# Use of water and irrigation management models to promote productivity of major crops in Lebanon- MOA experience

## Challenges and Opportunities

Maya Mhanna – Ministry of Agriculture

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# Overview of Irrigation Sector in Lebanon (MoA, 2010)

- Half of the agriculture area in Lebanon is irrigated → 113,000 Ha
- Irrigation increase with the increase of the area of the property going from:
  - 38% of properties less than 2 ha are irrigated
  - 65 % of properties more than 20 ha are irrigated
- Yearly irrigation requirement → 1050 MCM (70% of water consumption)
- Half of the irrigated area uses water efficient techniques.
- Most areas equipped with water efficient materials are in Bekaa. (75%)

# Challenges facing irrigation sector

- Poor irrigation water management
- Low efficiency in the distribution networks
- Lack of knowledge in irrigation scheduling
- Climate change : increase in the length of the irrigation period
  uneven distribution of rain
  increase in water needs due to increase in T◦C

# Challenges facing irrigation sector(con't)

Irrigation needs are highly compromised since drought seasons are becoming more frequent

- Irrigation season may start earlier due to shorter winter season
- Many crops may not tolerate the new climatic conditions (adverse and drought)
- More pressure on Groundwater due to increasing demand and decreasing supply.
- Traditional cropping patterns may be affected

# Actions to increase water use efficiency

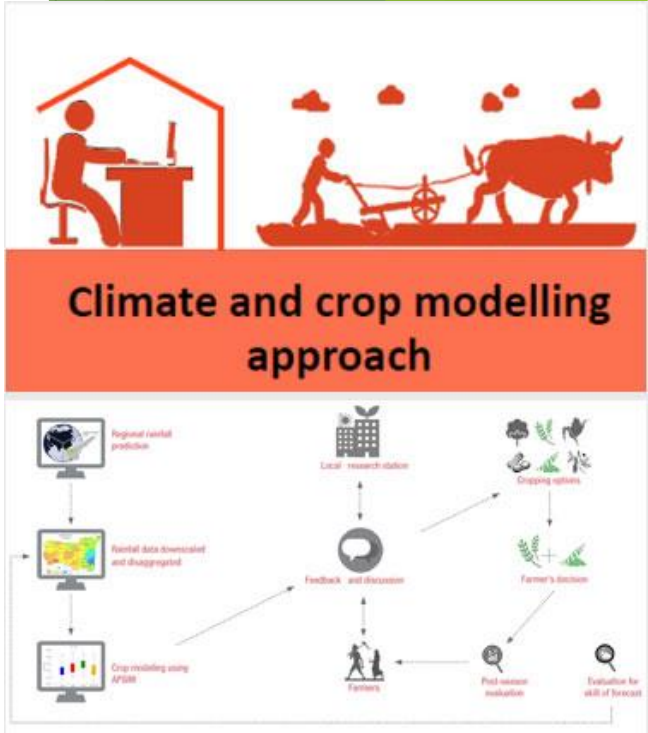
Irrigation consumption is not measured is to be reduced, by:

- Improving irrigation efficiency of existing and planned irrigation schemes
- Optimizing on-farm irrigation techniques.
- The adoption of government plans for the development of the irrigation sector
- Irrigated areas are to be increased in line with government policies.

# Technologies in Agriculture and Irrigation

- **computer** hardware, software, **electronic instrumentation**, and **control systems** for solving problems in **agriculture**, including agronomy, horticulture
- Relevant areas of technology include
  - **Artificial Intelligence**,
  - sensors,
  - machine vision,
  - robotics,
  - Networking
  - **simulation modelling.**

# Crop simulation models (CSM)

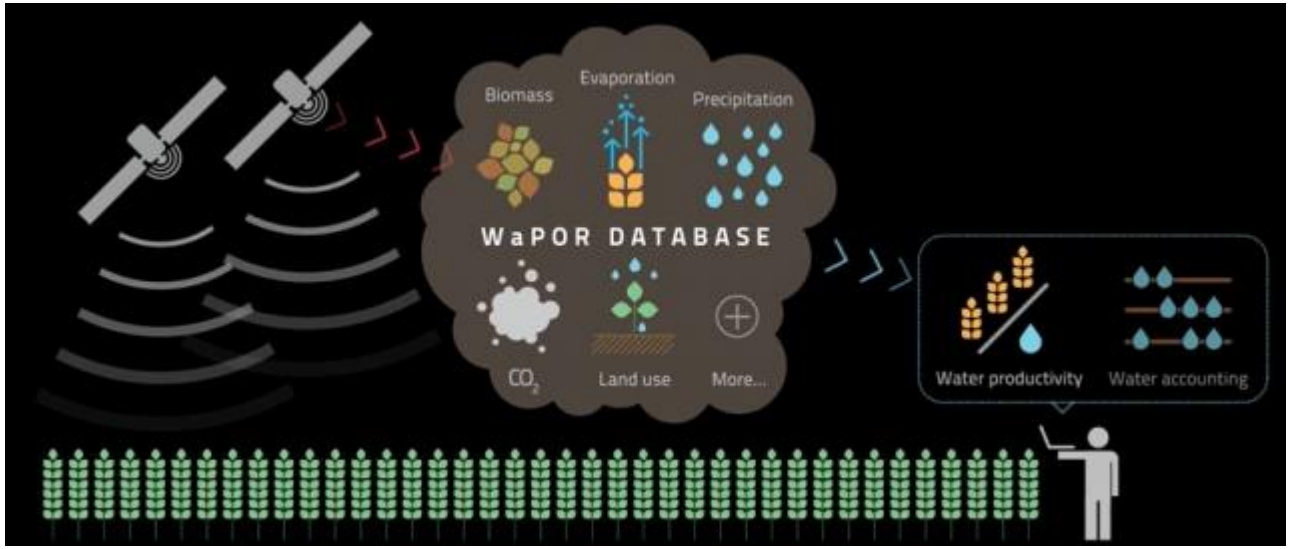



- A **Crop Simulation Model** (**CSM**) is a simulation model that describes processes of crop growth and development as a function of weather conditions, soil conditions, and crop management

- Examples of CSM
  - CropSyst
  - APSIM

# Climate and agriculture model using remote sensing

**The WaPOR data portal**, developed by (FAO) is a tool that uses satellite data to monitor agricultural land- and water productivity throughout Africa and the Near East.



# Aquacrop

AQUACROP-OS

- It is a FAO crop water productivity model.
- Simulates yield response of herbaceous crops to water, especially where water is a key limiting factor in crop production
- Assess the effect of the environment and management on crop production.
- Studies interaction between Soil- Plant- Climate

# Aquacrop benefits

- It has many benefits enabling its practical use :
  - Use Canopy Cover instead of Leaf Area Index
  - needs relatively low number of parameters
  - Input data requiring explicit and intuitive parameters
  - Applicable on diverse agricultural systems

# Output

- Water balance in the soil
- Deficit irrigation
- Supplemental irrigation
- Irrigation scheduling
- Water productivity

# Data needed

**Simulation model** needing long term data :

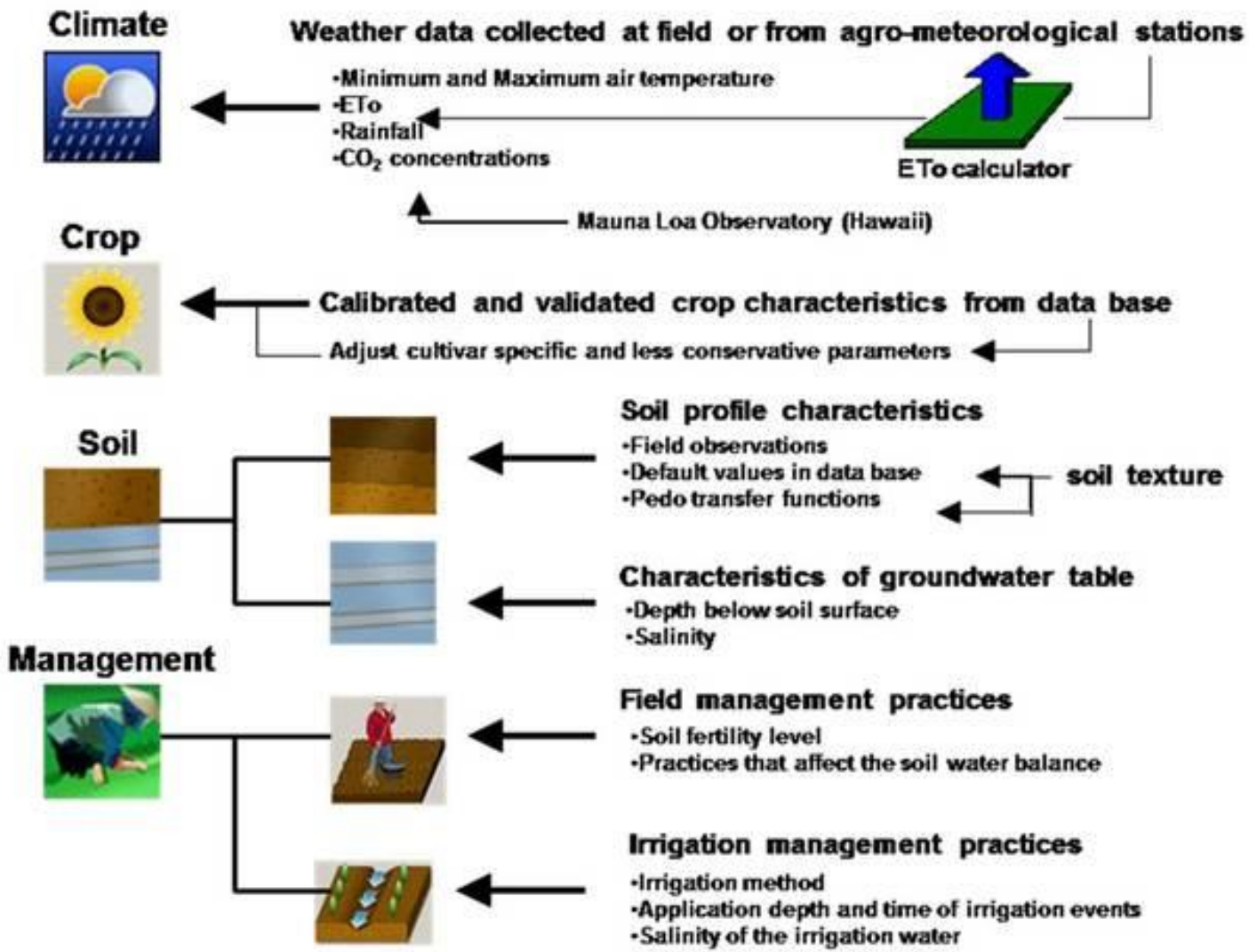
- Climate (at least for 10 yrs : Tmin, Tmax and Rainfall)
- crop characteristics  (through experimental trials) growing stages, root development …
- soil characteristics : physical characteristics

  soil water content

  soil water retention


**Real time calculation**

- Everyday climatic data
- Everyday soil condition data (moisture and water content level)

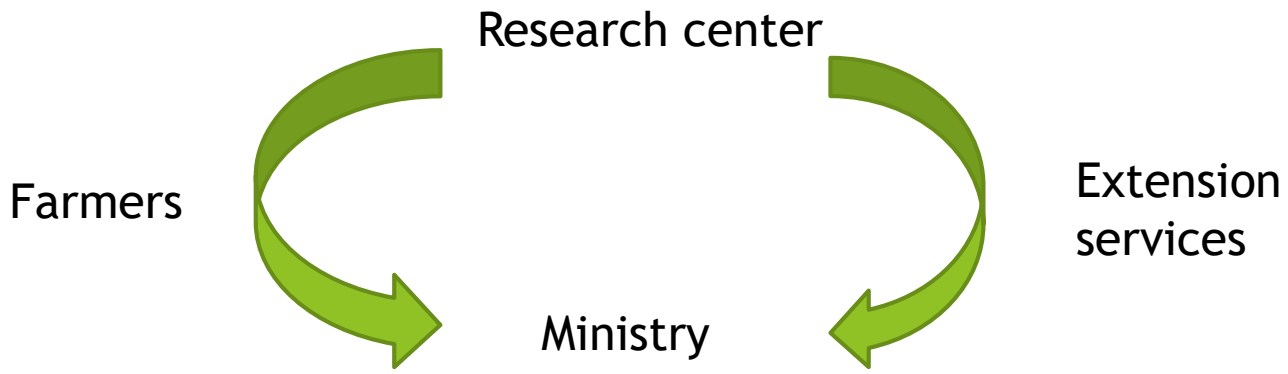

Climate
Weather data collected at field or from agro-meteorological stations
•Minimum and Maximum air temperature
•ETo
•Rainfall
•$CO_2$ concentrations
ETo calculator
Mauna Loa Observatory (Hawaii)
Crop
Calibrated and validated crop characteristics from data base
Adjust cultivar specific and less conservative parameters
Soil
Soil profile characteristics
•Field observations
•Default values in data base
•Pedo transfer functions
soil texture
Characteristics of groundwater table
•Depth below soil surface
•Salinity
Management
Field management practices
•Soil fertility level
•Practices that affect the soil water balance
Irrigation management practices
•Irrigation method
•Application depth and time of irrigation events
•Salinity of the irrigation water

# Challenges using Aquacrop

- Simulation model → long term climatic data → not always found and accurate in every location
- Soil data → needs experimental field data → needing instrumentation, workers and financial resources which are not always available
- Crop data → needs experimental studies over several years for each crop under specific climate and soil condition → needs financial and human resources
- Needs wide knowledge in soil, crop and water to analyze results
- Needs information of the farm → farmer registry
- Cannot be used on fruit trees (Mainly Bekaa and Akkar)

# Recommendations

- We need to build a systemic information sharing system




- AQUACROP is good to be used to elaborate guidelines for irrigation water management of crops.
- Can be used on Potatoes and Wheat
- Still need more work on other field crops and vegetables in Lebanon

# Recommendations (cont'd)

- Need to apply irrigation water management at irrigation schemes level and not only at farm level → enhance collaboration and communication between different parties

- Support and subsidies research studies on agriculture and irrigation.


THANK
YOU!