

Vertical Agriculture in the Fraser Valley

Dr. Alesandros Glaros, Food and Agriculture Institute

alesandros.glaros@ufv.ca, B351



Background

Vertical agriculture is a form of 'controlled environment agriculture' that involves growing a variety of crops indoors using stackable shelves, LED lights, and plant nutrients that are circulated to root systems by water pumps or via spray.

We are a group of **academic and industry collaborators** working with local government and communities to explore the role that vertical agriculture can play in local food systems in British Columbia. We are examining considerations and different scenarios as well as approaches for **vertical agriculture development and deployment in municipalities**. Working with consumers, grocery stores, restaurants, developers, and city planners, our research aims to map and model **sustainable and resilient scenarios** for vertical agriculture. This project is managed in partnership between the Food and Agriculture Institute at the University of the Fraser Valley, Royal Roads University, QuantoTech, and i-Open Technologies.



This work spans 3 domains:

- Ag-tech perceptions
- Willingness to try/buy vertically grown product
- Food system planning

Emerging approaches to urban agriculture such as vertical agriculture have the potential to increase local, year-round availability of produce using minimal land and water resources. However, questions remain about the degree to which vertical agriculture can contribute to food security and environmental objectives.

Approach

In this work, we undertook focus groups, a large-N survey, and constructed qualitative scenarios and quantitatively modeled their outcomes. We acknowledge the following **Three Key Assumptions**:

1. Ag-tech is not a panacea, and is part of a broader 'portfolio' or approaches to transform food systems
2. Governance and policy solutions are key to achieve socially, environmentally, and economically sustainable food systems
3. For vertical agriculture, diverse business and development models will contribute to sustainability to varying extents

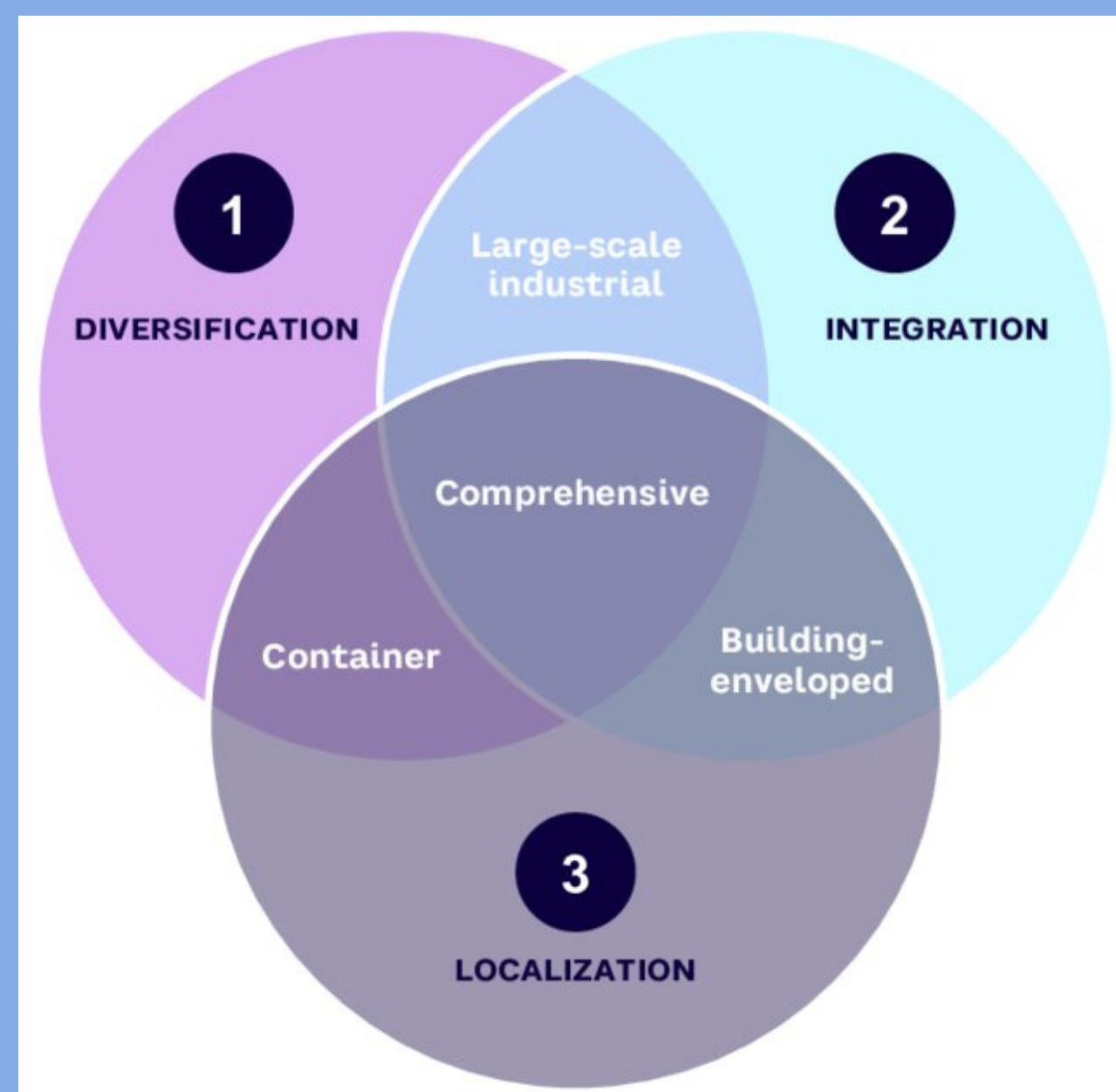
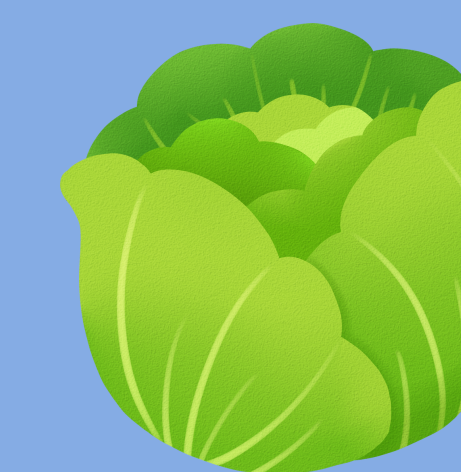


Figure 1. Vertical agriculture business models and their implementation of conservation-related principles (Pizzirani, et al 2023). Certain business models may lend themselves better to achieving specific goals related to conservation or sustainability, more broadly.

Ag-Tech Perceptions

We undertook a set of **focus groups** and lettuce tasting with folks engaged in community food system development in the Fraser Valley to explore what they think of vertical agriculture as an emerging ag-tech. We found that:

- Focus group participants were optimistic that vertical agriculture (VA) can contribute to **local food security**, increase **supply chain efficiencies**, make relationships between customers and food producers **more transparent**, and mitigate against **severe weather events**.
- Participants highlighted the importance of engaging in **clear, accessible, and transparent communication** strategies with local communities to increase the acceptance of vertical farming and minimize **potential tensions** with other forms of agriculture.



Willingness to Pay

We disseminated an **online survey** that was answered by 476 individuals in Metro-Vancouver. We broke apart the dataset into those who were willing to pay more, only the same, or less for VA, and explored associations with demographic and food preference variables.

"[I wouldn't pay more] because I feel vertical farming is kind of artificial."
- Quote from Survey



Figure 3. Demographic as well as purchasing habit variables and willingness to pay. The "+" sign denotes a significantly higher average (i.e., the average is higher for the variable for those willing to pay more than those not willing to pay more).

"With changing weather patterns, it is important that we have alternative solutions."
-Quote from Survey

- Key concerns regarding VA are to do with its **affordability and being perceived as unnatural**.
- Further research is necessary to explore effective **communication strategies** regarding the perceived safety issues of VA.
- Individuals with **higher income** and those who **identify as male** have strong associations with willingness to pay more for VA.
- Willingness to pay statistically and spatially **varies between the communities** examined in this study.

VA may not be accepted within specific communities. Local market research ought to be undertaken prior to its implementation.

Food System Planning

We developed, outlined, and modelled six **planning scenarios** for vertical agriculture, through literature review and in consultation with industry partners and local government. We then modeled the potential food security and sustainability benefits of these scenarios.

- Scenarios for VA development vary depending on the **scale** of operation, **business model**, and the **land-use and building type**.
- Approximately **85% of the census tracts** within the Lower Mainland British Columbia were deemed as potentially suitable for VA deployment.
- **53 census tracts were appropriate sites of VA in all scenarios**, and thus may be the most opportunistic for targeted planning.
- In best case yield scenarios, VA could meet the daily recommended greens intake for between **20-130% of residents located within walking distance of each farm**, while in medium yield scenarios **4-25% of local residents** could be supplied their recommended greens intake.



Figure 4. Community development (top), industrial commercial (middle), and mixed-use (bottom) vertical agriculture development scenarios.



Future Work

1. Testing qualitative scenarios with local land use planners
2. Engaging the public via interactive map demos and lettuce tasting
3. Comparative sustainability assessment between VA and traditional agriculture
4. Building virtual farm simulators for student training and public engagement



Special thanks to Dr. Lenore Newman, Dr. Stefania Pizzirani, Dr. Robert Newell, and all industry and local government collaborators for their contributions to this work.

For access to our publications, please visit this QR code

