Project Fact Sheet

Technische Hochschule Ingolstadt
Institute of new Energy Systems

Project Title	**Dig-e-Farm - Digitalisation of Tunisian farms through AI-based Agri-PV energy systems for optimal management of the water-energy nexus**
Keywords	Agri-PV, AI-controlled irrigation, water-energy nexus

Project Details

Project Start	2024	**Duration**	3 Years
Funding Authority	Bavarian State Chancellery	**Project ID**	C I 4-1162-106-254-1
Project Budget	641.811,- €		
Project Leader	Prof. Dr.-Ing. Wilfried Zörner		
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Description

Population growth in the Global South is increasing the pressure on agriculture to meet the rising demand for food and the associated energy and water requirements (energy-water nexus). In Tunisia, agricultural land accounts for around 65% of the country's total area and more than 15% of the labour force is employed in the agricultural sector. Tunisian agriculture therefore faces urgent technical and economic challenges, particularly with regard to the unstable energy supply and water scarcity.

The Dig-e-Farm project aims to develop an innovative approach based on artificial intelligence (AI) and using Agri-PV technology to digitise critical agricultural processes and help farmers optimise their water and energy consumption.

Dig-e-Farm implements a holistic approach based on three novel concepts that are being validated through on-site pilot tests:

1) AI-controlled, solar-powered irrigation based on soil moisture
2) Support of a weak power grid in normal operation and autonomous energy supply in the event of a power failure
3) AI-controlled digital dashboard (app) for monitoring and controlling irrigation and energy supply

As part of this holistic approach, an Agri-PV system ensures a reliable power supply that prioritises agricultural activities and controls irrigation. In the event of overproduction, the

surplus electricity is fed into the grid to further stabilise it.
The use of advanced AI technology should also reduce current water consumption by up to 40%. Based on soil moisture and precipitation measurements as well as weather forecasts, an algorithm calculates precise and efficient water use that is customised to the needs of the plants.
The information on irrigation and energy supply is linked via an app and supplemented by AI predictions of expected energy bottlenecks. As a result, farmers are optimally informed about the operation of the system and possible power outages and can react accordingly to ensure the continuity of key agricultural activities.
The planned pilot plant combines theory and practice to not only demonstrate the benefits of digitalised agricultural practices, but also to validate the performance of the system and gather valuable feedback from farmers on the ground.
Dig-e-Farm also aims to create sustainable added value beyond the project phase. Scientific exchange, capacity building and networking are therefore key elements of the project in order to tackle the challenges of the water-energy nexus in the long term.