Royal Academy of Engineering

Case studies

Improving Food Resilience Through Introducing and Disseminating Smart Agricultural Techniques

Faces of Frontiers 2023: Husam HajAli, Manager of Food Security & Biodiversity Studies in the Water, Environment and Climate Change Centre at the Royal Scientific Society (RSS), Jordan

Project title Improving Food Resilience Through Introducing and Disseminating Smart Agricultural Techniques

Focus on Jordan, water-scarce Middle East countries and the UK

Collaborators: The University of Sheffield, and Plymouth University

How the project addresses Sustainable Development Goals (SDGs)

- SDG 2 Zero Hunger: The system can be used to grow food in areas where traditional agriculture is difficult. It will improve productivity even in areas where food production is not possible in the present conditions with sustainable and environmentally friendly technology. This can help in reducing hunger and food insecurity.

- SDG 3 Good Health and Well-being: SDG 3 (Good Health and Well-being): The system can be used to grow a variety of fruits and vegetables, which can provide a healthy and diverse diet for people. Furthermore, controlling the environment, such as light, temperature, and nutrients, allows the plants to grow faster, stronger, and healthier.

- SDG 13 Climate Action: SDG 13 (Climate Action): The system is often used in indoor settings, which can help in reducing the environmental footprint of agriculture. It will also minimize the use of fertilizers and water, which will contribute in reducing the carbon footprint of agriculture.

Project start 24 February 2023 **Project end** 31 January 2024

Grant funding: £10,000.00

"Our priority in the face of water scarcity is developing Controlled Vertical Farming that saves 70-90% of irrigation water and is key to the survival of the region and beyond." **Husam HajAli**

Overview

Jordan is the second most water scarce country in the world and is semi-desert. 0.5% of the population have no reliable access to enough affordable, nutritious and healthy food. 13% are at risk of this. The country faces harsh climatic changes affecting water availability and agricultural production that are expected to worsen.

The most vulnerable groups are local communities, women, young farmers, and unemployed agriculture engineers. Improving agricultural water productivity to achieve more crop per drop is vital. Climate-smart agriculture systems raise productivity in an environmentally and socially sustainable way. They provide farmers with resilience as they adapt. Smart systems are used to cultivate tomatoes, potatoes, lemons and olives.

About Husam

Husam is an M.Sc. Environmental Engineer who has worked at the Royal Scientific Society (RSS) in Amman, Jordan as a water expert for 10 years. He is currently the manager of Food Security and Biodiversity studies in the Water & Environment and Climate Change Center working with 200 colleagues on hydroponics and smart agriculture.

Husam has over 20 years' experience in multiple environmental disciplines including Environmental Auditing & Monitoring, Compliance, EIAs' assessment, Environmental Permitting.

For 12 years he worked in the regulatory Environment Agency-Abu Dhabi as a Unit Head for the Environmental Assessment and Permitting. He managed the Environmental Assessment, Permitting and Compliance activities for mega projects including desalination plants, solid waste projects, Abu Dhabi Industrial City and reclamation of the Saadiyat, Reem, Mariyah, Naril, Hudayriat islands.

Husam and this team at RSS introduced hydroponic agriculture and vertical farming into the Azraq Syrian refugee camp in Jordan that contains some 37,000 refugees. They installed four hydroponic systems and trained diverse volunteers who are successfully growing crops of cucumbers, lettuces, and onions.

"The health situation has been improved rapidly in Jordan and worldwide. WHO has declared the end of COVID-19 as a public health emergency in May 2023. However, if unexpected circumstances occurred, protective and appropriate actions like effective online communication, and remote training & working will be implemented." **Husam HajAli**

Project highlights

Main objectives:

- Develop a regional online digital hub for hydroponic and controlled environment agriculture (CEA). It will be bilingual in Arabic and English connecting the farmers and communities with the experts through a trusted platform.
- Build capacity and raise awareness with local and regional stakeholders of smart agriculture technologies, hydroponic and CEA
- Enhance collaboration between the Royal Scientific Society (RSS) in Jordan and universities in the UK.

The team is developing an accessible online regional platform to introduce hydroponic systems, controlled environment agriculture (CEA) and vertical farming to young farmers and local communities. The hub will be launched at an in-person ceremony for local stakeholders with international guests attending virtually.

The team works with the Ministry of Agriculture, The Vocational Training Centre, the Jordan Valley River (NGO), local agricultural companies as part of making these technologies economically feasible for local communities.

They will provide concise digital training material on CEA and hydroponic uploaded to the platform and hold training sessions for fresh graduate engineers and scientists about CEA and hydroponic. There will be awareness sessions women and vulnerable groups in Jordan, highlighting the role of such technologies in improving their resilience to climate change and food shortage.

Lessons learnt

Husam was responsible for building the original regional digital platform for hydroponic and vertical farming supported through a Frontiers Champion grant awarded to his colleague Dr Almoayied Assayed, Director, Water, Environment and Climate Change Centre (WEC) at RSS in 2021.

Dr AlMoayied Assayed initiated the concept of the Vertical Farming and arranged a hybrid workshop on Vertical Farming. The workshop hosted experts from the UK, Kingdom of Saudi Arabia and Jordan. There is ongoing collaboration with the University of Plymouth and University of Sheffield on supply chain management of LED lighting that is essential for CEA and vertical farming practices.

Husam attended a Frontiers Symposium ‘From seeds to needs; in October 2021 that discussed engineering solutions that can mitigate the global biodiversity crisis, and how natural solutions can contribute in biodiversity restoration and climate change adaptation.

Ambitions

Husam's goal with this team is to enhance collaboration between the RSS in Jordan and universities in the UK. All project activities will be interlinked to achieve the impact of improving the food resilience for local people and vulnerable groups. Key to this is virtually disseminating knowledge about CEA and supporting local stakeholders to adopt it. The project enhancing North-South collaboration and ensures involving all stakeholders with multi- disciplinary approach.

"Through this project, the RSS can scale up vertical hydroponic farming within a CEA system to be a sustainable cultivation model helping attain United Nations Sustainable Development Goals." **Husam HajAli**