FAO’s Water Scarcity Initiative stimulates sustainable efficient management of agricultural water through partnerships and cooperation: Oman and Jordan cases

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Outline

• **FAO new strategic objectives**
• **Regional Initiatives**
• **Water Scarcity Initiative**
  • Why
  • Where
  • When
• **Partnership**
• **Initial Analytical Framework of the WSI**
• **Supply Cost Curve (SCC) Approach**
• **SCC Early Results from Oman and Jordan Case**
• **Conclusion Remarks**
## FAO’s Strategic Framework

<table>
<thead>
<tr>
<th>Corporate Areas for Resource Mobilization</th>
<th>SO1</th>
<th>SO2</th>
<th>SO3</th>
<th>SO4</th>
<th>SO5</th>
</tr>
</thead>
<tbody>
<tr>
<td>** farmers, forests and fisheries more productive and sustainable**</td>
<td>Help eliminate hunger, food insecurity and malnutrition</td>
<td>Make agriculture,</td>
<td>Reduce rural poverty</td>
<td>Enable inclusive and efficient agricultural and food systems</td>
<td>Increase the resilience of livelihoods to disasters</td>
</tr>
</tbody>
</table>

### Strategic Areas

- **Climate-Smart Agriculture (CSA)**
- **The Blue Growth Initiative (BGI)**
- **Statistics: Monitoring for Development**
- **Food Chain Crisis - Emergency Prevention System (FCC-EMPRES)**
  - Investing in a Hunger-Free World
  - Doing More with Less - Sustainable Intensification of Agriculture
  - Ecosystem Services and Biodiversity for Food and Agriculture
  - Rural Transformations: Boosting Smallholder Family Farming and Rural Employment
  - Social Protection for Food Security and Rural Poverty Reduction
  - Efficient and Inclusive Agricultural and Food Systems
  - Building resilience in protracted crises and natural disasters

### Delivery Mechanisms – Regional Initiatives and Country Programming Frameworks (CPF)
Delivery Mechanisms- Regional Initiatives and Country Programming Frameworks (CPF s):

15 initiatives in the 5 FAO regions, 3 are in NENA region, the FAO RNE Initiatives are:

- Water Scarcity – SO2
- Sustainable small-scale agriculture - SO3
- Building Resilience to Enhance Food Security and Nutrition – SO5
Water fact

The Near East and North Africa region is the most water scarce region in the World.
Water facts?

• Physical water scarcity; > 60% of the NENA’s water is coming from outside the region
• The region population growth is 2.8-3% annually
• Rapid NR degradation, desertification and groundwater depletion
• The demand on food is increasing, more than 70% is imported from outside the region.
• The climate variability and change impact is furthering the pressure on the resources:
  - Temperature is 1.5 to 4 oC by the end of the century
  - Precipitation reduction of up to 25%; 30-50% drop in water availability by the end of the century (IPCC 2007)
• Extreme events frequency and intensity has already started to increase – Drought (exposing >25 million of urban residents !)
• More salt water intrusion in the coastal areas because of GW over drafting and Sea level rise

Figure 24.3: Total Renewable Water Resources per Capita, by Country

ICARDA- Climate Change: Relative change in mean annual precipitation 1980/1999 to 2080/2099

Groundwater dropping over years at Tel Hadya

http://www.skepticalscience.com/sea-level-rise.htm
From http://academics.eckerd.edu/instructor/hastindw/MS1410-001_FA08/dw/
The Water Scarcity Initiative (WSI)

What, Where?

WSI was initiated in 2013 by FAO in response to the FAO’s Strategic Framework:

– demands from the national governments of the NENA regions, and
– the prevailing water facts

Objectives
Support member countries in identifying and streamlining policies, governance, and best practices in agriculture water management, that can significantly contribute to boosting agriculture productivity, improving food security and sustaining water resources.
Build on?

- Arab Water Security Strategy 2010-2030
- The Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region” (RICCAR)
- Other relevant actions (i.e. several national/regional strategies)

How?

- National programs are key players in joining FAO and others in implementing the WSI
- Regional Collaborative Strategy and Strategic Partnership- innovative approaches for knowledge sharing and technology transfer and disseminations
- Total of 19 countries and thus far, and 19 agencies/organizations are working together and joining FAO to implement the Initiative
Elements of innovation

1. A **Regional Collaborative Strategy** among the NENA Countries
2. A Strategic Partnership, **actions-oriented** and **results-based**, to generate a critical mass of ‘capacities’ for ‘**impact-at-scale**’
3. **Forward-looking ways of visioning** for strategic planning of water allocation
4. **Farmers** as full partners (commercial operator and ultimate manager of soil and water)
5. Involvement of **private sector** (food value chain, technology)
6. **Effective synergies in innovation and learning** (from farmer-to-farmer exchange of solutions, practitioners as main actors)
Focus Areas of Work

1. Strategic planning & policies
2. Strengthening/reforming governance at all levels
3. Improving water management, performances (efficiency) and productivity in major agricultural systems and in the food chain
4. Managing the water supply through the use of nonconventional waters
5. Climate change adaptations
6. Building sustainability with focus on salinity, groundwater, and livelihoods
7. Benchmarking, monitoring and reporting on water use efficiency and productivity
## Partnership with regional and international organizations

<table>
<thead>
<tr>
<th>Focus Areas</th>
<th>Partnerships</th>
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<tbody>
<tr>
<td>1. Strategic planning &amp; policies</td>
<td><strong>IWMI, GIZ, ICARDA, LAS</strong> + IFPRI and selected national Agencies of focus countries</td>
</tr>
<tr>
<td>2. Strengthening/reforming governance at all levels</td>
<td>The Netherland (donor), National Agencies</td>
</tr>
<tr>
<td>3. Improving water management, performances and productivity</td>
<td><strong>World Bank, CIHEAM, ICARDA, DWFI</strong>, National Governmental Agencies and Ministries, WUAs and Farmers Groups, private sector</td>
</tr>
<tr>
<td>4. Managing the water supply through reuse and recycling of unconventional waters</td>
<td><strong>AWC</strong>, National Governmental Agencies, WHO, Abu Dhabi Food Control Authority (ADFCA)</td>
</tr>
<tr>
<td>5. Climate Change Adaptation, Resilience, DRR and Drought Management</td>
<td><strong>GIZ, ESCWA, ACSAD, LAS</strong>, Countries Organizations, UNCCD, IUCN, UNESCO, ISESCO, GM</td>
</tr>
<tr>
<td>6. Building sustainability</td>
<td>....Work and partnerships in progress....</td>
</tr>
<tr>
<td>7. Benchmarking, monitoring and reporting on water use efficiency and productivity</td>
<td>....Work and partnerships in progress....</td>
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*Food and Agriculture Organization of the United Nations*
**Staring in the fall 2013**, Six countries (Egypt, Jordan, Morocco, Oman, Tunisia and Yemen) are applying the initial analytical framework of the WSI

- **Gap Analyses** -> availability, use, and projections
- **Use the Food-Supply Cost-Curve** -> alternative options to produce more food ‘internally’ and compare the related costs from the ‘financial’ and ‘water’ perspectives.
- **Water accounting** -> ensure Water Supply and Water Demand are balanced.

and to work on

- **Existing research outputs:** accelerate the scaling out of resource management practices/technologies/information that are proven to make difference in improving water productivity.
The Approach: Staring in the fall 2013, Six countries (Egypt, Jordan, Morocco, Oman, Tunisia and Yemen) are applying the initial analytical framework of the WSI

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Water productivity: a broader framework

Water Productivity (WP) = \[ \frac{\text{Return}}{\text{Unit of water consumed}} \]

**What return??**
- Biomass, grain, meat, milk (kg)
- Income ($)
- Environmental benefits (C)
- Social benefits (employment)
- Energy (Cal)
- Nutrition (protein, carbohydrates, fat)

**What water??**
- Quality (EC)
- Location (GW depth)
- Time available

Consumed (depleted)
- Evaporation
- Transpiration
- Quality deterioration

Theib Oweis, ICARDA
Tradeoffs between water & land productivity

\[ y = -0.4278x^2 + 4.7328x - 0.543 \]

\[ R^2 = 0.7611 \]

Theib Oweis, ICARDA
Pathway to Impact

FAO & other DAs

National/Regional/International Research Institutions

Research activities
Research outputs
Technology Development
Evaluation, adaptation
End users buy in
Scaling out

The Regional Initiative on Water Scarcity
The Regional Initiative on Water Scarcity

Inefficient furrow irrigation

Advantage
Improve seasonal irrigation efficiency from <40% to >75%

efficiency from <40% to >75%

Efficient- Low-head sprinkler irrigation
courtesy of ICARDA (Sudan)
The Regional Initiative on Water Scarcity

Conservation Agriculture

CA- Advantage
Reduce land degradation and improve moisture and nutrient
Improve productivity by up to 30%

courtesy of COTUGRAIN
Advantage
31% increase in grain yield
24% saving in irrigation water
73% increase in WUE

courtesy of ICARDA (Egypt)
Conclusions

Irrigation management—not the irrigation system—was the key to water conservation and drainage reduction.
The selected domestic supply options are simply those whose unit cost is lower than the international price (inclusive of trade margins). In Figure 1, projects associated with shaded rectangles are selected. The sum of yields obtained by all efficient options identifies the domestically produced quantity $q_d$.

At the price $p_m$, at which the good can be purchased on international markets, the domestic demand exceeds domestic production. The difference $q_m$ is simply the optimal level of imports.

In principle, domestic supply could also exceed domestic demand. In this case, the difference between supply and demand would identify optimal export levels.
The Regional Initiative on Water Scarcity

Food supply

Area expansion under irrigation

Intensification

Improvement of rain Agric.

Reduction of losses along the food chain

Gap

Target

Water requirement
Wheat in Oman - Expected production cost $/ton

Source: Prof. Roberto Roson; Dept. of Economics, Ca’Foscari Univ., Venice; IEFE, Bocconi Univ., Milan
Wheat in Oman-

Conclusion:
The expected costs are quite higher than the international market price, thus making the production of wheat a non-viable alternative. The results are quite coherent in the sense that production of wheat in Oman will require heavy investments in terms of irrigation as well as at farm level, besides to the use of large quantity of extremely scarce irrigation water, compared to rainfed wheat production in exporting countries.

Source: Prof. Roberto Roson; Dept. of Economics, Ca’Foscari Univ., Venice; IEFE, Bocconi Univ., Milan
## Oman Case (3)

### Tomato in Oman - Expected production cost $/ton

<table>
<thead>
<tr>
<th>Option</th>
<th>Min cost $/Kg</th>
<th>Max cost $/Kg</th>
<th>Selection Probability</th>
<th>Expected cost $/Kg</th>
<th>Expected production in tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomato replacing Rhodes Grass 900 ha</td>
<td>0.063</td>
<td>0.109</td>
<td>100%</td>
<td>0.118</td>
<td>85,050</td>
</tr>
<tr>
<td>Tomato higher yields &amp; Best management practices 600 ha</td>
<td>0.102</td>
<td>0.214</td>
<td>100%</td>
<td>0.209</td>
<td>59,400</td>
</tr>
<tr>
<td>Tomato in New established Greenhouses 100 ha</td>
<td>0.304</td>
<td>0.615</td>
<td>70%</td>
<td>0.459</td>
<td>17,443</td>
</tr>
</tbody>
</table>

Source: Prof. Roberto Roson; Dept. of Economics, Ca’Foscari Univ., Venice; IEFE, Bocconi Univ., Milan
Tomato in Oman—Conclusion
The expected costs are quite lower than the international market price, thus making the production of tomato a viable alternative.

The production of tomato during winter season is already a wide practice in Oman.

The proposal here is to benefit from the comparative advantages and increase the supply of tomato first in open fields and then in greenhouses. However, care should be taken to the increase of supply of tomato, as the local market is almost saturated. Thus the extra quantities should be oriented towards export. This requires the organization of the supply chain and respect of the international standards in terms of pesticides and chemical uses, packaging, storage and transportation to the final destination.
Irrigated Olive in North East of Jordan (Mafrak Governorate- groundwater source)-

The expected costs are quite higher than the international market price, thus making the production of olive is not a viable alternative.

Irrigated Potato in Jordan Valley and elsewhere in Jordan (surface and groundwater sources)-

The expected costs are quite lower than the international market price, thus making the production of potato a viable alternative.
Moving Toward Remote Sensing-ET Based Water Management Approach

Wu Bingfang, Zhang Miao, Zeng Hongwei, Liu Guoshui, Chang Sheng, René Gommes

Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences
Evaluation of water consumption for water saving measures

Water saving measures implement in Tongzhou

Water saving effect supervision after crop pattern adjustment

Planting structure adjustment in the downstream of Miyun reservoir

A change in 2001

Agricultural engineering

1999

2002

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Legend (unit: mm)

- 0-200
- 200-300
- 300-400
- 400-500
- 500-600
- 600-700
- 700-800
- 800-900
- 900-

Courtesy:

Wu Bingfang, Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences
Concluding Remarks

Accelerating the implementation of measures reducing ‘water productivity gaps’ and utilizing ET-based WM

Developing analytical frameworks identifying pathways to increase physical and economical water productivity (water delivery; on-farm; market & value-chain)

Lead, inspire and influence other countries of the Region in the water reform agenda (scenario analysis; visioning development trajectories; strategic planning, policy change and governance restructuring)
Concluding Remarks

NENA WSI Success

commitments and active participation!

Regional collaborative strategy and partnerships among the NENA Countries; creating a broad consensus, and ownership.
The Regional Initiative on Water Scarcity in the Near East

A collaborative strategy and partnership to address the water-food security nexus

The Near East and North Africa Region (NENA) faces the challenges of addressing a wide range of complex and intertwined issues associated with the management of natural resources, particularly land and water, and securing food supply for a growing population. To address these challenges, FAO has launched a Regional initiative on Water Scarcity in the Near East. The overall goal of the initiative is to support member countries in identifying and streamlining policies and best practices in agriculture water management, and beyond, that can significantly contribute to boosting agriculture productivity, improving food security and sustaining water resources. The initiative will identify critical areas that require action, assist in the formulation of a regional collaborative strategy and build broad partnerships to support its implementation.

Based on FAO’s publication Coping with Water Scarcity: an Action Framework for Agriculture and Food Security, the initiative will inject fresh thinking into the process of finding sustainable solutions to water scarcity and food security problems through promoting the implementation of cost-effective water investments and management practices and through addressing issues of national food security and trade, and reduction of food losses.

The initiative will enhance cooperation among member countries and between countries and international and regional partners. It will focus...
Thank You

http://neareast.fao.org

The Regional Initiative on Water Scarcity