UrbanFarm2023

Integrating social, economic and environmental sustainability pillars for sustainable food systems and urban regeneration

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Francesco Orsini, Michele D'Ostuni, Ilaria Zauli, Giuseppina Pennisi, Marie Larsson, Anna María Pálsdóttir

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

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Food Systems in European Cities (FoodE)

Scan Me

Scan Me

www.foode.eu

Led by the University of Bologna and financed under Horizon 2020*, FoodE brings together a highly qualified consortium of 23 organizations, including universities, research institutes, SMEs, NGOs, as well as city councils distributed across 8 EU countries.

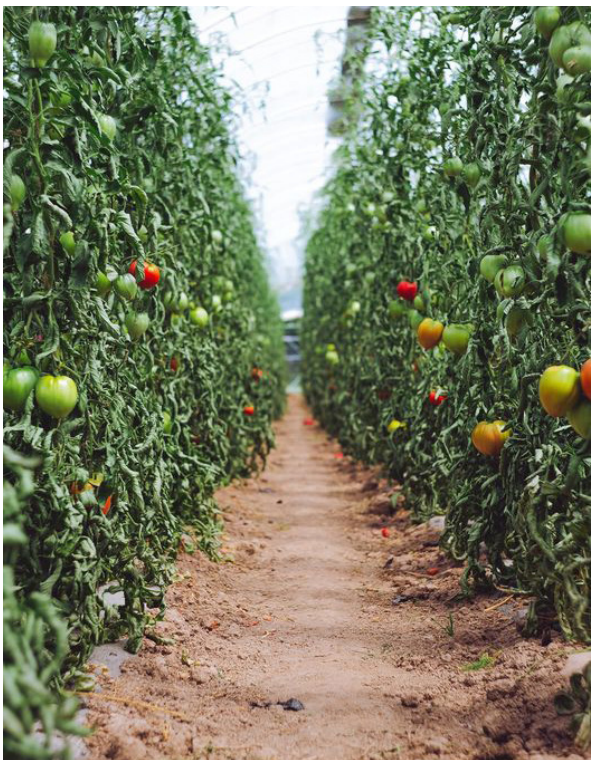
The project aims to build and promote a "Think global, eat local" mindset with a view to accelerate the rise of City/Region Food Systems (CRFS) that are sustainable and resilient, thus able to guarantee food security while boosting local economies.

Cities and Regions represent the scale at which ecological, social, and economic interconnections may be fostered through co-governance and active involvement of urban and regional institutions and players, such as:

- Citizens;
- Food system start-ups and small businesses operating in the urban food landscape;
- Cities and regional authorities;
- Academia;
- Schools.

By increasing the relationships and interlinkages between the different actors of the food chains, FoodE will pave the way for job creation, enhance local economies, and enable local communities to contribute to the United Nations Sustainable Development Goals.

* The European Union Research and Innovation Framework Programme (2014-2020)



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Francesco Orsini, Giuseppina Pennisi

Joining multiple branches of knowledge to rethink urban agriculture projects: urban farm challenge and experiences

by Francesco Orsini
Full professor, Alma Mater Studiorum - University of Bologna.
Chair, Division on Landscape and Urban Horticulture, International Society for Horticultural Sciences (ISHS).
Coordinator, Food Systems in European Cities (H2020-862663-FoodE)

and Giuseppina Pennisi
Assistant professor, Alma Mater Studiorum - University of Bologna

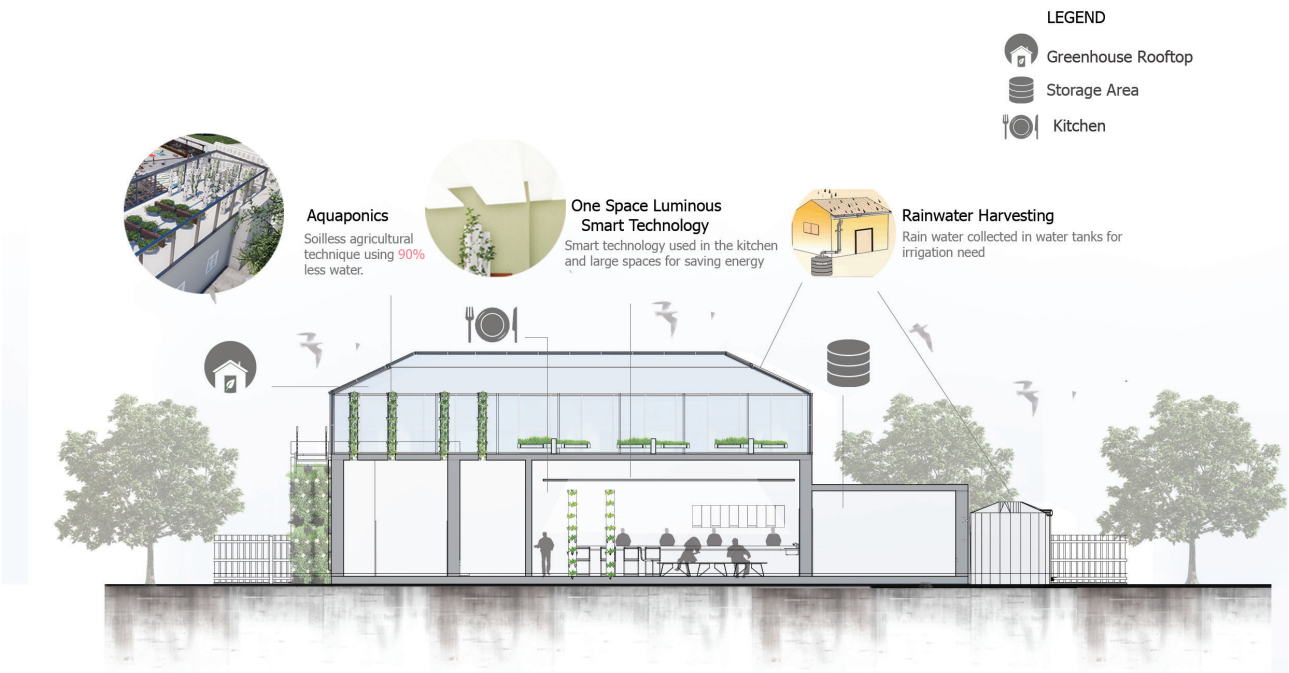
Nowadays, with the current and foreseen scenario of urbanization and world population growth, urban agriculture (UA) represents an opportunity and a strategy to improve food production and supply, local economy, social integration, environmental sustainability as well as health conditions. Within this context, UA can reach and integrate the three pillars of sustainability: economic, social, and environmental. For these reasons, UA has become a popular and common urban land use form worldwide in many cities.

Indeed, in recent times, UA projects have spread across the world, guided as well as supported by governments and born by community-based initiatives. These projects may have a great variability: they range from low to high technological UA projects or they may have different purposes, being projects

with a purely social and educational purpose or instead mainly devoted to food production and environmental services. Therefore, UA brings together multidisciplinary fields and opportunities. To facilitate a wider uptake of innovative policies and instruments for the promotion of the sustainable goals associated with UA, it is fundamental to first create and raise awareness both between institutional stakeholders as well as civil society through innovative and interdisciplinary approaches.

The international student challenge UrbanFarm2023, which has now reached its 5th edition, is dedicated to the design of new spaces, activities, and solutions in the Botildenborg project (Mälmo, Sweden): the aim is to integrate the already existing urban farm spaces and social opportunities with new ideas created by the young minds of the teams, integrating the three pillars of sustainability. As in previous editions, the teams had the task of bridging the most innovative strategies in urban farming as well as environmental technology and solutions with multifunctional planning of urban spaces. Moreover, students also had the opportunity to see with their eyes the project itself during a technical visit organized in Mälmo and Botildenborg area, to fully understand the project, the spaces, and the environment. Through this challenge, teams must apply their knowledge in real contexts, dealing with the environment and spaces as well as with the local policies. Moreover, they gain a significant opportunity to exchange views and approaches with their peers from different countries as well as backgrounds. Their dissemination and soft skills may also take advantage and be improved, for instance in how to prepare a promotional video or how to orally present their project in front of an audience, making this challenge an important teaching tool.

This publication aims to summarize the main ideas, projects, and solutions that student teams brought together with great enthusiasm, dedication, and effort. We believe that these kinds of ideas and projects may not only raise awareness on these topics but also inspire urban planners and institutions to foster the sustainability and liveability of their cities.



UrbanFarm Student Challenge 2020, archive picture. Team Fenice

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Anna María Pálsdóttir, Marie Larsson

The importance of preparing students to meet the challenges of urban agriculture

by Anna María Pálsdóttir
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and Marie Larsson
Senior lecturer in Landscape Architecture, with the emphasis on collaboration planning and urban garden cultivation at the Swedish University of Agricultural Sciences (SLU)

During the last years, urban agriculture (UA) in Sweden has rapidly grown and covers a vast range of actors, such as municipalities, organizations, and private initiatives. The need for competent advisers and growers is warranted and educational institutions such as SLU need to provide adequate education to meet these demands. One such initiative is the course Urban Agriculture and Social Interaction. The course is interdisciplinary on the theme of urban agriculture.

From a global and national perspective, urban agriculture is discussed as a social and political expression in society. Its significance as a marker for ecological resilience and participative citizenship is taken up. On a more detailed scale, the possibilities for urban agriculture are analyzed: what is allowed in the urban areas, how to consider the identity and cultural values of the site, what can you cultivate and how, as well as

what kind of risks and outcomes there may be.

The aim is to prepare students from different disciplines to meet the challenge of urban agriculture in their professional lives by combining theory and problem-based learning. As a part of the course, students work in international and transdisciplinary teams on challenges of urban agriculture and urban farming in a real-life context. In that way, they train to work in an international context, solving a real-life challenge that urban farmers face in their work. To think of different aspects such as sustainability, economics, and social values of UA, they will gain insights into the dynamics of running urban agriculture.

Example of a urban agriculture garden in Stockholm

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Michele D'Ostuni, Ilaria Zauli

Urban Agriculture and the journey towards UrbanFarm Challenge

by Michele D'Ostuni
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and Ilaria Zauli
Ph.D. candidate, Alma Mater Studiorum - University of Bologna

Agriculture has always been the primary sustaining source for human living. Since the very beginning of civilization, the Homo Sapiens had to struggle with the natural environment to procure food and finally ceased to be a nomad species when they discovered how to cultivate the land. Agriculture stands at the very beginning of the urban environment and has conditioned where and how cities were built for thousands of years.

As the population grew, together with the human ability to submit the land to its will through scientific progress, agriculture practices changed and were able to feed an increasing number of people. Not long after the Second World War, a huge amount of chemicals, like nitrate, were converted into cheap fertilizer leading the way for the first Green Revolution which dramatically increased the production of food, opening up a new industrial era of agriculture.

In recent years, we have gone from questioning our capacity to produce enough food to

questioning the way we produce it: our food system's ecological footprint is not sustainable, and it is endangering the biodiversity of local ecosystems. More than 75 billion tons of fertile soil are lost every year due to desertification, soil erosion, and soil degradation. We reached a paradox where the way we produce food now is an actual threat to our ability to produce food at all in the next future.

The way we produce food is not the only threat that our food system has and will have to face. Global crisis factors such as rapid climate change (where industrialized agriculture is one of the main contributors), the increasing population and urbanization trends, together with the progressive abandonment of rural areas in the developing regions of the world, forced us to rethink our global food strategies and pushed the international scientific community to find alternatives and complementary solutions to reach food security goals in an already overcrowded world.

In this scenario, it is not difficult to understand why in the past 20 years there has been a growing interest towards urban agriculture and even though the concept is not new, recently, a broad range of research has been published on this topic. The growing demand for food in massive urban areas makes nutrition one of the greatest issues to be addressed. In this regard, city authorities, planners, economists, environmentalists as well as individual citizens are becoming increasingly involved in this subject area. Indeed, besides its capacity to produce and distribute food in urban areas, it is possible to explain urban agriculture's growing interest as it is considered to be a source of significant environmental, social, and health-related benefits as well as economic development opportunities. Each of these has been well documented in the research literature. Nonetheless, the application of urban agriculture projects within cities' boundaries faces several challenges such as a diffuse skepticism from the local population, barriers to cooperation with more traditional farmers, lack of investments, or difficulties in making or maintaining profits.

Thus, it is crucial that all the actors involved in the development of urban agriculture projects, from planners to agronomists, from architects to engineers, work together to overcome these challenges. For this reason, during the past five years, the UrbanFarm Student Challenge aimed at reducing the knowledge gap between future practitioners and promoters of urban farming initiatives. To this end, the challenge has fostered collaboration between students from highly diverse backgrounds, from agriculture to architecture, passing through social sciences and humanities. Moreover, the teams have always been characterized by the union of students originating from different countries and universities, further enriching through their own experiences and knowledge the expertise of the teams. This journey aims at generating awareness concerning the social, economic, and environmental issues connected to farming the city, forcing students to face a series of challenges that can be easily translated into real-life applications.

UrbanFarm Student Challenge 2020, archive picture. The grand finale at NovelFarm in Pordenone

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URBANFARM AT GLANCE

Visions and impressions from former participants

Francesco Lombardo, Luca Settanni e Gian Marco Tamborra
University of Bologna, Italy
Team ReGeniusLoci - Aquaponic Social Garden (Bologna) - UrbanFarm2019

Team RGL, UF2019

"From the experience of UrbanFarm2019 we have learned a lot, especially: how to work in multidisciplinary teams bringing home excellent results. Surely it is an experience that we feel to promote and in which we believe as it gives students of any sector the opportunity to face a first experience of innovative design with high social and environmental impact. For us at Aquaponic Design it was the first project together and we always remember it with happiness because it was ***thanks to UrbanFarm2019 that we realized how much fun we would have working together to transform the city of Bologna*** *into the first Urban Farming hub in Italy."*

Ricardo Souza

Montepellier SupAgro, France
Team Phoenix – L'Azienda Zanussi (Conegliano) - UrbanFarm2019
Team GreenID – Green Cycle Urban Farm (Galliera) - UrbanFarm2020

Team Phoenix, UF2019

*"**I was part of UrbanFarm for three years!** I started as an undergraduate student in 2019 in Brazil. We did fundraising so one of our team could represent us during the final in Pordenone (Italy). A few days before the Final Event, we got the money we needed, and my colleague took a 23h flight to Italy. **This award and the participation in an international student challenge fitted well in my application for a scholarship in a European Master.**"*

Andrea D'Aprile

University of Bologna, Italy
Team FENICE - Green Symphony project (Lanuvio) - UrbanFarm2020

Team Phoenix, UF2019

"*If I have to explain this experience in few words I could use: cooperation, challenge and future. **Urban Farm 2020 has been the start point of my experience inside the incredible world of international research and cooperation.***"

Team The Wanderers, UF2019

Haidy Takieldin Adel Ali Mousa

Cairo University, Egypt
Team The Wanderers – GILGAMESH (Conegliano) - UrbanFarm2019

"I am Haidy Mousa, an award-winning architect. ***UrbanFarm created a transition point in my life, as it was a great starting point to find a solution to return life to the city.*** *"*

Elisa Appolloni

University of Bologna, Italy
Team Future-A - DolomiNet (Belluno) - UrbanFarm2019

Team Future-A, UF2019

"The experience of ***Urban Farm represented an opportunity to test myself concerning organizational skills, design and management of a multidisciplinary project****. In addition, thanks to the competition, I was able to deepen a theme of great interest to me: indoor and vertical agriculture. Now I'm currently doing a PhD and collaborating with the research group Rescue-AB, organizer of the Urban Farm contest."*

Emanuele Durante

University of Bologna, Italy

Team Hop-E –SIEPE (Sustainability-Inclusion-Energy Production-Environment), UrbanFarm2020

Team Hop-E, UF2020

*"A year after I can definitely say that **UrbanFarm had an important role in my recent life**. My team and I continued working on the project, which got also accepted for the World Renewable Energy Congress in Lisbon. We are still in contact with the municipality of Galliera, which is willing to implement a lot of the aspects we proposed for the site."*

Matteo Landolfo

University of Bologna, Italy

Team Symbiont Society - Ecological, environmental, energy and food challenge of the world's northernmost city (Longyearbyen) - UrbanFarm2020

Team Symbiont Society, UF2020

*"**UrbanFarm is not just a challenge, but an all around experience** that combines the educational, professional and personal experience of the participants in the competition and especially the members of my team."*

Evaluation committee

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LOVE SILOW
Lecturer in the SLU master program Food and Landscape. Research interests relations between food, people and landscapes


Rooftop
Urban
Agriculture

Malmö, SWE
Botildenborg

The Botildenborg project

Botildenborg is a small urban farm and meeting place in Malmö, integrating the three sustainability spheres, namely social, ecological, and economic. The farm focuses on market gardening and social farming. The enterprise is a mix of for-profit and non-profit which allows applying for funding concerning social projects and enables as well to bring profit to the farm through sales, workshops, and other activities.

Botildenborg appears as an urban space on the city's outskirts, next to the city's bypass. On a broader scale, Skåne – the county, is a traditional agricultural landscape with great conditions for farming, such as flat topography, good soil, and mild weather. The soil consists mainly of heavy clay, and the site is on a slow slope from west to east, benefitting from solar radiation throughout the year but also being highly exposed to wind. Accordingly, throughout the year, it is windy on site; the winters are wet, with main rain and little snow, whilst the past summers have been very hot and dry. The land is leased by Malmö Stad (the local municipality), while Botildenborg owns the building.

<u>Existing urban farm activities</u>

- Social farming with outdoor cooking
- Market gardening
- Monthly markets, where the public and other local farmers participate, boosting knowledge about the project among the local population and contributing to short food supply chains.
- Study visits by various groups, including students, municipalities, growers and private companies

<u>Other activities at Botildenborg related to the farm</u>

Furthermore, other creative activities are carried out in Botildenborg to engage with companies and the general public such as: 'cook, eat and talk' where participants go out to harvest the farm and learn how to cook dishes with the food ambassadors from the kitchen. Since the pandemic, other activities also involve a digital version of this event (without the harvesting) called 'digital cook along'. All food harvested from the farm is used in the kitchen from Monday to Friday, mainly when the house is open for lunch, conferences, and study visits. The kitchen also produces a lot of preserves and condiments, especially when there is a crop surplus.

At times companies, students, and other prominent groups come to work at the farm as a part of a more extensive experience of Botildenborg and community engagement and education

Farming spaces at Botildenborg

- The social garden is used by school groups and for community gardening with different social groups. The primary purpose of this space is education and social interactions; it is a garden for experimenting with small-scale farming and learning through doing. School groups (ages 5-16) visit the social garden 1-3 times per week. The social garden's main space is the outdoor kitchen, and a fire pit is used regularly for cooking the farm's produce harvested by the school's groups. In this space, several ways of growing food are used, including no-dig, raised beds, and perennial food crops. All is carried out just with manual labor without using any machinery.
    - The perennial food garden (currently under implementation).
- The market garden grows food for the kitchen and the farm shop. It is farmed using small-scale market garden principles and only manual labor and hand-driven tools. The food is grown using organic principles and with low tillage.
- Former test beds, where until 2022, farmers partaking in the Incubator Program for Urban Farming could practice cultivation and experiment with different techniques. Whilst the funding for this project is over, the space currently remains of no use.
- The polytunnel is used by both the market garden and the social garden to grow crops such as tomatoes, cucumbers, peppers, and chili in the summer.

The polytunnel greenhouse

Job creation at Botildenborg urban farm

At the market garden, people are involved in work training in groups of 5-10 people at any time. This is part of a program run by Botildenborg and aims at getting unemployed people back into the job market. They are overseen by an employee from Botildenborg who coordinates the work. Additionally, 2 to 4 farm interns are on site from March until November and work full-time. The interns and the work practice can work across all the spaces.

Main objectives of the challenge:

Closing nutrient loops: designing a new composting unit.

The compost can act as the stomach of the farm, where green waste is turned into new nutrients, creating a circular system. Botildenborg is far from being self-sufficient in compost, and they currently buy municipal compost made from the green waste of the city as well as organic fertilizers based on seaweed. In the social garden, nettle and comfrey water are also prepared and fertilized.

The task is to develop functioning composting systems that can maximize the amount of compost self-produced within the farm and act as a pedagogical tool for groups working in the garden.

The composting unit would be fed by both the cooked kitchen waste and the organic material generated within the farm consisting of old plants, crop residues, and organic substrates from microgreen production and mushroom cultivation.
Botildenborg displays a smaller but functioning composting system in the social garden with a cold composting system and a small worm unit.
The new composting unit will have to meet the requirements of being manually operated (to allow for realizing workshops and training) and preserve the space's aesthetics and usability. As so many different groups use the garden, Botildenborg aims to showcase several ways a farm can compost waste so that the nutrients stay in the farm loop.

Post-harvesting area and washing station

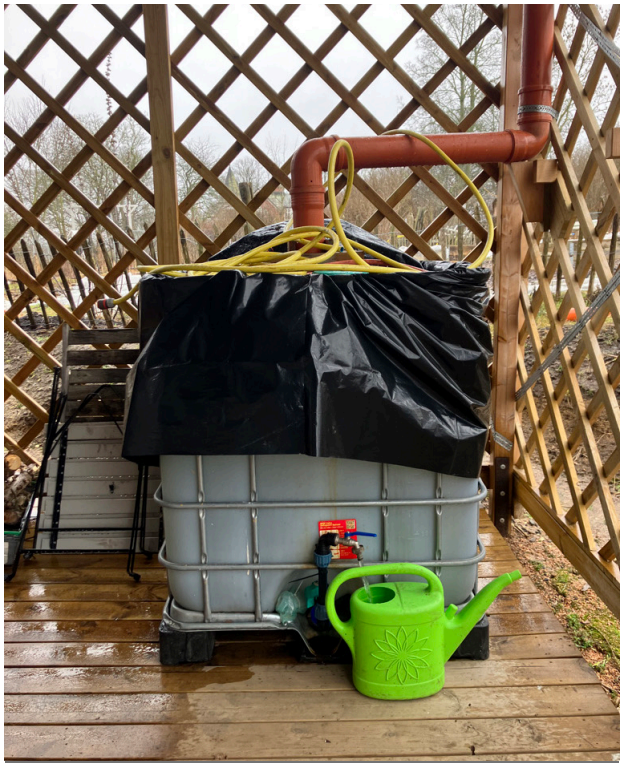
Create a system for water harvesting and minimise water use.

Malmö often has wet winters and dry summers. Botildenborg site is exposed to sun and wind throughout the summer; therefore, one of the main challenges of Botildenborg is to find solutions that can maximize the capture of rainwater and minimize water use on crops, especially during the summer.

Currently, Botildenborg has installed six IBC (intermediate bulk containers) tanks capturing the water runoff from the farm building's roof. However, an experienced problem was associated with the high rainfall during the winter (exceeding tank capacity in a period when water is not needed). A small pond is also present, which enables capturing the water run-off from the vegetable washing station and precipitations; water from the pond could also be used for irrigation.

It should be noted that municipal tap water is used for washing vegetables during harvest season (April-November) for food hygiene reasons. The same applies to the irrigation of microgreen, mushroom, and hydroponic cultivation units in shipping containers. The challenge here is to develop methods that can be used to maximize the use of rainwater and minimize the use of municipal water, as well as identify cultivation systems and strategies that can reduce water requirements, especially for what concern crop production in both the market garden and the social garden.

Entrance to the social garden



IBC tank at the farmhouse

Designed tools used for cultivating the soil

Keywords

Small-scale farming, urban farming, water harvesting, water capture, composting, resilience, closed-loop systems

TEAMS

Participating students

Wastewarriors

Aurel Lashermes (University of Bologna), Navodi Namalgamuwa (Swedish Agricultural University), Chiara Piscopo (University of Bologna), Jhorman Cardona (University of Bologna), Andrea Giovannini (University of Bologna), Santa Kirsanova (Swedish Agricultural University)

The Compost League

Emily Schrödel (University of Bologna), Angelica Rampini (University of Bologna) , Sabrina Pognant Viù (University of Bologna), Golia Roshani (University of Bologna), Marguerite Arnedo (University of Bologna), Victor-Adrian Roșca (University of Bologna), Tamara Hadházi (Swedish Agricultural University), Sara Rahbaran (Swedish Agricultural University)

Brown Blues

Daniella Vecsei (Swedish Agricultural University), Line Tangen-Hestnes (Swedish Agricultural University), Masoumeh Dehghan (University of Bologna), Francesca Missanelli (University of Bologna), Emma Albertelli (University of Bologna), Tanguy Vierne (University of Bologna), Nicolas Kahn (University of Bologna)

Vermicelli

Chien Hua Lee (Swedish Agricultural University), Zhonghao Duan (Swedish Agricultural University), Miriam Aluise (University of Bologna), Riccardo Prandi (University of Bologna), Pavel Pavlov (University of Bologna), Erich Kronsteiner (University of Bologna)

The Compost Cup

Antoine Cadet (University of Bologna), Lisa Bellini (University of Bologna), Anton Zakurin (University of Bologna), Michele Razzaboni (University of Bologna), Dona Dilrukshi Madurawala (Swedish Agricultural University), Nikita Weerasinghe (Swedish Agricultural University), Ferstina Wady Scott (University of Bologna)

Koltrast Innovation

Giulia Stanzani (University of Bologna), Karin Stureson (Swedish Agricultural University), Alessandra Valenti Martinez (University of Bologna), Tijana Cukic (University of Bologna), Amber van Loosbroek (University of Bologna), Simone Boni (University of Bologna) Federico Venturi (University of Bologna), Hrishikesh Rajendra Dhamdhere (University of Bologna)

Agri Flow

Sara Dellaglio (University of Bologna), Stefan Hölfont (University of Bologna), Andrea Mancuso (University of Bologna), Iana Romanchuk (University of Bologna), Anjali Senarath (Swedish Agricultural University), Margot Tura (University of Bologna), Sara Ubbiali (University of Bologna)

Co-Wormers - 1st RANK

Gaia Besate (University of Bologna), Georgia Chaniotaki (University of Bologna), Héctor Leandro Fernández Colino (University of Bologna), Pauline Crouiller (University of Bologna), Bruno Burke (University of Bologna), Thea Jönsson (Swedish Agricultural University)

Aurel Lashermes, Navodi Namalgamuwa, Chiara Piscopo, Jhorman Cardona, Andrea Giovannini, Santa Kirsanova

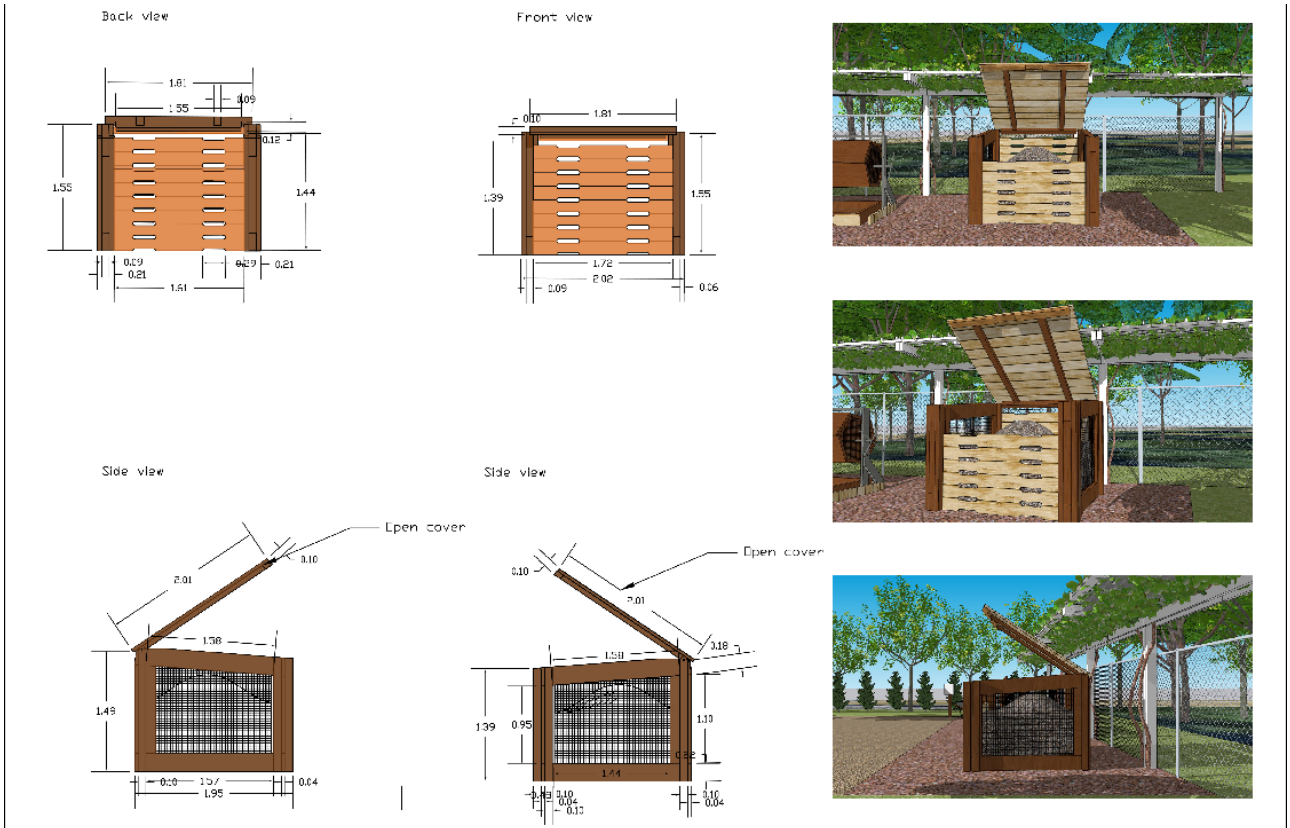
Wastewarriors

Abstract - Too good to waste: an innovative composting system to close the nutrient loops in Botildenborg

The group Waste Warriors project will focus on aerobic composting, using a 3-bin compost system to compost large volumes of organic material, efficiently and quickly, typically within a few months. The first bin will be used for fresh organic material, the second will host the organic matter beginning to break down into a nutrient-rich soil amendment, while the third will be used for finished compost that is ready to be used in the garden or other planting areas.

This makes an excellent choice for our project, as we want to be able to produce compost promptly that can be used to support sustainable urban agriculture. This will help to close the nutrient loops of the farm and make it furtherly independent from industrial compost, conforming to a circular economy perspective.

The main challenges the group wants to focus on are exposure to wind, pests, and the sun's harsh rays, which can disrupt the composting process. To address these challenges, the group plans to design and implement new composting units with protective covers, barriers, and specific compost designs to prevent pests from entering. The project will take place on the North-West side of the area, which offers open space for the composting system while being protected from the main North winds.
In addition to these practical features, the composting units will be designed to create a space that is welcoming and engaging to the public. The plan is to offer educational information about composting and urban agriculture, as well as workshops and classes that will teach people about sustainable living practices. By doing this, we hope to encourage an increasing number of people to get involved in composting and urban agriculture and to help promote a more sustainable way of living in urban environments.



Compost units design

Rendering of the compost units

Emily Schrödel, Angelica Rampini, Sabrina Pognant Viù, Golia Roshani, Marguerite Arnedo, Victor-Adrian Roşca, Tamara Hadházi, Sara Rahbaran

The Compost League

Abstract
First of all, we would like to present our group "The Compost League". We are eight students from the University of Bologna and the SLU Alnarp near Malmö.

The aim of our project is to create a larger, more easily manageable composting unit on site, that is based on the "One rule compost" strategy and integrates a separate worm unit, so we have diversity in methods. The composting frames could be made out of recycled wood slates and a wire mesh to help the compost breathe, and therefore it would not require a lot of workloads (turning it often). Applying a mesh screen on top and on the bottom would also prevent rats from getting access to the compost. The frames themselves can be disassembled and moved, so that the compost doesn't have to be extracted. This way, the pile stays in one place once the compost reaches the desired quality, and the frames can be moved to the side to start a new pile.

The worm farm would be a different method of composting since it generates composting worms that can be used additionally to conventional compost. Worm farms are an enclosed compost area in which worms consume food scraps, digest them, and then produce worm compost. For this kind of composting systems you need special kinds of worms (e.g. Red wigglers or European Night crawlers). The worm bins are usually made either out of plastic or wood because those materials don't have any antimicrobial properties. Bacteria and other microbes are highly needed for worms to thrive and start their composting process. Important is the diet of worms. It usually consists of organic kitchen waste like vegetables, fruits, eggshells, and coffee grounds in addition to shredded newspaper or tea bags. You should stay away from meat or dairy products for those worm farms. Inside the worm farm you need to mimic the natural habitat of the worms. You could use materials like wood chips, shredded paper, peat moss or shredded brown cardboard. Worm farming is not for everyone. It is sometimes quite hard to start farms and you need to establish a relationship with local farmers in order to have a consistent source of income.

As we know that Botildenborg struggles with the yield of collecting enough resources for their compost, which prevents them from being self-sufficient, we also offer the initiative of a registration system, where nearby neighborhoods can offer their own organic waste to the farm in for example exchange of discounts on their products. For this to be easily managed, a volunteer/worker from Botildenborg would go out every week to the registered households and collect their organic waste. In the end it is a win-win situation for every member.

Taking the design in mind, we would also create a visual separation through installing a hedge or a "green screen" that also contributes to mitigating the smell of the compost during the flowering period.

Infographics for possible Botildenborg's events and projects

A possible flyer for the workshops at Botildenborg

Daniella Vecsei, Line Tangen-Hestnes, Masoumeh Dehghan, Francesca Missanelli, Emma Albertelli, Tanguy Vierne, Nicolas Kahn

Brown Blues

Abstract - Dry and hot solutions for Botildenborg

Botildenborg is a sustainable urban farm and a meeting place in the eastern part of Malmö and works with cultivation and food, contributing to a more sustainable city. In particular, Botildenborg focuses on market gardening (crops grown for the kitchen and farm shop on site) and social farming (improved knowledge of people and kids through direct experience and as a pathway for reintegration in the job market). The farm also integrates an ecological and an economic aspect to become a complete and autonomous system. The farm includes the cultivation of vegetables and fruits, a cooking workshop, and a market to sell the products.

The farm is constantly looking for techniques to improve its sustainability and trying to solve problems related to the use of water and nutrient loops: in particular, new solutions to maximize the use of rainwater and strategies to reduce water requirements. The farm aims to be more self-sufficient in composting by looking for techniques to recycle cooked kitchen waste and organic material generated within the farm.

In this project, we will try to find additional solutions that can be implemented within the farm taking into consideration all three spheres of sustainability and the already present infrastructures and services in the farm.

As far as composting, we found two main ideas that could improve the sustainability of the farm: dry toilets and hot compost.

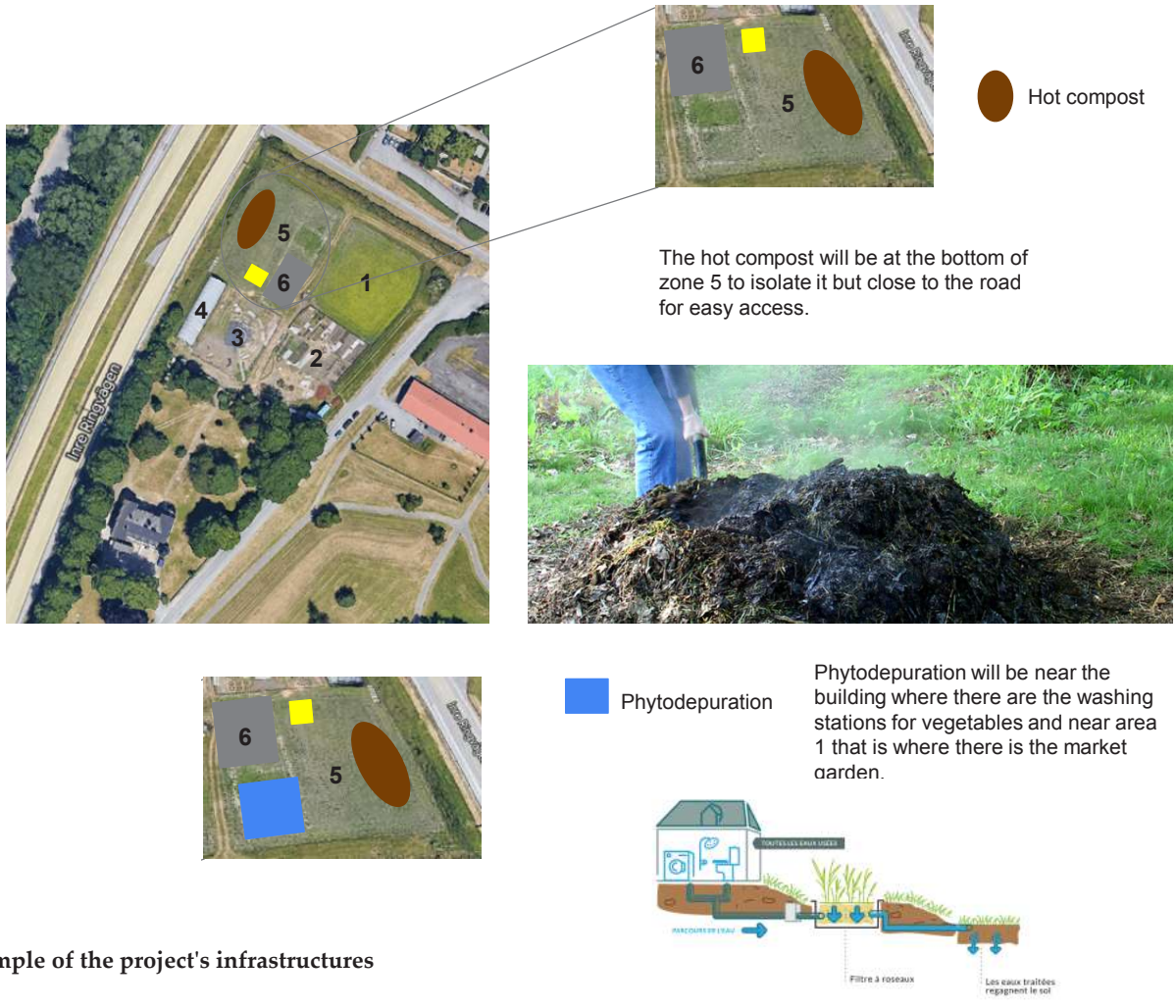
The former solution is an outside toilet system that doesn't require flushing and uses urine for irrigation after treatment and excrements as manure. For the latter solution, hot composting is a technique using heat to optimize microorganisms' activity to rapidly decompose organic waste.

About different uses of water, we thought about Phytodepuration to reuse wastewater that is purified by the action of microorganisms hidden in the root system of the plants: an economical process with great ecological interest.

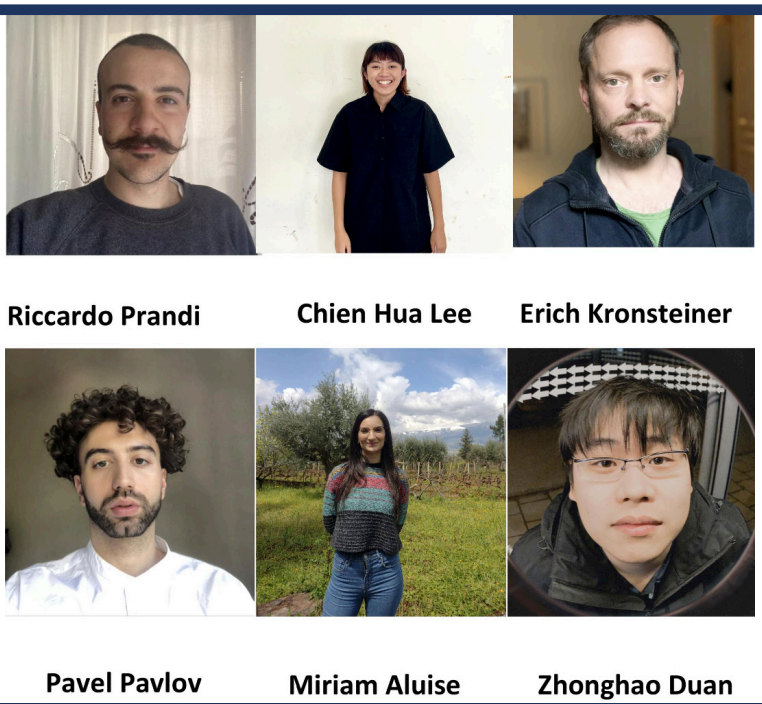
All our methods are sustainable and quite easy to realize. Socially speaking, they are systems that can expand the knowledge of the people attending the farm and be helpful to students who visit it. In addition, since phytodepuration uses plants, it is also a method to visually improve the environment of the farm which can provide non-material benefits like recreation and aesthetic experiences (cultural ecosystem services).
From an economic point of view, the systems are cost-efficient and allow the farm to avoid waste of money: i.e., the water produced by the phytodepuration process can be used instead of the tap water needed to wash vegetables. It is a natural system continuously working that requires little maintenance.

Lastly, the solutions we suggest are ecologically sustainable since they recycle materials already present or that can be produced on the farm: hot compost uses a scrap of food from the kitchen and harvesting; the result of dry toilets can be recycled for irrigation and compost that is completely natural without adding pollution into the soil; phytodepuration uses plants that can provide additional water and help with the absorption of CO2 from the atmosphere.

The production system needs to be completely integrated into the social environment to reach its maximum power of transformation; doing so, it is fundamental to involve all the stakeholders. This challenging and powerful environment will be possible by developing the strategy into four main pillars that will be detailed ahead on this paper:



Example of the project's infrastructures



Chien Hua Lee, Zhonghao Duan, Miriam Aluise, Riccardo Prandi, Pavel Pavlov, Erich Kronsteiner

Vermicelli

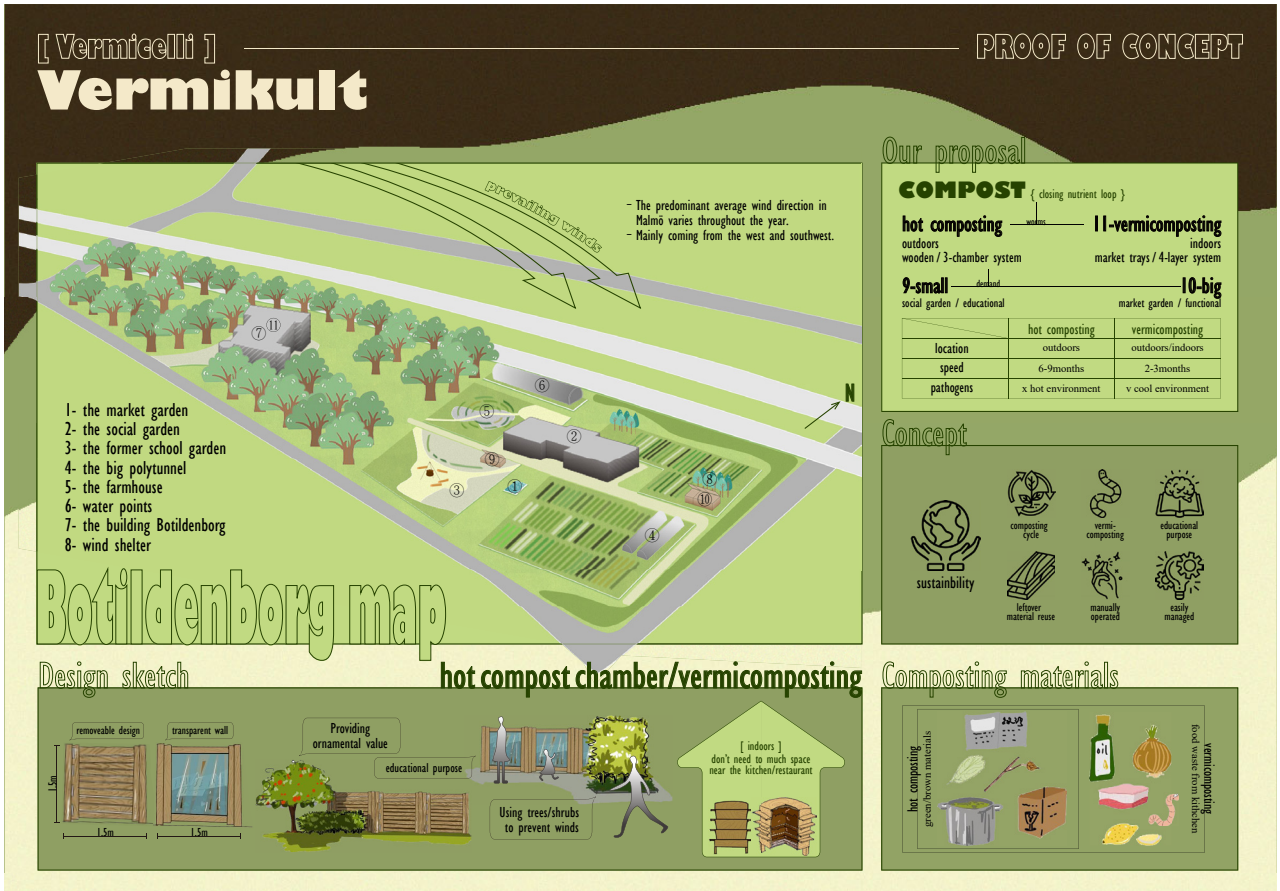
Abstract - Vermikult

Vermikult is a blend of existing composting approaches, such as permaculture and vermicomposting, designed to meet the needs of a vegetable farm. We have introduced a low-tech system with minimal space and energy requirements, which is easy to maintain and requires only a short training period for the operators. To develop a sustainable but highly efficient composter, we scaled up a home garden system and improved the decomposition process by introducing compost worms (Eisenia fetida), beneficial microorganisms, and mechanical mixing. The compost unit can be built with waste wood like boards from garbage dumps. It is a three-chamber system where the three compartments are aligned next to each other. The front part can be removed, and the top is covered by plastic sheets. Each compartment has a vertical transparent glass or plastic strip on its backside, where visitors and growers can monitor the rotting process. To protect the microorganisms and worms from daylight, a removable board covers those display strips. For the base layer, we recommend spreading shredded woody parts and shrubs. The first batch in chamber number one is inoculated with organic matter-degrading bacteria, fungi, and compost worms. To create and maintain a favorable environment for the worms, moist paper shreds are spread over them. Before adding fresh organic waste, the paper must be set aside (with a small hand rake) and then the fresh organic waste can be placed over the decomposing matter and worms. After the first rotting phase is completed, the half-rotted compost is shoveled to the second chamber – easily accessible by removing the front wall. This mixes the raw compost with the soil-beneficial organisms, aerates the entire batch, and accelerates the rotting process. When it reaches the next degradation stage, the compost is shoveled into the third chamber.

There, not all of the garden soil is harvested, but some are kept aside to be used for future compost making, just like a sourdough starter, therefore recycling the beneficial soil (micro)fauna by mixing it with green waste in the first chamber as the next cycle begins. Also, the compost worms are recycled by easy-to-apply mechanical measures. This three-chamber construction represents the smallest operating unit which can be replicated as needed throughout the farm. We assume that the

rotting process with Vermikult is up to twice as fast as the passive systems when the composition of carbon- and the nitrogen-rich matter is balanced and the living environment for the worms and oxygen supply is maintained. As with any compost, it is recommended to move it through a sieve before distributing it. To summarize, Vermikult is:

- Easy to use - without much training for employees
- Built with affordable or recycled material
- Offers a fast decomposition process
- Requires only initial input of compost worms and microorganisms.
- Ensures an almost complete plant nutrient cycle by converting bio-waste into highly fertile, ready-to-use garden soil



Example of the composting systems

Antoine Cadet, Lisa Bellini, Anton Zakurin, Michele Razzaboni, Dona Dilrukshi Madurawala, Nikita Weerasinghe, Ferstina Wady Scott

THE COMPOST CUP

Abstract

The Purpose of The Project
Compost is a useful product derived from fermenting processes of fresh organic matter, including organic waste derived from home activities, like food waste and gardening. The "Compost Cup" will involve the inhabitants participating in the compost production chain, in particular for children and their families. The project's objective is to teach how to compost work and stimulate the community to participate in the process to increase sustainability, creativity, and team-work, with the creation of a circular business.

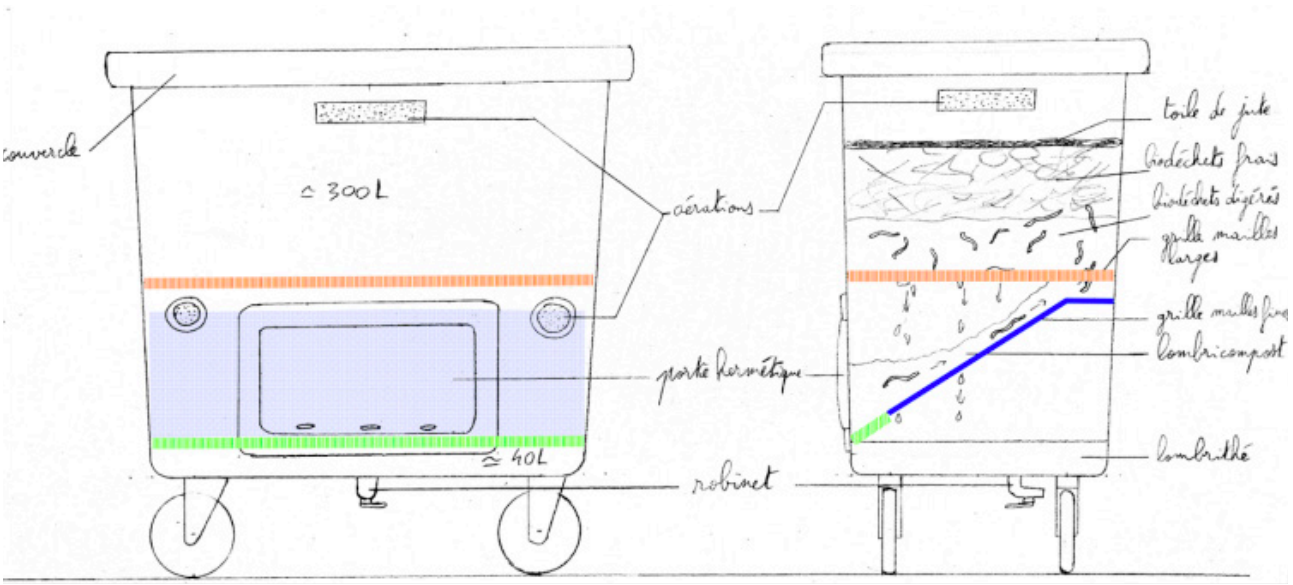
No waste, local business, and natural resources are the three main pillars of our project, and also of the sustainability mindset that we wish to teach children with our game, we strongly believe in the power of education, and in the fundamental role that it has in the realization of a sustainable society.

We wish to give Malmo's kids the opportunity to be aware of their environmental footprint and how this can be reduced using their creativity, indeed another fundamental feature of the project is that we teach them a very simple model of a circular business: local organic waste gets managed by themselves, and in the end, it gets sold to the very local community, generating richness at almost zero cost, since one of the mandatory tasks of the competition is to use only recycled materials.

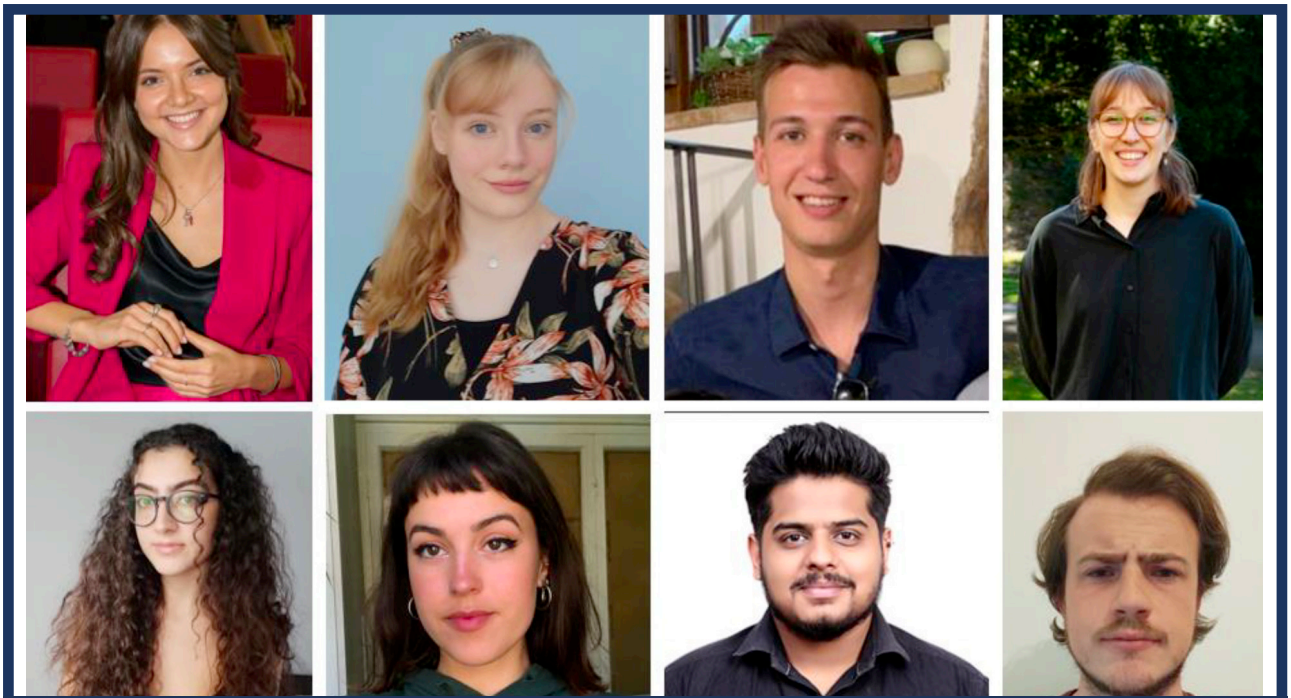
The Composting Methods
We wish to teach kids three different composting methods, among which they can choose the type that best fits their situation. Here there are:
1. Bokashi bin
2. Three level basket
3. Woven Compost Basket

The final product consists in liquid compost and soil compost that everybody can use in their orchard. All these fermenting tools can be built at home using recycled materials and the functionality is very high, indeed each team just needs to add inside, for the Bokashi and the three level basket, food waste, and in the woven compost basket every gardening residue, like branches and cut grass.

The Compost Cup is a fun game open to everyone who wants to participate, the winner will be the one team that succeeds to produce the best and most abundant fertilizer.



Idea for the been worm compost unit



Giulia Stanzani, Karin Stureson, Alessandra Valenti Martinez, Tijana Cukic, Amber van Loosbroek, Simone Boni, Federico Venturi, Hrishikesh Rajendra Dhamdhere

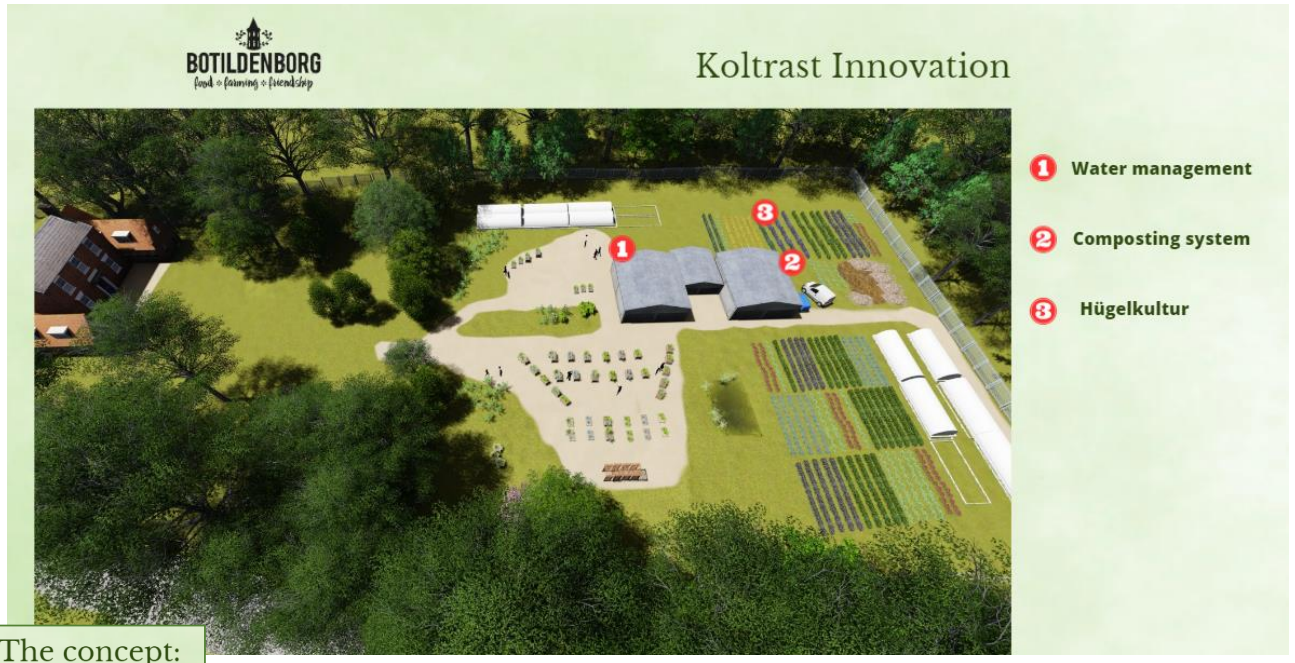
Koltrast Innovation

Abstract

To innovate the Botildenborg farm in Malmö we look at two factors: water management and composting. Botildenborg deals with wet winters and hot and dry summers. To improve the water use on site it is key to obtain and store water during the winter that can then be used in summer. We propose this via a rainwater collection system. The system consists of wide gutters alongside the buildings on the site that will collect rainwater, which is in turn stored in a collector. This collector will be equipped among other things with filter systems, a control panel, and a water level indicator. Furthermore, the soil of the farm consists of heavy clay, this soil type has high water retention. The wet winters can cause drainage issues. Therefore, we want to use the unused land to perform agriculture using hügelkultur. On this plot, species that are also used in the kitchen and sold at the market will be grown. Lastly, to tackle water efficiency use of the farm irrigation must be monitored and a new irrigation plan will be made. The improvements in water use tackle the ecological sustainability sphere as water use will be more efficient and thus more sustainable. The construction of the unused land into the hügelkultur will also provide an educational and thus social purpose. Lastly, by using this land more produce will be grown, which will benefit the economic structure of Botildenborg.

Botildenburg currently uses a cold-composting technique. We want to improve this aspect of the farm by introducing a Bokashi composting system to the kitchen. This type of composting uses an anaerobic process and produces a nutrient-rich liquid called Bokashi-tea, and fermented food scraps. This method of composting is designed for food scraps and is thus perfect for the kitchen. Bokashi composting combines inoculant and effective microorganisms (EM), such as bacteria that belong primarily to three strains: Saccharomycetes spp., Lactobacillus spp., and Rhodopseudomonas spp. The tea is used in a diluted form on the soil and the solid food scraps left are added to the outdoor composting unit. Improvements will also be made to the outdoor cold-composting method by shifting it to combination composting which is a combination method of open-air composting, direct composting, vermicomposting, and EMO composting. Yield will likely go up by having richer

compost resulting in an economic improvement. It also serves as an ecological improvement as food scraps and garden waste are reused and turned into compost. Besides commercial crops, medicinal plants will be grown on the unused land. These species can be used as compost activators and help initiate the composting process, like, Symphytum officinale, Urtica dioica, Urtica urens, and Achillea millefolium. These plants also trap nutrients and act as beneficial insect attractants. By involving these types of plants in the garden people can be taught about the use of medicinal plants in agriculture and thus also serve a social and educational function.



The concept:

Example of activities in Botildenborg

Sara Dellaglio, Stefan Hölfont, Andrea Mancuso, Iana Romanchuk, Anjali Senarath, Margot Tura, Sara Ubbiali

Agri flow

Abstract
The only possible way forward for technical advancement and development in the urban framework is following the three pillars of sustainability: environmental, economic, and social.

This is why a project must be grounded on all the aforementioned aspects and take an ecosystemic approach to be properly defined as "sustainable".

First and foremost, water, nutrients, biodiversity and soil health should be considered when discussing **environmental sustainability**.

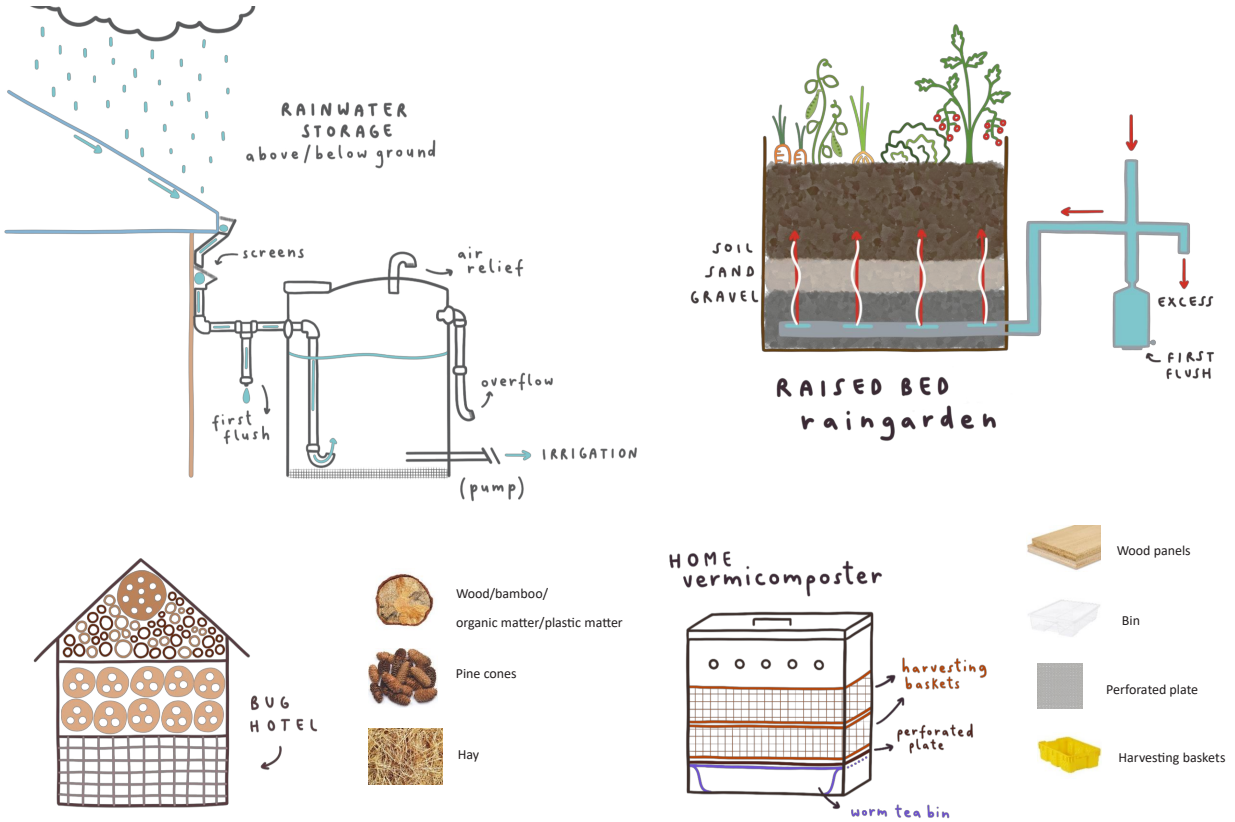
One solution to address water scarcity issues in the peri-urban context is the realization of a small-scale irrigation system based on rainwater harvesting from building roofs.
For open-field cultivation, drip irrigation is the most efficient method and limits contact with edible biomass when using rainwater.
Even better, the best way to reduce water use is certainly soilless cultivation: indoor closed-loop hydroponics allows you to save up to 95% of water while securing year-round pesticide-free production.
Another concept that comes in handy when planning a circular agroecosystem is the idea of creating a perennial food forest and inserting rain gardens.

Moreover, to improve nutrient cycle circularity and efficiency it is important to implement an effective composting process.
Vermicomposting uses earthworms to break down organic matter into nutrient-rich compost that improves soil health and also has antifungal and insecticidal properties.
The kitchen scraps resulting from the restaurant can be fermented through a Bokashi composting process, thus ensuring the recycling of resources.

Pollinators such as bees, butterflies, and birds play a crucial role in our food system.
Creating a pollinator-friendly environment with natural windbreaks and bug hotels helps support these important species, safeguard biodiversity, and maintain a healthy ecosystem.

Next, **economic sustainability** can't be overlooked.
In terms of water and nutrient management, both water harvesting and composting systems can lead to cost savings, as water expenses are reduced, less fertilizer and potentially pesticide need to be purchased, and at the same time crop yield is improved.
Experiences could be at the core of Botildenborg's farm business model: proposing technical workshops based on sustainability issues could be a source of income while emphasizing brand identity and preserving the farm principles.
Then, promoting and selling fresh hydroponic products and also processed ones (like hydroponic pesto) is an innovative market opportunity.
Another proposal that can have a direct impact both financially and socially is the institution of a fidelity membership card, obtainable through an annual payment for membership, to promote social cohesion around the farm and underline the feeling of community while supporting the farm projects.

Economic initiatives also reflect into **social sustainability**.
Workshops for both kids and adults are a way to make citizens from the surroundings feel involved in the farm-inclusive reality, promote social integration and educate about sustainability matters.
Some workshop ideas are modular simplified hydroponics, home vermicomposting units, and bug hotels for the urban environment.
In this way, Botildenborg could play an active role in spreading awareness and promoting sustainable lifestyles that may benefit the entire community, helping everyone feel that taking action is easier than people think.



Example of composting and rainwater collecting in Botildenborg

Gaia Besate, Georgia Chaniotaki, Héctor Leandro Fernández Colino, Pauline Crouiller, Bruno Burke, Thea Jönsson

Co-Wormers - 1st Rank

Abstract

The goal of this project is to design and implement a series of efficient composting units with a vermiculture system that can maximize the amount of compost self-produced within the farm and act as a pedagogical tool for groups working in the garden.

The first step is to create a worm nursery. It will be formed by containers with a little clear see-through window, filled with soil and organic waste (from the kitchen) and Specy earthworms. Here the worms will thrive and grow and each week the kids can help by providing them their food and seeing them moving from the window on the boxes. The containers will be stored on shelves inside, to have controlled conditions.

Once the worms are ready, they will be taken from the nursery and placed in the compost units, which will be located at strategic points outside the garden.

Each composting unit is made of three stackable boxes. In the middle one, there are the worms, ready to act. The green and brown waste got will be put in the upper one, and then covered with a lid. On the bottom, there is a container that collects the exudates from the worm's activity or the so-called “compost tea”.
The composting unit will be manually operated and will be fed by both the cooked kitchen waste and the organic material generated within the farm consisting of old plants, crop residues, and organic substrates from microgreen production and mushroom cultivation.

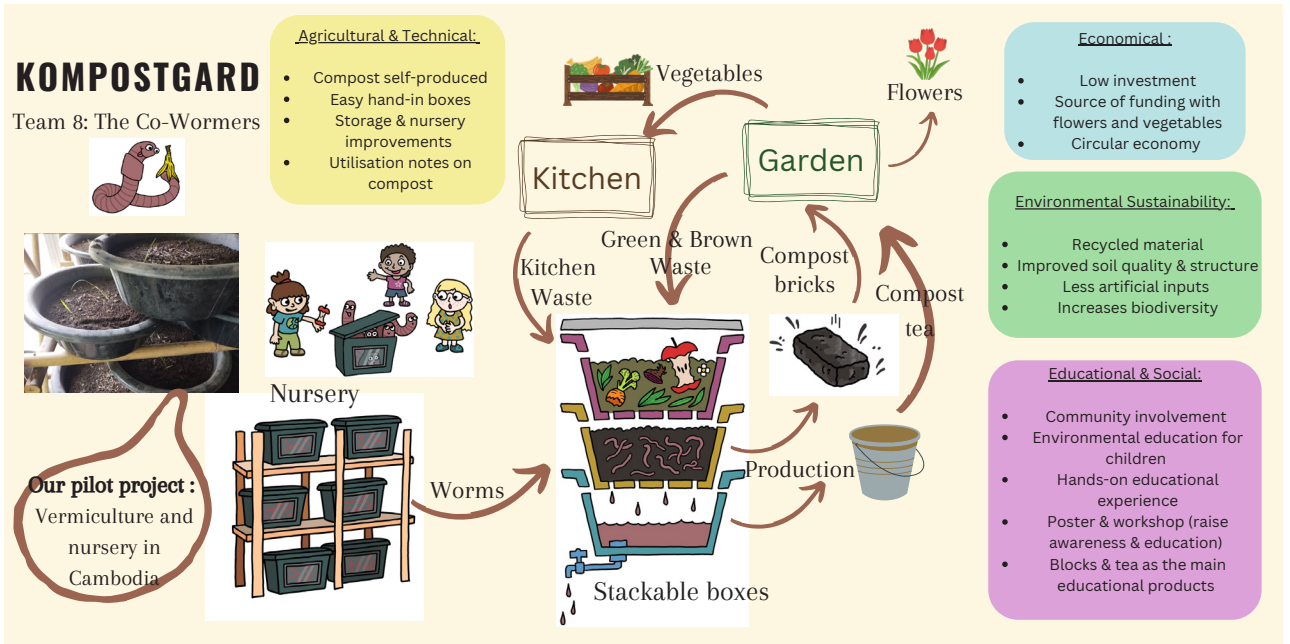
The worms will naturally move toward the upper box where their food is, following a nutrient gradient.

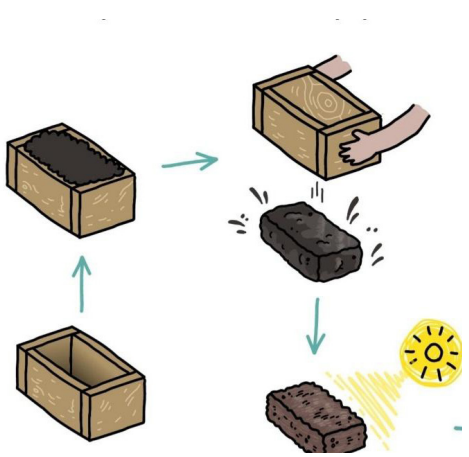
From each composting unit there will be two products:

1. The compost tea directly from the faucet on the bottom that can be taken up by kids and use to water the soil and plants since it acts as a natural fertilizer, rich in nutrients.
2. The mature compost will be used to build bricks manually with molds and let them dry in the sun. Once they are dried, they can be placed where they are needed, to fill the soil with nutrients, available for the veggies and flowers to grow.

Kids are included in the whole process, from vermiculture to composting and actively participate in reassuring nutrient recycling in the Botildenborg site.

The addition of a vermiculture system will increase the efficiency and speed of the composting process while also minimizing waste. This project will be implemented at Botildenborg in Sweden, where they already display a smaller but functioning composting system in the social garden with a cold composting system and a small worm unit.





Example of the composting concept

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