MUSHNOMICS – Unlocking data-driven innovation for improving productivity and data sharing in mushroom value chain (2021-24)

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

MUSHNOMICS leverages an innovative, bottom-up and co-creative approach to optimize mushroom production using the 'MUSHNOMICS Module', an IoT-based and environment-controlled modular container farm unit, with the aim to provide real-time data analysis and maximize resource use efficiency throughout the production process.

Methods

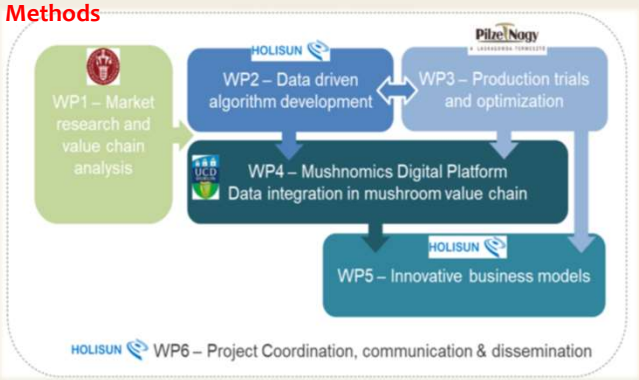

Figure 1. Work flow & linkages between the WPs in MUSHNOMICS project

Results

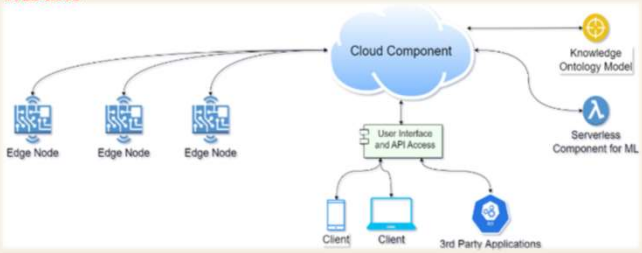

Fig 2: High Level Architecture for Distributed Learning

Figure 3: Work flow showing earthworm and BSFL composting process

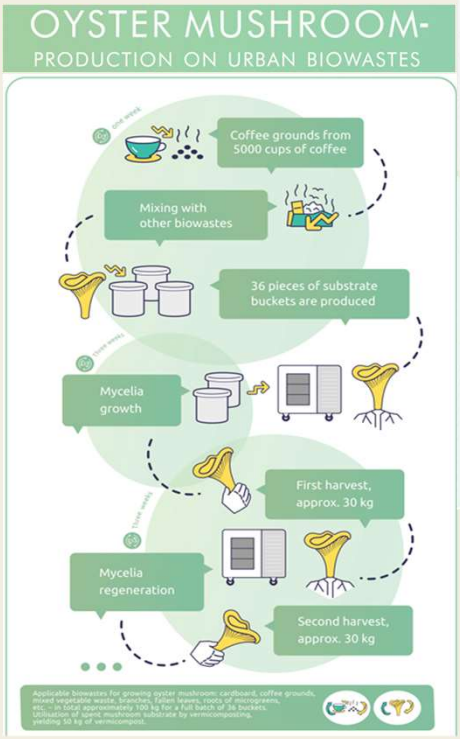

Figure 4: MUSHNOMICS work flow

Figure 5: Timelapse snapshot

Figure 6: MUSHNOMICS mushroom cabinet

Figure 7: Oyster mushroom in buckets

- ✓ Mushroom value chain analysis
- ✓ MUSHNOMICS algorithms development
- ✓ Mushroom production trials and spent mushroom substrate valorisation through vermicomposting and BSFL-composting
- ✓ MUSHNOMICS Digital Platform, implemented as a Digital Companion App, that integrates the research results from all WP's into an easy to use and intuitive application for beginners and small scale home growers
- ✓ MUSHNOMICS module system: tailor-made and modular technology offering a circular solution to turn urban biowastes into oyster mushroom substrate to grow oyster mushroom

Table 1: Key parameters of composting using earthworm and black soldier-fly

Indices	Formula	Unit	Vermi-composting	BSFL-composting
Waste Reduction Rate	WRR = (S-R)/S* 100	%	63.41	94.2
Waste Reduction Index	WRI = [(S–R)/S]/T* 100	g . day^{-1}	1.17	5.54
Conversion Ratio	CR = (W1-W2)/S* 100	%	14.98	2.97

S is the total quantity of substrate (grams); **R** is the residue left after bioconversion (grams); **T** is the bioconversion time (days); **W1** is the weight of BSFL/earthworm at the end (total wt. grams) and **W2** is the BSFL /earthworm weight at start (total wt. grams)

Conclusions

- ✓Demonstration of oyster mushroom production on urban biowastes such as coffee grounds and cardboard
- ✓Synthesis of data on mushroom waste in partner countries (Ireland, Hungary, Denmark and Romania) for waste valorization to achieve circular bioeconomy
- ✓Developed a modular and scalable smart MUSHNOMICS module system to realize circular oyster mushroom production in cities on biowaste
- ✓MUSHNOMICS digital platform

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