Water Pricing: Balance Between Cost Recovery, Social Equity, and Crops Profitability—Tunisian Case Study

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Abstract

In Tunisia, more than 90% of the total public irrigated area was transferred to water users associations (WUAs). The adoption of a participatory approach was seen as a prerequisite for efficient water use in Tunisia. However, the Ministry of Agriculture reports show that most WUAs face a critical financial situation. Low water tariff is considered the leading cause of this situation. Therefore, WUA's managers often require an overall tariff increase to cover costs. This study seeks to know whether increasing water price is the only way to achieve the financial sustainability of WUA and to analyze the likely impact of such an increase on the profitability of principal crops and, therefore, the economic viability of farming systems. It was conducted at the level of five WUA, which manage public perimeters in the North and the Center of Tunisia. Results showed that the studied WUA has little margins to balance their budgets apart from increasing the water price at least by 10–20%. Such an increase has no significant impact on the profitability of high-value crops like vegetable and fruit trees. However, the profitability of wheat and forage crops would be severely affected. As a consequence, the economic viability of the systems based on the association of wheat, forage crops, and dairy farming will be threatened. Although necessary, the water tariff increase should be done carefully according to the type of farming systems and the social category of farmers in each region. This study suggests supporting wheat and milk output prices to stabilize farmers' incomes.

Keywords

Water pricing · Budget · WUA · Social · Farming systems

1 Introduction

In Tunisia, more than 90% of the total public irrigated area was transferred to WUAs. Adopting a participatory approach was seen as a prerequisite for the efficient use of water (Marlet & Mnejja, 2016). However, the Ministry of Agriculture reports show that most WUAs face a critical financial situation, mainly due to the low water price (Gharbi, 2015). The water fee is the only source of revenue for WUAs in Tunisia. Theoretically, irrigation water pricing should be required to achieve multiple objectives that are often not compatible, such as economic efficiency, equity, water saving, and financial sustainability (Belgin et al., 2004). Water users associations are not at liberty to increase water tariffs without consultation with the authority of the Ministry of Agriculture. WUAs managers often require an overall tariff increase to cover the cost.

However, high water tariff may likely affect the economic profitability of some crops and may be also unaffordable to low farmer's income groups. This study was undertaken in this context.

The objectives were: (a) to know whether increasing water price is the only way to cover the operating cost and achieve financial sustainability of WUA, and (b) to analyze the likely impact of such an increase on the profitability of main crops and, therefore, the economic sustainability of farming systems.

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2 Methodological Approach

2.1 Study Area

The study was conducted at the level of five WUA, which manage public perimeters. These WUA were selected to represent a range of physical, institutional, and social conditions prevalent in Tunisian irrigated agriculture. Three WUA are situated in the lower Medjerda valley (North of Tunisia). They purchase water directly from the Regional Department of Agriculture and sell it to farmers. The main cultivated crops in these areas are wheat, vegetables, fruit trees, and fodder crops associated with livestock (mainly dairy cows). The two other WUA are located in the center of the country and use groundwater as an irrigation source. Again, vegetables and forage are the dominant crops.

2.2 Conceptual Approach

The research design of this study consisted of two steps. First, the managers of the selected WUA were interviewed to collect the needed data to calculate the performance indicators: annual volume of irrigation water delivery, annual volume of irrigation water purchased or pumped, gross revenue invoiced and gross revenue collected, operation and maintenance costs, total number of personnel employed in the provision of the irrigation service, and the water price sell. The collected data were first used to calculate the production and distribution cost of water, which was then compared to the sale price to determine the financial situation of each WUA.

In the second step, a sample of 120 farmers was used to collect information on the farm budgets of various crops. The data included the cost of all inputs, output price, yield, and water applications. Then, the partial budget and the economic value of water, using the residual computing method, were calculated for each crop.

3 Results

3.1 Water Tariff Insufficient to Cover the Cost

Financial analysis results noticed an unbalance between revenues and costs for all the investigated WUAs. As given in Table 1, the revenues collected are still insufficient to cover operating and maintenance costs. This is due to high staff cost, increased maintenance costs, and insufficient tariff levels. As a result, the studied WUA has few margins to balance their budgets apart from increasing the water price.

Indeed, an increase ranging between 10 and 20%, according to WUAs, allows for balancing the budgets. However, this has led to a differential impact on economic profitability, according to the type of crops, mainly because the cost of irrigation represents the major component of the total production cost.

3.2 Differential Impact of Increasing Water Tariff

As indicated in Table 2, the economic value of water, which can be taken as an indication of the profitability of the crops, is many times higher for vegetable crops than the current water tariff, suggesting thus that water price can safely be increased by 20% or more without a significantly

Table 1 Revenues from water sales for studied WUAs

Crops	Unit	Bach Hamba	Utique	Tobias	Agilette*	Bir Ben* Kemla
Water purchase price or pumping cost* ($C1$)	TND/m^3	0.11	0.11	0.11	0.054	0.085
Water distribution cost ($C2$)	TND/m^3	0.023	0.027	0.029	0.052	0.073
Total water cost ($C = C_1 + C_2$)	TND/m^3	0.133	0.137	0.139	0.106	0.158
Sale price (S)	TND/m^3	0.14	0.14	0.14	0.11	0.17
Profit ($S - C$)	TND/m^3	**0.007**	**0.003**	**0.001**	**0.004**	**0.012**

Table 2 Economic value and water valorization for various crops

Crops	Unit	Tomatoes	Watermelon	Potatoes	Wheat	Oat
The economic value of water	TND	5555	6600	8400	2010	384
Water valorization (WV)	TND/m^3	0.724	0.95	2.8	0.35	0.15
Water price (WP)	TND/m^3	0.14	0.14	0.14	0.14	0.14
Ratio (WV/WP)		5.08	6.7	20	2.5	1.07

negative effect on economic profitability. On the other hand, the lowest value of water was found for wheat and fodder crops.

Because wheat and fodder crops require little capital, they are mainly cultivated by small farmers. Therefore, any increase in water tariff would severely affect their profitability and, consequently, the income of this category. Furthermore, the price increase will affect mixed farming systems based on the combination of cereals, fodder, and dairy cows.

4 Discussion

Research results noticed a significant unbalance between revenues and costs for all the investigated WUAs. The water price increase seems the only way to reach budget balance as there is no significant additional margin to reduce the management cost. This research shows that an increase ranging between 10 and 20%, according to WUAs, allows for balancing the budgets. The financial viability of WUA is a critical component of the sustainability of the WUA itself and the irrigation infrastructure. The WUA should be able to raise enough resources to cover the high costs of necessary operations and maintenance. Increasing water tariffs also stimulate farmers to save water, contributing to the sustainability of the environment. However, this has led to a differential impact on economic profitability, according to the type of crops, mainly because the cost of irrigation represents the major component of the total production cost. Such an increase has no significant impact on the profitability of high-value crops like vegetable and fruit trees. However, the profitability of wheat and forage crops would be severely affected. Consequently, the economic viability of the systems based on the association of wheat, forage crops, and dairy farming will be threatened. Although necessary, the water tariff increase should be done carefully according to the type of farming systems and the social category of farmers in each region. This study suggests supporting wheat and milk output prices to stabilize farmers' incomes.

5 Conclusion

This study aimed to ascertain whether an increase in water tariff is the only way to cost recovery and to analyze the likely impact of such an increase on the profitability of main crops and, therefore, the economic sustainability of farming systems. Results showed that the studied WUA has little margins to balance their budgets apart from increasing the water price at least by 10–20%. Such an increase has no significant impact on the profitability of high-value crops like vegetable and fruit trees. However, the profitability of wheat and forage crops would be severely affected. Therefore, although necessary, the water tariff increase should be done carefully according to the type of farming systems and the social category of farmers in each region.

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