The fate of agriculture in MENA countries

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Water scarcity and agriculture in MENA

Water is scarce and getting scarcer in MENA region

- 15 of 21 MENA countries have less than 1000 m^3 per year per capita in TARWR
- Population is growing 1.8 % per year; per capita water supplies are steadily decreasing
- Urban/industrial water demand will rise with economic development.
- Groundwater extraction is excessive, deteriorating in quality and must be reduced.

Climate models predict

- Regional precipitation will decline sharply, especially in Eastern Mediterranean
- Lebanon and Morocco expected to experience 10 % to 15 % decrease in water supply for every $1\,^{\circ}\mathrm{C}$ increase in mean temperature
- Higher temperatures will increase evaporation, reducing water availability to plants and increase frequency of extreme climate events
- Crop yields expected to decline 9 % to 19 % for temperature increase of $2\,^{\circ}\mathrm{C}$
- Temperature may increase as much as $5\,^{\circ}\mathrm{C}$ by 2100

As water declines, agriculture will lose most

- Agriculture currently accounts for 80 % of total water use in MENA countries
- Economic development and urbanization will require more water
- Water use in agriculture is residual, as marginal value of water is higher in urban/industrial sectors
- Decline in total water availability combined with increased non-agricultural water demand implies sharp decline in agricultural water use

Predicted effects of water loss

- Rainfall and temperature increase will cause sharp decline in area cropped, in yields, agricultural employment and rural incomes
- Agriculture accounts for large share of regional employment:
  - 28 % in Egypt
  - 44 % in Morocco
  - 50 % in Yemen
- Declining incomes and employment will cause a severe crisis
- Farmers and rural communities will suffer increased poverty and rural to urban migration will increase sharply

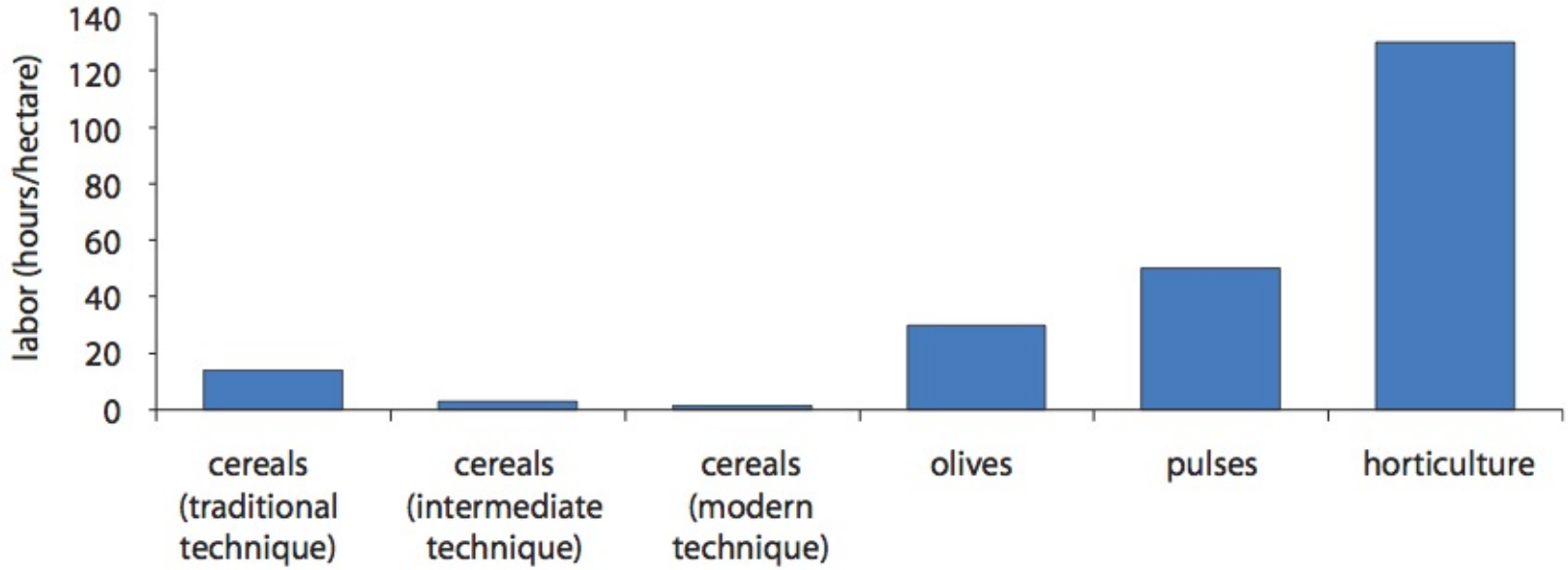
Agriculture must use water efficiently to produce high value output

- Agriculture and rural communities cannot prosper unless agriculture modernizes and uses scarce water more efficiently to produce higher value, skill intensive output
- MENA countries have a comparative advantage in a wide range of fruits, nuts and vegetables, as well as cotton and potatoes
- The switch to these higher value crops is the only bright spot on the horizon
- Increasing agriculture value added and employment may be able to offset a large part of the effect of worsening climate, sustaining agriculture and (some) rural communities

MENA has comparative advantage in horticulture

- World Bank estimates fruit and vegetables offer higher returns to land and water than field crops such as cereals currently produced
  - Wheat produces about 0.05 and vegetables about 0.50 per m^3 of water
  - One full magnitude difference in value per unit of water, the scarce resource
  - Horticultural crops are also significantly more labor intensive, allowing opportunity for more employment: see figure below.

Labor Requirements of Moroccan Agriculture



Source: Ministry of Agriculture, Rural Development and Fisheries.

From: World Bank, 2007

Total farm area will decline, perhaps sharply

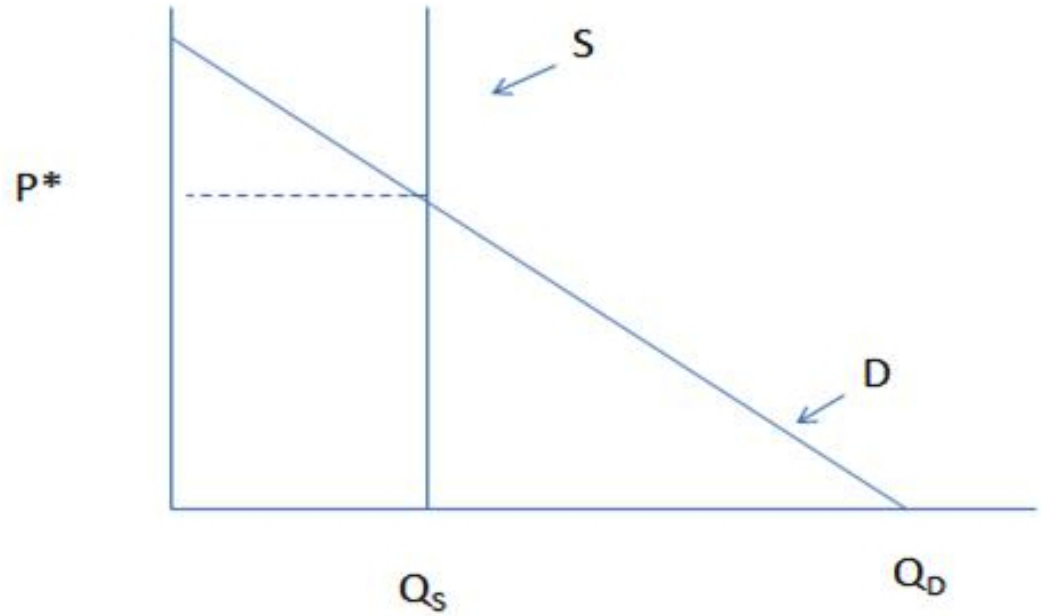
- With climate change, total area planted will probably decline, even with greater efficiency in water use
  - Less water availability
  - More water per plant because of higher evaporation/transpiration
  - Shift to crops that are per unit area more intensive in water use
- Some farms, farming areas and rural communities will be abandoned

Non-agricultural employment

- Rural residents may obtain employment elsewhere than in farming
- Development of modern input and supply chain will create many new jobs
  - Input supply
  - Post-harvest processing,
  - Transportation
  - Communications
  - Marketing
  - Finance
- Migration to urban areas is another outlet

Water pricing and allocation

A model of water market with $P = 0$



P = Price of water
S = Supply of water
D = Demand for water
Q_D = Amount of water demanded when price is zero
Q_S = Quantity of water available

Water prices must rise

- Water pricing is a crucial reform
- Water is usually free or water prices are very low
- Water allocation is generally administered by bureaucratic authority
- Water prices far too low in face of scarcity; don't channel water to most productive use

Low water prices cause economic losses

- When the price is too low, more water is demanded than is available: Recall figure above
- At low prices, water must be rationed, i.e., allocated by bureaucratic authority
- Water allocation often then depends on political, not economic criteria
  - Subsidize poor
  - Reward influential/wealthy clients
  - Encourage production of politically important output that is not economic
- Current water use does not optimize economic output

Must use water more efficiently

- With declining water availability, it is crucial to use this scarce resource better
- Higher water prices will reduce agricultural water consumption
- Rosenberg, Howitt and Lund (2008) estimate a 10 % increase in the water price will, over 5 years, reduce agricultural water consumption in Jordan by 1 %
- Estimated price responses usually accurate only for small changes, but given current low prices, it appears water price changes can have large effect on water use

Higher water prices will improve water use

- Water will automatically flow to more productive use
  - Encourage water conservation, via improved irrigation systems
  - Discourage production of products that produce little value (wheat), freeing up water for more valuable products (horticulture)

Raise water prices administratively

- Increase administered prices toward waters approximate opportunity cost
- Water markets will be politically and administratively infeasible in short run
- Create expectation of higher prices at margin; crucial to guide long term production decisions
- Provide transparent information about present and future prices and water allocations

Cushion effects on poor, but force change

- Allocate some water to poor farmers in fixed block at lower price to cushion initial income effect, while forcing them to face higher prices for incremental water use decisions
  - Charge farmers with larger and more profitable farms a higher price for water
  - Must shift water toward higher value use over time

Develop water infrastructure and clarify rules for allocation

- Improving water use requires further development of infrastructure and regulation
  - Allow movement of water so water can be transferred from less efficient to more efficient users
  - Establish rules that are understood and accepted by constituents and authorities
  - Involve water users to improve management and achieve buy-in
  - Regulate externalities
  - Transition for the poor – not easy

Must have broad economic reforms

- Economic reforms must involve agricultural, trade, industry, infrastructure and education, because they are importantly interrelated
- Greater reliance on the market is essential because it is impossible to direct these changes administratively; using a decentralized approach is key
    - Trade and price reforms to encourage expansion of horticultural production for export markets
    - Infrastructure investments in rural communities to facilitate agricultural modernization and labor force improvements
    - Industrial development to absorb rural to urban migrants in productive jobs

International trade reforms

- Trade reforms should increasingly cause domestic prices to mirror international prices for agricultural and industrial inputs and outputs
  - Existing economic distortions encourage farmers to favor wheat instead of horticultural products
  - Reforms would reduce wheat prices and raise horticultural prices
  - Horticultural products must be exported to high income European markets which are proximate, but which demand high quality, standardized products supplied on schedule

Exporting requires quality

- MENA farmers must modernize to achieve these quality standards
- Farmer and worker skills must improve significantly
- Effective, honest, timely government services
- Community investments in infrastructure, including improved schools and health care

Rural development must be selective

- Some communities will become poles of attraction
  - Focus rural investments on key centers, which become poles of attraction for commerce, rural industry, services, and rural to rural migrants
  - Look to local effort and activity for indications of opportunity
- Some farming areas and communities will disappear

Outmigration

- Even with modernization of agriculture and rural communities, outmigration from rural to urban areas will occur
- Economic development in urban areas is needed to achieve rising productive employment

Economic reforms essential

- Trade liberalization to raise domestic prices of potential exports
- Remove subsidies to domestic cereal production
- Financial innovations for rural sector
  - Loans to finance improved irrigation systems and inputs needed for to produce higher value crops
  - Index Insurance, linked to loans (relatively poor farmers are risk constrained)

Public Investment

- In addition to policy changes, public investment needed
  - Develop infrastructure
  - Improve communications and access to market information, especially abroad
  - Facilitate remittance transfers from migrants
  - Provide training to help farmers and workers acquire skills and change jobs
- Provide direct income support and local services to older agricultural population who remain in rural area

Challenges to the transition

- Higher water prices will be resisted by all farmers, large and small
- Higher water prices will significantly reduce farmer incomes unless farmers can increase water and agricultural output
- Owners of small farms, currently predominantly engaged in grain production, will suffer most, as they will face difficulty obtaining financing, making investments and changing crop mix

Water may flow from poorer farmers to wealthier farmers

- Larger farmers may find it more profitable than poorer farmers to purchase additional water
- Pressures to protect unprofitable farms and diminishing rural communities will be intense
- Providing assistance to the poor during a long transitional period is key and will be difficult financially and politically

Food security is a political issue

- MENA countries are important importers of basic staples, e.g., wheat, and a shift to other crops will leave countries more vulnerable to fluctuating wheat prices
- Countries hesitancy to rely on trade to feed their people makes this a politically charged issue that will worsen when prices are volatile
- Education of the public is essential to make this change palatable, as with other policy changes

Conclusion

- MENA needs new vision that is consistent with scarcer water
- Alternative to reform is bleak
- Reform would generate:
  - Improved use of dwindling water resources
  - Higher output, employment and incomes
  - Agricultural development paired with peripheral industries and services in rural centers
  - Gradual movement of well-prepared migrants to urban employment
- Other countries have achieved this type of transition and are prospering; their experience may offer useful lessons

Thank you!