REGIONAL THEMATIC APPROACH TO INTEGRATED MANAGEMENT OF LAND, WATER AND LIVELIHOODS

MODELING
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Modeling of what?

- **Watershed modeling** (maximize productivity and reduce degradation) - SWAT

- **Water allocation and distribution** (Basin, Region) - WEAP

- **Water and crop productivity** (farm) - CropSyst, Aquacrop

- **Economic analysis** tools for improved water management techniques
Challenges ...

- **Scale** (Global, Regional, National, Basin, watershed, Farm)

- **Uncertainty, variability and accuracy** (biophysical and socio-economic)

- Adaptation of models to the arid environments

- Ground data for calibration

- **Impact** of recommended technologies is not very well established
## Irrigated system

<table>
<thead>
<tr>
<th>Country</th>
<th>Achievements</th>
<th>Future plans</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Iraq</td>
<td>Experiments on the effect of various irrigation techniques on water productivity of selected crops</td>
<td>Selecting a model to analyze the data and support decision makers</td>
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<tr>
<td>Yemen</td>
<td>Bio-physical characterization and land use planning</td>
<td>GIS and modeling to improve land use planning</td>
<td></td>
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<tr>
<td>Tunisia</td>
<td>Use AQUACROP to model climate change impact and assessing adaptation strategies</td>
<td>Calibration of AQUACROP and training on CROPSYST model</td>
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<tr>
<td>Lebanon</td>
<td>Experiments on the effect of various irrigation techniques on water productivity of selected crops</td>
<td>Training on modeling</td>
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<td>Egypt</td>
<td>Building a model to improve water productivity</td>
<td>Continue assessment &amp; evaluation of the model, improve communication strategies with decision makers</td>
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## Rangeland and Rainfed systems

<table>
<thead>
<tr>
<th>WLI Country</th>
<th>Achievements</th>
<th>Future plans</th>
</tr>
</thead>
</table>
| **Tunisia** | Studying consumption of water in relation to feed and livestock feeding options | Effects of CC on cropping systems  
Adapting SWAT in the arid watersheds |
| **Jordan**  | Some progress in adapting SWAT to arid environment                            | Calibration and Out-scaling                                                   |
| **Palestine** | Pilot testing of water harvesting technologies                                 | Establish watershed monitoring and SWAT application                          |
|             | Capacity building in SWAT                                                      |                                                                              |
Example:

- Adapting SWAT to predict the impacts of water harvesting interventions on biophysical and hydrological parameters
Two small sub-watersheds (paired swales) to measure soil erosion using geo-textile trap (silt fences)

- One contains continuous contour ridges and planted with Atriplex halimus shrubs
- The other one was control site planted with Barley as farmer practices
Two small sub-watersheds were selected to measure runoff and sediments (ISCO auto-sampler)

- One contains (Vallerani intermittent pits) and Salsola shrubs
- The other one without any interventions (natural rangeland)
Considerations / changes in model setup and simulation processes

- Consider the **contour ridges** planted with Atriplex in the produced HRUs: by adding a **new landuse class** and modifying the crop database (HVI), (LAI) parameters.

- Modifying the **management practices** (SCS Curve number values) and the operations for each site (**heat units**)

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**Table 1**: Some parameters values changed in the SWAT landuse code

<table>
<thead>
<tr>
<th>Site</th>
<th>Parameter</th>
<th>HVI</th>
<th>LAI</th>
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</thead>
<tbody>
<tr>
<td>Continuous Contour Ridges</td>
<td></td>
<td>0.9</td>
<td>1.5</td>
</tr>
<tr>
<td>Winter Barley</td>
<td></td>
<td>0.54</td>
<td>4</td>
</tr>
</tbody>
</table>

* modified by Dr. Srinivasan
the simulated runoff for these sites was under predicted from measured one

Under-estimated flow:
- Rainfall intensity
- Soil characteristics – surface crust
Limitations and Suggested solutions:

- Modifications of Models databases and parameters (e.g. SWAT) … Need more research

- How the model account for WH interventions, especially with limited number of storms
  … Monitoring for many years
  … duplicated sites (e.g. Palestine and Tunisia)

- Data availability in the arid environment
  … Remote sensing and photogrammetry
  … Involvement of rangeland specialist
  … Soil-Landscape modeling
Develop new program to close the gap in soil data needed for modelling

GIS-based, User-friendly, Public domain

Stand alone OR Sub-model within SWAT

SLEEP

Soil-Landscape Estimation and Evaluation Program
Future

- Integrated use of various models to manage the three agro-ecosystems – focus “system”

- Promote collaboration among WLI counties including data and knowledge sharing

- Making use of student exchange programs, facilitate engagement of partnering US universities
Future

- **Capacity building** (SWAT workshop in January 2014)
- Engage **end users**
- **Out-scaling** to larger areas
- **Bio-physical** modeling results inputs to **Bio-economic** modeling
- **Indicators** for success