

DEPLOYING URBAN AGRICULTURE SOLUTIONS: A NEW OFFER FOR REGIONS?

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Vegetable farm pilot project in Lille -
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After 24 years working in Veolia's waste recycling and recovery business in France as a regional operations director, Loïc Couttelle is currently project director at 2EI Veolia where he heads up the Urban Agriculture project. He also privately runs a 40-hectare farm on the outskirts of Lille.

Against a background of increasing soil sealing and dramatic climate change, urban and peri-urban agriculture offer solutions to new regional challenges. Veolia supports cities and industries in the management, optimization and development of their water, material and energy resources, and is leading the debate on creating new agricultural production systems in urban and peri-urban settings, in synergy with its historical businesses. Its innovative experimental approach has identified an agricultural model that is both intensive and high-quality, in partnership with startups, social enterprises and local authorities. The model combines aquaponics with bio-intensive vegetable microfarming, and delivers a number of ecosystem services while ensuring efficient production with high added value. Located on available land within urban and peri-urban areas, these solutions are a response to growing consumer expectations in terms of short circuits and the traceability of food products. They offer great opportunities for urban development to improve landscape quality and inclusivity in cities, along with the well-being of their inhabitants.

INTRODUCTION

Between 2006 and 2015, mainland France has witnessed the disappearance of more than half a million hectares of agricultural land and natural areas, the equivalent of losing a department like Seine-et-Marne, Drôme or Loir-et-Cher every 10 years in terms of agriculture and ecosystems¹. Soil sealing², which is growing more rapidly than the population³, is destroying natural environments and threatening biodiversity, while also increasing flood risks. In this context, developing new methods of producing and supplying food is more necessary and strategic than ever for regions. Urban and peri-urban agriculture removes some of the pressure on rural land and brings biodiversity back into the city in response to these new challenges. Sharing many synergies with the Veolia Group's historical businesses, this activity corresponds to the growing appetite of city dwellers and local authorities for high-quality food production, short circuits and greener cities.

1 "La nature sous pression, pourquoi la biodiversité disparaît" [Nature under pressure, why biodiversity is disappearing] Bilan 2019 de l'Observatoire National de la Biodiversité, Agence Française pour la Biodiversité.

2 According to Eurostat, sealed land includes built land and covered and stabilized ground (roads, railways, parking lots, paths, etc.).

3 +1.4% per year on average between 2006 and 2015.

AN INNOVATIVE EXPERIMENTAL APPROACH

EXPLORATION PHASE

Veolia's interest in urban agriculture arose from its conviction that real opportunities exist for the Group in this area. Since 2016, staff at 2EI have been working on the design of new intensive and high-quality farming systems in urban and peri-urban settings. Extensive research has also been carried out on existing urban agriculture projects around the world, to build an understanding of the challenges involved and key success factors. The study's goal was to imagine what role the Veolia Group could play in creating this new food production model, drawing on the expertise of its historical businesses. It also sought to identify robust and repeatable business models.

These preparatory studies revealed two forms of urban agriculture of interest to Veolia:

- aquaponics (1)
- bio-intensive vegetable microfarming (2)

The aquaponics system (1), which combines aquaculture with hydroponics, makes use of Veolia's expertise in the design and construction of aquaculture processes through its subsidiary Veolia Aquaculture, and in the construction of circular models for managing energy, irrigation and fertility.

Bio-intensive permaculture-based microfarming (2) offers the opportunity to create new inclusive food-producing ecosystems for cities, including through the rehabilitation of industrial wasteland, where Veolia has significant expertise in decontaminating and bringing sites up to standard.

Two pilot projects have emerged from these two urban farming models, thanks to partnerships formed with local stakeholders:

- the Ferme Abattoir project in Anderlecht (Brussels), headed by Steven Beckers, which inspired Veolia to take a stake in BIGH (developer and operator of aquaponic urban farms) in 2019;
- an experimental bio-intensive microfarm, inspired by techniques developed at the Ferme du Bec Hellouin⁴ in Haute-Normandie and implemented with the social enterprise ELISE on the site of the national wholesale market (MIN) in Lomme (Lille).

In Brussels, the Ferme Abattoir is BIGH's first production site. Located on the roof of a food market, its aquaponics system (which links fish farming ponds with horticultural greenhouses) operates according to the principles of a positive-impact circular economy, thanks to numerous synergies between the farm, the building it rests on, the district and the city itself. This magazine contains an article⁵ on the subject.

4 Cf. Interview with Charles Hervé-Gruyer, co-founder of the Ferme du Bec Hellouin, in this issue of FACTS - the Veolia Institute magazine, "Permaculture and Bio-intensive Micro-agriculture: the Bec Hellouin Farm Model."

5 Cf. Steven Becker's contribution to this issue of FACTS - the Veolia Institute magazine, "Aquaponics: a Positive Impact Circular Economy Approach to Feeding Cities."

THE VEGETABLE FARM PILOT PROJECT IN LILLE

Veolia, already active in communal services management in Lille, joined forces with the back-to-work social enterprise ELISE in early 2018 to launch a short circuit, bio-intensive urban microfarm pilot project on the site of France's second-largest national wholesale market in Lomme, on the outskirts of Lille.

Encircled by a large green belt, the European Metropolis of Lille is France's most agricultural metropolis, with almost 45% cultivated land and more than 750 farms.⁶ Bringing the rural and urban worlds closer together is an integral part of the city's development strategy, and often inspires projects to rehabilitate industrial wasteland, which is not lacking in the region. The conjunction of these regional characteristics with a strong political will to take on the challenges of food production and soil sealing made this urban agriculture pilot project possible.

The project has multiple objectives:

- develop expertise conducive to this type of farming, in terms of agronomy, economics and organization;
- assess its environmental benefits;
- explore roll-out conditions;
- exploit the potential of this new activity from a social inclusion perspective.

The 6,000-square-meter plot has been disused for 30 years, but is now being cultivated using methods inspired by the

6 <https://www.lillemetropole.fr/votre-metropole/competences/developpement-territorial-et-social/agriculture-et-alimentation>



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Parisian market gardeners of the 19th century. To make every square meter as productive as possible, in a sustainable way, these methods, in use at the Ferme du Bec Hellouin, hinge on the following: growing on permanent boards, densely planted mixed crops, and the management of organic matter flows and soil richness. Operation of the farm is also systemically organized according to the principles of permaculture.

In addition, the experiment made it possible to develop a dedicated digital planning and decision-making tool, plus a method for teaching bio-intensive microfarming techniques tailored to disabled people and/or people returning to the workplace. The training will be tested on the experimental farm site with the help of two disabled ELISE employees.

FROM CREATING THE ECONOMIC MODEL TO DEVELOPING A SOLUTION

AN ECONOMICALLY VIABLE URBAN AGRICULTURE MODEL

While urban agriculture projects are often implemented on a small scale, with limited goals in terms of food production, Veolia instead wants to develop economically viable models centering on efficient production processes and strong local partnerships. Based on the experiments conducted in Lille and Brussels, Veolia's urban agriculture model combines vegetable microfarming and an aquaponic farm on the same site. These two activities complement one another from an economic, social, and environmental point of view:

- Although it is seasonal, bio-intensive vegetable microfarming requires little initial investment. The main costs arise from human resources, as production is not mechanized. The farm can operate in collaboration with the social and solidarity economy and provide an opportunity for people returning to the workplace. From an environmental perspective, the diversity and concentration of vegetable varieties offers high potential for carbon storage in the soil. According to a study carried out by the University of Liège⁷ at the Bec Hellouin farm, the storage rate in plots cultivated using bio-intensive microfarming was between 7 and 26 times higher than the "4 per 1000" target⁸, depending on the cropping intensity and production type. Other environmental benefits provided by this type of agriculture include increased soil permeability (which reduces the risk of flooding), retention of biodiversity, and the reduction of urban heat islands.

Based on experiments conducted in Lille and Brussels, Veolia's urban agriculture model combines vegetable microfarming and an aquaponic farm on the same site

- Faced with the fragility of fisheries stocks and the need to rethink our consumption of animal protein, demand for farmed fish is currently growing strongly. In this context, the high-quality aquaculture production made possible by aquaponics ensures the economic solidity of the model. Unaffected by the seasons, fish farming and greenhouse vegetable growing are almost continuous throughout the year, but do require highly specialized technical management. The main ecological advantage of aquaponics lies in making use of resources from the urban setting: heat, water, CO₂ and organic material. A real lever for circularity, this farming method draws on recirculating aquaculture system (RAS) technologies developed by Krüger Kaldnes, a subsidiary of Veolia Water Technologies. Equipped with an aeration device, this semi-closed loop system is designed to maximize production while simultaneously reducing pollution and water consumption, using a continuous mechanical and biological treatment system. Hydrotech Drumfilters separate solids, while carbon and nitrogen pollution are eliminated by the AnoxKaldnes™ MBBR (Moving Bed Biofilm Reactor) process, with biomass fixed to a suspended surface. This internal expertise provides a powerful competitive advantage to potential aquaponics projects supported by the Group.

DEVELOPING SYNERGIES WITH THE GROUP'S HISTORICAL SOLUTIONS

Urban agriculture now provides a major boost to Veolia's historical water, energy and waste businesses.

In the face of soil sealing, climate change and biodiversity loss, local food production solutions address needs expressed by city dwellers that foreshadow a profound transformation in consumption patterns, centered on short supply chains of traceable and high-quality products. In Asia and the Middle East especially, increasing food self-sufficiency is a major priority. In that respect, urban agriculture is an effective tool for transforming regions; Veolia's proposed intensive and high-quality production system, with its strong social dimension, is a move in this direction.

The development of urban agriculture solutions is in step with the Group's activities in two ways. Firstly, the Group's expertise in sanitation, developed with its water businesses, justifies launching activities linked to food production. Secondly, its technological expertise in effective circular systems is a key advantage in positioning Veolia as a pivotal player in this future strategic sector.

In addition, the many sites run by Veolia represent considerable land resources, with privileged access to heat and energy resources, and immense potential for future urban agriculture projects with their need for 1 to 1.5 hectares. It is now a question of convincing partners and subsidiaries that there is a genuine opportunity to be seized with positive impacts. Initial results are encouraging, as since 2018, the team responsible for this area has received

⁷ Valentin Sohy, Félix de Tombeur, and Jean-Thomas Cornélis, *Influence des pratiques de la Ferme du Bec Hellouin sur la fertilité et la matière organique du sol*, Université de Liège and Institut Sylva, 2017.

⁸ Based on solid, documented science, the international "4 per 1000" initiative launched by France at COP21 on December 1, 2015 aims to identify and implement actions to store carbon in soil. It takes its name from its target of a 0.4% annual increase in soil carbon stocks, in the first 30 or 40 centimeters of soil, which would significantly reduce the concentration of CO₂ in the atmosphere linked to human activity. <https://www.4p1000.org/fr>

numerous requests from business units, in Europe and beyond, interested in integrating these solutions into their range of services.

CHALLENGES TO LARGE-SCALE IMPLEMENTATION

SUCCESS FACTORS

Aside from the necessary synergies with the Group's activities and resources, the pilot projects enabled identification of the factors for successfully starting up urban agriculture projects and building sustainable food supply chains.

Involving local stakeholders

Local organizations (local authorities, associations and social enterprises) are the main stakeholders in the project. Aside from the land-use dimension of urban agriculture projects, strong political impetus at the local and national levels can accelerate scaling-up considerably. Public procurement plays a leading role in rolling out these solutions: urban agriculture can significantly help public-sector food providers to meet their new obligation to supply 50% of food from local sources or with origin and quality labels and 20% organic food by 2022 as required by the EGalim Law.⁹ Whether they are a local authority or business organization, implementing a participatory system with technical support from Veolia constitutes a key success factor.

Becoming part of the local production system

It is crucial to remember that urban agriculture alone cannot satisfy all a city's food requirements. However, to ensure local production is not thrown off balance, it is essential for the project's success to work with farmers on keeping solutions compatible. This is why urban agriculture solutions must be designed and implemented to blend harmoniously with the local production system.

Shaping the local food supply chain

Developing urban agriculture requires the construction of regional food supply chains that necessarily involve building partnerships between different stakeholders, from production through to consumption.

Raising end consumer awareness of the quality of urban agriculture

The high quality of the produce obtained from urban agriculture must be emphasized and promoted, as must the environmental benefits offered by Veolia's chosen techniques. Additionally, understanding any psychological barriers relating to indoor production is an essential part of the marketing effort necessary for an urban agriculture project to succeed.

Building expertise to facilitate roll-out

Pilot sites make it possible to combine and consolidate the expertise required for Veolia's chosen agricultural methods to succeed, whether in the fields of agronomy, biodiversity,

or operational processes and fertility management. This applies especially to the field of bio-intensive vegetable microfarming, where the dissemination of good practice around the world has so far been patchy. Tools for capitalizing and spreading knowledge are essential to the expansion and scaling-up of the urban farming solution.

Making urban agriculture a tool for inclusion

The link with the social and solidarity economy is essential: working with people excluded from employment via back-to-work organizations or local associations allows urban agriculture to fulfil its potential as a regional tool for inclusion.

IMPROVEMENT MEASURES

Various measures currently exist for improving the model:

- On a technical level, the model proposed by Veolia still needs to be standardized, which would optimize production while adapting to the features of the different sites. In view of this, Veolia recently launched a research program with the Institut Supérieur d'Agronomie in Lille, which aims to create practical techno-soils, composed of local organic and mineral resources, to enable vegetable microfarming on sealed or polluted land.
- The supply of fish food, currently based on fish meal that has been imported over long distances, is currently the least sustainable link in the production chain. It would be preferable to use insect-based feed, which would be facilitated by Veolia Group partnerships with startups working in insect farming.
- The circularity of the model could also be improved. The aquaponic farm operation currently depends on access to clean water to supply the system, via a borehole or the urban network. Research is under way into using recycled or desalinated water, but this is subject to confirmation that this model is acceptable to end consumers.
- The possibility of building processing facilities on site remains open.

CONCLUSION

As part of its mission to provide services to the environment, Veolia has developed expertise in the area of urban agriculture with a view to supporting regions in shaping high-quality local food production. The experimental phase implemented in Brussels and Lille uncovered a new activity compatible with all the Group's businesses, based on technical capabilities it already possesses via its existing recirculating water treatment and soil decontamination technologies. In response to one of the major challenges of the coming decades, the model proposed by Veolia and its partners can exploit unused resources in circular loops, create social value through employment, and continue to make urban spaces healthier and more pleasant places to live.

⁹ Law passed on October 30, 2018 to balance commercial relationships in the agricultural and food sector with making food healthy, sustainable and accessible to all.