

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# Climate Change and Agriculture Adaptation and Mitigation

Traditional agriculture rain fed sector as a case study in  
Sudan

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# • Preface

## مقدمة



- Developing countries are the most vulnerable to climate change impacts because they have fewer resources to adapt: socially, technologically and financially.
- Sudan as agriculture country depend on 200 million Feddans (4200 m<sup>2</sup>) distributed as (irrigated, mechanized rain fed and traditional rain fed) sectors in its most economy, food security and livelihood. Climate change effected as drought cycles (shortage rainy season), floods, heat and heat storms and desertification.



- **Traditional agriculture sector (15) million Feddans. Forest, wood and rangelands (300) million Fedden's were most effective of this elements climate change, farmers and pastoralist adapted with this changes. Research interaction throw produce some crop varieties resist the shortage of rainy season and water scarcity. Many simple techniques with other traditional knowledge's take place to adapted or mitigated climate change effects.**

- Indigenous crop varieties adapted with **the** local conditions, water harvesting **crops** in both micro and macro level in order to suitable water conservation and using. In addition, intercropping and promising technology as a seed priming and adding a micro dose of fertilizer in planting, beside the indigenous knowledge's in (the rate and distant between the seeds, crop structure caring , crop regeneration.



- local cultivated methods like seeding **special** crops before the rainy season (*Remmal*)<sup>1</sup>, cultivated crops in low lands in order to conservation water in the rainy season (*Sheerak*)<sup>\* 2</sup> make a trap to the rainy water)), or making plant fence around cultivated area utilize brows dry plants to stop desert creeping towards cultivated lands.



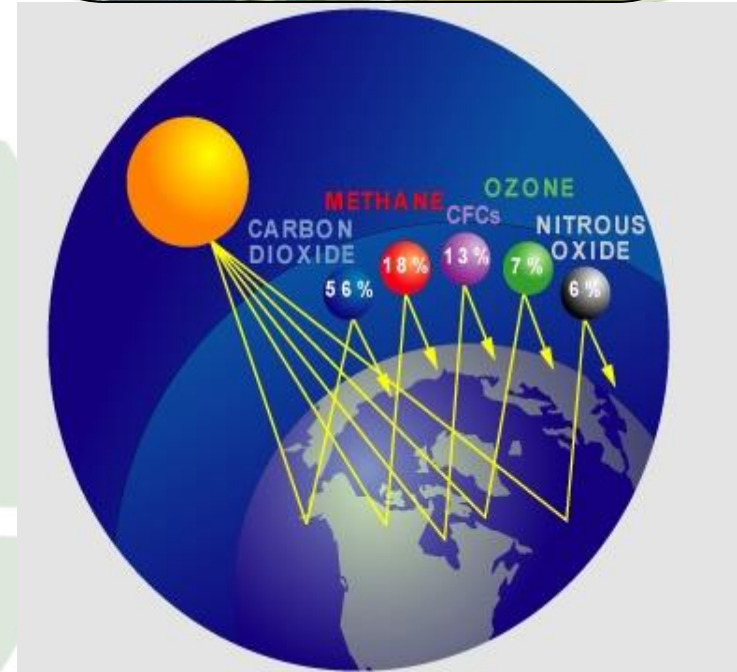
- In animal production sector, the indigenous knowledge's take place as different methods of migrations, herd structure and crossing mating with other breeds in order adapted or mitigated the climate change effects.



# Climate Change in Sudan

## What Dose it Mean

- 1- Drought.
- 2 – Heat Storms.
- 3- Dust Storms.
- 4 – Desertification
- 5 - Floods.







- **Drought:**

- The most important disaster that threatens Sudan is drought. The total area considered 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, 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:

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



# Effect of drought in Sudan differs in **different** parts of the country:

**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 causing tribal conflicts.**

**During this season wide spread drought was recorded in western Sudan and to lesser extent in southern Sudan.**



## Heat Stress dust storms:

In Sudan, heat stress affects many life activities

It has direct effect on livestock performance specially in diary production

Heat stress is the main constrain masking all trials to improve the national diary herd through introduction of higher potential breeds.

Excessive heat sometimes causes self ignition fires.

This noted commonly in the oil seed stores causing serious losses in cereal storage depots.

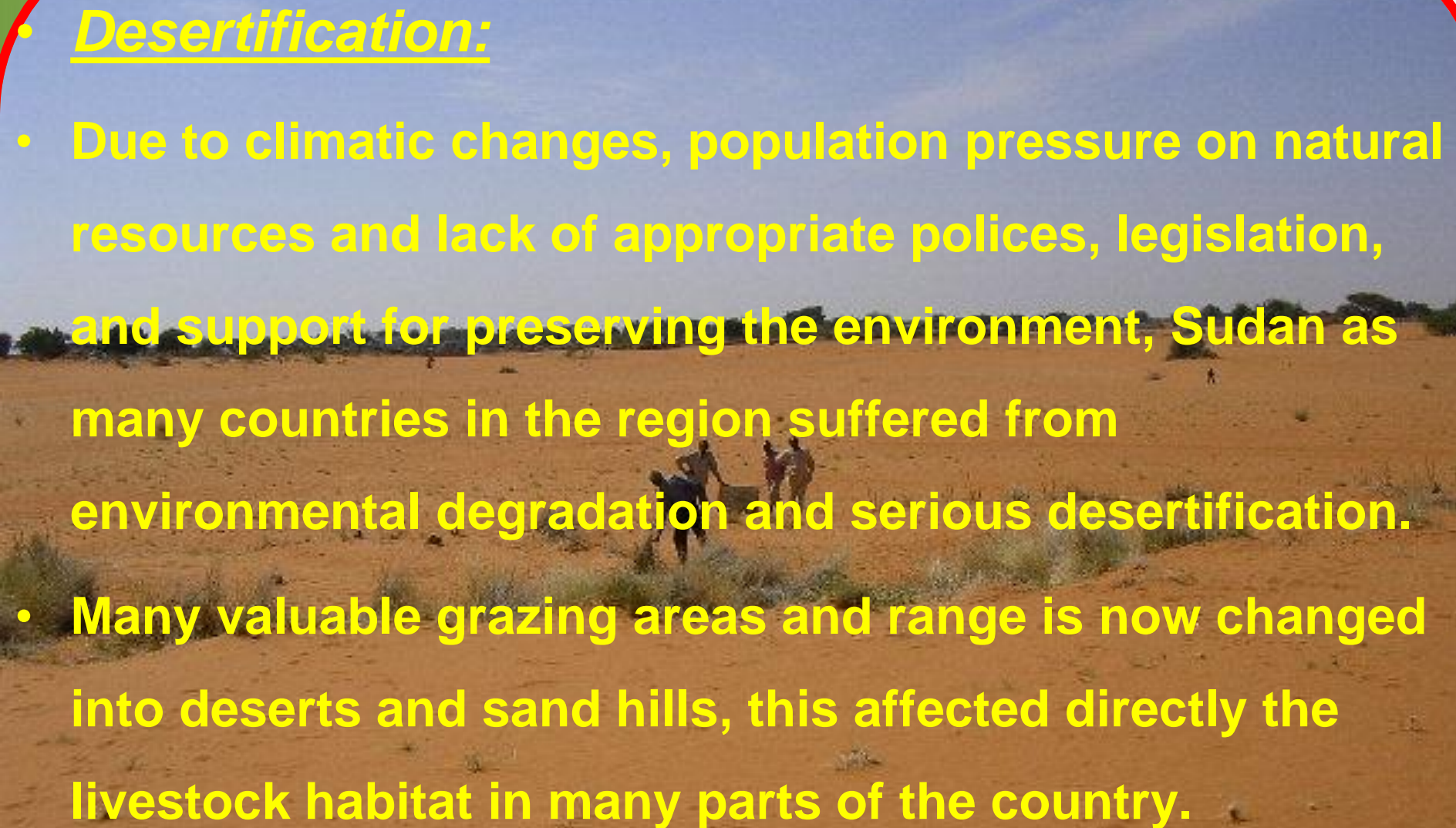
Heat stroke is reported frequently at the red sea costal areas. Many deaths were recorded in August 2002.

# Dust storms

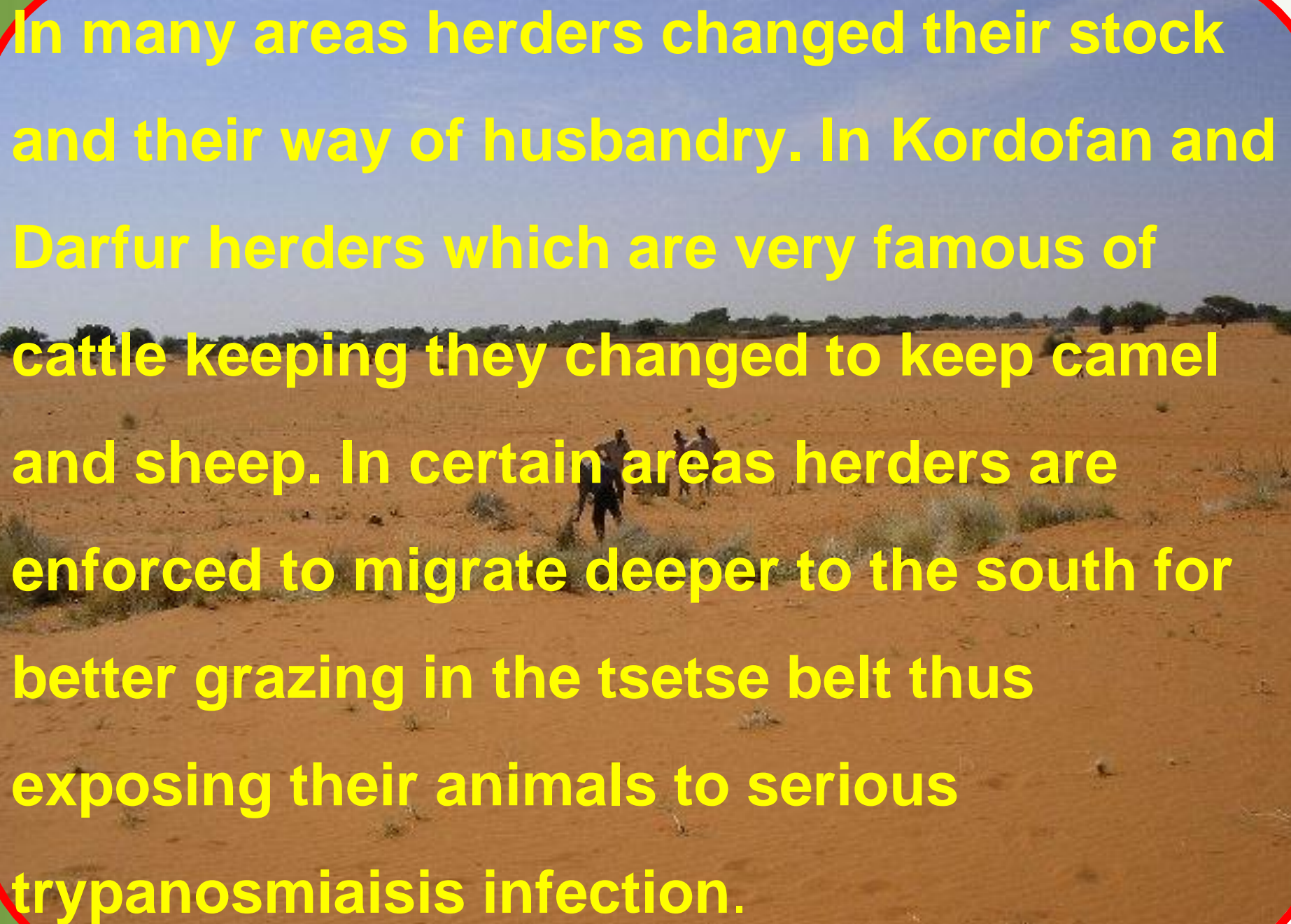


# Dust storm hit Khartoum 2006



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- **Desertification:**
  - Due to climatic changes, population pressure on natural resources and lack of appropriate policies, legislation, and support for preserving the environment, Sudan as many countries in the region suffered from environmental degradation and serious desertification.
  - Many valuable grazing areas and range is now changed into deserts and sand hills, this affected directly the livestock habitat in many parts of the country.

**In many areas herders changed their stock and their way of husbandry. In Kordofan and Darfur herders which are very famous of cattle keeping they changed to keep camel and sheep. In certain areas herders are enforced to migrate deeper to the south for better grazing in the tsetse belt thus exposing their animals to serious trypanosmiaisis infection.**

A photograph of a dry, open landscape, likely a savanna or tsetse belt. The ground is reddish-brown and sandy, with sparse, low-lying vegetation. In the middle ground, a group of people and animals, possibly a herd, are visible, moving across the field. The background shows a line of trees under a clear blue sky. The entire image is framed by a red circular border.

# Drought impacts on agriculture

**The most important current and potential**

**Drought impacts are:**

- 1- reduction in the length growing season and period of crop growth.
- 2- reduced agricultural productivity.
- 3- Changes in distribution and incidence of insects, diseases and weeds.
- 4- Accelerated land degradation (declined soil fertility and soil erosion).
- 5- Increased livelihood of crop failure and increase in the diseases mortality of livestock.



# Traditional Rain – fed Sector



# Production in Agri. Traditional rain fed sector



# Agriculture Adaptation & Mitigation

- The traditional farming system features:
- 1- small size of holding (5 – 20) feddans.
- 2- farming operation are entirely manual family labour using traditional hand tools.
- 3- little or no external inputs are used.
- 4- farming have limited resources and poor access to market, credit and improved production technologies.
- 5- farming is cured out under risky environmental conditions.
- 6 – low agriculture inputs.



# Adaptation & Mitigation



- **1- Crop varieties adapted with the local conditions:**
  - \* Early maturity.
  - \* Constant productivity.
  - \* Adapted with the shorten of rain fall season.
  - \* Resistant to the pests and insects.

# Three local groundnut adapted species; *Sodary, Waed and Gibash*



10.09.2008

# Adaptation & Mitigation



- 2- Water harvesting crops in both micro and macro level in order to suitable water conservation and using.



# Water harvest techniques



# Adaptation & Mitigation



- 3- Intercropping:

To growing tow types of crop in the same area utilize deferens levels of soil and air vegetation e.g. (legume with sorghums).

- 4- Agro forestry:

Combining Acacia Senegal with filed crop.

# Sesame & Acacia



# Sorghum & Groundnut



# Adaptation & Mitigation



## 5-Promising Technology:

- Seeding Priming and micro dose of Fertilizer.
- **A- Seed Priming:**
- Seeds should be priming for a period about 8 hours , a little drying and treated against pests before seeding.
- Priming in water accelerate the germination giving a strong plant.
- Priming in water for along time resulting loose the plant.

# Adaptation & Mitigation



- B - Adding a micro dose of Fertilizer. (NPK)**
- \* Adding a micro dose of fertilizer (less than one gram) in with the seeds in planting lead to increase in the productivity.
  - \* Methods & quantity of adding fertilizer very simple low cost without hazard.
  - Raised the resistance of the plant against environments stress.

# Methods of Implantation



- 1- Indigenous Knowledge.**
- 2- International Organization Governments Projects.**
- 3- Major Government Project : National Program Integrated Solution for Agriculture Sector (NPISAS).**

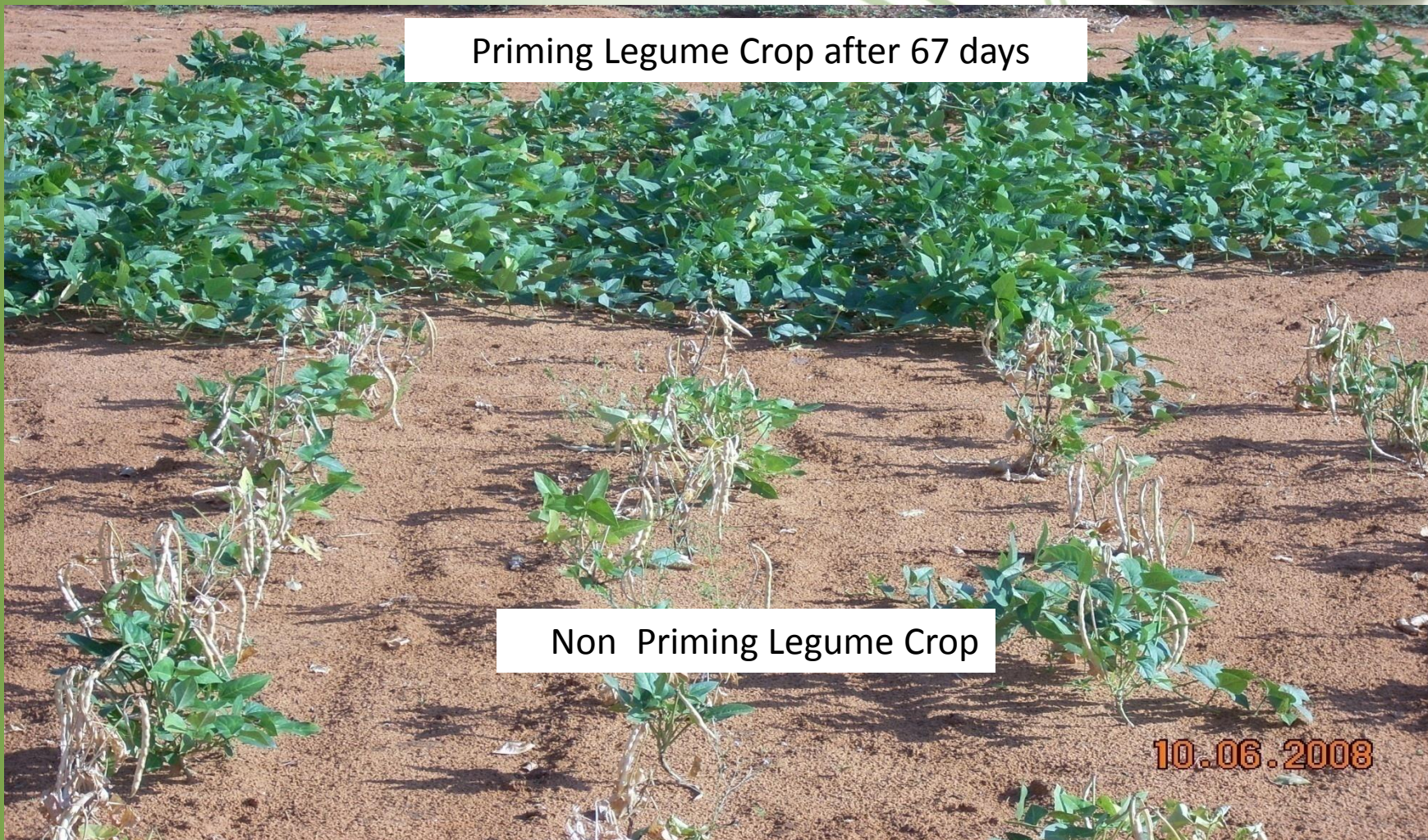
# Seed Priming



Priming Legume Crop after 67 days

Non Priming Legume Crop

10.06.2008



# Storage water in trees



# Reserving rain water



# Indigenous knowledge to resist desert creep



# Micro water harvest



# Small scale water harvest (*Sherrak*)





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# **International Organization Government Projects**



- **1- Water Scarcity and Drought Management  
United Nation / Department of Economic  
Social Affairs (UNDESA), in effected local  
communities.**
- **2- Green Great Wall. GGW.**

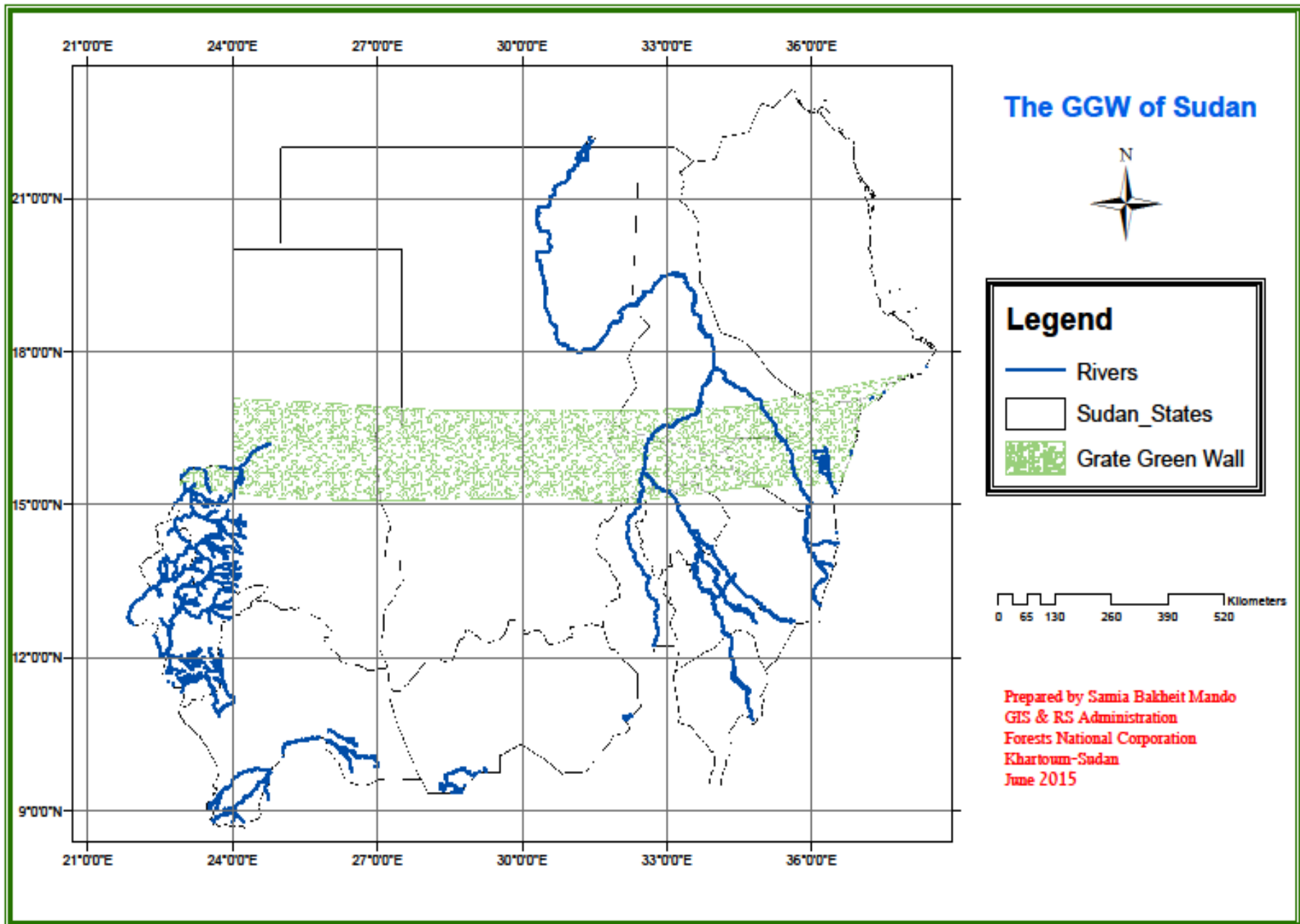






Source: ESRI

AFP

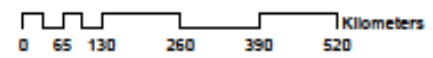


## The GGW of Sudan



### Legend

- Rivers
- - - Sudan\_States
- Grate Green Wall



Prepared by Samia Bakheit Mando  
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# NPISAS



- **Governmental program ( 5 years) take place in the Traditional Rain Fed Sector (TRS) (20 Million Faddan) in order to rise the productivity of the cultivated lands through two major techniques:**
  - **1- Water harvest techniques.**
  - **2 – Conservation Agriculture (zero or minimum tillage).**
- **All the applied technique must be under the concept of Natural Resources Conservation.**

# Supplementation Irrigation





# Modern Techniques Throw NPISAS



# NPISAS

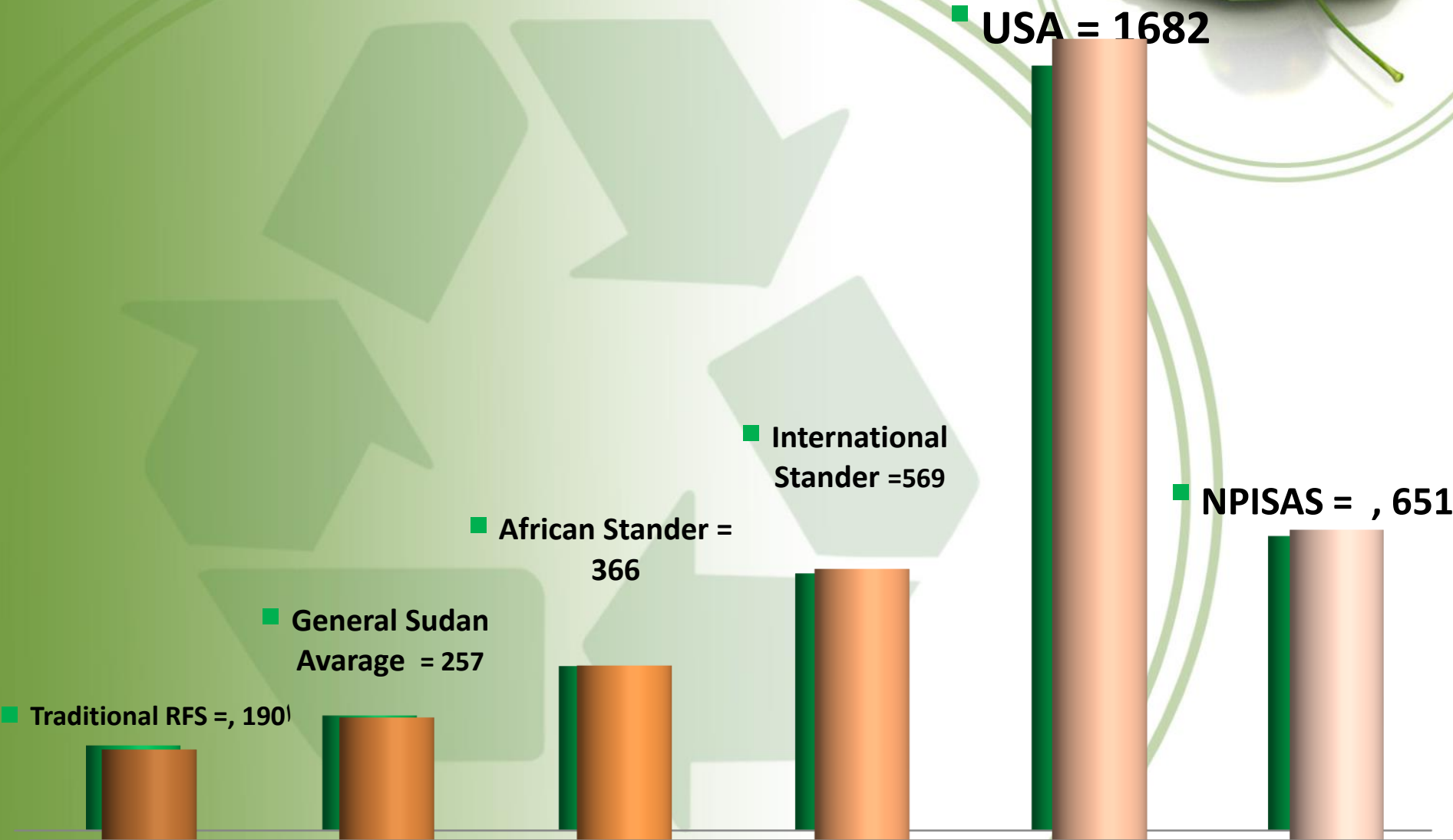


- **The Major remarks:**
- 1- Increase soil moisture in more depths.
- 2- Early cultivated and early plant growth.
- 3- Mitigation the seasonal drought period due to the high rain fall storage.
- 4- Stop soil leaching process throw water, ideal water distribution and efficiency.
- 5- Raising crop production.
- 6- Develop capacity to the farmers.



**Checking moisture** 26

# NPISAS: Comparing Production Kg / Faddan



# NIPSAS: Conservation vs. Traditional Agriculture



**Green = conservation Agriculture**  
**Yellow = Traditional Agriculture**

# Recommendations



- 1- The concept of natural **resources** conservation in climate change mitigation programs mainly in large agriculture projects lead to the suitability.
- 2- Building capacity of local **communities,** and **qualified facilitators** become the first **issue of any development programs.**

# Recommendation

- 3- Applied modern techniques to **rise the** agriculture crop production for traditional farmers must follow by other develop capacity in storage and marketing.
- 4- Traditional Farmers must be grouped and register as agriculture societies in order to find the enough fund to own the technical machines for leading them selves in future.
- 





Thank you for Your Attention

# See You in Sudan

