Chapter 7
Monitoring Agricultural Dynamics and Its Impact on Water Resources Using GIS and Remote Sensing Data:
A Case Study in the Ben Mansour–Mnasra Region, Kenitra, Morocco

Tarik Bahouq
Département de Géographie, Faculté des Sciences Humaines et Sociales, Université Ibn Tofaïl, Kénita, Morocco

Amina Moumane
https://orcid.org/0009-0001-9188-6964
Département de Géographie, Faculté des Sciences Humaines et Sociales, Université Ibn Tofaïl, Kénita, Morocco

Nadia Touhami
Département de Géographie, Faculté des Sciences Humaines et Sociales, Université Ibn Tofaïl, Kénita, Morocco

ABSTRACT

The Ben Mansour region in the Kénitra province of northwestern Morocco, a vital agricultural hub, is facing significant environmental and hydrological challenges due to its intensive agricultural practices and climatic conditions. This study examines land use and land cover changes over two decades (2000, 2010, and 2020)

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and assesses groundwater quality and levels in the region. Using Landsat satellite imagery, the authors analyzed vegetation dynamics through the NDVI, revealing substantial shifts in land use. Groundwater assessments, including depth and electrical conductivity measurements, reveal critical issues of overexploitation and salinization. Groundwater levels vary widely, with notable depletion and increased salinity due to intensive extraction and seawater intrusion. These findings underscore the urgent need for sustainable water management practices and land use strategies to address the environmental impacts and ensure the long-term viability of agricultural activities in the region.

INTRODUCTION

In recent decades, the intensification of agriculture and increased water extraction have emerged as critical challenges with profound implications for water resources and agricultural sustainability, particularly in arid and semi-arid regions (Molle and Tanouti 2017). Morocco, located in North Africa with a predominantly arid to semi-arid climate, faces significant water stress driven primarily by human activities rather than solely by natural factors (Benabderrazik et al. 2021; Ouassanouan et al. 2022).

The Mediterranean region, characterized by its distinctive climate with hot, dry summers and mild, wet winters (Tramblay et al. 2020), is experiencing escalating pressures due to intensified agricultural practices (Devkota and Yigezu 2020). In Morocco, these pressures are manifested in the overextraction of groundwater to support high-yield farming and greenhouse cultivation (El Mountassir and Bahir 2023). This has led to unsustainable extraction rates, especially in areas where groundwater resources are already limited (Moumane et al. 2021). The situation is further exacerbated by climate change-induced droughts, which intensify the competition for limited water resources and strain existing water management systems (El Assaoui et al. 2021).

Within this context, the Ben Mansour- Mnasra region in the Kénitra province of northwestern Morocco represents a microcosm of the broader challenges facing the Mediterranean region (Hssaisoune et al. 2020). This area, integral to Morocco's agricultural sector, is characterized by its fertile sandy-loam soils and favorable climatic conditions. However, these advantages are overshadowed by significant water-related challenges. The region's reliance on groundwater for irrigation, driven by the expansion of private wells and intensified agricultural practices, has led to critical concerns about the sustainability of water resources (Aguedai et al. 2022).

Groundwater resources in coastal zones like the Ben Mansour- Mnasra are particularly vulnerable to overexploitation. The sandy sediments that characterize the region's aquifers offer high recharge potential but are also prone to salinization