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# INTEGRATING AND DIGITISING RESOURCE EFFICIENT CLEANER PRODUCTION (RECP) IN FOOD INDUSTRIES: TOWARDS A CIRCULAR ECONOMY IN JORDAN

Lead partner: Dr Almoayied Assayed, Royal Scientific Society, Jordan

## THE PEOPLE

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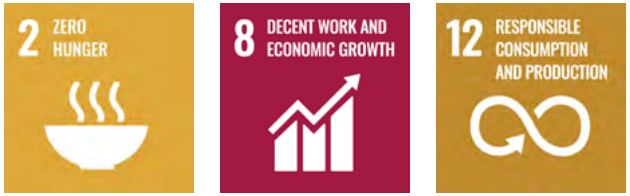
## THE CHALLENGE

The food industry in Jordan is facing huge challenges. Companies are struggling to remain competitive and produce food for affordable prices, due to high costs of energy, water and other resources. Given that Jordan's food industry accounts for half of the market in the country and is therefore contributing to food security and the economy, it is crucial to secure its long-term sustainability.

There are also significant environmental issues arising from current models of food production in Jordan. The dairy processing industry, in particular, results in high levels of energy and water consumption and generates large amounts of emissions and waste. In a country with an energy crisis and limited water resources, which are likely to be diminished further due to climate change, these environment impacts need to be addressed.

It is essential that the food industry is able to operate efficiently and effectively in order to reach the national goals set out in the Jordan National Vision Strategy 2025, which aims to increase renewable energy use, and National Green Growth Plan, which outlines plans to pursue economic growth in ways that ensure that Jordanian industries become economically and environmentally sustainable.

The digitisation of manufacturing and creation of "smart factories", a transition known as Industry 4.0, offers considerable potential for manufacturers in Jordan to improve their efficiency and sustainability.




## THE PROJECT

This TSP project focused on improving the sustainability of dairy production in Jordan. Dairy accounts for a significant portion of the Jordanian diet and the dairy production industry has grown rapidly since the 1980s. However, production techniques are inefficient. The yields produced by dairy cows are relatively low, resulting in a high feed-to-milk ratio, and cold chain logistics (i.e. refrigeration and transport) are under-developed.

The project team developed a pilot study, which focused on reducing water and energy consumption and CO2 emissions at industry partners in the dairy and chicken processing industries. This applied the principles of Resource Efficiency and Cleaner Production (RECP). Championed by the United Nations since the 1990s, RECP increases efficiency and reduces risks to humans and the environment through the continuous application of preventative environmental strategies to processes, products and services. This involved supporting the implementation of new technologies and processes, as well as training engineers and other staff working for the industry partner.

Before these innovations could be implemented, the research team had to conduct a detailed RECP assessment of the Jordanian industry partners' operations. This enabled the researchers to identify root causes of losses and pollution and then develop solutions specific to the context.

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As well as providing technical assistance, the researchers also delivered training on the new technologies and led awareness-raising sessions to educate stakeholders on RECP, Circular Economy and Industry 4.0. The project team also decided to focus on dairy producers that employed large numbers of women, so that they could enable them to develop their skills and expertise.

*"By implementing RECP measures at Al-Mazraa dairy industry and Al-Wady Food Industries, the project will stimulate the creation of new business opportunities and decent employment while reducing the environmental impact of production activities."*

Dr. Almoayied Assayed, Lead Partner

### IMPACTS

After the completion of two detailed **RECP assessments at two Jordanian food production companies**, the research team were able to implement measures to tackle the root causes of waste.

Consistent with Industry 4.0 approaches, the main technical solution introduced during the project was the use of **digital meters to monitor multiple elements of production processe**s. The system was then linked to blockchain. The use of blockchain enabled the researchers to assess production methods in more depth and helped the food companies to reduce energy and raw material consumption.

*"The primary achievement was the significant reduction in water, energy, and raw material consumption at our two industry partner companies. This was followed by the increased awareness of Industry 4.0 concepts and their potential impact on resource conservation in the industrial sector."*

Dr. Almoayied Assayed, Royal Scientific Society

The team also introduced new sensor technology systems to eight micro-food industries working in dairy production in Jordan who predominantly employed **women and/or disadvantaged people**. These employees benefited from **additional training on the use of digital meters and monitoring technology** through the project. By improving the competitiveness of the businesses, the project also **increased job security**.

The research team **shared knowledge of practical applications of Industry 4.0 and RECP concepts** through workshops with food industry stakeholders, government organisations and universities in Jordan. They also shared their ideas with the **Jordan Chamber of Industry**, who then incorporated the concept of RECP and industry 4.0 tools into a new Green Factory Award, which launched in December 2022.

**Dissemination of research outputs to academia** included two chapters in a two-volume book Industry 4.0 Technologies, which the research team co-edited. The chapter 'Industry 4.0 in Resource Efficient and Cleaner Production: A Case Study from the Food Sector in Jordan', discussed the findings of the TSP project in detail. Moreover, through the project **over 100 early-career researchers and students** took part in the training workshops and engaged with the research.

The project team were **grateful for the enhanced collaboration opportunities** between partners.

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## THE FUTURE

The researchers have continued to monitor the impacts in one of the industry partners, to understand the water and energy consumption savings.

Since the TSP project ended, the team have German Agency for International Cooperation (GIZ) to develop several policy instruments for reducing the environmental impact and improving the efficiency of manufacturing in Jordan.

The project team are still working towards the integration of RECP and Circular Economy concepts in curricula at Jordanian universities.

The project team's career development was enhanced by their participation in the TSP programme. Through the project, Dr Almoayied Assayed was offered a visiting professorship at the University of the West of England, which he has used to create opportunities for future collaborative projects. One of the early-career researchers on the team was selected for the Academy's Leaders in Innovation Fellowships programme, using the same digitalisation RECP concepts.

## SOURCES:

This impact case study was prepared using information from interviews with the project team, documents supplied by the Academy including reports, and additional online resources.

- Interview and written correspondence with Dr Almoayied Assayed
- TSP2021/1000398: Final report
- TSP2021/1000398: Progress report 1 (March to December 2021)
- TSP2021/1000398: Progress report 2 (January to June 2022)
- TSP2021/1000398: Application

This project was made possible by DSIT (formally BEIS) ODA funding under the Engineering X TSP programme, in partnership with the Industrial Research and Development Fund in Jordan.

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