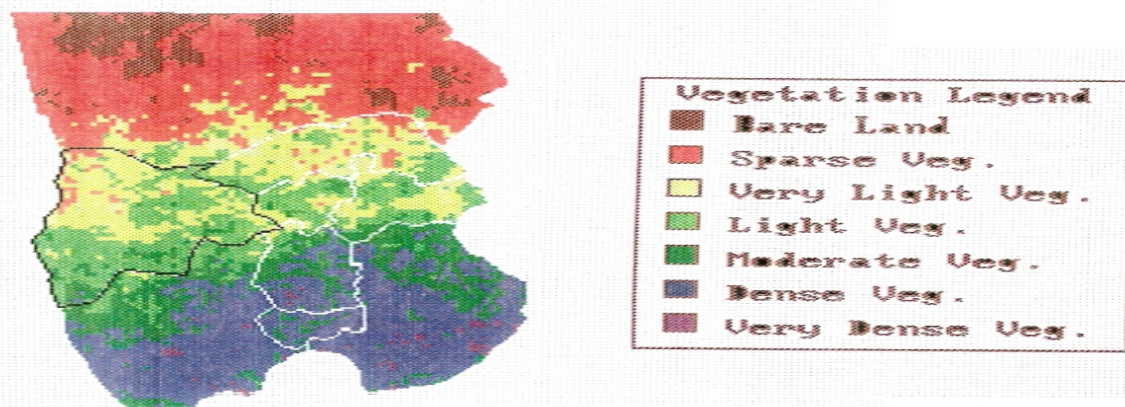
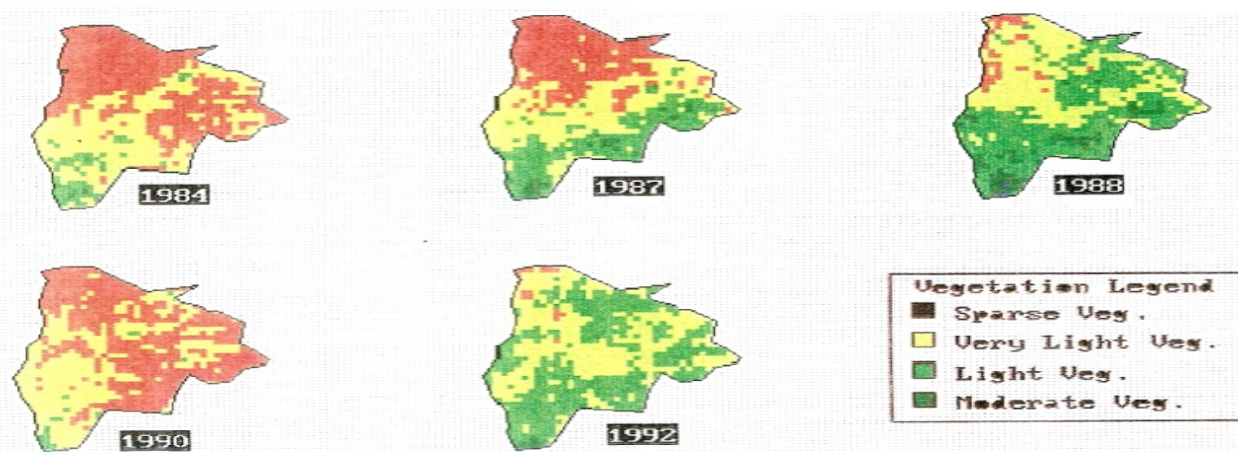







Fig 4.8 Vegetation Changes 1984 - 1992  
West Kordofan State



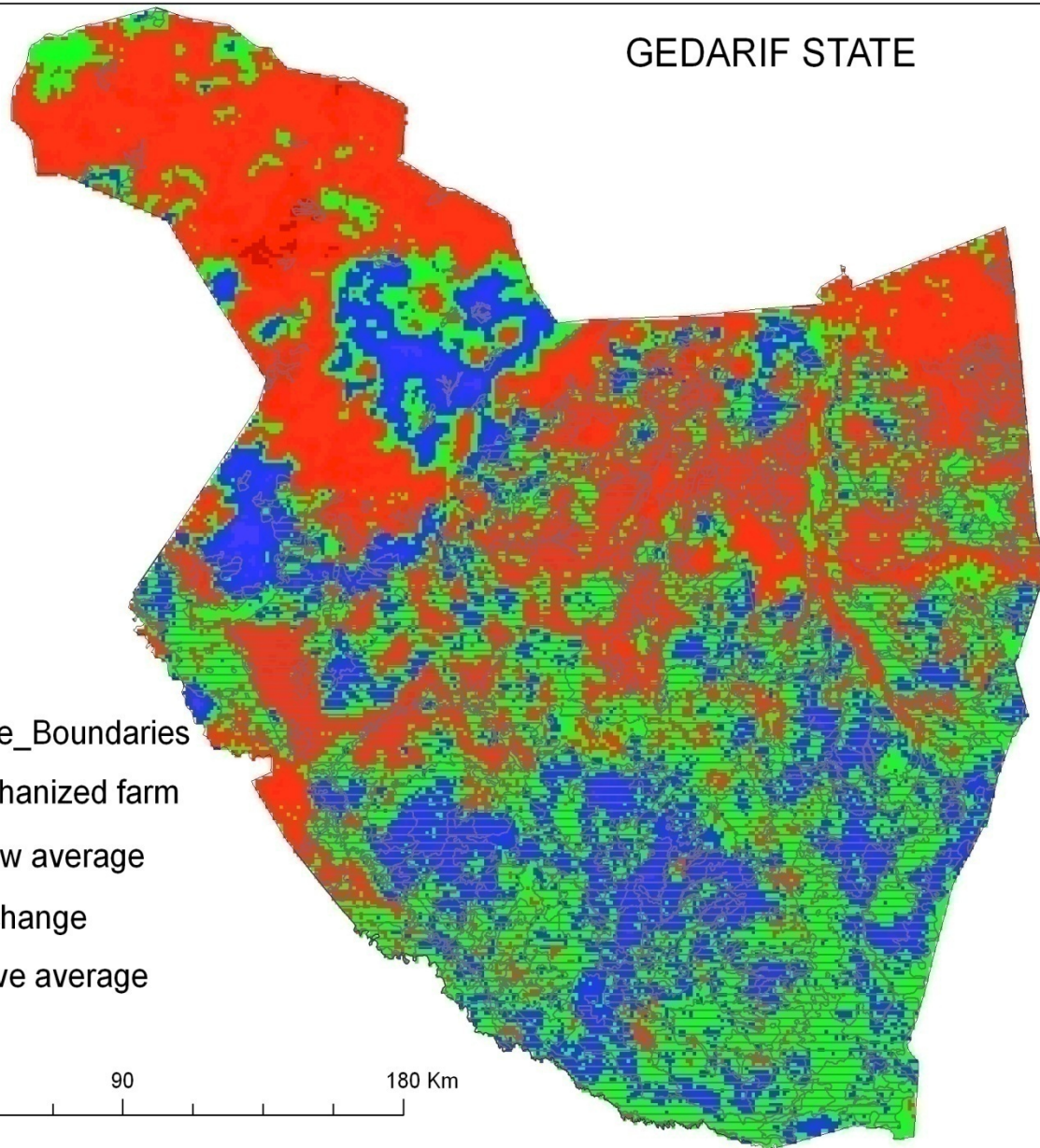



# GEDARIF STATE

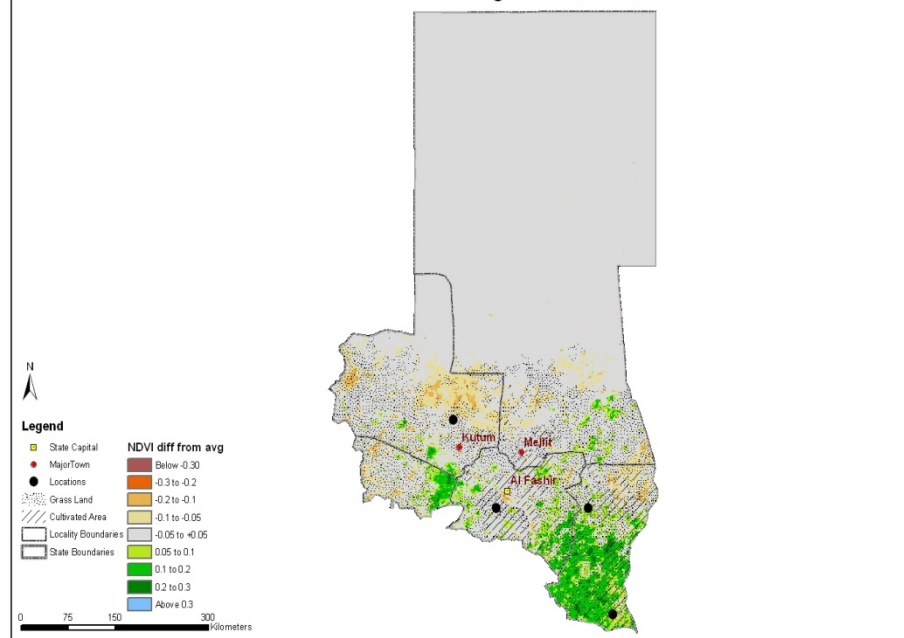
## Legend

-  State\_Boundaries
-  mechanized farm
-  below average
-  no change
-  above average

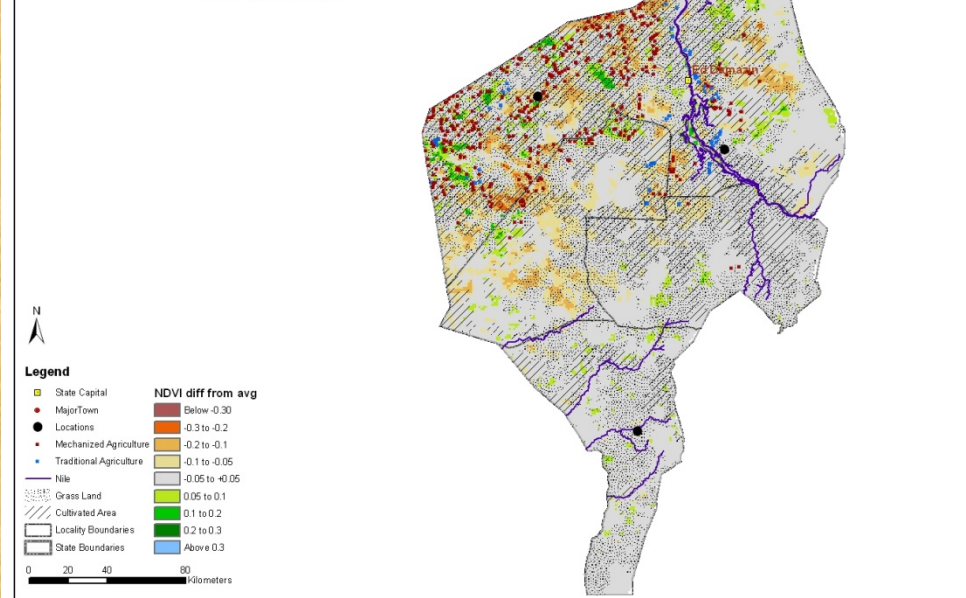
0 45 90 180 Km



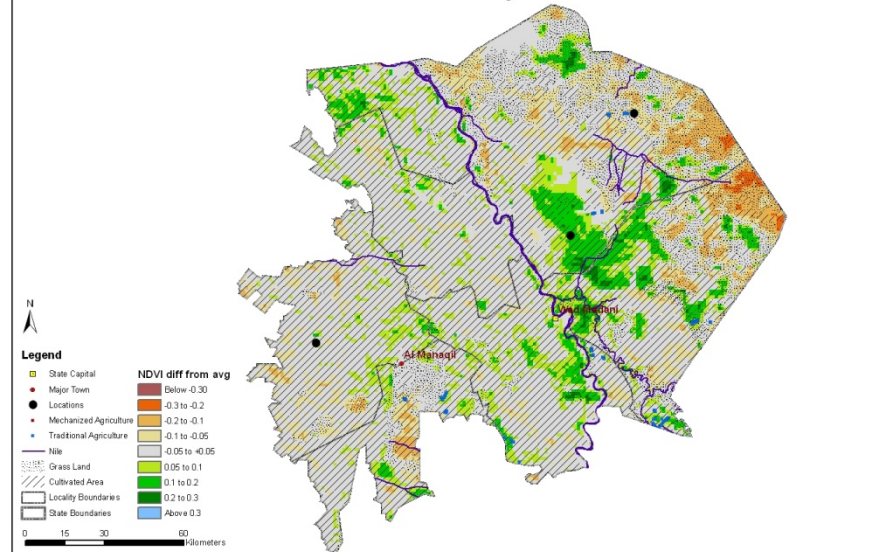
NDVI maximum difference from average 2009 Northern Darfour State



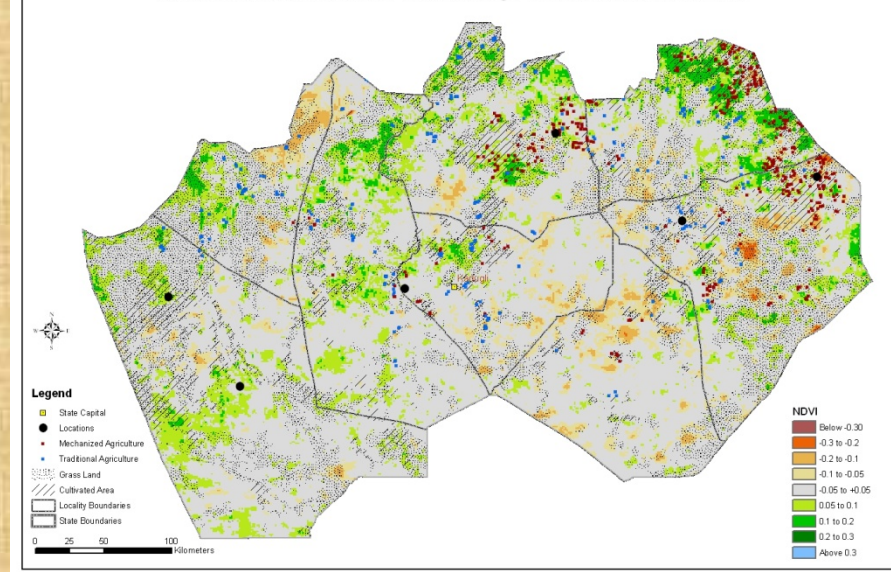
NDVI maximum difference from average 2009 Blue Nile State



NDVI maximum difference from average 2009 Gezira State



NDVI maximum difference from average 2009 Southern Kurdufan State





# **The major socioeconomic impacts of drought**

- **Immigration in search of employment opportunities,**
- **Social disruption as a result of displacement,**
- **Increasing violent-conflicts over the resource base,**
- **Malnutrition and epidemics.**



# **Institutes that are currently involved in drought monitoring**

- 1. Remote Sensing Authority, NCR, MOST: Carries out research, raising of awareness and capacity building (teaching and training: including image processing, interpretation and utilization).**
- 2. Sudan Meteorological Authority for Meteorological Forecasting, using remote sensing at a limited scale**
- 3. Universities; and other research institutes: research and teaching adopting other methods not included remote sensing**

# Challenges

1. Availability and accessibility of space-based information,
2. Efficient utilization of space-based information for drought monitoring and sustainable development
3. High level of coordination between different resources management actors and Space institutes, and
4. Integration of Space-based information in the planning, monitoring and management systems

# Conclusion

- ✓ In Sudan, drought represents a steadily aggravating phenomenon, especially in the northern part where it forces the rural population to internally immigrate towards big cities in the southern direction and abandon their farms and agricultural lands, leading to the emergence of several social and economical problems.
- ✓ drought adverse impact threatens the county unless quick remedial measures are taken.
- ✓ drought monitoring, and planning can be based on the vegetated area estimation in addition to some other related factors.



**Thank you**