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BioGrow: Modular Bio-Integrated Indoor Farming System

Submitted by: FarmXic UK Ltd.

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1. Project Title

BioGrow: Modular Bio-Integrated Indoor Farming System for Low-Carbon, High-Efficiency Controlled Environment Agriculture (CEA)

2. Background & Rationale

Agriculture faces increasing pressure from climate change, high input costs, land scarcity, and the need for low-carbon, scalable food production systems. Current Controlled Environment Agriculture (CEA) solutions remain expensive, energy-intensive, and inaccessible to smallholder farmers and urban communities.

BioGrow is a next-generation modular indoor farming system designed to solve these gaps by integrating bio-inputs, AI-driven optimisation, and energy-efficient hydroponic/aeroponic technology. The system aims to provide consistent, climate-resilient crop production, reduce input waste, and lower operational costs for farmers in Africa and globally.

BioGrow aligns strongly with Horizon Europe Cluster 6 priorities—particularly topics addressing sustainable food systems, biodiversity protection, circular bio-based solutions, and low-carbon agriculture.

Grow More,
Grow Smarter

3. Project Objectives

The BioGrow initiative aims to deliver:

Primary Objectives

1. Develop an energy-efficient modular indoor farming system that integrates renewable-powered hydroponics/aeroponics for leafy greens and high-value crops.
2. Integrate bio-fertilisers and biological pest suppression into the system to reduce chemical inputs by 90%.
3. Deploy an AI-driven sensing and optimisation engine for irrigation, nutrient dosing, yield prediction, and climate control.
4. Pilot and validate the system in both urban and peri-urban locations across Africa and the EU.

Secondary Objectives

- Reduce water use by 80% compared to soil farming.
- Reduce GHG emissions and energy consumption through high-efficiency LED lighting and optimised workflows.
- Build a scalable model for replicating the units for SMEs, youth cooperatives, and local food enterprises.

4. Project Description

4.1 System Components

The BioGrow system consists of:

- Modular Growth Towers (hydroponic/aeroponic configurations)
- Smart IoT Sensor Kit (EC, pH, humidity, nutrient, CO_2, camera vision)
- AI & Data Platform (cloud dashboard + on-device analytics)
- Bio-Integrated Inputs (microbial inoculants, compost tea extract capsules)

- Low-Energy Lighting and Pumps (renewable-compatible)

5. Technology & Innovation

Technical Innovations

- Bio-integration layer adds microbial and organic nutrient delivery into a clean, food-safety-compliant system.
- AI models trained on environmental + crop data deliver real-time optimisation and predictive alerts.
- Plug-and-grow user interface enabling non-experts to operate the system.
- Scalable modular design enabling home units, SME units, and commercial clusters.

TRL Level

Current TRL: 4–5

Target TRL by project completion: 7–8

6. Expected Outcomes

- A validated prototype of BioGrow suitable for commercial deployment.
- Demonstrated 30–50% improvement in yield versus baseline hydroponics.
- Increased adoption of sustainable, circular bio-based practices in indoor farming.
- Strengthened EU–Africa collaboration on climate-resilient food production.

7. Target Beneficiaries

- Urban and peri-urban smallholder farmers
- Youth agripreneurs
- SMEs in fresh produce value chains

- Restaurants, hotels, and institutional buyers
- Research institutes and CEA innovation hubs

8. Role of FarmXic in Consortium

FarmXic will contribute:

- CEA system design and hardware development
- Bio-integration engineering (nutrients + biologicals)
- Deployment and testing in African pilot sites
- User experience insights from existing hydroponic kit deployments
- Technical documentation, training, and replication strategy

FarmXic is suitable for roles as Partner or Co-Coordinator depending on consortium needs.

9. Required Partners

We seek partners with expertise in:

- LED lighting innovation
- Biologicals & microbial optimisation
- Data science & AI for agriculture
- Renewable energy integration
- Urban farming testbeds (EU cities)
- Circular bio-based solutions
- Dissemination & policy impact

10. Budget Range & Timeline

- Estimated budget: €2.5M – €4M (depending on consortium structure)
- Duration: 30–36 months

11. Alignment with EU Priorities

This project directly aligns with:

- Horizon Europe Cluster 6 – Food, Bioeconomy, Natural Resources, Agriculture & Environment
- Net-Zero and low-carbon agricultural systems
- Circular bio-based solutions
- Sustainable food systems and resilient supply chains