

## Importance of the *Meskat* system and its landscape insertion through the olive groves of Sousse Region (Tunisian Sahel)

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**ABSTRACT:** The present work aims to study the importance of the hydrological *Meskat* system and its landscape insertion through the olive groves of Sousse region. The inventory of the anti-erosion works reveals that the management of watersheds by the *Meskat* system was performed on approximately 44 000 ha, so, 40.5% of the supported area of the region by the erosion control structures (108 500 ha). This is an architectural and hydraulic heritage with a good quality rural landscape. This work aims to minimize the soil losses, to capture the surface runoff, to increase the soil fertility and to improve the crop yields.

The current landscape of *Meskats* is an old as well as a current farmer's work. There is a richness conceded by the ancestors to their descendants. But this heritage is, in some cases, badly preserved. It should be noted that if, in the past, olive-tree left to the reconquest of the lowest parts of the hills to take advantage of the runoff, in the present, the urban population is looking for a natural landscape, is leaving to the reconquest of the hills (impluviums) to enjoy a world of pleasant views over the surrounding agricultural landscape, which risk the peril. However, the *Meskat* system remains the essential component of the territory organization, of the olive oil production and of the suburban and rural landscapes in Tunisian Sahel.

**KEYWORDS:** *Meskat* system, olive groves, rain mode, landscape insertion, Tunisian Sahel.

### 1 INTRODUCTION

Since the independence, several techniques of water and soil conservation have been adopted in Tunisia to meet a rational and sustainable use of natural resources. Thus, the erosion control work was inherited from the expertise of the different succeeded civilizations in the country [1]. Moreover, Tunisia is very rich with traditional anti-erosion structures characterized a geographical dispersion and a big decentralization. Furthermore, these erosion control works are influenced by many climatic, pedological and topographic factors. The *Meskat* symbolizes the ancestral system of the Sahel, characterized by an annual rainfall ranging from 200 to 350 mm [2].

*Meskat* system is widespread in the region of Sousse. This region is characterized by low slopes relief, by hilly areas in the South and mountainous areas constituting the typical hillsides in the North of the region. Based on these characteristics and on the pedoclimatic conditions, this area is known by a culture diversification and landscapes that have sustained the development of tourism. The soil occupation is dominated by the presence of the olive groves characterized by their economic wealth and landscape beauty. The olive-trees, planted in rain mode, use the agriculture conservation based on the collection of the surface runoff [3]. Hilly areas behave like impluviums for olive groves situated at a lower level. However, the arid climate and the water scarcity accentuate the fragility of the natural environment. Indeed, the *Meskat* system

participates efficiently to guarantee a satisfactory production of olive groves. This work presents the main characteristics of the Meskat and reveals its distribution and its integration into the landscape through the olive groves in Sousse region.

## 2 CHARACTERIZATION AND MESKAT SYSTEM DISTRIBUTION

### 2.1 SPECIFICATION

The hydrological Meskat system is considered as an ancient technique in Tunisia, which had a large extension from the Roman era. It is a soil and water conservation work adopted in semi-arid regions, mainly the Sahel of Tunisia. The Meskat represents a catchment structure of rainwater for fruit trees and mainly for olive groves.

### 2.2 COMPONENTS AND OPERATING PRINCIPLE

The components of the *Meskat* system from the upstream to the downstream, are: (i) the catchment area or «*Meskat*» or «*H'mada*» which represents the hilly area that, often encrusted, not cultivated and characterized by the dominance of the limestone layer, the development of spontaneous plants (*Artemisia*, Rosemary, Halfa, etc.) and the existence of old structures such as «*Fesguias*» or «*Majels*» to conserve the surface runoff, (ii) the furrow which are designed to conduct water from upstream to downstream, (iii) the dispatchers which are the embankments built in parallel between the catchment area and the plantations, (iv) the «*mankâas*» or compartments that symbolize the downstream part of the *Meskat*' system (they are planted with olive trees and other crops), (v) the «*tabias*» which are mounds of soil and low-rise bordering the *mankâas*, and (vi) the «*manfes*» or the «*majref*», are located at the extremity of the *tabia*, and allowed the water flow between the compartments (Fig. 1 and Fig. 2).

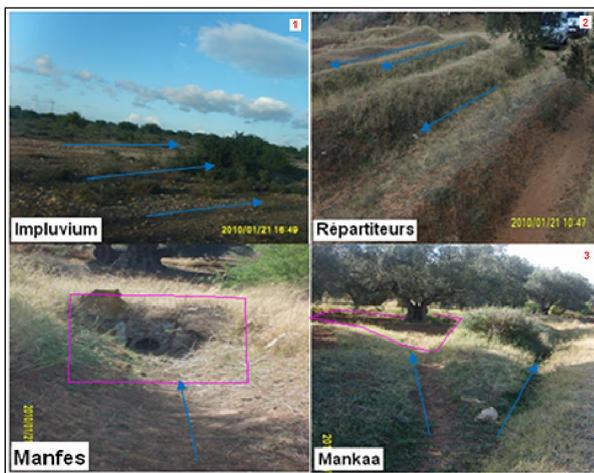


Fig. 1. Some illustrations of the components of the Meskat system

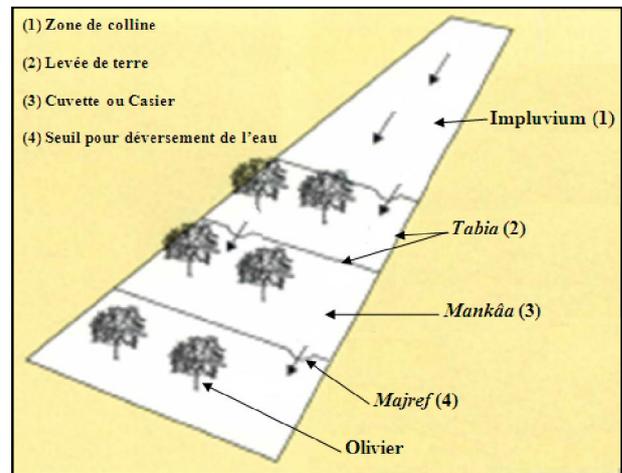


Fig. 2. Constitution and operating of the Meskat system

The operating principle of the Meskat system (Figure 2) consists on the exploitation of the hills area to capture rainwater which will be transported and subsequently directed through channels to be distributed by dispatchers, to *mankâas*. These later are planted with olive trees in the valleys. The water passes from locker to another through the «*majref*» [3].

### 2.3 IMPACT OF THE MESKAT SYSTEM

The Meskat system plays, first, an important role to struggle against erosion by water and soil retention. In addition, Meskats are excellent structures to correct the stabilization and soil balance slope [4]. Moreover, this system allows the improvement of soil fertility ([5], [6]) and the increase of agricultural production. The role of the Meskat did not stopped at this stage, since it can also recharge the ground water and decrease the stream flow.

## 2.4 LOCATION AND OCCUPATION OF MESKAT SYSTEM IN SOUSSE REGION

The area occupied by the Meskat system is about 44 000 ha, so 40.5% of the area supported by the anti-erosion structures (about 108 500 ha). M’Saken region represents the most managed area (61%), followed by 30% of the area of Kalâa Kébira (Table 1).

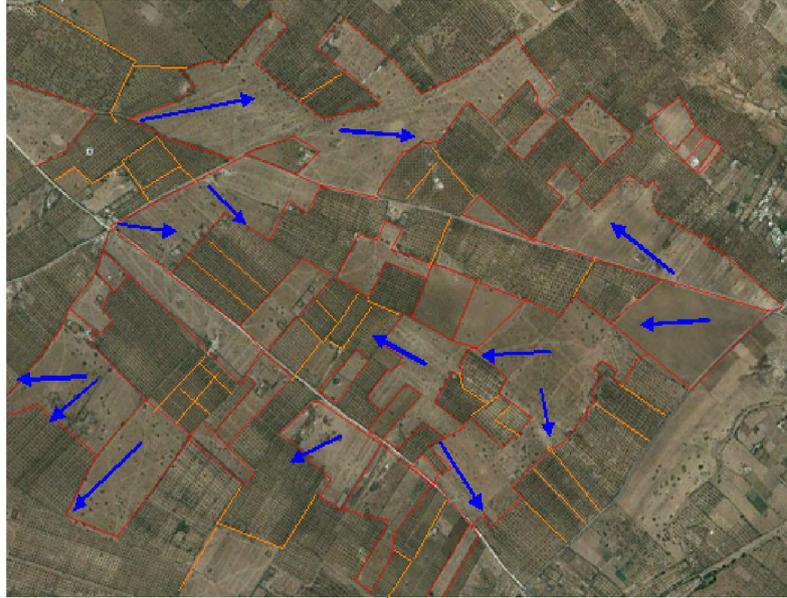
*Table 1. Distribution of Meskat system in Sousse region [7]*

Zone	Area (ha)	%
Bou Ficha	0	0.0
Kalâa Kébira	13 246	30.3
Kalâa Sghira	1 133	2.6
Enfidha	0	0.0
Sidi Bou Ali	1 512	3.5
Kondar	0	0.0
Sidi El Hani	0	0.0
M’Saken	26 520	60.6
Akouda	1 181	2.7
Hammam Sousse	101	0.2
Hergla	0	0.0
Sousse Riadh	68	0.1
<b>Total</b>	<b>43 761</b>	<b>100.0</b>

## 3 LANDSCAPE INTEGRATION OF *MESKAT* SYSTEM THROUGH THE OLIVE GROVES OF SOUSSE

### 3.1 HARMONIOUS LANDSCAPE VIEW

Water, soil and topography are elements that enroll the landscape by determining the spaces organization and agricultural activities. Regardless their scale, open agricultural areas participated in urban and architectural heritage setting. The developed areas by a *Meskat* system reveal the particularity of a mosaic ecosystems (Fig. 3), where coexist a harmonious panorama of natural cultivated and uncultivated and semi-natural areas (roads, ditches, channels, etc.). Areas of the extreme west of Sousse region are characterized by the presence of field and feed crops in hillsides and olive groves in *mankâas*. In addition, farmers in these areas are installing annual crops between lines. The coastal zone, with lower slope (3%) and sandy soils, will split into two almost juxtaposed areas following the coastline, one in the east of the spreading with nodules and in which wells familial irrigated areas were created and the other in the east in contact with the sea, favorable for vegetable crops (for example the region of Chott Meriem). This particular landscape composition has a strong impact on plant biodiversity. The habitat is so fragmented and influenced by human activities related to agriculture, which largely pleased eco-tourists.



**Fig. 3. Over view of Meskats and their landscape integration**

### 3.2 CONSTRAINTS OF THE AREAS PLANNED BY THE *MESKAT* SYSTEM

The population explosion and urbanization are the major constraints imposed to *Meskat* system [8]. Indeed, according to studies of the Center of Research in Agricultural Engineering (CRAE, Tunisia) and the Institute of Agricultural Engineering in Lausanne (Switzerland), accomplished in 1975 and 1982, the use of mechanical tools for tillage instead of animals makes the access to plots difficult (basins) and force farmers to destroy some *tabias* located between the basins. In addition, maintenance operations which are a prerequisite for the success of the work are increasingly weakened by the increasing number of owners by inheritance.

The movement of rural decline in the downstream parts of watersheds, resulting in land abandonment and therefore the lack of maintenance as well as of tillage, was the cause of soil compaction, *tabias* clogging, these separating basins, and the appearance of erosion manifestations. This phenomenon is the result of the importance of surface runoff during special hydrological events (floods). The consequence of this situation is a general decrease of productivity of olive groves managed by *meskats* systems and a renunciation for maintenance of these systems, which led to a resumption of streams runoff which have never flooded before [2]. This situation is now more pronounced.

## 4 CONCLUSION

The *Meskat* system is a specific example of the traditional water and soil conservation work that collects rainwater for olive cultivation in semi-arid regions (Tunisian Sahel). Therefore, it succeeds in improving soil fertility, in increasing production and in developing the tree carpenter. Topography and land use diffuse a typical landscape in a mosaic form, thus justifying the landscape harmonious integration of *meskats* through olive groves and offering a good quality rural landscape.

The proper operation of *Meskat* system is guaranteed by maintenance and preservation of this ancestral system. Nevertheless, abandonment and overexploitation had neutralized gradually the importance of the system. In addition, periurban *meskats* are threatened by urbanization. This phenomenon intensified the degradation of land managed by the *Meskat* system, and therefore, the decline of olive groves and hills occupation by the buildings so that residents enjoy a variety of existing landscapes. Ultimately, the rational use of *meskats* is of a great importance for a sustainable development, taking into account water issues as part of life in sustainable landscapes.

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