MUSHNOMICS

UNLOCKING DATA-DRIVEN INNOVATION FOR IMPROVING PRODUCTIVITY AND DATA SHARING IN MUSHROOM VALUE CHAIN

MUSHNOMICS aims to demonstrate the feasibility of dynamic data-driven analytics for multidomain mushroom production environments in order to optimize yield, lower costs and improve the economic viability of this agrifood sector. The project will develop ICT technologies for use in the agrifood domain exclusively focusing on mushroom value chain, combining smart sensors, AI, Deep Learning and Big Data analytics. The multi-factor, multidiscipline MUSHNOMICS team will lead to the development of ICT platform in the mushroom value chain, which will be demonstrated at TRL7 for post-project exploitation by the SMEs. The project team constitutes has a wide geographical spread with partners from Ireland, Denmark, Romania and Hungary

BACKGROUND

Commercial edible mushroom cultivation is a 'big business' world-wide with a total production exceeding 27 million tons, a 25-fold increase during the last 35 years, which is combined with a high increase in the respective per capita consumption. Among them, several species of the genus Pleurotus are of particular interest because:
(a) their production amounts to ca. 30% of the total, corresponding to the fastest growing and most profitable section of the mushroom market during the last two decades;
(b) they are commonly grown on pasteurized wheat straw, however, they can also be cultivated on a wide variety of agro-industrial residues whose disposal is otherwise problematic.

The composition of mushroom substrates is anticipated to exert an effect on mushroom yield thus optimization of relevant bioprocesses to maximize yields is absolutely essential. This can be achieved by quantifying the effects of environmental factors such as temperature, humidity, oxygen, carbon dioxide and light throughout the mushroom production process from substrate preparation and mushroom cultivation right through to the consumer including valorisation. There are data available from commercial growers, however, is of variable duration, due to commercial considerations. To this end, data must be collected and analysed in a systematic manner over the production processes along the mushroom value chain in order to quantify the effects of different environmental schedules on mushroom yield.

MAIN PROJECT ACTIVITIES

The aim of the MUSHNOMICS project is to demonstrate the feasibility of dynamic data-driven analytics for multi-domain mushroom production environments in order to optimize yield, lower costs and improve the economic viability of this agri-food sector. The specific objectives are to:

- Develop best-performing artificial intelligence (AI)-driven algorithms for yield prediction of mushrooms in a prototype MUSHNOMICS module with IoT (Internet of Things) devices for real time production management and demonstration in our end-user (PILZE), Hungary by 2022.
- Develop an ICT (Information and Communications Technology) platform to exchange data and information from production to points of sale along the entire value chain of mushrooms by 2023.
- Co-develop innovative business models based on container retrofitted MUSHNOMICS Module for informed decision making by mushroom growers/entrepreneurs by 2024.

EXPECTED SOCIAL IMPACT

The MUSHNOMICS Module will be tailored to the needs of entrepreneurs, farmers and their cooperatives to better serve the local community and generate income through co-creation activities. It is about building new forms of cooperation and alliances between farmers and other rural actors, between municipalities, the private sector and civil society. MUSHNOMICS believes that its concept can be used as a model to ensure stability in the agri-food sector, provide food security, nutritious food and underpin the EU family farming model. The innovative business model of the MUSHNOMICS project will encourage potential entrepreneurs to adopt it, and ultimately contribute to jobs, growth and investments in the local economy. MUSHNOMICS will also enable consumers to pick up freshly harvested food from the MUSHNOMICS Module in cities where farmers can grow indoors year-round by controlling light, temperature, humidity and carbon dioxide. MUSHNOMICS will create a safe, protein rich food that can be produced with a low environmental footprint compared to animal protein. The diet of 30% of the world population is protein deficient, and recent analyses have proven that 200 g of mushrooms can replace 100 g of meat as a protein source. Mushrooms are also rich in fibre, minerals and vitamins, and have low crude fat content, with a high proportion of polyunsaturated fatty acids. These properties constitute mushrooms as "healthy" foods.

Keywords

- Smart sensors
- ICT platform
- Artificial intelligence
- Big data analytics
- IoT enabled mushroom production

Duration

01/02/2021 - 31/01/2024

TRL

Technology Readiness Level 7

Consortium

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