ACCISI-GEM

ADAPTING TO CLIMATE CHANGE IMPACTS THROUGH SMART IRRIGATION AND THE WEFE NEXUS APPROACH IN GHAR EL MELH WETLAND AREA,TUNISIA

This Policy Brief reflects the results of the Policy Dialogue component of the ACCISI-GEM project (2024-2025) that is a practical demonstration of a holistic multidimensional, innovative, community-based, gender-sensitive, and partnership-focused approach to sustainable coastal agricultural practices in the Gulf of Tunis, using a WEFE (Water-Energy-Food-Ecosystems) Nexus perspective.
The Dialogue allowed building a shared consensus among key stakeholders on the enabling environment and the financial incentives for replication and upscaling of the technical interventions at national level in Tunisia and the dissemination within and beyond the country .

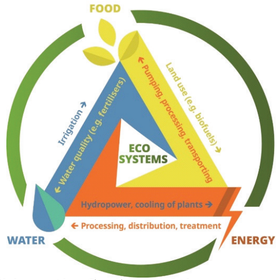
Summray

In response to the growing water crisis in Tunisia, accentuated by climate change, the ACCISI-GEM project, proposes a concrete solution: intelligent irrigation combined with solar energy. The pilot project carried out in Ghar El Melh demonstrated optimized water management and improved farm profitability. Recommendations and an action plan are proposed for scaling up this approach, including the establishment of a national WEFE policy, the creation of a dedicated national fund, financial incentives for the acquisition of smart irrigation systems and solar energy, and capacity-building of institutional actors. This document details opportunities and recommendations to accelerate the adoption of smart irrigation using the WEFE Nexus approach in Tunisia.

Introduction

Tunisia is facing escalating challenges regarding its natural resources, accentuated by climate change, rising food demand, and the ongoing energy transition. In 2023, the country implemented water rationing after enduring several years of drought and increased water stress. The hydrological year 2022 saw a significant rainfall deficit, with average precipitation at 135.7 mm, compared to the usual 232 mm. Consequently, water inflows to dams were significantly low, totaling only 1109 Mm3, 59% of the estimated average of 1888 mm. This resulted in a decrease in dam storage levels from to 34% within the year. Agriculture, which accounts for nearly 75% of water usage (2,722 Mm^3), is particularly vulnerable to these challenges.
The overexploitation of groundwater has continued to increase over the past two decades. The levels of both shallow and deep aquifers are continuously declining, with a drawdown that can reach up to 2 meters per year in some regions. According to the latest groundwater exploitation directory (2020), prepared by the DGRE every five years, the extracted water volumes were estimated at 914 Mm^3/year, compared to a renewable volume of 767 Mm^3/year, resulting in an overall exploitation rate of 119%.
Food security is directly correlated to the availability of water resources. For instance, due to prolonged drought conditions, although the annual cereal consumption is 174 kg per capita, the cultivated areas of this strategic sector have decreased, from 1.5 million hectares to 1 million hectares during the 2021/2022 season.
At the same time, and with over 3,000 hours of sunshine per year, Tunisia has strong potential for solar pumping development. Photovoltaics, particularly cost-effective for pumping and irrigation systems not connected to the STEG network and using diesel (GIZ, 2019), offer a quick return on investment (less than 4 years) and an attractive internal rate of return (IRR) (26%).
To explore the interlinkages and cross-benefits across sectors, an integrated approach is essential. The WEFE Nexus (Water-Energy-Food-Ecosystems Nexus) approach offers an effective response, moving beyond a traditional fragmented thinking and adopting an integrated and coordinated approach across sectors for the management of natural resources by reconciling the potentially conflicting interests of different sectors and stakeholders that may even compete for the same resources (figure 1). The Nexus can contribute towards the achievement of the Sustainable Development Goals (SDGs) as well as meeting the goals of building low carbon and climate resilient economies and societies.

[1]Rapport national du secteur de l'eau,2022
[2](http://www.onagri.nat.tn/uploads/secteur-eau/revue-sectorielle-eau-2022.pdf)
[3]https://www.anme.tn/fr/content/solaire-photovoltaique
https://energypedia.info/wiki/File:Rapport_Etude_Marche_Final_fin221119POUR_BAT.pdf



The ACCISI-GEM project builds on the findings of the GEMWET project, which concentrated on the conservation and sustainable development of coastal wetlands in Ghar El Melh during 2020-2021. It aims to enhance water, energy, and food security in order to protect its valuable ecosystems and their functions from significant environmental pressures, while improving community resilience to climate change. A key component of the project was the implementation of smart irrigation systems using solar energy for water pumping to assist local farmers in optimizing their water usage. Smart irrigation has been able to increase water productivity by 20% and 54%, while increasing yields by 25% and 50%, thus improving water efficiency and farm profitability.

Figure : Farmer Adopting Smart Irrigation Technology for Sustainble agriculture

These results clearly illustrate the potential of smart irrigation technologies and solar systems to optimize water resource use and improve the profitability of agricultural operations in Tunisia. However, its large-scale adoption is hindered by several obstacles: limited access to financing, lack of appropriate incentives, and lack of clear integration into public policies. To overcome these barriers, it is important to establish an
incentive political and regulatory framework, relying on three strategic points:

1-Develop incentive financing mechanisms to facilitate farmers' investment in smart irrigation solutions and solar energy.
2-Strengthen the integration of the WEFE Nexus approach into public policies to ensure sustainable and coherent resource management.
3- Disseminate good practices and support sector actors through training and technical support mechanisms

This Policy Brief is part of this dynamic process by exploring opportunities and recommendations to accelerate the adoption of smart irrigation using the WEFE Nexus approach in Tunisia..

[4]https://www.gwp.org/en/GWP-Mediterranean/WE-ACT/News-List-Page/2021/gemwet-an-ambitious-project-with-tangible-benefits/

Approach

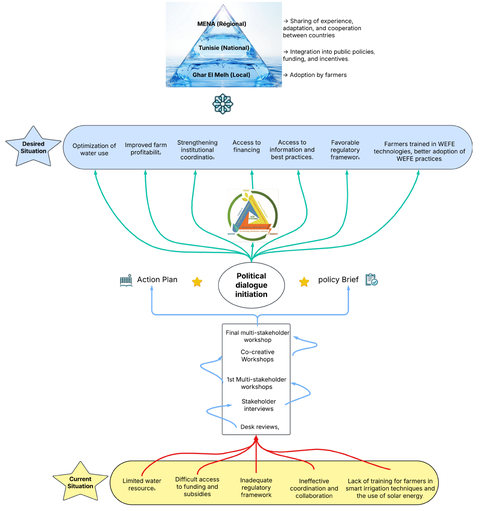
An approach based on an analytical and participatory methodology aimed at identifying institutional and financial blockages, mobilizing key stakeholders, and proposing operational options tailored to field constraints. It relied on four main axes:

Desk study analysis:
Assessment of existing regulatory frameworks and financial incentives to map opportunities and constraints in order to produce recommendations aligned with national strategic orientation.

Semi-structured Interviews:
Collection and analysis of perspectives from key stakeholders at national and regional levelto understand barriers to adoption, evaluate existing mechanisms, and propose appropriate adjustments.

Dedicated panels during the ACCISI-GEM Multi-stakeholder Workshops :
Consultation with partners, experts and financial institutions to raise awareness and discuss the barriers to adopting this approach by farmers, propose suitable mechanisms, and share results among stakeholders and policymakers.

Concertation workshops:
Co-construction of a governance framework and a collaboration model with a core team. The objective is to identify strategic stakeholders, refine the persona of the policy brief, and establish an action plan for the implementation, adoption, and scaling up of the WEFE Nexus mechanisms.



Findings and solutions for adopting the WEFE Nexus approach

Framework	Findings	Options/solutions
Institutional Framework	- Distribution of competencies among different ministries and agencies (MARHP, ANME, STEG, APIA), insufficient coordination and collaboration among public actors concerned, hindering the effectiveness and efficiency of WEFE Nexus implementation. - Lack of a clear regulatory framework for the governance of WEFE Nexus. - Complex and cumbersome administrative procedures related to the process of acquisition of the smart irrigation and solar energy systems. (e.g., difficulties accessing information on government portals and manuals that lack clarity.) - Few pilots across various agricultural sectors providing access to reliable and updated data to demonstrate the technical and economic viability of the WEFE Nexus approach. - Limited availability of case studies and lack of information on financing opportunities hinder the adoption and scaling up of WEFE Nexus good practices in Tunisia. - Few financing mechanisms and guarantees for such entrepreneurial projects in the context of energy efficiency (e.g., SOTUGARS; FGEEE energy efficiency guarantee fund).	-Potential for institutional reform to improve coordination and simplify administrative procedures. - Evolving regulations that can be adapted to encourage a transition to sustainable agriculture by adopting the WEFE Nexus on a larger scale.
Access to Financing	- Expensive cost of smart irrigation equipment and photovoltaic systems, hindering adoption by farmers. - Existence of financing mechanisms (the Energy Transition Fund distributed by the National Agency for Energy Management (ANME) which provides financial support for various energy management actions, particularly in the agricultural sector, Tunisian Investment Fund distributed by the Agricultural Investment Promotion Agency (APIA) allowing grants for material investments for mastering new technologies and improving productivity at 50% of approved investment costs with a ceiling of 500,000 DT), with long disbursement timelines for grants, and the absence of these grants in the financing scheme, which burdens farmers' own contributions and maker access to financing difficult. - The two types of aid (Tunisian Investment Fund and Energy Transition Fund) are not cumulative. - Absence of financing mechanisms tailored to the needs of small and mid-sized farmers to promote investment in the WEFE Nexus.	- Development of a collaboration model between financing mechanisms (the Energy Transition Fund and the Tunisian Investment Fund) to optimize resource allocation and simplify administrative procedures, thereby facilitating the acquisition of the smart irrigation and photovoltaics systems.
Training and Support for Farmers	- Lack of training and technical support for farmers and technicians on the use of new WEFE Nexus technologies. - Resistance to change and limited access to information on the benefits of sustainable practices. - Fragmentation of agricultural lands, hindering the application of large-scale solutions.	- Development of training and support programs to strengthen the technical skills of farmers and actors concerned with the subject. - Initiatives to promote resource pooling and mutualize technological investments.
Regulatory Framework	- Inadequate regulatory framework for self-generated solar energy and smart irrigation systems. - Insufficient incentive policies for integrating renewable energies into agriculture, financing mechanisms, and guarantees for entrepreneurs.	- Gradual integration of the principles of the WEFE Nexus approach into public policies to ensure optimized resource management. - Creation of specific regulatory frameworks to facilitate the adoption of renewable energies in agriculture and ensure a conducive environment for sustainable investments. - The WEFE Nexus approach has already been integrated into the outline of the 2050 Water Vision and Strategy.

https://letsgo.com.tn/
https://letsgo.com.tn/fonds-de-garantie-de-defficacite-energetique-fgee/

Policy Recommendations:

To overcome the identified challenges, below are concrete and tailored recommendations, proposed during the multi-stakeholder consultation process, that will facilitate the adoption and scaling up of smart irrigation practices using the WEFE Nexus approach.

1- Institutional:
- ▸Adopt a national policy aligned with the WEFE Nexus approach.
- ▸Establishment of a formal WEFE Nexus monitoring committee to ensure the steering and effective implementation of the coordination and collaboration model, based on the outcomes of the core team's work.
- ▸Institutionalize a public-private dialogue through thematic sectoral committees (water, energy, agriculture, ecosystems).
- ▸Integrate the WEFE Nexus approach into the Water and Energy Strategy 2050, with measurable objectives and monitoring mechanisms.

2- Financial:
- ▸Create a National WEFE Nexus Fund, funded by public-private partnerships and contributions from international donors.
- ▸Establish subsidized loans and tax exemptions for the acquisition of smart irrigation systems and solar energy equipment.
- ▸Accelerate grant disbursement timelines through a digital single window that brings together various agencies (ANME and APIA), facilitating the submission and evaluation of requests.
- ▸Establish low-interest green loans, guaranteed by the state, for farmers to acquire of smart irrigation systems and solar energy equipment.

3- Technical and Socio-Economic:
- ▸Integrate WEFE Nexus modules into agricultural and technical training programmers, in partnership with Agency for Agricultural Vulgarization and Training (AVFA) and Universities.
- ▸Create a network of WEFE Nexus Pilot Farms to demonstrate the effectiveness of technologies and promote learning exchange among farmers.
- ▸Develop an online training platform featuring practical guides, educational videos in Arabic, a simplified manual of procedures to assist farmers in preparing their proposals for funding and testimonials from farmers who have successfully adopted these technologies.
- ▸Raise awareness among small farmers through targeted campaigns and technical support.

The ACCISI-GEM project is a practical demonstration of a holistic, multidimensional, innovative, community-based, gender-sensitive, and partnership-focused approach to sustainable coastal agricultural practices in the Gulf of Tunis, using a WEFE (Water-Energy-Food-Ecosystems) Nexus perspective.
The project has a dual objective:

- ▸Develop and expand smart irrigation practices: Smart irrigation systems were established in four farms in Ghar El Melh, Tunisia. These systems incorporate renewable energy sources and closely monitor groundwater and deep water levels to promote sustainable agricultural practices, ultimately contributing to improved ecosystem health.

- ▸Policy dialogue and scaling up: A Policy Dialogue was initiated to discuss the enabling environment and financial incentives necessary for upscaling an replicating the smart irrigation practices at the national level.

ACCISI-GEM is managed by the Global Water Partnership (GWP) and implemented by GWP-Mediterranean (GWP-Med) under the leadership of the General Directorate of Rural Engineering and Water Exploitation (DG-GREE) within the Tunisian Ministry of Agriculture, Hydraulic Resources and Fisheries, in partnership with the National Institute of Agronomy of Tunisia (INAT) and in collaboration with the Regional Commissary for Agricultural Development (CRDA) Bizerte. It is financially supported by the Maltese Office of the Deputy Prime Minister and Ministry for Foreign Affairs and Tourism, and the GEF UNEP/MAP MedProgramme – Child Project 2.2 'Mediterranean Coastal Areas: Water-Energy-Food-Ecosystems Nexus Management'.

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