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Adaptation to Climate Change of Mediterranean Agricultural Systems

GUIDELINES

Adaptation to Climate Change in Mediterranean Agricultural systems

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Adaptation to Climate Change of Cereal Production Systems in North-Eastern Tunisia

Target area description

Case Study Area

North-Eastern Tunisia

General Characteristics	
Location	North Eastern Tunisia
Main crops in the area	Cereals (102000 ha) Legumes (13000 ha) Other crops (184000 ha)
Annual rainfall	400-600 mm/year
Annual evapotranspiration	1100-1300 mm/year

Environmental Characteristics

- Increasing Temperature
- Decreasing rainfall
- increasing soil degradation
- Poor management practices.

Directly Involved Actors

- Farmers
- Engineers and technicians
- Stakeholders

Alternative Technology Scenarios		
crops	Technologies	Main Objectives
Cereals/legumes	integrated management (crop rotation)	Agro-efficiency improvement, environmental protection, sustainability & food security enhancement
Wheat	Adapted varieties	Resilience to climate change
	Supplemental irrigation	Production stability & drought mitigation
Legumes	Adapted varieties	Protein production & soil health improvement
	Weed and disease control	Profitability enhancement

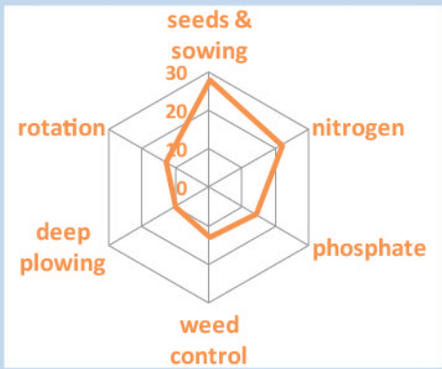
Actual Agro-efficiency Performance

Indicator	Value
Cereal Yield (q/ha)	23
Water productivity for cereals (Kg/m3)	0.6
Legumes Yield (q/ha)	8
Water productivity for legumes (Kg/m3)	0.2
Irrigated/rainfed cereals	10%
Legume area/cereal area	13%

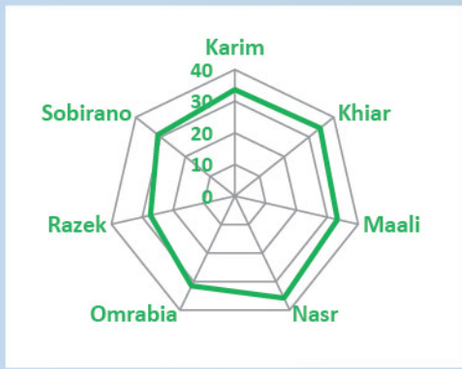
Target agro-efficiency Performance

Indicator	Value
Cereal Yield (q/ha)	32
Water productivity for cereals (Kg/m3)	0.8
Legumes Yield (q/ha)	14
Water productivity for legumes (Kg/m3)	0.3
Irrigated/rainfed cereals	10%
Legume area/cereal area	25%

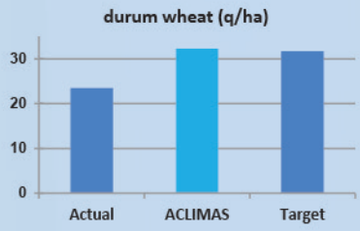
Contribution of production factors (%) to yield improvement (durum wheat)

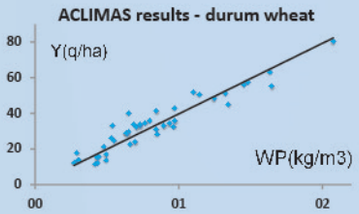


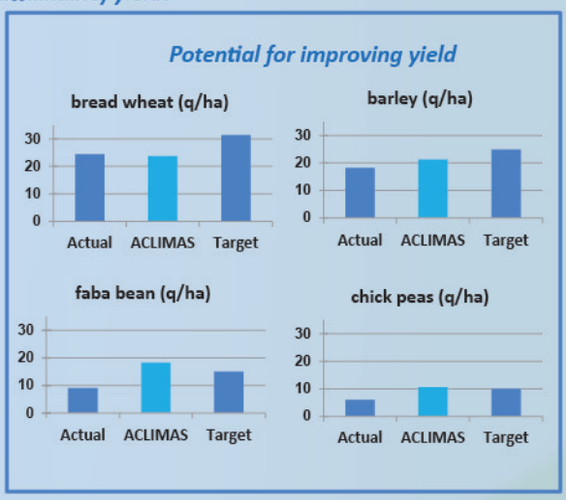
Varieties Performance Assessment (yield (q/ha) durum wheat)



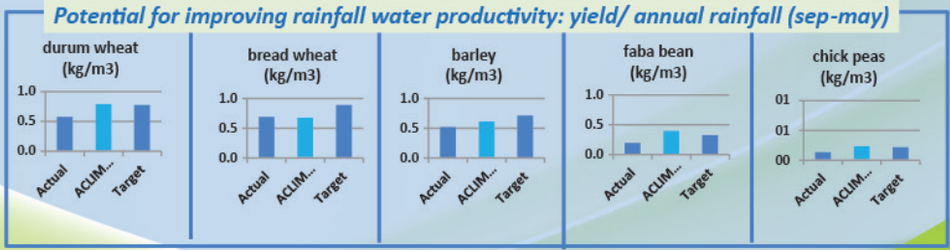
ACLIMAS achievements, in terms of yield (q/ha) and water productivity (yield /precipitation of Sep-May, kg/m3) in the implementation sites (2012-2015) compared to actual and target (attainable) yields







Potential for improving rainfall water productivity: yield/ annual rainfall (sep-may)



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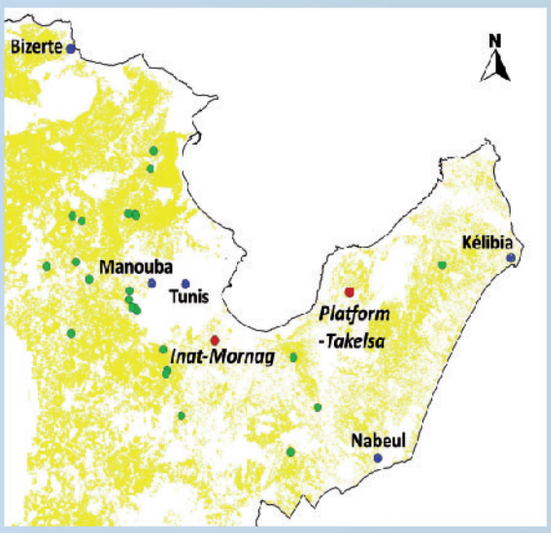
Project Duration: 29/12/2011 - 28/12/2015

DEMONSTRATION & IMPLEMENTATION FACTS

The implementation farms (25) were used for the dissemination of adapted varieties of durum wheat (7), bread wheat (4) barley (2), Faba beans (3) and chick peas (2). Improved practices included deficit supplemental irrigation (60-160mm), fractioning of nitrogen supply (1-3) and best practices in disease and weed control. Data were collected from 142 different fields and used to check progress in technology transfer. Thematic training courses (5) and field days (21) were organized to increase awareness about climate change and adaptation measures. A total of 706 participants attended these events.

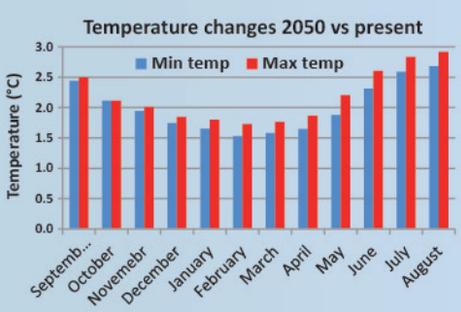
From top-left clockwise: visit of EU-officers to the project's demonstration & implementation sites, farmers at a field day, participants to training course, visit to the platform and installation of the meteo station in this new site.

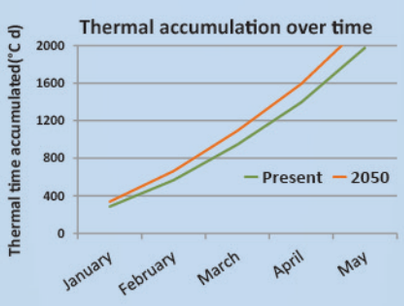


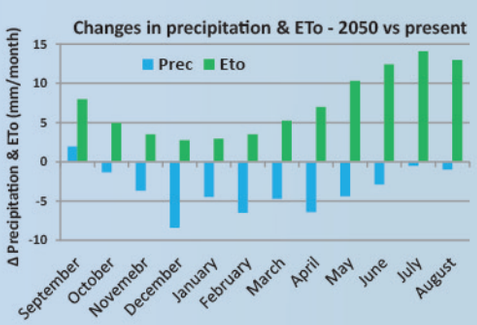
Location of the implementation Farms, the demonstration site of INAT-Mornag and the newly created (2014) platform of Takelsa.

CLIMATE CHANGE IMPACT: year 2050 vs. baseline (1961-2000)

Climate change projections for the medium-term (2050 as average over 2041-2060) were defined for Northern Tunisia as average over 19 Global Circulation Models based on the RCP4.5 scenario, which is a medium emission scenario. For simplicity the results indicate average values, and not uncertainty (especially significant for precipitation). According to these medium-term climate projections, North Tunisia will experience an average increase in mean annual temperature of 2.1 °C (1.6 to 2.7 °C according to different GCMs). Seasonally, increases in temperature will be greater in summer and lower in winter. Change in maximum and minimum temperatures are similar in fall and winter, while maximum temperatures increase more than minimum temperature in spring and summer, widening daily temperature ranges. Higher temperatures will lead to increasing evapotranspiration and crop water demand. Increasing temperatures will also raise thermal accumulation over time, measured as Growing Degree Days (°C d, Tbase = 0 °C), shortening crop growing seasons.







The average projected precipitations will show a moderate reduction of about 10% for 2050. However, the changes in precipitation projected by different GCMs vary, with uncertainty ranging between -23 to +4%. Reduction of precipitation will be more evident in winter and spring. Higher temperature will increase evapotranspiration and crop water requirements, which, together with reduced precipitations, will amplify aridity and soil water deficit. The cumulated deficit during the growing season, suggests increasing crop irrigation requirements, which need to be compensated by either irrigation application or water use efficient agronomic practices.

Climate variable	Baseline	2040-2060 RCP4.5	Changes vs. baseline	
			Difference	%
Precipitation (mm)	466	424	- 42	- 9.1
Mean Temperature (°C)	17.4	19.5	+ 2.1	--
Minimum temperature (°C)	11.5	13.5	+ 2	--
Maximum temperature (°C)	23.3	25.5	+ 2.2	--
Thermal time accumulated January-May (°C d, or GDD)	1976	2235	+ 259	+ 13.1
Reference ET (mm)	1316	1403	+ 87	6.6

Climate change analyses elaborated by CMCC

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