

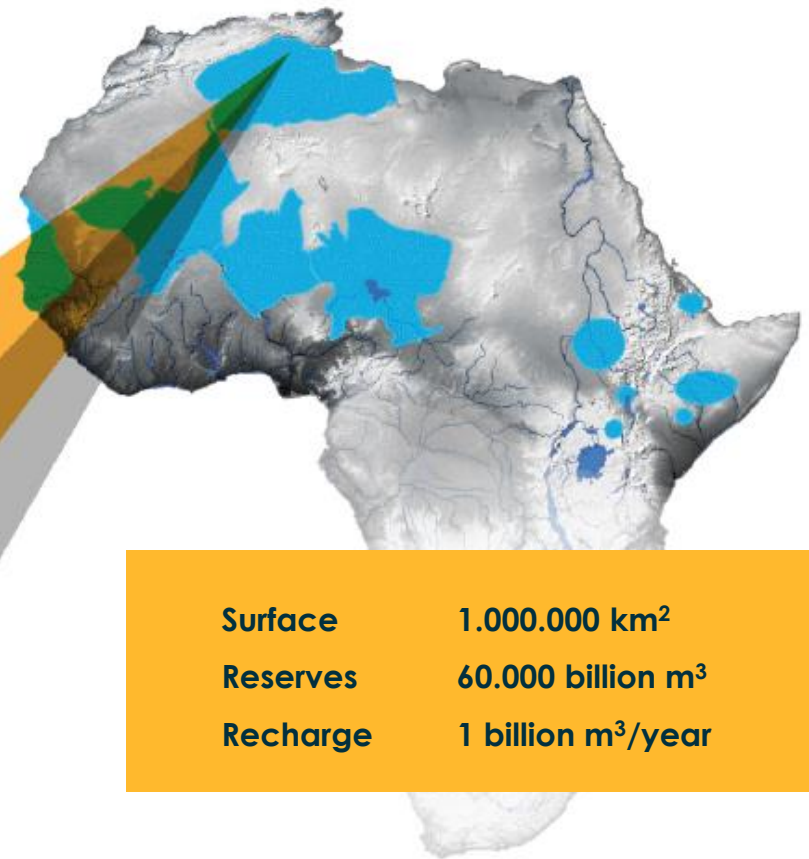


# Innovations in hydro-agricultural management to strengthen resilience to climate change

## SASS

**North-Western  
Sahara Aquifer System**  
*Algeria, Libya and Tunisia*

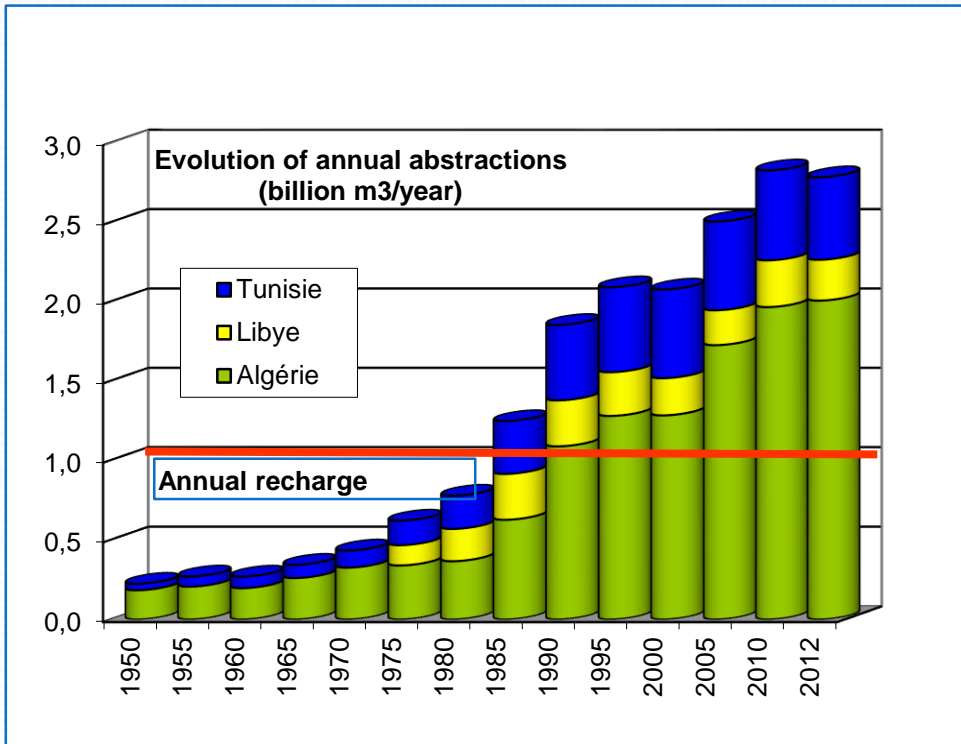
2007 - 2014



Surface	1.000.000 km <sup>2</sup>
Reserves	60.000 billion m <sup>3</sup>
Recharge	1 billion m <sup>3</sup> /year



# The SASS has vast but little renewable water resources



## Population Growth

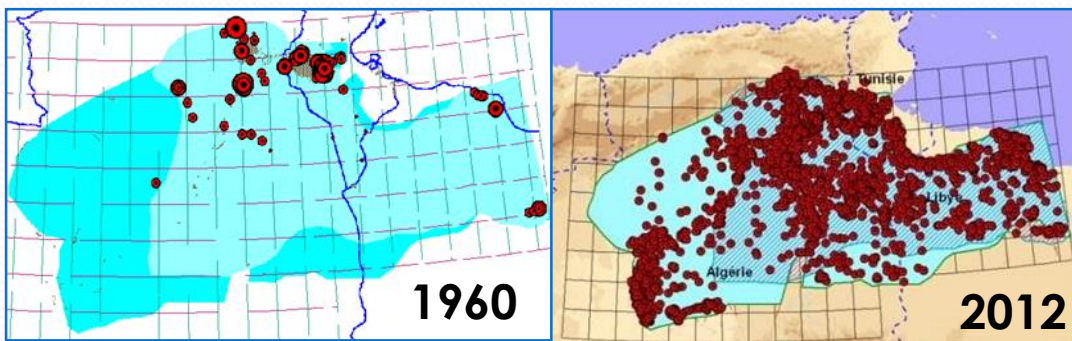
- 1.0 (1970) – 8 millions (2030)

## Increase of irrigated areas

- 50.000 ha (1970) – 400.000 ha (2030)

## Impacts

- Disappearance of artesianism
- Increase of pumping height
- Depletion of outlets
- Drying-up of traditional catchment systems “Foggaras”
- Water salinity
- Sea water intrusion in the Gulf of Sidra zone







# Impacts of Climate Change

## Rising temperatures

→ increase in water demand from populations and agriculture → rise in abstractions

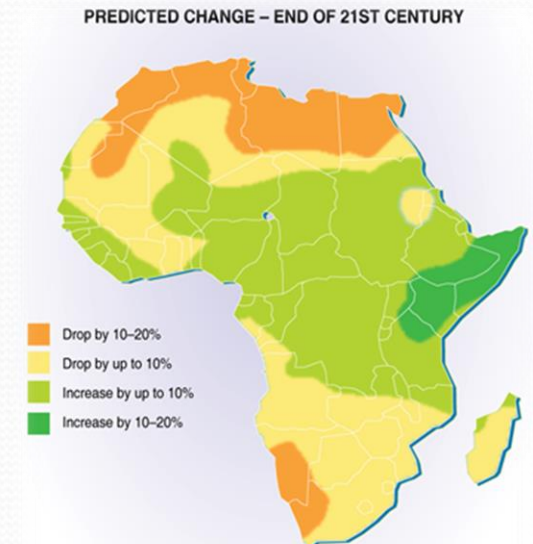
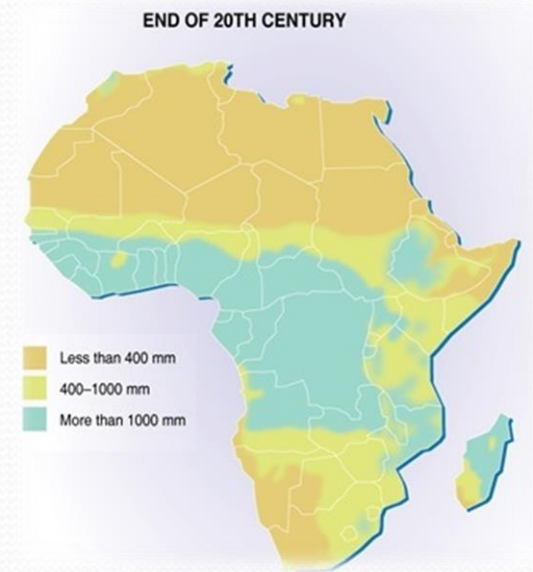
## Decrease in precipitations

→ diminish aquifer recharge in certain areas (i.e. the Djefara plain area)

→ rise in abstractions as an efforts to compensate the rainfall deficit

## Sea-level rise

→ accelerates sea water intrusion in the coastal zones







## Objectives of SASS III project

- **Pilots to demonstrate the possibility of improving water efficiency in irrigation**
  - **Adopt new techniques for water efficiency**
  - **Redefine irrigation strategies**
  - **Valorize non-conventional water resources**
- **Conduct a quantitative study on water costs and pricing**
  - **Implement a progressive water pricing policy**
  - **Promote a water management and valorization strategy**







# Rationalization of soil and irrigation water management

## Objectives

- Resolve the problem of hydromorphic soil and salinity
- Improve irrigation water efficiency

## Activities

- Building of an underground drainage network
- Replacement of flood irrigation system by localized irrigation networks

## Results

- Groundwater level lowered by 30 to 40 cm
- Reduction of Soil salinity
- Land use increased by 100% with no increase in water use
- Incomes increased by 150%







# Rehabilitation of irrigated lands

## OASIS OF JEDIDA - Tunisia

### Objectives

- Address problem of salinization and hydromorphy
- Improving irrigation water efficiency

### Activities

- Installation of a buried drainage network
- Use of solar-energy for drainage water pumping
- Construction of a new well

### Results

- Lowering of the water table
- Soil desalinization process







# Protection of « Foggaras »

REGGANE - Algeria

## Objectives

- Restoration of the initial flow of « foggaras »
- Restoration of the oasis traditional system (date palms and intercropping )

## Activities

- Introduction of localized irrigation system
- Cultivation of date palms and intercrops
- Installation of solar pumps to restore the flow

## Results

- Two o threefold increase of the crop yields
- Doubled irrigated perimeters
- Water saving estimated at 40 %
- Strong demand for the replication of experience



Foggaras drying-up



Plot before the project



Plot after the project





DJEFFARA - Libya

# Restoration of irrigated agricultural production systems

## Objectives

- Development of appropriate agricultural production systems combining rainfed olive farming with irrigated vegetable intercrops

## Activities

- Introduction of the drop irrigation system
- Introduction of changing irrigation calendar

## Results

- Improved yields and farmers income
- Soil salinity controlled
- Water savings: reduction from 13 000 to 8700 m<sup>3</sup>/ha to
- Demand for replication







# Rational use of brackish waters for irrigation

## Objectives

- combining rainfed olive farming with irrigated vegetable intercrops
- Partial desalinization of water (4 to 2g)

## Activities

- Installation of desalinization station (400 m<sup>3</sup>/day with 50% lower salinity)
- Introduction of intercrops in-between olive trees
- Change of irrigation calendar

## Results

- Water efficiency more than doubled
- Better olive yields and increased income
- Profitability of the desalinization system







# Irrigation using desalinated geothermal water

## Objectives

- Capitalization of a successful initiative in soil/water desalinization
- Pilot devoted to off-season food crops in a greenhouse heated and irrigated with desalinated geothermal water (average temperature 60°)

## Activities

- Organization of field visits and open house days for water actors of the three countries



Heating network



Artificial soil used in greenhouses





**The project has demonstrated that safeguarding Saharan agriculture is possible.**

**The project has also demonstrated that it is possible to improve farmers' income while preserving water and soil resources.**



**Thank you for your attention**

