Water Policy and Poverty Reduction in Rural Area: A Comparative Economywide Analysis for Morocco and Tunisia

Workshop on Agricultural Trade and Food Security in the Euro-Med Area

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Presented by Chokri THABET

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Plan of the presentation

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II. Importance of agriculture and recent features of water balance in Morocco and Tunisia

III. Main characteristics of the proposed water CGE model

IV. Description of the reference scenario

V. Simulations and results

VI. Conclusions and policy recommendations
I. Introduction and Objectives (1)

• Water constitutes one of the major constraining factors of agriculture development in Southern and Eastern Mediterranean and particularly Tunisia and Morocco.

• According to the Blue Plan on the future of the Mediterranean basin, estimates by 2025 per capita water resources will be 310m³/year in Tunisia and 600m³/year in Morocco. This index would be less than 1000 m³/year, deemed critical by various experts and indicator of chronic shortages.

• Based on this concept, Morocco and Tunisia are considered countries where the scarcity of water resources may cause a serious constraint to the development of their economies.

• In terms of water consumption, the agricultural sector is the most important consumer with more than 80% of the total consumed amount in both countries.
I. Introduction and Objectives (2)

• Water has been for a long time underpriced for reasons of food security, limiting rural-urban exodus and improving the agricultural trade balance. However, if present water policies continue to under-price the resource, this will increase the likelihood of severe water shortages and could even shorten its horizon.

• This situation has led governments to design and implement ambitious policies aimed at water resources improvements (supply side) and efficiency of water utilization in agriculture (demand side).

• Despite many previous attempts to remove water subsidies in both countries, progress has been mitigated given the key social role of agriculture in reducing social pressures. Thus, water pricing has usually been below full cost recovery.

• Irrigation water subsidy is found to be much higher in Morocco (45%) than in Tunisia (20%).
I. Introduction and Objectives (3)

• An economy wide analysis of water policies in Tunisia and Morocco will permit addressing the allocation and distribution issues of water resource management. Those issues have high policy relevance as part of the effort of policy makers to manage resources in the long term and to reduce poverty in rural areas.

• The main objective of the study is to explore the impacts of alternative domestic water policies in the form of a cut in irrigation water subsidies and/or increases in public expenditures on water mobilization needed to fulfill the expected water needs escalation by the different users.

• The evaluation of alternative policies will be conducted on a comparison basis between Morocco and Tunisia since that a same policy instrument applied in two different countries can have different impacts. In fact, heterogeneous socioeconomic structures, different market features and economic policies, various levels of natural resources endowments explain the different impacts of same policies across countries.
II. Importance of agriculture and recent features of water balance (1)

For Morocco

Importance of agriculture

• Agriculture is considered as one of the main pillars of the Moroccan economy.

• Its contribution to the GDP lies between 12 and 17%. It has the most important multiplier effect on the rest of the economy (Global Forum on Agricultural Research, 2012).

• Agriculture absorbs almost half (46%) of the active population

• The total agricultural area is about 9 million hectares of which 17% is irrigated contributing in average to 45% of the value added of the agricultural sector.
II. Importance of agriculture and recent features of water balance (2)

Recent features of water balance

• Morocco is ranked among the poorest countries in water resources worldwide with a potential estimated at 22 billions m³ per year.

• The annual average rainfall is 340 mm, but varies more than 450 mm in the North (rainfed possible) to 150 mm in the South where irrigation is absolutely necessary.

• Significant investments have been made in the past which allowed the construction of 130 major dams and hydro-agricultural extensions networks with a capacity of more than 17.5 billions m³.

• To cope with the threats of the scarcity of water resources, a new strategy was established in 2009 aiming at: i) achieving the ambitious goals related to water consumption, ii) radically change water use and management behavior, iii) implement a truly sustainable water management.
For Tunisia

Importance of agriculture

• While declining through time, agriculture continues to play significant roles in the economy. It contributes around 10% of the total GDP and provides a livelihood for about 35 to 40% of the population. Agriculture employs around 16% of the labor force and contributes about 10% of total exports. It also absorbs about 10% of total investment and is increasingly feeding an agro-food industry with the primary commodities. That sector represents today about 25 to 30% of agricultural GDP.

• The sign of apparent salient strength that agriculture has shown since the political change in Tunisia (2011) has turned to be a stabilizing factor of the overall economy in view of the revealed greater fragility that the nonagricultural sectors have exhibited.

• Agriculture has constantly been the target of numerous and discontinuous set of policies and particularly those related to water.
Recent features of water balance

• Tunisia is also endowed with a moderate water resources. The annual average rainfall is 230 mm and it varies between a max of 1500 mm in the North and a minimum of 50 mm in the South.

• Most of the public investment in agricultural sector (over 50%) has been in the hydraulic infrastructure. 27 large dams and more than 182 hill dams and 700 artificial lakes were constructed in the country over the 5 past decades.

• This water mobilization policy has enabled the development of near 450000 ha of irrigable land corresponding to a bout 7-8% of the total arable land. It accounts for 35% of the value of agricultural production.
III. Main characteristics of the proposed water-CGE model (1)

The water CGE-Model

- The model used in this study is based directly on the prototype developed by the OECD (Beghin et al., 1996) which has been applied on many developing countries including Tunisia and Morocco. It’s a recursive CGE model solved for 2005-2020.

- Additional features have been incorporated in the original model for the purpose of this study:
  - The backbone of any water-CGE specification is usually the production function. Our model includes water, physical capital, labor and land as production factors. Substitutions are allowed using nested CES functional forms.
  - The model focuses more on production than on private demand, given the predominance of agricultural water uses.
- CES substitution at each nest
- No Substitution is possible among intermediates. Domestic products can be substituted with the corresponding foreign ones.
III. Main characteristics of the proposed water-CGE model (3)

Originalities of the proposed CGE-Model

• Typically, government and investment demands are not a major focus of interest in CGE models. However, in our case they are, given the importance of public investment in water mobilization.

• Water is supposed to be perfectly mobile across all the agricultural activities. However, in modeling water trade between rural and urban activities, we assume an imperfect substitution according to the relative prices.

• The model developed specifies a market for water as a factor of production whether there is an existing market or not.

• The model considers a large set of policy instruments: subsidies per activity, consumptions subsidies, VAT, tariff barriers, direct taxes etc.
IV. Description of the reference scenario (1)

The data

• SAM’s used for Morocco and Tunisia have the same structure and were built for the year 2005. They account for 15 productive sectors and their 15 corresponding commodities. Two types of households (rural, urban) and one trade partner (ROW)

The Reference scenario

• The reference scenario assumes observed growth rates for both GDP and government consumption in 2006-2012. It also assumes a marked GDP deceleration in Tunisia related to the political unrest and a recovery of GDP at a rate of 5.5%/year by the end of the simulation period (2020).

• The baseline scenario takes also into account the decline of the economic growth since 2008-9. However, this crisis barely affected the sector of water mobilization because public spending grew on average by 4.6 and 7%.
IV. Description of the reference scenario (2)

The Reference scenario

• GDP growth and real government consumption growth are imposed in the baseline scenario. However, GDP is fully endogenous but by adjusting productivity using a calibration procedure, we impose its growth. This allows taking into account the observed loss in productivity after the Tunisian revolution.

• Regarding government spending, it is assumed that consumption and other components of recurrent spending grow at a given rate per annum.

• Other macroeconomic closure rules have been used to generate the baseline scenario: government investment spending is covered through current savings and fixed levels of borrowing (domestic and foreign) and tax rates. Any remaining imbalance will be covered by a “foreign aid”.

• The baseline scenario reflects the actual aggregate functioning of the Tunisian and Moroccan economies.
Table 1: Tunisia and Morocco: Additional public spending by 2020 required to keep the domestic price of water at its level in 2005

<table>
<thead>
<tr>
<th></th>
<th>Tunisia</th>
<th>Morocco</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.8 (% GDP)</td>
<td>1.1 (% GDP)</td>
</tr>
<tr>
<td>Current</td>
<td>0.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Capital</td>
<td>0.6</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Closure: additional public spending will be financed through an increase in taxes

**Alternative scenarios**

Three alternative scenarios have been tested:

- Cutting subsidies on water prices by 50%
- Doubling public spending on water mobilization progressively over the period 2014-2020
- Both above scenarios implemented simultaneously
In both baseline and alternative scenarios one financing variable clears the government budget while three others remain fixed and updated according to a % of GDP.

- Foreign transfers from abroad clear the government budget in the baseline scenario.

- This rule changed under the alternative scenarios when the financing mechanism alternatively is: domestic borrowing, domestic taxation or foreign borrowing in which case, one of these three becomes the clearing variable of the government budget.
In Tunisia, Removing 50% of water subsidies resulted in different effects. The first one is positive with an improvement of public saving. The second is negative reflecting the deterioration of the rural household’s welfare. In addition, efficiency gains resulting from a better use of water is also found to be important. The overall impact is positive (growth in GDP under all financing alternatives).

- Increasing public investments in the mobilization and distribution of water is also expected to enhance production and exports.

- The cumulative impact of the implementation of the two previous scenarios is also positive.
In Morocco, removing 50% of subsidies on water affects negatively the overall economic activity through a reduction in the level of GDP because of three main reasons:

- In Morocco, the level of water subsidy is higher than Tunisia (45%).
- The contribution of the agricultural sector to the Moroccan economy is much higher than Tunisia (15 against 9%, in 2012).
- Irrigated agricultural sector contributes much largely to the economic activity given its higher multiplier effects.

The results of both models show clearly that the Tunisian agricultural sector has more flexibility to positively adjust to higher water prices compared to Morocco where agriculture is more rigid.

In both Tunisia and Morocco, the effects of reducing subsidies didn’t affect farmer’s decisions on crops because intensive water crops continue to be more profitable than the others.
## V. Simulation and preliminary results (5)

Cutting subsidies by 50% (scen1), doubling public investment in water mobilization (scen 2), 1+2 (scen 3)

<table>
<thead>
<tr>
<th></th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
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<tr>
<td></td>
<td>tax</td>
<td>Fb</td>
<td>Db</td>
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<td>Consumption – government</td>
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<tr>
<td>Fixed investment – private</td>
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<td>Fixed investment - government</td>
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<td>0.6</td>
</tr>
<tr>
<td>Exports</td>
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<td>-1.4</td>
<td>-1.2</td>
</tr>
<tr>
<td>Imports</td>
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<tr>
<td>GDP at market prices</td>
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<td>0.2</td>
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Results of the water-CGE model for Tunisia
V. Simulation and preliminary results (6)

**Cutting subsidies by 50% (scen1), doubling public investment in water mobilization (scen 2), 1+2 (scen 3)**

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<td>Consumption – private</td>
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<td>Consumption – government</td>
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</tr>
<tr>
<td>Exports</td>
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<tr>
<td>Imports</td>
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<tr>
<td>GDP at market prices</td>
<td>-0.1</td>
<td>-0.4</td>
<td>-0.4</td>
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Results of the water-CGE model for Morocco
VI. Conclusion and policy recommendations (1)

What we have presented is still preliminary results that have to be completed by calculating the water shadow prices for the different users, the impacts on poverty indicators.

• In both countries, pricing policies need to be continuously accompanied by educational efforts to raise awareness on water consumption levels.

• Despite many previous attempts to remove water subsidies in both countries, progress has been mitigated given the key social role of agriculture.

• Irrigation past policies have encouraged in both countries the adoption of profitable crops but water intensive.

• Water subsidies do not provide sufficient signal to stimulate water efficiency, such as the introduction of water efficient technologies or the renew of old infrastructures, which are currently responsible of huge losses.

• Increasing water prices would enhance practices with less water loss.
The reform of water subsidy can be through an outright or a phased elimination:

- **In case of outright elimination**, the substitution of crops with less water intensive ones can be used as a flanking measure if financial and technical support is provided by the authorities simultaneously with the removal of subsidies.

- **If phased elimination** is chosen, authorities can direct crop selection to less water intensive crops without removing subsidies immediately using incentives instruments.

- The last approach involves smaller threats to farmer’s income.

- Because irrigation water demand is generally inelastic, water subsidy remove entails an increase in the production cost and a lost of competitiveness and income of farmers.

- This study reveals negative effects on farmer’s income by about 20% in the case of Morocco and 12% in Tunisia.
Thank you for your attention…