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## STUDY OF THE PERFORMANCE OF OASIS AGROSYSTEMS IN THE KEBILI REGION

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## Introduction

Irrigation management requires organization and coordination, whether for construction, maintenance, management of hydro-agricultural facilities or distribution of the resource. It thus becomes intrinsically linked to a structuring of society. Today the intensive use of groundwater, especially by the agricultural sector, leads to an increased need to design governance mechanisms and to study the management of these resources at local and national levels.

In Tunisia, these groundwater resources are weakened by increasing anthropogenic pressure, climate and socio-economic changes. Without sustainable management, they risk becoming a serious obstacle to development.

Since the 1970s, the oases of Kebili have undergone significant territorial changes due to the rapid expansion of date palm plantations irrigated from illicit drilling exploiting non-renewable groundwater. Despite State investments in everything through national projects for safeguarding, renovating and saving water, the ancient oases suffer from great vulnerability: accentuated fragmentation, low profitability, water scarcity and malfunctions related to the collective management of water.

## Aim

This work contributes to the evaluation of technical and agronomic performance mainly through indicators related to collective water management and production in the palm groves of Om Somâa South (Souk Lahad) and Blidette (Kébili South).



## Method

### 1. The study area :

The region of Kébili is located in the South-West of Tunisia. It covers an area of about 22,454 km<sup>2</sup> (figure.1). The study mainly concerns the two sites "Oum somaa South" located in the Souk Lahad delegation (221.83 ha operated by approximately 600 farmers) and "Blidette" located in the Kébili south delegation (80.28 ha operated by 404 farmers) .

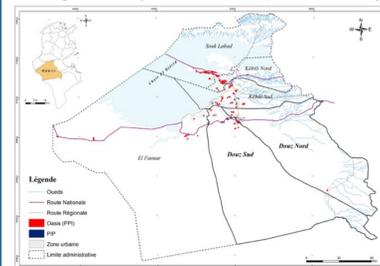


Figure 1.: Location map of Kébili (Mekki et al., 2021).

### 2. Materials and methods :

This work was carried out based on a collection of data from agricultural institutions (CRDA, CTV and GDA), on the realization of surveys with farmers and on the determination of the water needs of the date palm based on climate data of the year 2021-2022.

- The data collected from the CRDA and the CTV made it possible to build a database around the water consumption of farmers who operate the collective network of the GDA, in the two study areas.
- The data collected from the GDA of Oum Somaa South was used to understand how the water tower is built between the irrigators and to determine the general characteristics of the farms (area, number of plots, etc.).
- Surveys with farmers focused on water management practices, date palm production (common variety and Deglet Nour variety) and the explanatory factors of these practices.
- For the year 2021-2022, the average annual water consumption in Blidette was determined based on water fee monitoring data collected from the CRDA. In Oum Somaa South, the monthly water consumption and the durations between two successive irrigations are determined from the GDA royalty files during the period from March 2022 to January 2023.

The sample includes data for 83 farms constituted from a single plot.

## Results

### 1. Satisfaction of irrigation water requirements from the collective irrigation system

Based on climate data (2021/2022) the annual water requirement of palm trees calculated is around **13775 m<sup>3</sup>/ha**. In the oasis of Om Somaa Sud, the results revealed that 65% of the farms are under-irrigated and 35% are over-irrigated (figure.2).

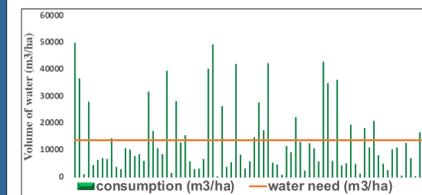


Figure 2. Assessment of water needs satisfaction-Oasis Om Somaa South.

### 2.Characterization of the mean irrigation intervals in the oasis of Om Somaa South

Three classes of the mean irrigation intervals between have been identified (Figure 3): (i) majority class 1 (55%) – irrigation interval less than 30 days; class 2 (42%) – Irrigation interval between 30 and 45 days; class 3 (3%) – irrigation interval more than 45 days.

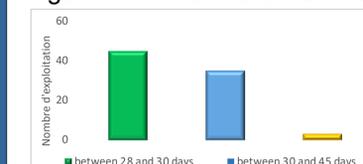


Figure 3. Histogram of irrigation intervals (2021-2022)

### 3.Average date palm production

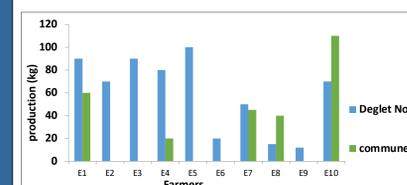


Figure 4a. Comparison of the productions of the varieties - Om Somaa South

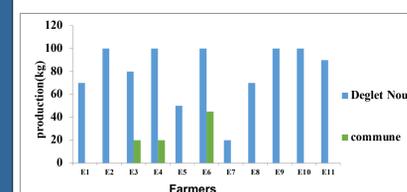


Figure 4b. : Comparison of the productions of the varieties - Blidette

The results show that there is a significant production of the common varieties in Om Somaa South (Figure.4a), unlike in Blidette (Figure.4b), where farmers prefer to grow the Deglet Nour variety.

## Discussion

The GDAs of Om Somaa South and Blidette manage the distribution of water to end users differently. In Om Somaa, farmers irrigate according to a water turn, while in Blidette, water is distributed according to the theoretical needs of the palm tree, taking into account the cultivated area.

The collective irrigation network of the Blidette oasis serves 545 farms. The calculated average consumption is around 9000 m<sup>3</sup>/ha. Compared to the theoretical water requirements of the palm tree, the farms are considered to be under-irrigated.

In the oasis of Om Somaa South, over irrigation is mainly detected in very small farms (less than 0.009 ha).

The difference in varieties can be explained by the fact that water scarcity is more pronounced in the oases of Om Somaa South. The presence of common varieties may be a form of adaptation to the lack of water, as these varieties consume less water and may be more tolerant to salinity.

## Conclusion

Many indicators have made it possible to study the performance of oasis irrigated systems. These indicators differ according to their objectives and methodologies. This work shows that improving performance depends primarily on improving water management by combining technical, agronomic and organizational aspects.

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