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AWESOME

WATER-ECOSYSTEM-FOOD

Efficient solutions

Crop productivity

Training

This factsheet has been prepared to showcase the achievements related to **Key Performance Indicators** (KPIs) 2, 4, and 5.
KPI 2 focuses on the number of efficient solutions, while KPI 4 highlights the increase in crop productivity. Lastly, KPI 5 emphasizes the involvement of entrepreneurs and farmers in training programs. This report aims to demonstrate the impact of the tested solutions by providing evidence of the Water-Energy-Food-Ecosystems (WEFE) Nexus in practice.

KPI 2

Multi-sectoral solutions for improving connection and coordination between research and policy-making

KPI 4

Increase in crop productivity per unit of water compared to standard agriculture

KPI 5

Local entrepreneurs and farmers participating to training

WP4 - MESO LEVEL MODELS

Multi-objective design of **WEF planning portfolios**

KPI 2

Multi-sectoral solutions for improving connection and coordination between research and policy-making

We found more than **500 efficient solutions** for the **water supply** system both under historical and future scenarios. These solutions show that integrating groundwater, reuse, aquaponics and desalination can reduce the trade off between hydropower production and agricultural deficit.

For each of the water supply solutions is possible to find around **1000 efficient solutions** that show where and in which amount to use aquaponics and the other measures. These portfolios indicate that aquaponics has a smaller impact compared to the other three measures (groundwater, reuse and desalination) because we only considered the production of lettuce. Still, it can be a powerful resource for Egypt, given its high water efficiency.

We calculated costs and other metrics related to aquaponics for 4 efficient solutions. To learn more about it, please read our Deliverable D4.3.

WP5 - MICRO LEVEL MODELS

HYDROPONICS

The **Deep Water Culture** (DWC) emerged as the best-performing subsystem among the tested ones, showcasing remarkable efficiency in food productivity per unit of water. Its adept nutrient delivery system and precise environmental control mechanisms translated into consistently higher yields, affirming DWC's potential to be a cornerstone for water-efficient crop cultivation.

Analysis of crop outcome, saved water and energy consumption

AQUAPONICS

Though slightly trailing behind the top hydroponic contenders in terms of food productivity per unit of water, the **Sandponic** (SP) subsystem demonstrated its prowess in integrating fish and plant cultivation symbiotically. By capitalizing on fish waste as a nutrient source for plants and reciprocating water purification, the SP subsystem showcased a holistic and resource-efficient approach to sustainable food production.

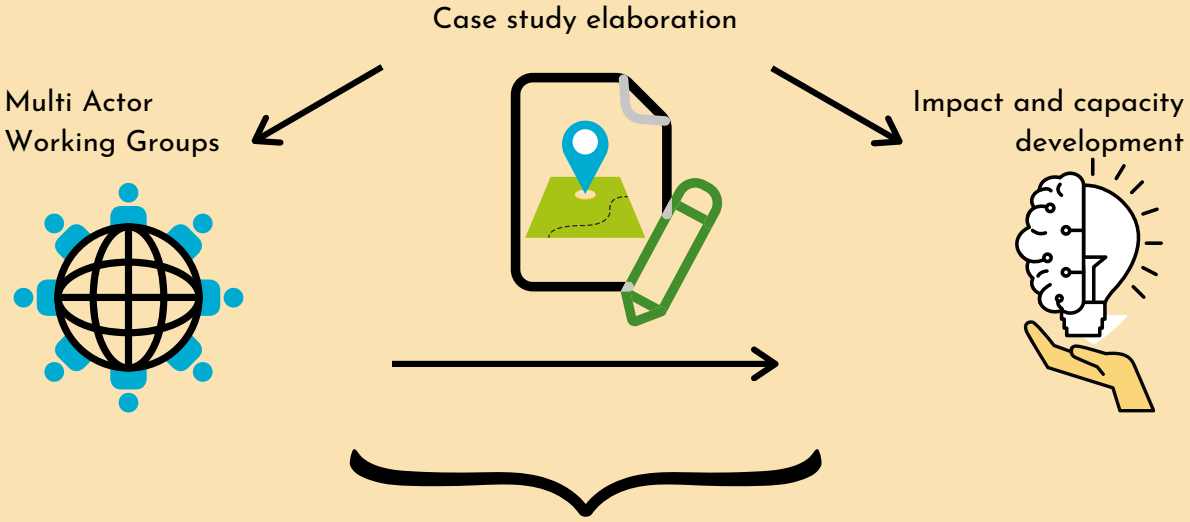
KPI 4

Increase in crop productivity per unit of water compared to standard agriculture

In the lettuce growth, hydroponic systems can **save** up to **8 times more water** compared to soil-based cultivation, and in the NFT system, during the winter season, water savings can be as much as 10-fold compared to traditional agriculture.
While in soil-based cultivation, on a 4 square meter area, 90 lettuce plants can be grown, hydroponic systems can accommodate the growth of **150 lettuce plants**. Furthermore, lettuce grown in soil may take anywhere from 45 to 90 days to mature, whereas in soilless farming, they can be harvested in just **28 days**.

In the aquaponic system, the required **water** per plant was **8.6 times lower** compared to soil-based lettuce cultivation.
Additionally, the potential for multiple cropping cycles in HP systems could significantly increase yields per unit of land area, optimizing land utilization. In aquaponic system, we obtained a **productivity per unit water of 30.90 kg/m3**, whereas this amount was calculated as 0.56 kg/m3 in soil-based cultivation.

WP6 - STAKEHOLDER ENGAGEMENT AND INTERACTION



Capacity building training was attended by **26 participants**.
The core topics covered were:

- hydroponic and aquaponic systems, and their fundamentals
- market opportunities, challenges of hydroponics and aquaponics
- global issues of agriculture, economic benefits and quality control
- soilless cultivation systems, integrated pest and disease management

KPI 5

Local entrepreneurs and farmers participating to training

A **Summer School**, made of 10 different teaching modules, was attended by around **30 people** (mostly from the MED region).

CONCLUSIVE REMARKS

This factsheet marks the end of the AWESOME project, and it highlights and quantifies some of the achievements obtained during the project's lifetime, through **three KPIs**, shortlisted as the most representative of the project results.

Overall, our findings provide a comprehensive foundation for the potential expansion of **hydroponic and aquaponic** technologies. Through rigorous **experimentation** and **economic analysis**, we have gained valuable insights into their feasibility, efficiency, and economic viability. These findings serve as a crucial resource for stakeholders and decision-makers in the **agricultural industry**, offering a sustainable path forward in modern agriculture.

We also captured the **skills** and identified the **capacity building** needs of the main beneficiaries of the soilless techniques developed. To obtain the maximum uptake by practitioners, we incorporated recommendations suggested as key directions for WEFE Nexus innovations uptake at the **case study level** from the scientists and stakeholders that took part in the Capacity Building Workshop.