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Estimating the potential gains from water markets: a case study from Tunisia

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Abstract

Water markets can improve water use efficiency through the transfer of water to users who can obtain the highest marginal return from using it. Existing water markets are implemented among farmers or between farmers and urban water companies or hydropower companies. Several studies have shown that farmers may benefit from trading water mainly in countries where water scarcity is increasing and new water supply projects are either very costly or not possible because of environmental concerns. This paper estimates the potential benefits and losses of implementing water market among farmers and between farmers and urban water company in Tunisia. We used linear programming to examine four separate farm models and an aggregate model. The method is applied to an irrigation area of 4500 ha in Northern Tunisia. Results indicate that water trading among farmers would be quite limited and would have a minor impact on farmers' income. In contrast, the market among farmers and the urban water company offers higher volumes of water trades to urban users and helps increase farmers' profitability by up to 7.9%. The sale of water to the urban company is accompanied by a decrease in occasional labor by as much as 34.8% and a decrease of up to 17.6% in farmers' expenditures for inputs and machinery. Additionally, results obtained in this paper show that inter-year storage of irrigation water may be more advantageous than selling water to the urban utility. Whether farmers would opt to sell water or inter-temporarily store it would depend on the establishment of water rights and the empowerment of farmers.

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1. Introduction

Water markets have been introduced in several developed and developing countries during the last two decades. Water markets are an economic instrument that can improve water use efficiency through the transfer of water to users who can earn the highest marginal return from its use. Even if farmers do not participate directly, water market prices provide an economic signal showing the marginal return, which constitutes an incentive for farmers to increase their water productivity. Water markets offer the largest benefits in countries where the scarcity of water is increasing and new water projects are either very costly or are blocked by environmental concerns. Existing water markets operate among farmers or between farmers and urban water companies or hydropower companies.

Water trades usually take one of three forms: permanent transfer of water rights, long term leases and short term leases. The most common trades involve short-term leases, while the least common is permanent water rights transfer (Zekri and Easter, 2003). Hamilton et al. (1989) showed that the benefits from short-term water trades between farmers and hydropower companies are very high, suggesting the feasibility of water trade in Idaho. Garrido (1998) showed that water transactions among farmers in the same district take place when farmers are assigned their regular allotments rather than when water is scarce and that the welfare gains from trade are quite modest, ranging between 1 and 12% compared to non-trade situation. He also found that the gains are significantly higher if trade is allowed between different irrigation districts with different rainfall patterns. In contrast, Horbulyk and Lo (1998) found that 90% of the gains come from opening water markets in individual districts. This paper estimates the potential gains that might arise from establishing tradable water rights and allowing water lease among farmers and between farmers and an urban water company in northern Tunisia. It aims at exploring whether farmers will engage in water lease or would prefer water storage and reservoir management on a multi-year basis and consequently whether the public water agency should consider establishing tradable water rights. Finally, the negative impacts of water transfer to urban uses, such as employment losses and decreases in inputs demand at the regional level, will be investigated.

2. The irrigated area of Bouhertma

The irrigated area of Bouhertma, situated in the northwestern Governorate of Jendouba covers 18,000 ha divided into five separate zones. The zone under study is Sector 1, which covers 4500 ha. This area has been irrigated since 1977 after a land reform program. Water salinity is approximately 1.6 g/l. Water is piped to farmers under pressure from two dams, Bouhertma and Mellegue, after being mixed for quality reasons. Two thirds of the water comes from Bouhertma dam with a salinity of 0.6 g/l. The remaining water comes from Mellegue dam, which has a salinity of nearly 3 g/l during summer. However, only a few farmers have complained about water quality and salinity has not been a serious issue in this Mediterranean region. Water is metered and each flow meter services a 10 ha area. Thus, farmers owning less than 10 ha share a single flow meter with their neighbors. The current water price is 0.12 Tunisian Dinar (TD)/m³, with 1 TD = 0.8 US\$ in 2003, which

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