GOhydro – A smart-sensing AI-driven platform for scalable, low-cost hydroponic units

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grand agreement no 862665 ICT-AGRI-FOOD.

Goal and context

- One of the biggest challenges of humanity in the 21st century is to devise sustainable solutions to produce more food while minimizing environmental impact.
- Hydroponics has emerged as one such solution, as it requires no arable land, reduces the usage of clean water and can be used in any urban setting
- GOhydro aims at developing a **cost-efficient** smart-sensing **ICT platform capable of monitoring** the crops' health and nutrient content of hydroponically cultivated microgreens in order to optimize the cultivation process and allow the harvest of the best possible products in **any hydroponic installation**

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Main project activities and challenges

- Review and analysis of the factors that affect microgreens growth and nutrient quality
- Appropriate selection of sensing devices to be included in the GOhydro platform as a multi-modal sensor kit
- Development of an artificial intelligence (AI) component implementing a multi-model approach that will be able to produce accurate predictions and recommendations with limited amounts of data.
- Evaluation cycles (in Greece, Denmark and Romania) of incremental proximity to the realistic usage of the platform, i.e., as a stand-alone hydroponic unit installable in everyday settings (offices, houses) and requiring no expertise to be managed and configured.

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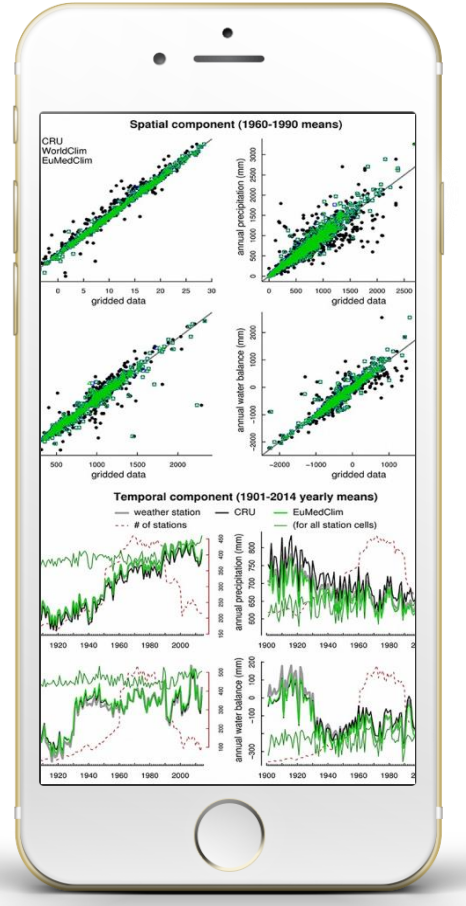
Objective and Hypothesis

"Optimal microgreens growth and cultivation can be achieved even in low-cost, ubiquitous hydroponic installations"

Objectives:

- Obj 1: Concretize best practices for microgreens growth (basil, basil, parsley, coriander and mint)
- Obj 2: Model best practices in correlation with easily attainable and installable sensing equipment
- Obj 3: Automate microgreens monitoring and streamline decision support for growers



The GOhydro Digital Companion

An easy-to-use e-agronomist, which can assist any grower to fine-tune and optimize their hydroponic production every step along the way

The GOhydro Sensors

- Temperature
- Humidity
- UAV / Solar radiation
- Electroconductivity

The GOhydro Multi-Modal Kits

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Main GOhydro Impacts

- **Economic impact**
  - Enhanced productivity per unit area
  - Reduced transportation cost and carbon footprint of microgreen production
  - Production of fresh microgreens round the year for consumption and sale
- **Societal impact**
  - Adding value to the living spaces and working environments with plants for healthy eating habits
  - Profitable and aesthetically pleasing exploitation of vacant spaces and abandoned buildings in the city
  - Used as a demonstrator farm in schools and kindergartens promoting sustainable solutions for the new generations
- **Environmental impact**
  - Reduced soil erosion and land degradation, freeing up land for vegetation regrowth and reforestation to reverse climate change
  - Reduction of water usage through recycling of the same water
  - Zero release of fertilizers and pesticides into the environments

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Research approach & activities

- Multiple evaluation cycles of incremental proximity to the realistic usage of the platform
- First experimentation cycle will be carried out in two locations (Denmark and Greece) and will be executed in fully controlled, experimental environments
- The climate recipes that are proven most promising will subsequently be tested in realistic hydroponic installations but under controllable environmental conditions
- The most effective configuration will be applied in hydroponic units installed in living spaces, without automatic interventions on the growth conditions of the plant
- Multi-model AI components will operate over the collected data towards associating measures from the installed sensors with the yield and nutrient quality of the growing microgreens

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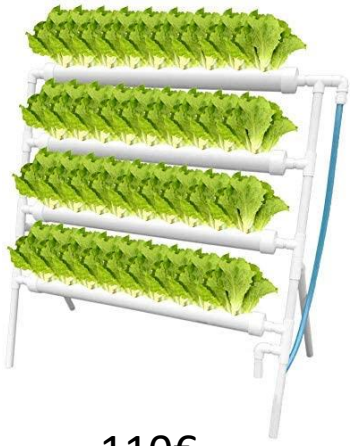
Cooperation with Stakeholders / value chain

Our goal is to directly (consumers) and indirectly (via unit providers and agronomists) enable everyone who wants to be a grower by supporting low-cost, low-maintenance hydroponic units



110€

81€

185€

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Dissemination and outreach

- Project online presence (web-site, social media)
- Production of (a) scientific and (b) general interest content will be produced
  a) Scientific publications, posters, and articles mainly addressed to scientific experts and professionals
  b) leaflets, brochures, fact sheets and multimedia assets, to be distributed either online or physically
- Outcomes will be presented to:
  - academic and non-academic audiences, including conferences and relevant workshops
  - industrial, international large expositions and trade fairs
- Each partner will set up one demonstration unit to spread the message and create awareness on production of nutritious and health promoting microgreens to non-scientific audiences
- Articles, talks, presentations and demonstrations to be used in mainstream channels like newspapers, magazines, radio and TV

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Partners and funders

Partners

1. SCiO, Greece
2. Institute of Nanoscience and Nanotechnology, National Centre for Scientific Research “Demokritos”, Greece
3. Department of Plant and Environmental Sciences, University of Copenhagen, Denmark
4. Nr21 Design, Germany
5. Holisun SRL, Romania
6. Department of Technical and Soil Sciences, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania

Funders

1. General Secretariat for Research and Innovation, Greece
2. Ministry of Environment and Food, Danish AgriFish Agency, Denmark
3. The Federal Office of Agriculture and Food (BLE), Germany
4. Executive Agency for Higher Education, Research, Development and Innovation Funding (Romania)

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Thank you for your attention!