Demonstration site factsheet
South Bekaa Valley – Lebanon

Description

- Lebanon demonstration site is part of South Bekaa Irrigation Scheme (SBIS), with an area of about 21,500 ha.

- Due to economic constraints, only a pilot area of 2,000 ha is equipped with a pressurized irrigation network.

- The demo-site is characterized by a Mediterranean semi-arid climate, hot and dry from May to September, and cold and wet extending for the rest of the year.

- Crops in the demonstration site consists of one-third of wheat and other winter cereals, mainly barley, one-third of potato, winter legumes and summer vegetables and one third of fruit trees, olive and vineyards and land kept as fallow during the in-between seasons.
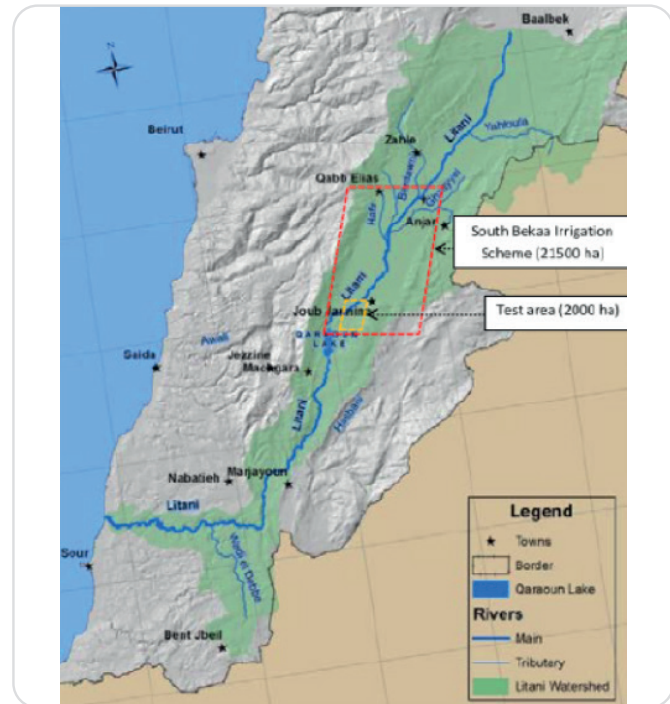

Figure1: South Bekaa Valley demosite

Specific problems

- Imbalance between water supply and demand

- Lack of technical assistance to farmers

- Poor animal production system

- Water stress during the growing season

- Lack of knowledge on the application of good production practices to improve productivity under the current conditions

Drought forecast 2021 – 2050, South Bekaa Valley , Lebanon

Projected Drought Assessment (hydrological years) through SPI evolution (2020-2049) Lebanon
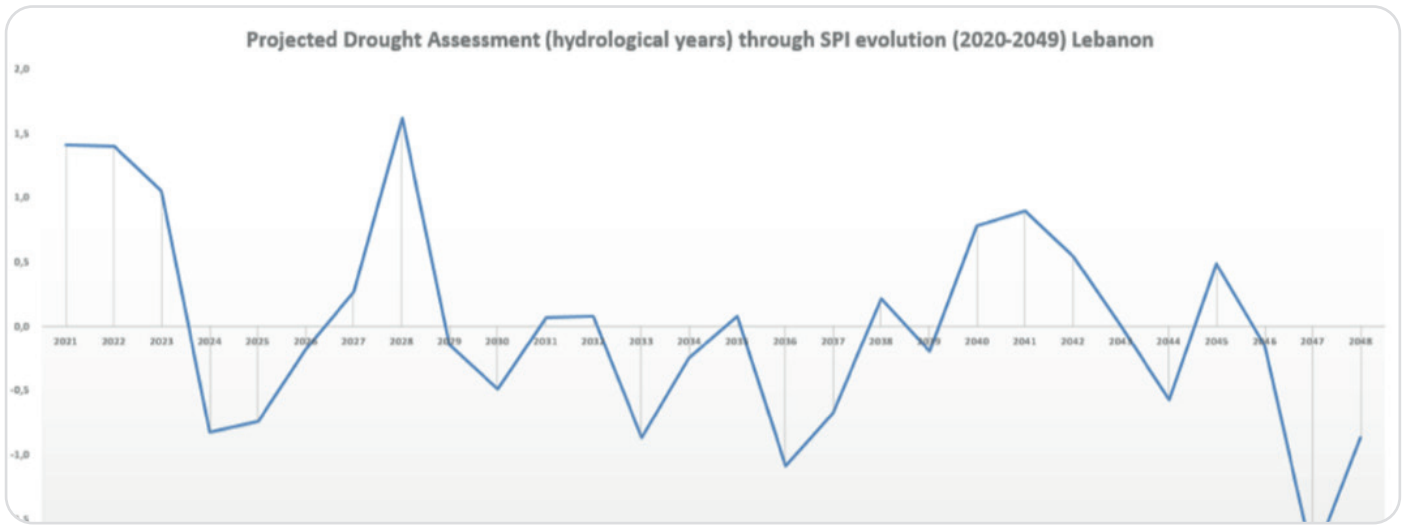
- Positive SPI values are indicating drought severity

Methodology

- Testing have been carried out on an area of 10,000 ha. For each type of crop, A leader farmer (LEA) and an average farmer (AVE) have been identified. Results achieved are compared for the same crop on parcels managed with SUPROMED recommendations and pacels managed directly by the farmer for the LEA. Another comparison is also done for the same crop on the plot of an AVE. Crop monitoring included crop phenology, fertilization program (quantity and dates of application), irrigation scheduling (volumes and dates of water supply) and yield. Measured indicators are irrigation water use efficiency (kg/m3), nitrogen use efficiency (kg UN/ha), Gross margin (€/ha; €/m3) and profitability (€/ha).

- practices, (iv) fertilization and (v) costs and revenues. Surveys were carried out on Leader (LEA) and Average (AVE) farmers, for which the results would be extendable to a third group of farmers, called Associated Farmers.

- SUPROMED tool MOPECO was calibrated during the 2020 growing year, using daily climatic data from a local weather station, soil data from SBIS (South Bekaa Irrigation Scheme), and agronomic information from farmers. Typical Meteorological Year (TMY) was generated using daily weather data from 1994 to 2018. MOPECO recommendations on wheat, onion, potato, corn and peach were analysed during the 2021 and 2022 growing years.

Crop monitored

Annual crops (potato, wheat, corn and onion), fruit trees (peach and vineyard)

Figure 2: A view of leader farmer's monitored potato plot

- A datalogger and soil moisture probes were installed, for monitoring plots managed by leader farmer (LEA), average farmer (AVE) and SUPROMED team. Readings of the soil water content at 6 depths of the soil profile: 10, 20, 30, 40, 50 and 60 cm, were made possible with an access to data through FieldClimate (web platforms designed for collecting-analysing, and displaying agronomic, meteorological, soil, insect and tracking data).

- An agro-economic questionnaire allowed to collect data from farmers necessary to calculate a set of KPIs (key performance indicators) for each of the monitored crop on the different plots. The questionnaire includes (i) bio-physical information, (ii) agronomic information, (ii) water management practices, (iv) fertilization and (v) costs and revenues. Surveys were carried out on Leader (LEA) and Average (AVE) farmers, for which the results would be extendable to a third group of farmers, called Associated Farmers.

Important results

- Net irrigation requirements were 20% lower in the SUPROMED monitored plots, compared to the farmers' monitored plots, while water and nitrogen use efficiencies were 15-20% higher in the SUPROMED monitored plots, compared to the farmers' plots.

- Pure nitrogen units applied per ha were 18% lower on average in the SUPROMED monitored plots, compared to the farmers' monitored plots.

- Profitability (€/ha) has been found to increase in the SUPROMED-grown plots by an average of 10%.

Figure 3 : Installation of the weather station

Final remarks

- Irrigation scheduling in South Bekaa should not be based on pre-established weekly basis and should be replaced by triggered irrigation based on soil moisture sensing.

- Fertilization program should foresee splitting the nutrient requirements at different rates. Less quantities per unit of area should be deployed at each application to assure an efficient uptake by the crop.

- Applying MOPECO recommendations allows reducing costs, improving revenues, and increasing profitability, per unit of land and irrigation water. It requires low-investment, and can be considered as a decision tool to guide farmers scheduling irrigation in water-limited environments.

- Both leader and average farmers are interested to use the SUPROMED Platform.

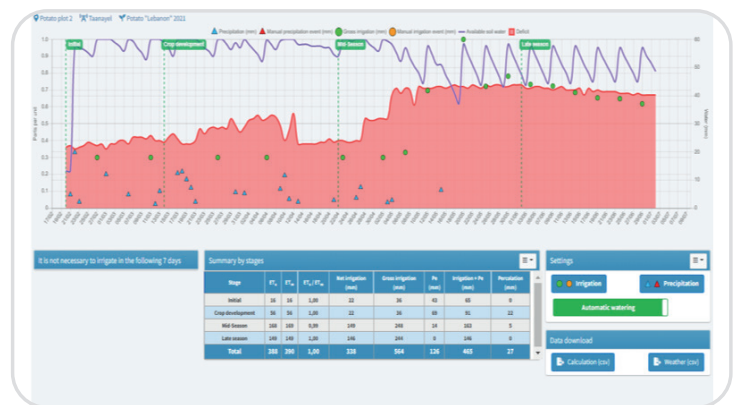*Figure 4 : Installation of soil moisture probe*

Figure 5 : Examples of MOPECO online irrigation scheduling tool for potato (left) and peach (right)

Potato	2021		2022	
	Leader farmer	Average farmer	Leader farmer	Supromed plot
INDICATORS				
Yield (kg/ha)	47500	40000	50000	52000
Fertilization (UN/ha)	258.75	258.00	277.00	266.00
Rainfall (mm)	88	126	11	11
ETc (mm)	421.0	438.2	455.0	456.0
Irrigation water (mm)	612.0	558	630.0	644.0
ETa/ETm	1.0	1.0	0.96	0.96
Total percolation (mm)	27	0	0	4
Irrigation water percolation (mm)	0	0	0	0

KPIs	Average improvement (%)
Yield (kg/ha)	+ (5-10)
Agronomic water productivity (kg/m³)	+ (2-5)
Economic water productivity (€/m³)	+ (2-5)
Water footprint decrease (m³/kg)	+ 5
Nitrogen productivity (kg/kg)	+ (5-10)
Energy (kWh/m³)	NA
Profitability (€/ha)	+ 10

Peach	2021		2022	
	Leader farmer	Supromed	Leader farmer	Supromed
INDICATORS				
Yield (kg/ha)	51000	55000	52000	54500
Fertilization (UN/ha)	156.0	130.2	146.25	123.5
Irrigation water (mm)	782	703	774	723
Profitability (€/ha)	13435.24	14505.00	14047.00	15075.70
Irrigation water productivity (kg/m³)	6.53	6.76	6.71	7.53
Irrigation water productivity (€/m³)	1.72	2.06	2.04	2.34
Water footprint (m³/kg)	0.1532	0.1477	0.1489	0.132

KPIs	Average improvement (%)
Yield (kg/ha)	+ (5-10)
Agronomic water productivity (kg/m³)	+ (2-5)
Economic water productivity (€/m³)	+ (15-20)
Water footprint decrease (m³/kg)	+ (3-5)
Nitrogen productivity (kg/kg)	+ (10-15)
Energy (kWh/m³)	NA
Profitability (€/ha)	+ 8

Table 1 : Results obtained on potato and peach during the 2021 and 2022 growing years

SUPROMED Website:
www.supromed.eu

SUPROMED platform:
dss.supromed.eu

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