Climate proofing agriculture in the Arab region: What can we do already now?

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What is Climate Proofing Agriculture?

**Definition**

The incorporation of climate change issues into agricultural / land use planning procedures at national, sectoral, and project level in order to increase resilience to climate change impacts.

**Which approaches?**

- **Pre-active CC adaptation management**: Acting according to acute challenges, but simultaneously planning for future vulnerabilities.

- **No-regret/low-regret approach**: Preferring options that deliver net socio-economic benefits irrespective of the nature of future climate; concentrate on win-win opportunities & synergies.

- **Adaptive management**: We have to apply flexible management approaches that adjust as (climatic) circumstances change.
Steps of Climate Proofing Agriculture

**STEP 1**
- Vulnerability screening (potential impacts + adaptive capacity) of rural areas

**STEP 2**
- Assessing biophysical & socio-economic impacts of Climate Change in agriculture

**STEP 3**
- Identifying and prioritizing suitable technical & policy options of CC adaptation

**STEP 4**
- Developing a strategy (measures + policy); implementation, monitoring, feedback
STEP 2: Assess Biophysical & Socio-economic Impacts of Climate Change in Agriculture

**BIO-PHYSICAL RISKS / IMPACTS**
- Higher water demand of people, crops & livestock
- Shorter growing periods
- Lower Gr.-water recharge
- More soil erosion & sedimentation

**SOCIO-ECONOMIC RISKS / IMPACTS**
- Social stress
- Economic losses
- Higher agric. production risk
- Less food, lower income

**OPPORTUNITIES**
- Better plant growth due to CO₂ increase

**Rising sea levels**
- Seawater intrusion
- Inundation of cities & agric. land

**Climate Proofing Agriculture: Guidelines**
1. Climate change adaptation (CCA) has to be an integral part of national water sector strategies, plans and investment decisions (IWRM based).
2. All options proposed have to be extensively studied regarding their economic perspective and applicability.
   We distinguish between technical and policy CCA options.
**STEP 3:** Identify and Prioritize Suitable Technical Options of Climate Change Adaptation. **Topic: ‘Higher Water Demand’**

<table>
<thead>
<tr>
<th>TECHNICAL OPTIONS</th>
<th>EXAMPLES</th>
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<tbody>
<tr>
<td>Demand Management</td>
<td>High water use efficiency, reduction of water / ET losses, avoiding pollution</td>
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<td>Water Conservation</td>
<td>Deficit irrigation, supplemental irrigation, soil &amp; water conservation, etc.</td>
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<td>More Water Storage</td>
<td>Construction of tanks, ponds, reservoirs; managed aquifer recharge;</td>
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<td>(Rain) Water Harvesting</td>
<td>Rooftop WH, Micro- &amp; Macro-catchments, floodwater harvesting, groundwater dams</td>
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<td>Water Re-use (with or without treatment)</td>
<td>Greywater, municipal wastewater, industrial process water, agricultural drainage water,</td>
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<td>Use of Marginal Quality Water</td>
<td>Low salinity water can be used for many tree and bush crops, incl. date palms</td>
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<td>Crop &amp; Variety Selection</td>
<td>Short cycle crops, drought / salt tolerant crops and crop varieties</td>
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<tr>
<td>Agricultural Production Mode</td>
<td>Changes in planting time, agroforestry, improved animal husbandry, aquaculture</td>
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STEP 3: Identify and prioritize suitable policy options of Climate Change Adaptation. Topic: ‘Higher Water Demand’

The eight 'Golden Nuggets' in agricultural CC adaptation, related to water demand:

- A water policy favouring Integrated Water Resources Management (IWRM)
- Strengthening agricultural extension service (better staffing, improved facilities, more training)
- Incentives / loans to farmers for investments in modern irrigation systems and water storage
- Applied research & demonstrations regarding new methods, such as WH, groundwater dams
- Adequate finance for construction of reservoirs (e.g. for floodwater collection) and aquifer recharge
- More stress on enforcement of laws & regulations to curb water pollution by industry, agriculture, etc.
- A water policy favouring water harvesting, water re-use and the use of marginal water
- Stakeholder involvement in planning and operation of CCA programmes. Improved exchange of data.
Case Study: Nile Delta Development
Example of Pre-active CCA Management

Water-Related Problems in the Nile Delta

Sea level rise

Seawater intrusion into Quaternary aquifer

Groundwater over-pumping by cities in the Delta:
- Seawater intrusion
- Further salinisation by uncontrolled drainage
- Water reuse

Groundwater pollution by cities in the Delta

Increased water demand of cities and crops in the Delta due to rising temperatures

Due to population growth & temp. increase in the Nile valley, less water is arriving at the Delta

Pollution level of Nile water entering the Delta is rising
Seawater has intruded inland to a distance of about **50 kilometers**.

Saltwater intrusion has occurred already about **100 kilometers**.

Sea level will rise by ~1 metre within this century, which will inundate about 34% of the Delta (Ghoneim et al. 2009).
STEP 3: Identify and Prioritize Suitable Options
(Pre-active CCA Management)

Options for the Nile Delta, Egypt (particularly for its northern part)

2017: 55 mio people
2050: 70 mio people
2070:? mio people

TECHN. OPT.
- Rice Cropping
  21000 m³/ha x a
- Higher Water Use Efficiency

Agric. Diversification
Salinity Tolerant Agric. Crops
Tolerant Tree & Bush Crops
Greenhouse Production
Aquaculture (Fishes / Shrimps)

POLICY OPT.
- Drainage Water Re-use
- Reducing GW Pumpg
- Reduced Pollution
- Shift from Supply to Demand Management
- Public Awareness Programmes

- Reorganisation of Infrastructure
- Support to Farmers
- Resettlement Programmes
- Monitoring Environmental Changes
- Capacity Development Progr.
We identified as present-day suitable measures: (a) Water demand management (IWRM), (b) Water conservation, (c) Water storage, (d) Water Harvesting, (e) Water re-use with and without treatment, (f) Use of marginal quality water, and (g) Selection of suitable crops & varieties.

The 'eight golden nuggets' were (1) An IWRM-oriented policy, (2) Strengthening agric. extension service, (3) Incentives for modern irrigation & on-farm water storage, (4) Support to applied research, (5) Financing reservoir construction & aquifer recharge, (6) Curbing water pollution, (7) Promoting water re-use, water harvesting and use of marginal water, (8) Intensified cooperation and exchange of data.

We have chosen the Nile river delta in Egypt as example of pre-active CCA management. A 1 m rise of the sea level is expected within this century, impacting large-scale saltwater intrusion.

We identified for the period 2020 to 2070 technical and policy options. The timely taking of required decisions is indispensable to overcome future problems.

All options proposed have to be extensively studied regarding their economic perspective and applicability.
Thank you for your attention!

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