



## SmartFood: Engaging citizens in food diversity in cities

### D4.2. Working prototype of hydroponic cabinet and insect farm box (integrated version dedicated to ULLs)

Funded by



Republic  
of Poland



Operated by



Working together for a **green**, **competitive** and **inclusive** Europe

SmartFood has received funding from the Norway Grants 2014-2021 and the state budget of Poland via the National Centre for Research and Development within "Applied Research" Programme. The project benefits from a grant of €1,364,249.99 from Norway as well as a grant of €240,750.00 from the state budget of Poland. The total project value is €1,604,999.99. The aim of the project is to provide a novel evidence-based socio-technological framework of sustainable food production and consumption towards the sustainable smart city of the future.



Politechnika Krakowska  
im. Tadeusza Kościuszki



WESTERN NORWAY RESEARCH INSTITUTE  
VESTLANDSFORSKING



Norwegian  
Business School

<b>Grant agreement No.</b>	NOR/IdeaLab/SmartFood/0005/2020-00		
<b>Acronym</b>	SmartFood		
<b>Full title</b>	Engaging citizens in food diversity in cities		
<b>Funding scheme</b>	Norway Grants, The IdeaLab Call for Full Proposals, Cities for the future: services and solutions		
<b>Start date</b>	September 2021	<b>Duration</b>	34 Months
<b>Project website</b>	<a href="http://www.smartfood.city">www.smartfood.city</a>		
<b>Project Promotor</b>	Research and Innovation Centre Pro-Akademia (RIC)		
<b>Deliverable</b>	D4.2 Working prototype of hydroponic cabinet and insect farm box (integrated version dedicated to ULLs)		
<b>Work package</b>	WP4		
<b>Date of Delivery</b>	11/2023		
<b>Nature</b>	DEM: demonstrator, pilot, prototype, plan designs		
<b>Dissemination level</b>	CO – Restricted to members of the consortium		
<b>Lead partner</b>	RIC		
<b>Responsible author</b>	Łukasz Gontar (RIC)		
<b>Contributors</b>	Rafał Majzer (RIC) Andżelika Drutowska (RIC) Iwona Adamkiewicz (RIC) Maksymilian Kocharński (RIC) Katarzyna Korczak (RIC)		
<b>Reviewer(s)</b>	Dr. Tuan-Vu Cao Dr. Mari Hanssen Korsbrekke		
<b>Keywords</b>	Hydroponic cabin, urban agriculture, prototype, NFT, insect farming, edible insects		

## Executive Summary

This deliverable presents the development and testing of integrated prototypes for a hydroponic cabinet and an insect farm box. These prototypes are designed for use in SmartFood Urban Living Labs (ULLs) as part of a broader effort to create sustainable food production systems in urban settings. The prototypes represent an advancement from initial lab-scale versions, incorporating feedback from end-users and addressing practical considerations for deployment in real-life conditions.

The developed hydroponic cabins consist of three modules—technical, cultivation, and electrical—allowing for easy maintenance and scalability. Designed to fit within the limited space of urban building corridors, the cabinet's dimensions and removable components facilitate user interaction and maintenance. Equipped with sensors and automated controls for pH, electrical conductivity (EC), temperature, and humidity, the system ensures optimal growing conditions. Notifications about system errors and water levels are sent via an app. The cabin uses energy-efficient LED lighting and includes systems to monitor water and electricity consumption, contributing to its overall sustainability. The device also features multiple flood sensors to detect and respond to leaks, minimizing risks of water damage. Initial tests of Cabins revealed that initial humidity levels were problematic, which was mitigated by introducing larger, fast-growing plants to boost humidity through transpiration. Minor issues with leaks in the hydroponic gutters led to design adjustments and the inclusion of additional leakage sensors.

The developed insect farm box was initially intended to be integrated within the hydroponic cabinet. It was redesigned for standalone use based on user interest and space limitations. The box includes adjustable drawers for separating insects at different growth stages and transparent walls for easy monitoring. Made from materials that are easy to clean and dishwasher-safe, the box ensures hygienic insect farming practices. It features a base to catch any spillage from the drawers, preventing contamination of the surrounding area.

Both prototypes are ready for deployment in ULLs, where they will undergo real-life testing by urban residents. These tests will provide valuable insights into their functionality, user experience, and overall impact on promoting sustainable urban agriculture. The data collected will inform further refinements, ensuring the systems are effective, user-friendly, and environmentally sustainable.

The integrated prototypes for hydroponic cabinets and insect farm boxes represent a significant step towards sustainable urban food production. The forthcoming ULL tests will be crucial in refining these solutions and advancing the SmartFood project's mission to engage citizens in sustainable food practices in urban settings.