



## RESEARCH BRIEF

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# Resistance to the Regulation of Groundwater in Rural Tunisia

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Cooperation regarding the use of common pool resources can be difficult to achieve. Different management regimes may channel a resource's benefits differently among users. This can be a problem when regulatory regimes are uniform in nature – in other words, when the same rules apply to everyone regardless of their different circumstances. To examine the role of this heterogeneity among resource users, we surveyed farmers in Tunisia about policies for managing groundwater pumping. We found that, on average, they would be willing to pay up to 2.5% of their income for a transparent and more credible system of metering the withdrawal of water. However, the largest landholders provide the least support for movement to the uniform water-charging management regime, and in fact withdraw their support in relation to increasing transparency and credibility.

In this study, we analyzed a problem of heterogeneity in the context of groundwater management in rural Tunisia. In particular, we focus on farmers' willingness to adopt an effective uniform water-charging scheme as a regulatory instrument over a common aquifer. In this context, groundwater is primarily used for irrigation purposes and farmers owning larger parcels of land are able to extract more water to grow their produce.

However, under the proposed uniform water-charging scheme, the larger landowners are required to reduce their water extraction relative to the current system, while the smaller landowners are able to increase theirs. This results in a redistribution of water extraction that favors smaller landowners to the detriment of larger landowners. For this reason, we would

### Key Points

- The adoption of an effective regime for managing common resources may be resisted by some groups of users. This is often because different users may have differing interests regarding regulation, with some benefiting more from existing regulation and others benefiting more under some alternative regime.
- On average, the Tunisian farmers whom we surveyed are willing to pay TD (Tunisian Dinar) 172.55 to stabilize the level of groundwater by adopting a metering system. On average, farmers are willing to pay an additional TD 37.74 for a transparent regime that publicizes information on individual water use.
- Farmers generally accept a restriction of irrigation of 10% of their land as part of this proposed water management plan, because this amount of land is often fallow, but they would not want to pay for a scheme that restricts irrigation by 30%.
- Fully 40% of farmers in the survey refused to support the move toward a more transparent mechanism for monitoring resource usage. This is indicative of the importance of heterogeneity, in that richer farmers tend to dislike transparency, while the average farmer tends to believe that the current water management system favors wealthier farmers.

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anticipate that resistance to a regulatory change would come from the largest landowners within the system. These are the users who benefited most from the use of the water when unregulated, and are also the group on whom the cost of a change to a uniform system of regulation will disproportionately fall. The objective of this study is to ascertain the evidence regarding resistance to regulation in Tunisia, when a uniform water-charging system is proposed for implementation in precisely these sort of circumstances. We undertook a survey of water users (farmers) in the Merguellil river basin in Tunisia. We used the survey to conduct a choice experiment investigating farmers' willingness to pay to shift to an effective uniform water-charging system.

Since the 1970s, successive Tunisian governments have engaged in large scale investment programmes to equip the country with an extensive water infrastructure with the aim of promoting rural development. As a result, the agricultural sector is by far the largest water user in Tunisia, with an 80% share of all water consumed. Our study area, the Merguellil river basin, is located in the central area of Tunisia.

The Merguellil basin is divided into two parts by the large El Haouareb dam: a hilly region upstream and the Kairouan plain downstream. Rainfall varies widely in time and space, and nearly 80% of annual rainfall falls within a period of about 12 days each year. The resulting sporadic and unpredictably violent surface runoff led to the construction of the El Haouareb dam in 1989. However, the dam does not serve much purpose for water storage due to infiltration and evaporation. Therefore, groundwater is the major water resource in the Kairouan plain. This groundwater is then subjected to heavy exploitation from the overlying agricultural sector.

Collective management of irrigation water by local tribes has a long history in Tunisia. It dates back to the 18th and 19th centuries in the Merguellil basin, and to the 13th century in the oases. After independence in 1956, the Tunisian state was eager to modernize the agricultural sector and promote rural development. In that pursuit, it centralized the management of water away from the tribes. Toward the end of the 1980s, the decentralization of the management of the irrigation schemes led to the creation of local collective water management associations. However, these associations often lack the financial, technical and organizational capabilities to adequately fulfill their mission.

Most farmers have simply resorted to the further construction of private wells. Larger numbers of wells are put in place on agricultural lands each year, and (as the water table drops) the existing wells are deepened using a local manual technique (*forage à bras*). Water management associations are seen to be powerless in the face of private expansion, while the local authorities prefer to turn a blind eye to these practices in order to encourage regional agricultural development. In general, Tunisian authorities have been unable to enforce existing laws restricting groundwater extraction, resulting in the decline of the water table on account of unauthorized boreholes.

Two obvious inefficiencies result. First, groundwater levels continue to fall rapidly (and so pumping and drilling costs continue to increase) on account of the unmanaged exploitation of groundwater. Second, due to lack of enforcement, existing mechanisms for monitoring and enforcement have proven ineffective in managing the aggregate impact of private exploitation, and so have lost all credibility. A complex water management problem exists in the Merguellil basin, and it will take a credible and transparent institution to move the users away from private appropriation and toward common management.

The key objective of our experiment was to elicit farmers' willingness to pay for the implementation of a credible management regime for achieving the stabilization of the water table. Such a management regime requires: (i) transparency regarding water exploitation (individual water use, water theft, meter destruction, etc.); (ii) user group confidence in the monitoring and enforcement system; and (iii) (as a possible complementary credible system) physical restrictions on water use over designated land areas.

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The first characteristic pertains to transparency. This entails a mechanism for disclosing information about individual water use, fraud and sabotage so that the system can be trusted and be less prone to free riding. It may translate into naming and shaming noncompliant users by the regular publicizing of relevant information for every water user. In addition to transparency, accountability is paramount. Because corruption may occur, it is important that the water users believe in the fairness of the monitoring system. The monitoring of the new system may be assumed by either a new water management association, or by the local authorities. The third characteristic relates to the restriction on irrigated land area. This has the advantage of being easily monitored. Finally, the implementation of such a system will require the payment of an annual fee for the installation of a water meter on the well. The requirement of a fee allows us to estimate in monetary terms the value that farmers place on these proposed changes.

The experiment was conducted with a sample 246 farmers in the districts (locally known as delegations) of Chebika, Hafouz, South Kairouan and North Kairouan/El Baten, where farmers rely heavily on private wells and boreholes. The experiment was presented to the farmers as follows:

*“In order to stabilize the groundwater table at the current level, the government is designing a policy to encourage people to reduce water use. In order to do this, the government plans to charge for groundwater use by metering. The Department of Agriculture will install water meters for all the wells in the governorat of Kairouan (Merguellil Valley) and will charge for groundwater use based on the volume used. The volumetric price will be the same as in the public irrigation scheme. Water management units will be instituted throughout the Merguellil Valley.*

*An annual installation and management fee will be required from the farmers. To ensure an adequate design of this policy, the farmers' opinions will be taken into account. You have the right to choose the fee level you are willing to pay. You also have the right to opt out of this policy and keep your current situation, with the water table deteriorating at the current pace. Whichever policy you choose, majority rule will be relied upon, i.e., if more than half of the people in the village vote for policy change, the new water management association will be formed and collective action will be taken.”*

In addition to the experiment, we collected information on socio-economic and demographic characteristics, cultivation and irrigation information, and information about the farmers' attitudes toward the environment and the use of water in the region. We also collected information on the distribution of farm land and the distribution of well depths for the year 2007. This information allows us to examine the effect of inequality across villages on the farmers' behavior.

### Conclusions

On average, farmers are willing to pay 172.55 Tunisian Dinar to shift to the new management regime targeted at stabilizing the level of groundwater. In relative terms, this represents 2.5% of the median farmer's income. On average, farmers are willing to pay an additional TD 37.74 for a transparent regime that publicizes information on individual water use. They further support monitoring by local government officials over the elected water management unit leader (indicating some dissatisfaction with the effectiveness of current arrangements). Farmers are indeed willing to pay an extra TD 20.54 for the local authority to guarantee accountability. This seemingly paradoxical finding is consistent with the locally-prevailing perception that the existing water management associations are involved in private dealings with wealthy farmers. Finally, farmers would reduce their contribution by more than half, i.e., TD 89.2, should irrigated land restrictions be introduced and exceed 30%. However, they would not oppose a minor restriction of 10%, as it is likely to not actually affect most users, probably because some fallowing of fields is a common practice in the Merguellil valley.

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Fully 40% of farmers in the survey refused to support the move toward a more transparent mechanism for monitoring resource usage. Because there is little prospect for the introduction of credibility in a regime in the absence of transparency, this is indicative of the importance of heterogeneity in supporting or resisting the introduction of a credible management regime. In addition, richer farmers tend to dislike transparency, unlike the average farmer.

We also find that farmers from villages with higher land inequality are more willing to pay for a water conservation regime. Moreover, our research shows that basic education has a positive effect on farmers' willingness to pay for water conservation action, while further education is not significant. Moreover, farmers' environmental awareness and concern has a positive impact and promotes regime change.

Farmers living in villages downstream are, as expected, more keen to stabilize the groundwater table, as they tend to be more vulnerable to groundwater scarcity. We also find that farmers who have experienced a greater fall in the water table fall since 1990 are more likely to vote for cooperative management of the resource.

In summary, the main obstacles that impede cooperation are most likely to lie in the heterogeneity that exists across current users. Those who benefit most under the current system would be least willing to support such a move.

### ABOUT THIS BRIEF

This brief is based on "Resistance to the Regulation of Common Resources in Rural Tunisia," by Xiaoying Liu, Mare Sarr and Timothy Swanson, July 2014, Efd Discussion Paper 14-17. (The DRB series of research briefs is associated with the Efd Discussion Paper Series.)

### FURTHER READING

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