Promoting Food and Water Security through Cooperation and Capacity Development in the Arab Region:

Strengthening Capacity to Assess Impacts of Changing Water Availability on Agricultural Production

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The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD)
Objectives

• 1 - Contribute for enhancing food and water securities in the Arab region

2 - Contribute for strengthening the national and regional knowledge base, capacity development and greater intraregional cooperation.

3 - Contribute for promoting sustainable development and strengthening capacity to assess impacts of changing water availability (climate change) on agricultural production in the Arab countries.
This project is implemented in a partnership among FAO, ACSAD, and ESCWA and funded by SIDA.
Target countries
• Climate change may affect agriculture due to changes in temperature, precipitation, soil moisture, an increase in the probability of extreme events such as droughts, extreme heat waves, heavy rainfall, cyclones, flooding of the coastal areas, erosion etc
Methodology

1. Historical yield records
2. Crop parameters
3. Soil data

Management data

Global climate modeling

Regional climate modeling

Crop growth simulation

Yield projections

Hydrological modeling

Water availability for irrigation

Adaptation measures

Socio economic analysis
Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR)
AquaCrop model

AquaCrop model simulate yield response to water

AquaCrop predict yield under climate change scenarios

Developed by FAO

Dirk RAES, Pasquale STEDUTO, Theodore C. HSIAO, and Elias FERERES
AquaCrop model

AquaCrop was selected because it has:

- Public domain
- Limited data requirements,
- A user-friendly interface enabling non-specialist to develop scenarios,
- Focus on climate change, CO2, water and crop yields,
- Developed and supported by FAO,
Training manuals

The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD)

Promoting food and water security through cooperation and capacity development in the Arab region

Training manual
Using AcquaCrop model to evaluate the impact of climate change on crop production
Final edition

Donor

Sweden
Sverige

User Guide
AcquaCrop model
Final edition

Donor

Sweden
Sverige
Training activates

6 sub regional and 7 national training sessions for 30 participants from 10 countries
<table>
<thead>
<tr>
<th>Country - Area</th>
<th>Crop</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Jordan</strong></td>
<td><strong>Mafrak</strong> Tomato - Irrigated</td>
</tr>
<tr>
<td></td>
<td><strong>Madaba</strong> Wheat - Rainfed</td>
</tr>
<tr>
<td><strong>Lebanon</strong></td>
<td><strong>Beqaa</strong> Wheat - Sup Irrigation</td>
</tr>
<tr>
<td><strong>Iraq</strong></td>
<td><strong>Swereh</strong> Tomato - Irrigated</td>
</tr>
<tr>
<td></td>
<td><strong>Swereh</strong> Wheat - Irrigated</td>
</tr>
<tr>
<td><strong>Palestine</strong></td>
<td><strong>Jenin</strong> Wheat - Rainfed</td>
</tr>
<tr>
<td></td>
<td><strong>Jenin</strong> Potato - Irrigated</td>
</tr>
<tr>
<td><strong>Yemen</strong></td>
<td><strong>Sanaa</strong> Wheat - Irrigated</td>
</tr>
<tr>
<td></td>
<td><strong>Sanaa</strong> sorghum - Sup Irrigation</td>
</tr>
<tr>
<td></td>
<td><strong>Dhamar</strong> Wheat - Irrigated</td>
</tr>
<tr>
<td></td>
<td><strong>Dhamar</strong> sorghum - Rainfed</td>
</tr>
<tr>
<td></td>
<td><strong>Alkod</strong> Maize - Irrigated</td>
</tr>
<tr>
<td></td>
<td><strong>Alkod</strong> Sesame - Irrigated</td>
</tr>
<tr>
<td><strong>Tunis</strong></td>
<td><strong>Shbeka</strong> Wheat - Irrigated</td>
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<tr>
<td></td>
<td><strong>Koudiat</strong> Wheat - Rainfed</td>
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<tr>
<td><strong>Morocco</strong></td>
<td><strong>Marchouch</strong> Wheat - Rainfed</td>
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<tr>
<td></td>
<td><strong>Zamamreh</strong> Wheat - Irrigated</td>
</tr>
<tr>
<td></td>
<td><strong>Zamamreh</strong> Sugar beet - Irrigated</td>
</tr>
<tr>
<td><strong>Sudan</strong></td>
<td><strong>Wad Madany</strong> Wheat - Irrigated</td>
</tr>
<tr>
<td></td>
<td><strong>Gedaref</strong> sorghum - Rainfed</td>
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<tr>
<td><strong>Egypt</strong></td>
<td><strong>Sakha</strong> Wheat - Irrigated</td>
</tr>
<tr>
<td></td>
<td><strong>Sakha</strong> Maize - Irrigated</td>
</tr>
<tr>
<td></td>
<td><strong>Nubareih</strong> Tomato - Irrigated</td>
</tr>
</tbody>
</table>
results
Assessment reports
Rainfed wheat Morocco

Ranifed wheat yield is projected to decrease between 9 and 26%.

Growth cycle of is projected to decrease between 8 and 19 days.
Rainfed Sorghum - Sudan

Ranifed Sorghum yield is projected to decrease between 7 and 11%.

Growth cycle of Sorghum is projected to decrease between 2 and 5 days.
Irrigated wheat yield is projected to decrease between 4 and 7%.

Growth cycle of is projected to decrease between 3 and 5 days.
Irrigated potato yield is projected to decrease about 3%
Potato yield is projected to decrease about 7%.
Supplementary irrigated wheat yield is projected to increase between 4 and 17%.

<table>
<thead>
<tr>
<th></th>
<th>2040-2050 (2030-2020)</th>
<th>2020-2030</th>
<th>1985-2005</th>
<th>Mean</th>
<th>Dry period</th>
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<tbody>
<tr>
<td>متوسط النمو خلال الفترة</td>
<td>4.19</td>
<td>0.73</td>
<td>0.43</td>
<td>17%</td>
<td>4%</td>
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<td>طول موسم النمو</td>
<td>173</td>
<td>176</td>
<td>181</td>
<td></td>
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</tr>
</tbody>
</table>
The results show that climate change will have several impacts on crops:

- Crop yields will decline, food production could be affected significantly.
- Crop growth cycle will decrease.
- The shortage of the growing-season length could have a negative impact on grain yield in terms of quantities and quality.
summary

Rainfed crops will be more sensitive to climate change than irrigated crops.

Adaption measures should be taken to alleviate the impact of CC on crops.
Proposed adaptation measures

– adjust **sowing dates** according to temperature and rainfall patterns,
Proposed adaptation measures

- use *crop varieties* better suited to new climate conditions (e.g. more resilient to heat and drought)
Proposed adaptation measures

- Apply conservation agriculture:
  - Minimum tillage + land cover + crop rotation
  - CA increase soil moisture and OM content
Proposed adaptation measures

• Rainwater Harvesting & supplementary irrigation
Proposed adaptation measures

- Change fertilizer application rate
- apply crop rotation
- Modify irrigation depth and application time
- Enhancing Water Productivity through Efficient Irrigation systems
Thanks