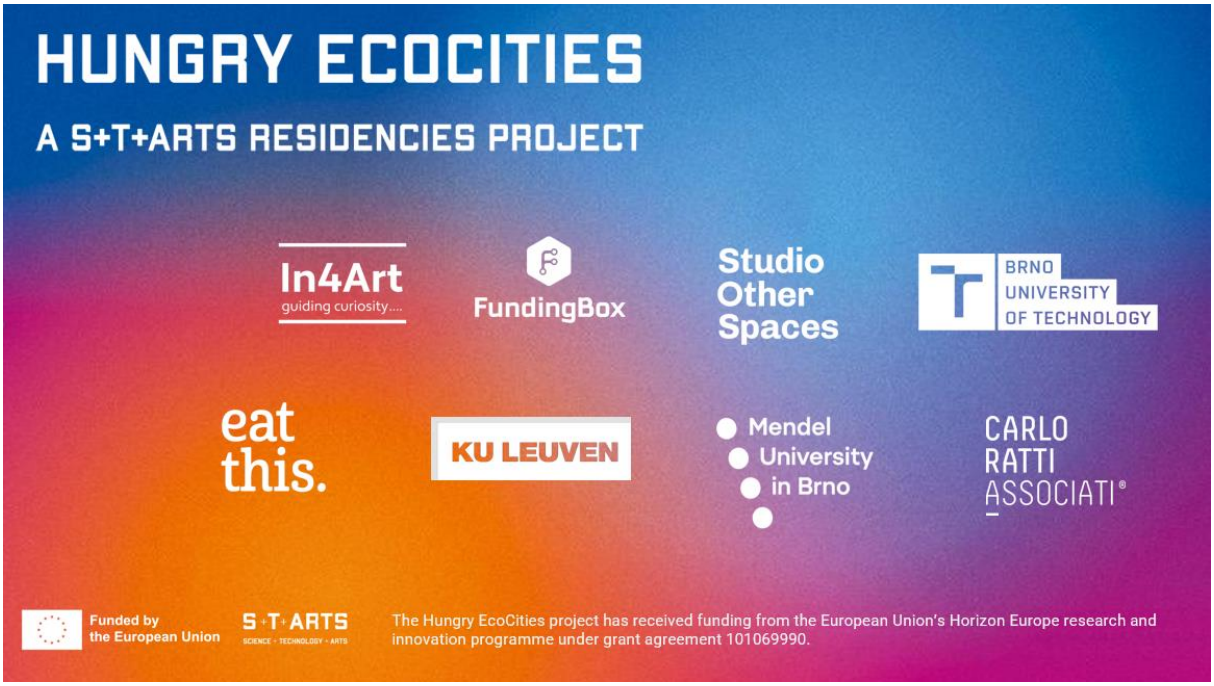

Deliverable 5.11 Experiments scale-up impact plan 1

Version 1.0

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Reviewers: Anca Marin (FundingBox), Monika Loeve (CRA)

Objective of the deliverable

This deliverable provides the detailed impact plans in the form of initial business development plans for the Humanizing Technology Experiments.

History of changes

Date	Version	Author	Comment
13.06.24	0.1	Klara Kaluzikova	Setup of deliverable
24.06.24	0.2	In4Art	First draft
15.08.24	0.3	In4Art	Full draft
28.08.24	0.4	Anca Marin	Review
30.08.24	0.5	Monika Loeve	Review
30.08.24	1.0	Rodolfo Groenewoud van Vliet	Final version

Table of Content

Abstract

By applying the PESETABS model to identify and assess art-driven innovation outcomes, the Humanizing Technology Experiments (9 in total), which have been conducted in 2023-2024, have resulted in 15 outcomes. These outcomes are stand-alone parts of the individual experiments. Each of these outcomes have delivered to the objective of experimenting with the intent to produce prototypes for innovations.

From the 9 Humanizing Technology Experiments, high potential impact outcomes have been produced in 8 of them. This is considered a good result by the consortium, confirming that most of the experiments have been successful in their execution. In this deliverable, we will focus on these projects to develop their business development plans.

We have high potential impact outcomes in 5 PESETABS categories: Social (1), Technological developments (1), Artistic directions (7), Business (4), Scientific knowledge (2). This results in the potential for 5 product innovations, 3 process innovations, and 7 artistic innovations.

This deliverable focuses on the (technological) achievements reached, the target benefits and the value proposition for each of the identified outcomes. It also sheds light on the ideas we have formed to enhance dissemination and foster spill-over effects for these results, in an effort to attract potential and future adopters.

PESETABS diffusion model

In Hungry EcoCities, we aim to translate artistic experimentation into responsible innovation with lasting impact for food system transitions. To do so, we make use of the art-driven innovation methodology and the PESETABs diffusion model. To understand the way of analysing and developing our business development plan for the Humanizing Technology Experiments (HTEs), we first provide some background.

Art-driven innovation (ADI) is a methodology developed by In4Art in 2019 to understand how artistic experimentation can create value, strategize for the diffusion of knowledge, ideas, and propositions, and find and pursue surprising, creative ideas. The methodology is based on the notion that art-driven experiments are a rich source for responsible innovations, especially when dealing with high uncertainty. It focuses on long-term visions and sustainable transitions.

Art-driven experimentation is characterized by its open-ended nature, exploring possible futures. It differs from scientific and business experimentation by focusing on the future rather than the past or present. The aim is to incorporate long-term visions into present-day strategic decision-making.

To analyse and create value from art-driven experiments, In4Art created the PESETABS diffusion model[1]. PESETABS is an acronym that explores eight directions for spillover potential: Policy (implications for laws and policies), Ecology (lowering emissions or increasing biodiversity), Society (empowering people or contributing to social wellbeing), Economy (enriching non-neoclassical economic thinking), Technology (new, responsible uses of technologies), Art (translation into a presentable, artistic outcome), Business (new products, services, or business models), and Science (scientific discoveries or new routes to conduct science).

The PESETABS method consists of three stages. First, it analyses the underlying focus of the art-driven experimental project, identifying the domain and theme. Second, it evaluates individual experiments within the project and lists outcomes. Finally, it conducts the PESETABS analysis to create value propositions in the eight directions.

The model also emphasizes the importance of identifying partners and stakeholders for each direction to activate spillovers and create impact. These partners are categorized into three layers: the core co-producing partners (owners), collaborators with direct involvement in diffusion (champions), and contributors who provide facilitation and support (sponsors).

By following this methodology, it provides a structured approach to harness the creative potential of art-driven experiments and diffuse their value in multiple domains, fostering sustainable and forward-thinking solutions to complex challenges.

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[1] Link to white paper on the model:
Developing Art-driven innovation spill-overs with PESETABS | In4Art

Related to innovation, we follow the following definition.

"The term 'innovation' can signify both an activity and the outcome of the activity. An innovation is a new or improved product or process (or a combination thereof) that differs significantly from the previous products or processes that have been made available to potential users (products) or brought into use (processes)."

Oslo Manual Definition of Innovation

From the 9 Humanizing Technology Experiments, high potential impact outcomes have been produced in 8 of them. Through the described methodology, we have identified 15 art-driven innovation outcomes. The below table gives an overview, in which the outcomes are linked to their respective HTE. Following the Oslo Manual definition, we have made a separation in the analysis by categorizing product and process innovations. For the artistic outcomes, we used a distinction in concept and experience.

	Project name (HTE)	**Art-driven Innovation outcome**	**PESETABS Outcome type**	**Innovation type**
1	Future Protein	Remote Sensing Predictive Model	Technological	Product
2		Food Sharing Event	Artistic	Experience
3	MVPxFFF	Food Forest Flavours Computer	Business	Product
4		Mock Wild Picnic	Artistic	Experience
5	Ecoshroom	Rhizome Sensor Box	Scientific	Process
6		Living Technologies	Artistic	Concept
7	Council of Foods	Policymaker Learning Platform	Business	Product
8		Food inclusive debating	Artistic	Experience
9	WTFood	Food System Glitches App	Business	Product
10		Food System Glitches	Artistic	Experience
11	Vegetable Vendetta	Vegetable Food Marketing Model	Business	Product
12		AI as Robin Hood	Artistic	Experience
13	Acoustic Agriculture	Transducer Growth Box	Scientific	Process
14		Plant based AI model training	Artistic	Concept
15	Symposio	Dedicated Eating Space Lighting	Social	Process

Table 1: List of high potential outcomes of the Humanizing Technology Experiments

Product Innovations

The ambition of Hungry EcoCities with the Humanizing Technology Experiments was to conceive, design, develop and deliver art-driven innovation experiments up to the level of early-stage prototypes for innovation (TRL4). The aim of innovation in this context was to explore current challenges and problems within the food system and address them through artistic exploration and art-science-technology collaborative efforts.

We have produced 5 such results which we consider prototype product innovations for food system transition. In this section, we will introduce the 5, share relevant links and present the current plans for dissemination and future development (the scale-up impact plans). Please note that this is an ongoing process and that our plans for scaling-up will evolve over time.

Project name (HTE)	**Art-driven Innovation outcome**	**PESETABS Outcome type**	**Innovation type**
Future Protein	Remote Sensing Predictive Model	Technological	Product
MVPxFFF	Food Forest Flavours Computer	Business	Product
Council of Foods	Policymaker Learning Platform	Business	Product
WTFood	Food System Glitches App	Business	Product
Vegetable Vendetta	Vegetable Food Marketing Model	Business	Product

Table 2: overview of product innovations

Future Protein: Remote Sensing Predictive Model

Future Protein is a **prototype location scouting and assessment tool for sustainable food production**, starting with mussels. A micro simulation tool for true food production value.

Why is this needed:
Mussels are considered a nutritious seafood choice, offering a range of important nutrients. They are an excellent source of high-quality proteins, omega-3, vitamins (A, B, C), minerals (iron, selenium, zinc). They are low in calories, fat, carbohydrates. They are low in cost (so a food for many) and a responsible choice of protein because of the sustainable farming practices. In the food transition, it is clear that mussels must become a (much) larger part of our future diet. However, the production of mussels in Europe is declining, even though the EU considers it an important food source for the future. This is mostly due to the economic unsustainability (price of mussels does not weigh up against the investment to produce). This is a mistake, since the value of mussels goes far beyond being a food source for humans. Yet, the benefits to nature are not priced into the equation. Future Protein aims to change this.

How it is related:
To calculate the true value of mussels for humans and nature, multiple factors need to be considered, including positive ecological benefits (nitrogen storage), the food value for humans (sustainable protein source), the water filtration capacity, the biodiversity support (a food source for other species), the sustainability factor (reproduction rate and conservation status), the biomaterial production (calcium carbonate shells) as well as the negative factors including harvesting costs and impacts and potential negative side effects (e.g. invasive species introduction).

Through a formula taking into account all these factors, an assessment of the true value of mussel farming can be made. In combination with a remote sensing-based predictive model, this forms a prototype product that could predict where to produce what type of mussels basing it on its total produced value (all positive and negative effects). Although not tested yet, this is not only relevant for mussels. The tool could be extended to land surfaces as well, allowing predictions of what to produce where intelligently both on the land and in the water.

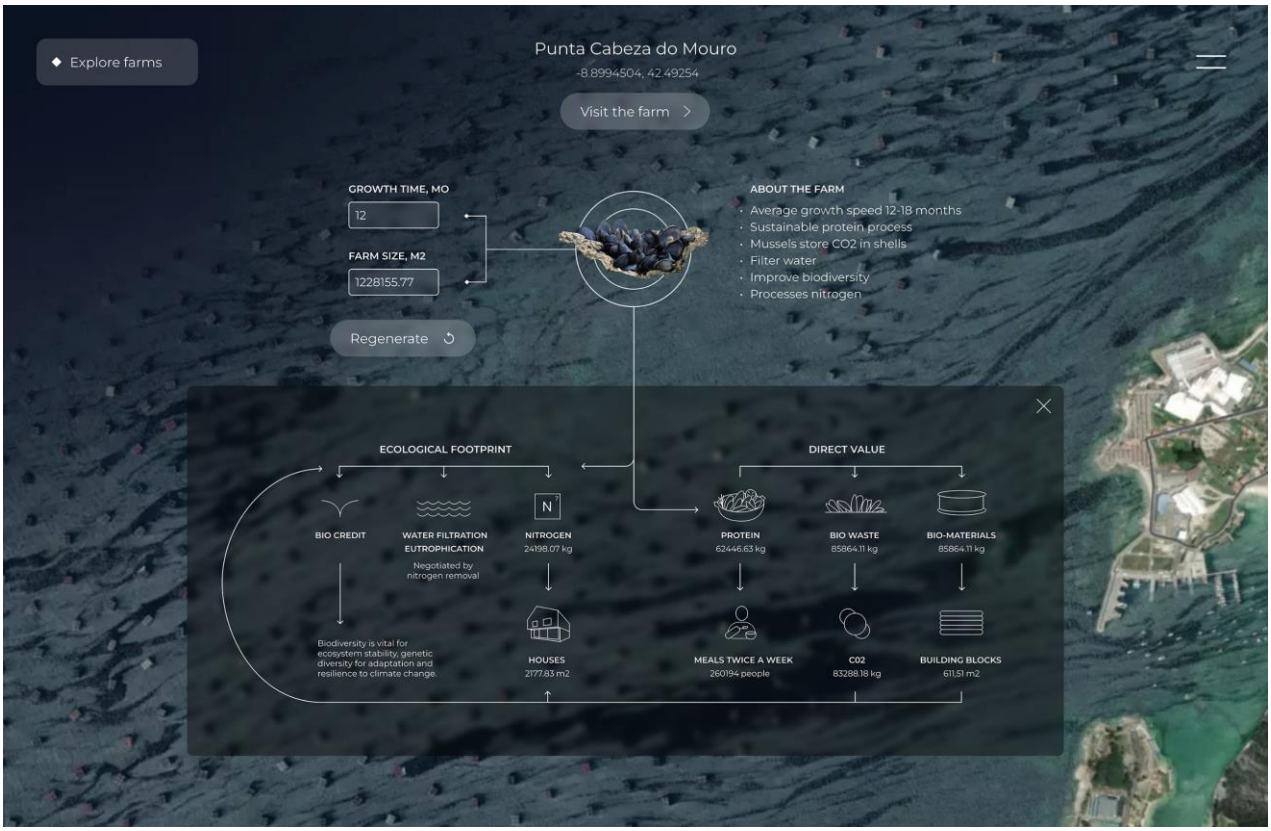
What does it do:
The current version, an early prototype, can estimate the total producible weight of mussels in kilograms for any water location in the world through a ‘generate mussel farm’ functionality. This is a rough estimate, as the model does not take into account many factors relevant for a reliable assessment. It gives a rough estimate for the amount of protein bred, the amount of nitrogen captured and the amount of biomaterial produced when generating a new farm, anywhere in the world.

Link to prototype card on the HEClab
Prototype Detail (heclab.eu)

Development plan:
To develop this prototype product innovation further, we have identified the following actions:

1. Improving the quality of the assessment through model/formula improvements. This will give a reliable predictive model that could calculate better and worse locations for aquaculture and their positive, as well as negative effects on their environments. For this, additional development budget is required and sought.
    a. A first attempt we have done is the application for a follow up EU funding from the FOODITY program. We are currently awaiting the outcome of this application.
    b. Other opportunities are being scouted.

2. Expand the model to the land surface. In first instance, we intend to explore if the same logic can be copied to make land-based predictions. This exploration will be done on the basis of one of the SMEs in the Path to Progress Experiments.



Minimal Viable Protein x Food Forest Flavours Computer

The MVPxFFF Food Computer is a **prototype recipe generation tool based on the expected harvest data of food forests and alternative protein producers**, generating ecologically-minded and nutritionally-complete recipes based on what is available in combination with user preferences.

Why is this needed:
Focusing on the benefits of food forests for sustainable agriculture, food forests contribute significantly to sustainable food production in several ways: (1) by mimicking natural ecosystems in multiple layers of plants, the diversity enhances ecological resilience and supports biodiversity. (2) minimal soil disturbance promotes soil health and enhances microbial activity. (3) plants capture and store carbon in their biomass and the soil, contributing to climate change mitigation. While food forests may not replace large-scale agriculture entirely, they offer a sustainable and productive model for local food production, particularly in urban and suburban areas. Expectations are that it can deliver 5% of global food production by 2035 and up to 20% of fresh produce in regions actively stimulating agroforestry.

How it is related:
We have identified three trends: (1) community food forests in urban areas and the integration of food forest principles in urban planning is ongoing. (2) small-scale farmers adopting food forest principles to become more diverse and resilient farmers. (3) large-scale agroforestry systems can significantly contribute to regional fresh produce.

The Food Forest Flavours Computer can support all three trends, but mostly small-scale farmers who are considering adopting food forest principles on (parts) of their farms. This by offering a tool, the recipe generator, that allows consumers to select and purchase food forest produce, in combination with alternative proteins (MVP producers, including insect farms, nut farms and algae farms), to consume good food. With enough small-scale farmers and MVP producers on the tool, it could offer year-round fresh produce to consumers.

What does it do:
The current version is based on static data from a small number of test forests and has a partially developed user interface. The back end has been developed, meaning that the foundation to expand the offering is there. Currently, the interface is not ready for use and a next step in the model is needed to have real-time data, incorporating seasonal and climate influences and predictions.

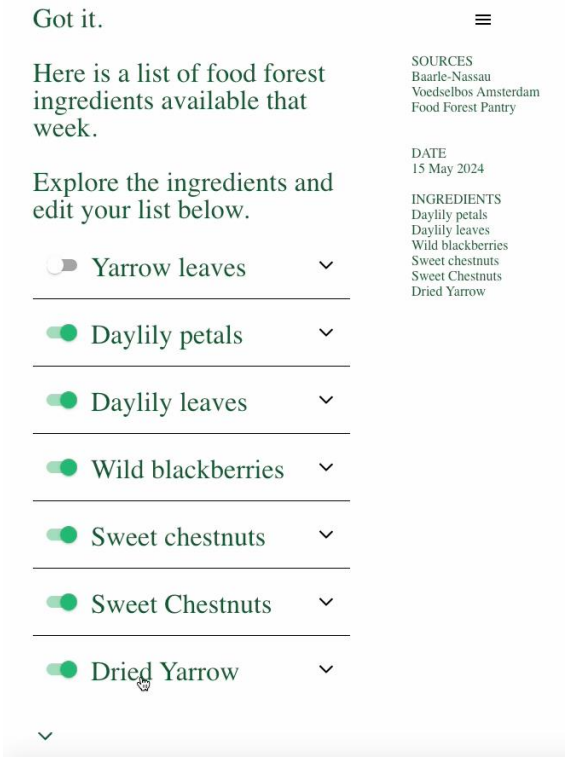
Link to prototype card on the HEClab
Prototype Detail (heclab.eu)

Development plan:
To develop this prototype product innovation further, we have identified these actions:

1. Developing the back-end model to include real-time data on food forest production and seasonal/climate influences. For this, additional development budget is required and sought.

2. Developing the front-end model to have a friendly user interface. For this, we will explore what the SMEs in the Path to Progress Experiments find useful for them to make the decision to adopt food forest principles or as MVP producers.

3. Using the MVPxFFF food computer as a case study for guided prompting research at KU Leuven.



Council of Foods: Policymaker Learning Platform

The Council of Foods is an **interactive website built to create a space to discuss the food system with food representing AI avatars**.

Why is this needed:
Knowledge gaps are a significant barrier in addressing food system challenges. Amongst other people active in the field, policymakers sometimes lack comprehensive understanding of food system complexities, leading to ineffective or counterproductive policies. Therefore, policymaker education is a crucial aspect of addressing food system challenges. Addressing this gap often involves briefings, workshops, field visits or stakeholder dialogues. Even though all of this is important, continuous learning tailored for policymakers on food system topics is often overlooked, yet important for keeping decision-makers informed and up-to-date. Currently, such an environment does not seem to exist. Existing platforms tend to be either broader in scope (covering general environmental or agricultural issues) or more specialized (focusing on specific aspects like nutrition or food safety). A dedicated, comprehensive platform for policymakers that covers aspects of food systems could be of aid. Creating a more comprehensive, policymaker-focused platform could significantly enhance the ability of decision-makers to address complex food system challenges effectively.

How is it related:
The prototype Council of Foods demonstrates technological readiness for personalized learning experiences through AI and machine learning, with council members (in this case prompted foods) potentially acting as tutors, as discussion partners, as criticizers or as best practice experts in dialogue with individual policy makers or groups of policy makers. With the feature of notetaking and reporting already built in, the knowledge produced and shared during the sessions can easily be shared, stored or referred to in draft texts, mails or otherwise by the policy maker using the platform.

What does it do:
The current version is well developed, including a variety of council members (10) and curated food system topics (5). However, the system is configured such that council members can be added or changed at any time, and the topics can be chosen on the spot. It is also already built in that humans interact with the council during council meetings or sessions. Preparing modules with council member speeches or preparing sessions / workgroups on specific topics and with specific goals for the policy maker can easily be done. The system is ready for this.

Link to prototype card on the HEClab:
Prototype Detail (heclab.eu)

Development plan:
To develop this prototype product innovation further, we have identified these actions:

1. Developing a pilot program focusing on a specific set of issues to test the platform as a policymaker learning platform.
   a. First presentation for the Sustainable Food Systems Network has been conducted to share the tool and seek for interested testers.

2. Expand the knowledge base of the Council of Foods (the foods) through cooperation with the SMEs in the Path to Progress Experiments.

3. Test the current version of the council in different alternative settings: ZOOP meeting Nieuwe Instituut (through HEC partner EatThis), as a form of informative entertainment (because the current version is designed to be funny yet meaningful).

4. Using the Council of Foods as a case study for LLM memory issues research at KU Leuven

WTFood: Food System Glitches APP

WTFood is a user tool to **explore food system glitches and learn about the actors working on solving these glitches**. Primarily it is a tool to improve consumer awareness of food system glitches and learn about the farmers, the NGOs, and other initiatives working on them.

Why is this needed:
Improving consumer awareness of food system challenges (nicely called 'glitches' by the artist) and who is working on them is the goal of WTFood. Most consumers have limited knowledge about how their food is produced, processed, and distributed. Therefore, they do not know whether agricultural practices were sustainable, whether animal welfare was considered, what the environmental impact of their choices is, how people are treated, etc. Bridging these knowledge gaps is crucial to enable informed decision making: with better awareness, consumers do make more informed decisions about the food they buy and consume, driving demand for more sustainable and ethical food products.

How is it related:
There are several approaches to work on addressing this knowledge gap. Improving food education in schools is one, clear and transparent labelling is another. Public campaigns can help, as does increased media coverage. Finally, initiatives to connect consumers directly with farmers and food producers is seen as a good approach. WTFood aims to contribute to this approach: allowing consumers in supermarkets to connect directly with farmers, NGO's and other initiatives working on addressing food system glitches and get informed or even empowered.

What does it do:
It works like an exploration map, with a website where the map grows when people use the APP in a supermarket to photograph a food. By doing this, the image morphs, text gets created and local initiatives working on this glitch for this food are sought by the AI system. All simultaneously. Within 30 seconds, the user is rewarded with a movie clip, a short statement text, and a list of links to relevant initiatives in their direct environment. The system has been fully developed and the website is operational. Hence, the tool is ready to be used.

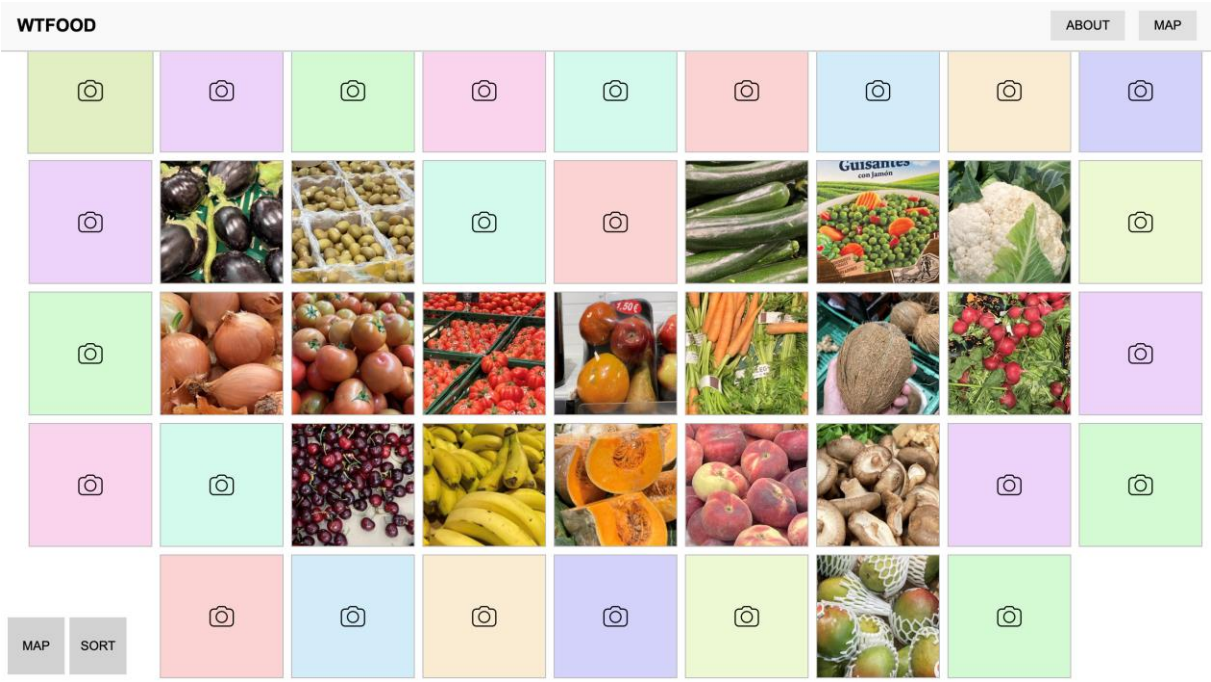
Link to prototype card on the HEClab:
Prototype Detail (heclab.eu)

Development plan:
To develop this prototype product innovation further, we have identified these actions:

1. Developing a pilot program focusing on a specific set of glitches for a substantial amount of users (currently, the system is hard to use at scale)
    a. A follow up funding application for this purpose has been submitted in partnership with Hungry EcoCities stakeholders through DRG4Food. We are awaiting the outcome.

2. Test the solution with SMEs from the Paths to Progress Experiments on suitability to communicate about their sustainable food system efforts to a wider audience.

3. Explore collaboration opportunities with large EU or global organizations and NGOs to improve consumer awareness of their activities in making the food system more sustainable through WTFood.



Vegetable Vendetta: Vegetable food marketing model

Vegetable Vendetta is **a tool to shift the perception of vegetables from mere side-dishes or obligatory foods to exciting, desirable components of a fulfilling lifestyle** through AI generated food marketing content.

Why is this needed:
Emotional appeal is considered the most powerful marketing tool in shaping food choices. That makes it the most powerful marketing tool to shift food choices as well. Emotional connections can override rational decision-making processes, leading consumers to choose products based on feelings rather than nutritional value or price. Brands that successfully associate their products with positive emotions, memories, or experiences often see strong consumer loyalty and repeat purchases. Large brands bringing processed or sugar containing foods to the market have the largest budgets to develop emotionally appealing content to successfully market their products. For example, leveraging childhood memories, offering sources of comfort during stressful times, bringing people together, luxury experiences, adventure or identity are all well proven marketing techniques to influence consumer food choices. However, healthy foods, like fresh vegetables, are not promoted in such ways, and therefore do not have these associations. This is because the brands producing these products do not have the marketing power to compete. As a result, vegetables, even though the most important part of a healthy diet, are seen as side-dishes or obligatory, instead of exciting and desirable. By changing this, consumers can shift their food choices.

How is it related:
The techniques are known, the examples many. Until recently, it required deep pockets to produce this attractive marketing content. But, with the introduction of advanced video generation AI models, this is no longer the case. By training a model on proven techniques and examples, it is now possible to generate high quality marketing content significant cheaper and very quickly. This offers an opportunity to vegetable brands to enter the food marketing arena.

What does it do:
The current version can recognize 2 vegetable types (potato and broccoli) and is trained on 4 emotional marketing techniques: luxury (exclusive desire), bringing people together (social values), artistic, retro (childhood memories). It is an intuitive system, designed as a desktop system that can be placed in any office as a stand-alone marketing content creator. By placing the food under the camera, the system starts generating the emotionally appealing marketing content. It is in a prototype stage of development, and will require additional development on all components (design of the machine, generation of the content, interaction with the human to name a few) before it could be used in practice.

Link to prototype card on the HEClab:
Prototype Detail (heclab.eu)

Development plan:
To develop this prototype product innovation further, we have identified the actions:

1. Develop the system to a more advanced level, so that it can work directly with the human counterpart in the vegetable company to produce high-quality, realistic food marketing content. Explore what is needed for this with SMEs in the Paths to Progress Experiments.

2. Explore the technical possibilities of integrating the real product more into the AI generated scenes with Brno University of Technology

3. Pursue a public campaign for desirable vegetables based on the Vegetable Vendetta system, e.g.,, to change the perception of vegetables at schools. Seek collaboration with national food authorities or NGOs for this purpose, starting in the Netherlands.

Process Innovations

In addition to the 5 prototype product innovations for food system transition, we have also produced 3 prototype process innovations through the Humanizing Technology Experiments.

In this section, we will introduce the 3, share relevant links and present the current plans for dissemination and future development (the scale-up impact plans). Please note that this is an ongoing process and that our plans for scaling-up will evolve over time.

Project name (HTE)	**Art-driven Innovation outcome**	**PESETABS Outcome type**	**Innovation type**
Ecoshroom	Rhizome Sensor Box	Scientific	Process
Acoustic Agriculture	Transducer Growth Box	Scientific	Process
Symposio	Dedicated Eating Space Lighting	Social	Process

Table 3: overview of process innovations

Ecoshroom: Rhizome Sensor Box

The Ecoshroom Rhizome Sensor Box is a **hardware interface measuring electrical stimuli originating from the plant, mycorrhizae and the plant/mycorrhizae interface**. Aside from the electrical signals, various ambient measurements are taken: light intensity, soil moisture, CO2 concentration, and relative ambient humidity. These signals are written periodically to an SD card for later post-processing and analyses.

Why is this needed:
A healthy soil microbiome refers to the diverse community of microorganisms living in soil that contribute to its overall health and fertility. This ecosystem includes bacteria, fungi, algae, protozoa, and other microscopic organisms. Many microbes form beneficial associations with plant roots, such as mycorrhizal fungi that help plants absorb water and nutrients, these relationships are crucial for soil and plant health. Mycorrhizal fungi form associations with 90% of land plants. There are different types, with Arbuscular mycorrhizae being the most common type. They extend the plant's root system, access nutrients from soil pores too small for plant roots to enter, improve drought resistance, improve soil binding through the production of glomalin, contribute to carbon sequestration, protect plants from pests and diseases and form underground networks where they facilitate nutrient transfer between different species. Inoculating crops with mycorrhizal fungi can reduce the need for fertilizers and improve yields, especially in stressful conditions.

How is it related:
Only recently has the value of mycorrhizae to contribute to sustainable agriculture been recognized, and research into (1) understanding the molecular dialogue between plants and fungi, (2) exploring the potential of mycorrhizal fungi in climate change mitigation and (3) developing more effective inoculants for various agricultural systems is needed. Ecoshroom aims to contribute to these frontiers of knowledge and understanding by having developed a Rhizome Sensor Box capable of studying the molecular dialogue between plants and mycorrhizal fungi in many different scenarios and circumstances. Therefore, it can possibly be useful to developing inoculants for various agricultural systems by changing soils, spores, plants and conditions flexibly.

What does it do:
The Ecoshroom system measures what happens in the plant/mycorrhizae interface under controlled conditions (soil, temperature, light, CO2, humidity, electricity). The system is easy to install, consists of easily available components, and is relatively cheap. Therefore, it is scalable, allowing for many potential experiments into effective inoculation as well as molecular dialogue analysis.

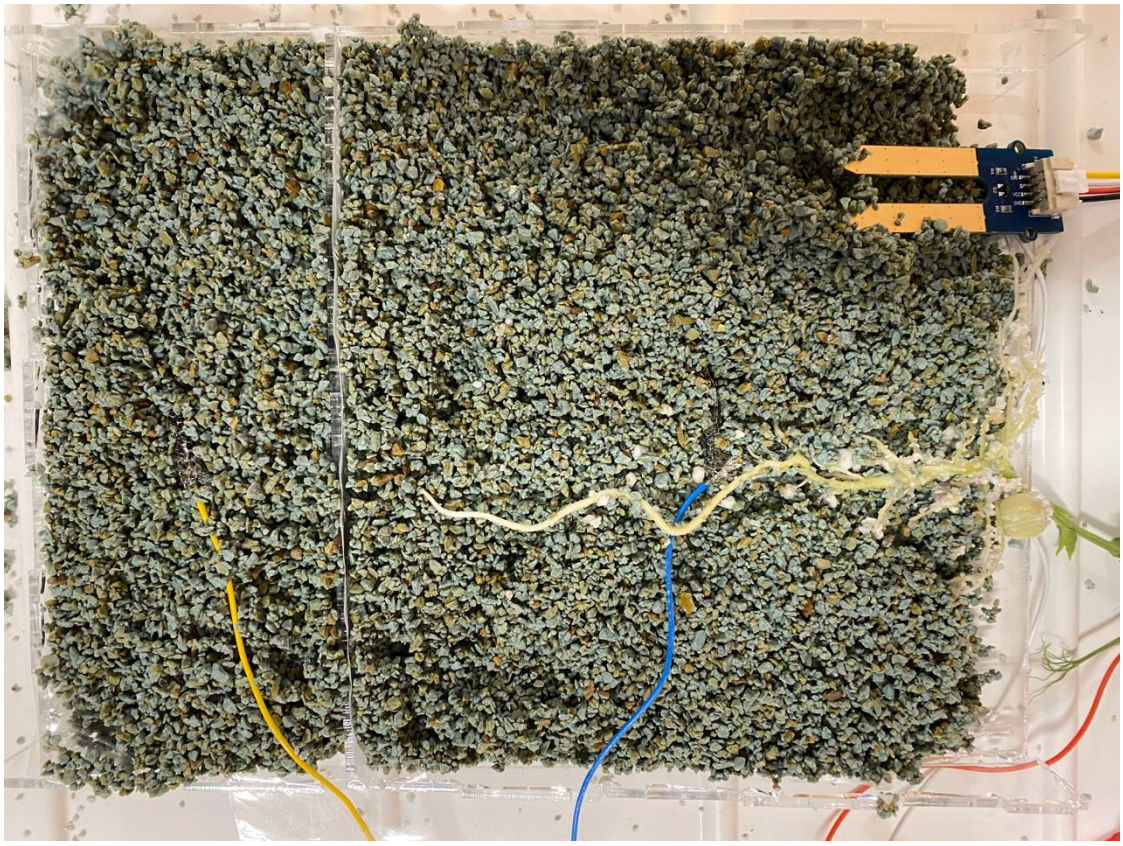
Link to prototype card on the HEClab:
Prototype Detail (heclab.eu)

Development plan:
To develop this prototype process innovation further, we have identified these actions:

1. Develop the Ecoshroom interface digital components (AI model training and visualization dashboard) to improve the functionality of the Rhizome Sensor Box data processing.
    a. For this we have submitted a first application for follow up funding in the DRG4Food program. We are awaiting the outcome.
    b. Other opportunities for funding this next development step are being explored

2. Replicating the experiments at Mendel University with students to prove the workings of the Rhizome Sensor Box interface.

3. Collaborating with SMEs from the Paths to Progress Experiments to further explore different angles to the topic: (a) how could this be useful for a farm, (b) how different is mycorrhizal inoculation from seed breeding practices, (c) can it be suitable for indoor farming practices



Acoustic Agriculture: Transducer Growth Box

The **transducer plant hydroponic growth box** is a new process to study the effects of sounds on plants at scale in a controlled setting. It is a setup of 100 individual boxes, each prepared with their own transducer, connected to a central system which orchestrates which plants are exposed to which sounds. The box contains sensors to measure the effects of the sounds on the plant health, nutrient uptake and growth.

Why is this needed:
The field of understanding the effects of urban environmental sounds on plant health and growth is a new and developing area of research. It has become clear that the relationships between urban sounds and plant health are complex and that more studies are needed to fully understand this. We do know that sound vibrations can influence plants, and that different frequencies and intensities have varying impacts. These impacts can be: changes in gene expression, growth rate alterations, pollination effects, stress responses. Since urban food production and urban farming practices are gaining in popularity as a strategy for food system transition – local/ urban food production – the topic of sound exposure and their effects is also increasingly relevant to understand how we can sustainably grow crops in urban areas.

How is it related:
The field is young and therefore mostly scientific. The focus of this project was to contribute to the ways in which sound effects can be studies for understanding. The system of transducer plant growth boxes, connected to an evolutionary AI model which tries to train on the plant responses to sound vibrations is a new process to study this topic. In that sense, the project is focused on contributing to science primarily.

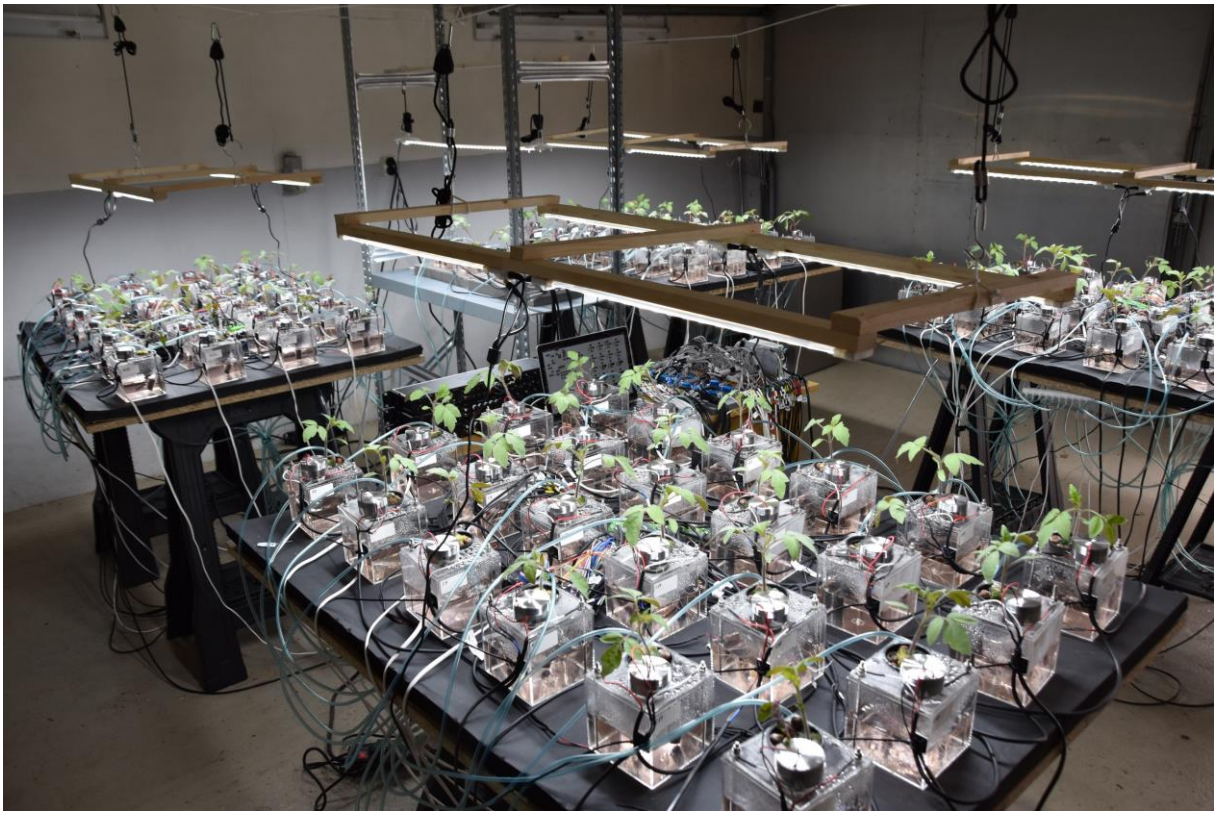
What does it do:
It is a system of 100 individual hydroponic growth boxes for plants which is collecting data and training a custom AI model based on autoencoder architecture and evolutionary algorithms. This involves tracking nutrient consumption in real-time and measuring biomass and photosynthetic efficiency to understand how different sound patterns impact plant growth. The system is located at Mendel University in Brno.

Link to prototype card on the HEClab:
Prototype Detail (heclab.eu)

Development plan:
To develop this prototype process innovation further, we have identified these actions:

1. Prepare a grant application to continue the research at Mendel University. The setup as developed in the Humanizing Technology Experiment is well designed and complex. It can be used for a series of sound on plant effect studies, which is the intent of Hungry EcoCities partner Mendel University in collaboration with the artist.

2. It could be interesting to explore the possibility to run an experiment on a plant which is grown by one of the SMEs in the program. Or even on seeds or the sprouting of seeds. This is to be explored with the SMEs and assessed on usefulness in this early stage of scientific discovery.



Symposio: Dedicated Eating Space Lighting System

Symposio is a **design for a dedicated eating space for mindful eating through light cues**.

Why is this needed:
The lack of a dedicated eating space is the most important underlying cause of overeating, leading to many physical and mental problems. Obesity is a direct result of chronic overeating. When people do not eat mindfully at a dedicated space, they tend to eat larger portions, less healthy foods and do not respond to bodily cues on fullness, hence, eating too much. Moreover, it increases stress levels which leads to additional overeating. Designing dedicated eating spaces in homes is an effective strategy to battle overeating.

How is it related:
Light plays an interesting and often overlooked role in mindful eating. Through proper lighting, we can enhance our ability to see and appreciate the colours, textures and presentation of food, activating all our senses when eating. Lighting can also significantly affect the ambiance of a dining area, influencing our mood and stress levels. The contract between food and plate colour, influenced by lighting, can affect perceived portion sizes (higher contract leads to smaller portion sizes). Changes in lighting can serve as a cue to transition states for eating. Good lighting can enhance social interactions, which can slow down eating speed.

What does it do:
Symposio is an experiment to design a good eating space through light cues which can be implemented in any house environment. The system consists of a table piece and WiFi connected lights. By listening to the sounds produced at the eating space, the system recognizes whether the people eating are eating mindfully or not. Through changing lights and using light to nudge behaviour, it helps the people at the eating space to avoid overeating.

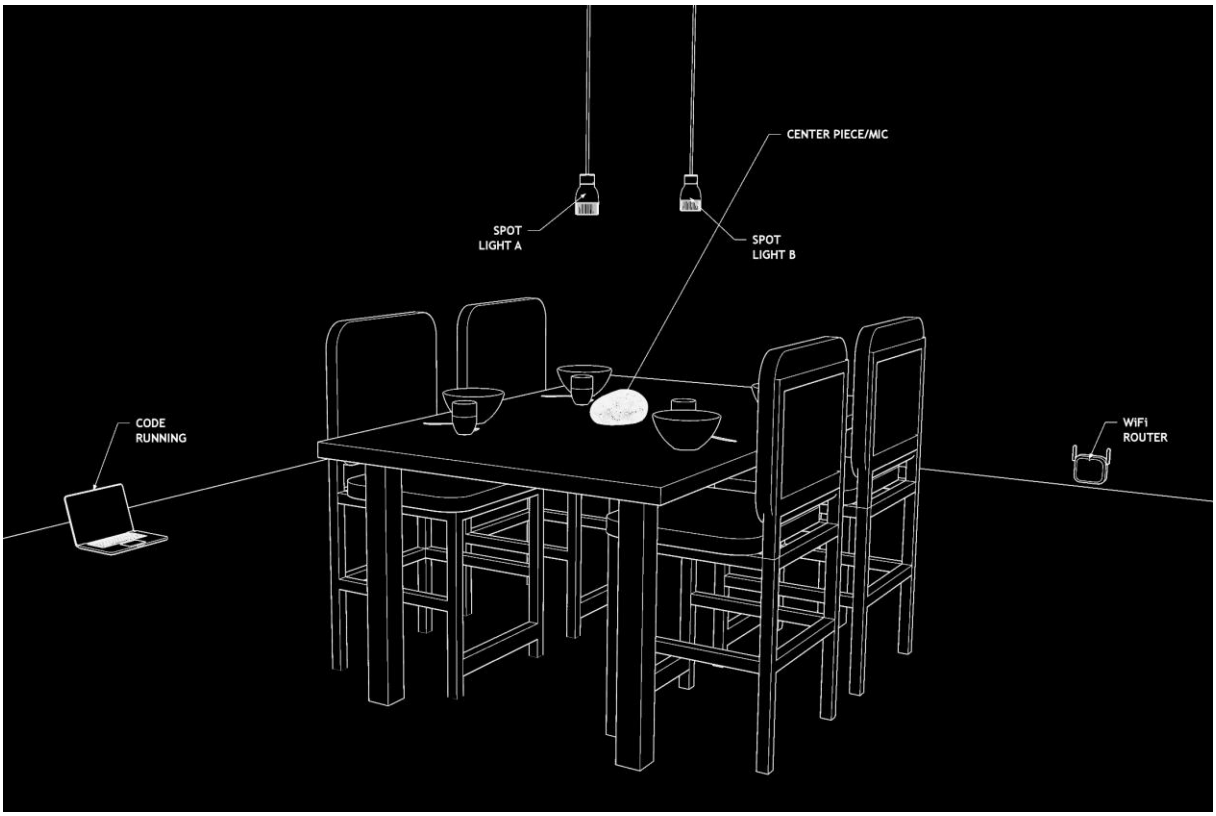
Link to prototype card on the HEClab:
Prototype Detail (heclab.eu)

Development plan:
To develop this prototype process innovation further, we have identified the actions:

1. Expand the research through a master thesis on light changing AI with KU Leuven

2. Being an open-source, social innovation, the aim of this project is to create awareness on the relationship between overeating and dedicated eating spaces and serve as inspiration for spatial designers to design dedicated eating spaces following the principles of mindful eating. For this, the project will be disseminated through public media channels.

3. Explore the relevance of this topic to one specific SME in the Paths to Progress Experiments which is working on taste experiences. There is a link between tasting and mindful eating, influencing the tasting experience of food products.



Artistic innovations

Besides the research and experimentation, the Humanizing Technology Experiments, also provided the ground to deepen artistic practice. One of the beauties of working with artists on innovation challenges is that good artists have the skill to look at the world and all within with different eyes than most of the rest of us do. By looking at topics from a distance, spying on them from a corner, zooming in on apparent futile details, turning logics upside down, changing perspectives, seeing things through coloured glasses or giving things a surface and skin, they are able to offer us a new way of looking at a topic, a theme or a thing. results of these efforts to materialize or manifest their ways of seeing are artworks, experiences, concepts or otherwise.

Also, through the Humanizing Technology Experiments, new ways of seeing have been developed by the artists: 5 new experiences and 2 new concepts. The new experiences have been tested as part of the residency in Hungry EcoCities. The concepts are in an earlier stage and have not yet been shown publicly.

They have been central and leading parts of the explorations and experiments and have resulted in artistic results on the names of the residency artists. In this section, we will introduce the 7 artistic outcomes, share relevant links and present the current plans to disseminate these works of art. Throughout the Hungry Ecocities project, we are scouting opportunities and continuing to disseminate about them. Next to that, for all videos[2] have been created to promote this.

Project name (HTE)	**Art-driven Innovation outcome**	**PESETABS Outcome type**	**Innovation type**
Future Protein	Food Sharing Event	Artistic	Experience
MVPxFFF	Mock Wild Picnic	Artistic	Experience
Ecoshroom	Living Technologies	Artistic	Concept
Council of Foods	Food inclusive debating	Artistic	Experience
WTFood	Food System Glitches	Artistic	Experience
Vegetable Vendetta	AI as Robin Hood	Artistic	Experience
Acoustic Agriculture	Plant based AI model training	Artistic	Concept

Table 4: overview of artistic innovations

[2] All videos have been collected in this playlist

Experience - Future Protein: Food Sharing Event

Future Protein: Reimagining Urban Nutrition
IM-A Studio's Future Protein explores sustainable urban nutrition through an intimate dinner experience. Collaborating with Berlin's Kin Dee restaurant, the project showcases mussels as an alternative protein source in a three-course meal. Guests engage with a custom app, identifying potential mussel farm locations globally. The mussel shells are recycled and 3D printed into table pieces. This interdisciplinary approach blends culinary innovation, technology, and environmental consciousness, challenging our relationship with food production and consumption. By **elevating mussels from overlooked ingredient to gourmet centrepiece**, Future Protein offers a tangible vision of sustainable urban dining. The project exemplifies art's power to inspire solutions to pressing global challenges, paving the way for resilient, delicious urban futures.

Link: Future Protein

Dissemination Showcases:

- Launch event: Prototype Park Studio Other Spaces Berlin, May 2024
- Exploring the opportunity to present during the Berlin Science Week in 2024.

Experience - MVPxFFF: Mock Wild Picnic

Mock Wild Picnic: Blending Technology and Nature in Future Foodscapes
Genomic Gastronomy's Mock Wild Picnic reimagines sustainable food systems through AI-driven culinary experiences. The project synchronizes food forests with diverse farming methods, creating hybrid landscapes and cuisines. Central to this exploration is the MVP x FFF Food Computer, the AI tool harmonizing Minimum Viable Proteins with Food Forest Flavours. Through immersive picnic events, participants taste and debate food futures that are simultaneously high-tech and wild. **Mock Wild Picnic challenges the dichotomy between technological progress and ecological preservation, offering a tangible vision of minimized harm and maximized benefits for wild species**. It exemplifies innovative approaches to urban nutrition, biodiversity, and sustainability.

Link: MOCK WILD – The Center for Genomic Gastronomy

Showcases:

- Launch event: Prototype Park Nieuwe Instituut Rotterdam, May 2024
- Mock Wild Picnic #01, Zone2Source, Amsterdam, 25.05.2024
- Exploring the opportunity to present at the Embassy of Food during Dutch Design Week 2024.

Experience - Council of Foods: Food inclusive debating

Council of Foods: Reimagining Food System Dialogues
Nonhuman Nonsense's Council of Foods creates a digital political arena where foods discuss our broken food system. This interactive artwork uses AI to give voice to ten diverse food items, representing various production methods and ethical standpoints. Human participants engage in discussions, influencing the dialogue's direction. The project illuminates the complex eco-social impacts of our food choices, typically obscured by marketing and low prices. By anthropomorphizing foods, it challenges us to reconsider our relationship with what we eat. The council generates policy recommendations, bridging artistic exploration with potential real-world impact, and offering a unique, accessible entry point into complex food system debates.

Link: [Council of Foods (council-of-foods.com)]

Dissemination Showcases:

- Launch event: Prototype Park Studio Other Spaces Berlin, May 2024
- Launch event: Prototype Park Nieuwe Instituut Rotterdam, May 2024
- Exploring the opportunity to present during the Berlin Science Week in 2024.

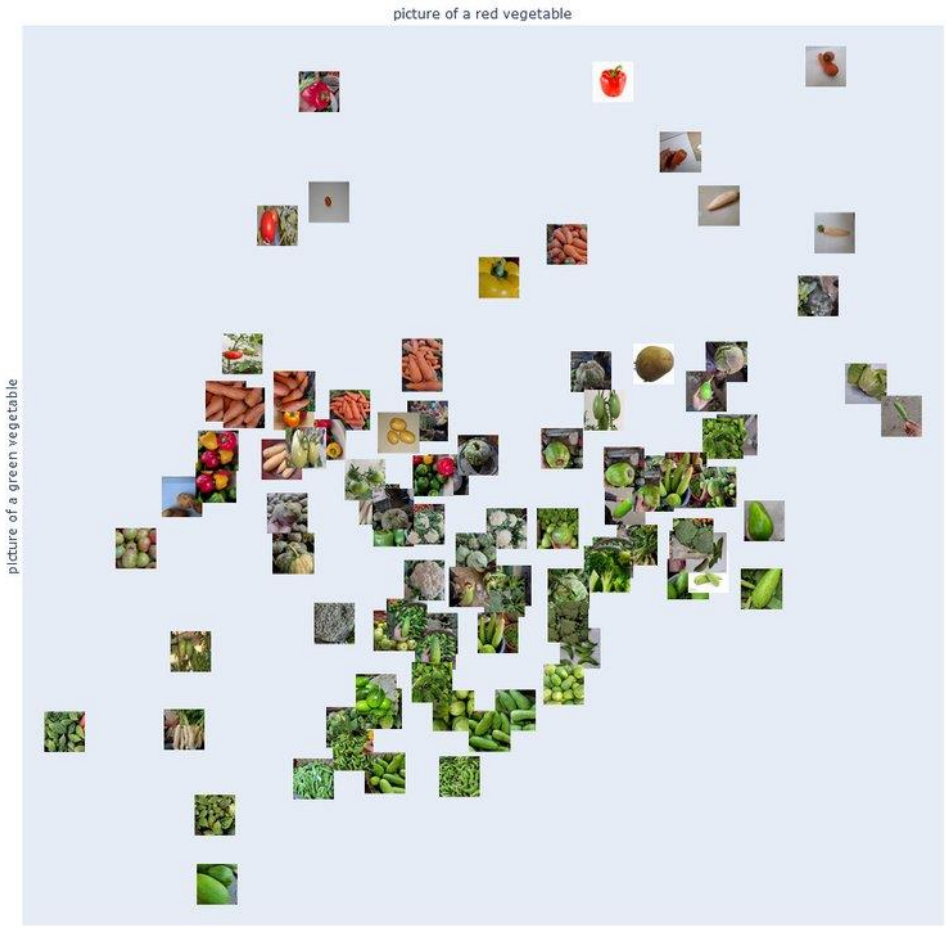
Experience - WTFood: Food system glitches

WTFood: Unmasking the Glitches in Our Food System
Bernat Cuni's "WTFood" transforms smartphones into portals revealing hidden realities of our food system. As produce morphs into glitchy metaphors on-screen, it exposes socioeconomic fissures beneath the supermarket's polished veneer. These digital distortions represent unseen workers, struggling local stores, and wasteful overproduction. More than exposing issues, "WTFood" catalyses change, connecting users to local initiatives fixing these systemic glitches. With each use offering new perspectives, it challenges us to see beyond marketing narratives, questioning our role in the food ecosystem. "WTFood" isn't just an app—it's a mirror, megaphone, and mobilizing force for urban food revolution. At the same time, it is an ever-evolving morphing map and interactive sorting set-up, that could be part of an installation.

Link: [WTFood — cunicode / Digital Craftsmanship]

Dissemination Showcases:

- Launch event: Prototype Park Nieuwe Instituut Rotterdam, May 2024
- Launch event: Let's Connect Westland, May 2024



Experience - Vegetable Vendetta: AI as Robin Hood

Vegetable Vendetta: The AI-Powered Uprising of the Humble Produce
In Jeroen van der Most's "Vegetable Vendetta," part of Hungry EcoCities, AI becomes the great equalizer in food marketing. This installation arms humble vegetables with the seductive power of luxury brands and fast-food giants. Visitors scan produce, unleashing AI-generated commercials that blend the digital and physical, turning broccoli into coveted stars. It's a playful yet pointed critique of our broken food system, where processed foods overshadow nature's bounty. By democratizing marketing powers, the project envisions a future where AI levels the playing field, empowering small producers. "Vegetable Vendetta" challenges us to reconsider our relationship with food, technology, and the power structures that shape our choices.

Link: Vegetable Vendetta — Jeroen van der Most

Dissemination Showcases:

- Launch event: Prototype Park Nieuwe Instituut Rotterdam, May 2024
- Test event: NWO Teknowlogy, June 2024
- Presentation, GreenTech, June 2024
- Presentation: The Next Web Conference center stage, June 2024
- Publication: TNW Conference dag 1: OnlyFans, Oura en AI-kunst (mtsprout.nl)
- Publication: An AI artist has exposed our broken food system — and a solution (thenextweb.com)
- Publication: Bonne nouvelle : L'IA peut vous aider à manger plus sainement! Voici comment… (lebigdata.fr)

Concept - Ecoshroom: Living Technologies

Ecoshroom: Decoding Nature's Underground Dialogue

Ivan Henriques' "Ecoshroom" unveils the hidden conversations between plants and fungi. Imagine a transparent wall pulsing with life, where the boundaries between home and nature blur into insignificance. This is the promise of Ecoshroom – a window into the subterranean social network that has been shaping our world long before we learned to cultivate it. Through this living lens, we witness the intimate tango between plant and fungus, a dance of nutrient exchange and mutual support that has sustained ecosystems for millennia. This living installation merges AI with biology, translating the silent language of roots and mycorrhizae into visible data. As humans interact, they trigger a chain reaction: robots nourish fungi, fungi feed plants, and machine learning algorithms decipher this subterranean social network. Ecoshroom challenges our perception of intelligence in nature, exploring fungal decision-making and its impact on crop resilience. By making the invisible visible, it reimagines our relationship with food systems and the environment. This interdisciplinary project offers a glimpse into a future where technology and nature collaborate, cultivating not just crops, but understanding.

Link: Project Video

Dissemination Showcases:

- Launch event: Prototype Park Carlo Ratti Associati, Turin, May 2024
- Exhibition: Zone2Source, Amsterdam, October-November 2024

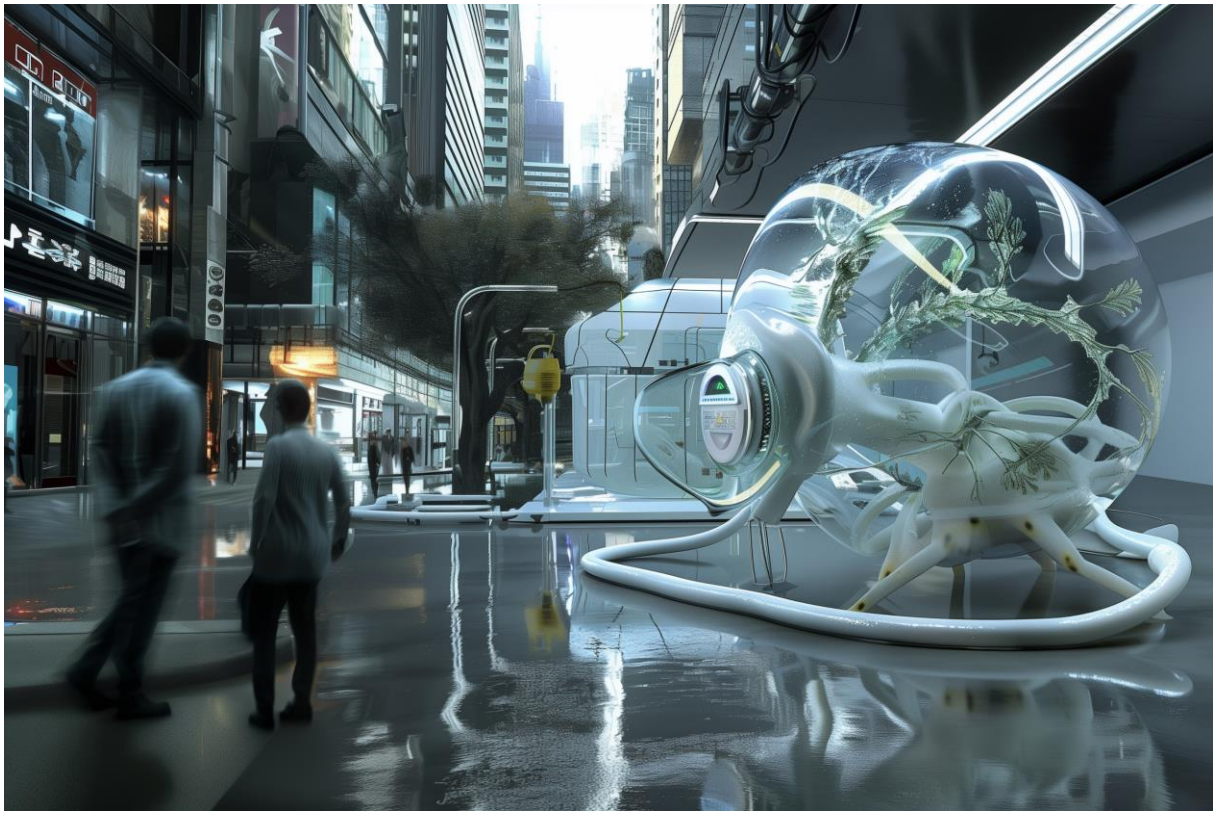
Concept - Acoustic Agriculture: Plant based AI model training

Acoustic Agriculture: Orchestrating Urban Harmony Through Plant-AI Synergy
Helena Nikonole's "Acoustic Agriculture" part of Hungry EcoCities, reimagines urban noise as a catalyst for plant growth. This installation features 100 hydroponic boxes, each a stage where AI-composed soundscapes nurture plants through vibrational speakers. Fed with urban clamour, nature's melodies, and scientific stimuli, the AI creates a new language of growth. As plants respond, their feedback evolves the AI's compositions, blurring lines between technology and nature. More than an experiment, it's a philosophical inquiry into interspecies communication and a prototype for future urban ecology. "Acoustic Agriculture" envisions cities where every sound contributes to sustainability, challenging us to hear urban cacophony as potential harmony.

Link: Acoustic Agriculture (nikonole.com)

Dissemination Showcases:

- Launch event: Prototype Park Carlo Ratti Associati, Turin, May 2024
- Artist conducted initial conversations with curators to include it in exhibitions winter 2024/ 2025



Conclusions & Learnings

In this deliverable, we have brought together the identified potential coming from the Humanizing Technology Experiments. They serve as input for business development actions, to assure that technical development goes hand-in-hand with market needs to contribute to a more healthy, sustainable, responsible and affordable agri-food system. To do so, the participating agri-food SMEs in the Paths-to-progress experiments will be the first testing partners. Next to that, we also identified various other technological, scientific, social and dissemination actions. To organize the actions, we have created the below table, in which we have identified 23 opportunities that we can pursue to push the potential of the art-driven innovation outcomes. Next to that, Hungry Ecocities will continue disseminating and sharing knowledge on the insights and possibilities of the prototypes.

Project name	**Art-driven Innovation outcome**	**#**	**Impact opportunities we can pursue**
Future Protein	Remote Sensing Predictive Model	1	development of reliable prediction model for aquaculture production location assessment.
		2	model expansion to land based predictions for agricultural SMEs
MVPxFFF	Food Forest Flavours Computer	3	development of real-time data incorporation functionality for food forests
		4	user interface design criteria assessment for agricultural SMEs
		5	scientific research case study for guided prompting with KU Leuven
Ecoshroom	Rhizome Sensor Box	6	development of the interface components with In4Art and Mendel U
		7	scientific research replication study with Mendel U
		8	mycorrhizal inoculation exploration for agricultural SMEs
Council of Foods	Policymaker Learning Platform	9	a pilot program to test the platform as a policymaker learning tool
		10	cooperate with agricultural SMEs to expand the knowledge base
		11	a pilot program to test the platform as a form of informative entertainment for public education
		12	scientific research case study for LLM memory issues with KU Leuven
WTFood	Food System Glitches App	13	a pilot program with HEC stakeholder to test the system for usage
		14	cooperate with agricultural SMEs to test the suitability for direct producer-consumer communication
		15	explore collaboration opportunities with EU institutions and NGOs to improve consumer awareness of their glitch activities
Vegetable Vendetta	Vegetable Food Marketing Model	16	development of the system to work with SME food marketeers directly in serving them to create content
		17	scientific research on integrating real product imagery with AI generated scenes with Brno University of Technology
		18	pursue a public campaign for desirable vegetables with national food authorities.
Acoustic Agriculture	Transducer Growth Box	19	20 scientific research continuation with Mendel University
		20	cooperate with agricultural SMEs to test the system for different plants, including seeds and seed sprouts.

Symposio	Dedicated Eating Space Lighting	21	scientific research through a master thesis on light changing AI with KU Leuven
		22	disseminate to spatial designers to raise awareness on the opportunities in designing dedicated eating spaces
		23	cooperate with agricultural SMEs on the link between tasting and mindful eating and the tasting experience of food products

In D4.8 *Application Experiment Scale-up Plans*, we report on the potential use groups of the 8 identified art-driven innovation outcomes.

About Hungry EcoCities

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Hungry EcoCities aims to explore one of the most pressing challenges of our times: the need for a more healthy, sustainable, responsible, and affordable agri-food system for all enabled by AI. More info: starts.eu/hungryecocities.nl