Introduction

This Capstone Project focuses on the economic potential of urban agriculture with specific reference to indoor farming. The research examines precedents of successful indoor farming operations and how these could be adapted to the Winnipeg context. To create a more accurate description of indoor farming operations, a typology was developed that examines the techniques used for food production and what form such enterprises have taken elsewhere. Specifically, the research investigates current indoor farming operations and identifies the types of indoor growing technologies and common urban locations. The information provided is from a third perspective of urban planning meaning it examines how municipal regulations, of which planning has influence over, can enable or inhibit indoor farming.

Problem Statement

Indoor farming as a business activity or as a land use is not mentioned in the City of Winnipeg’s zoning bylaws and the only reference to food production is regarding agricultural buildings as a permissible use or structure. The City also allows small-scale agricultural activities, however, there is no specific reference to indoor farming activities and rural residential lots are typically in-pen urban locations. Accordingly, urban agriculture and indoor farming operations in the city are in grey zones that are as common as they can define them and examine where they could occur in the city.

Research Methods

Developing the typology involved classifying information from the existing literature on indoor farming, drawing from specifications of indoor farming systems when necessary and analyzing four different indoor farming operations. The four indoor farming operations were: hydroponics, rooftop greenhouse, detached greenhouses or plant factories. This project examined the techniques used for food production and their success, how they operate in a four-seasonal climate in North America and the regulatory framework consistent with these. The findings are recorded throughout the literature. Within each case study there is provided background and context information about the operation, conclusion, and future interest. At the end, a summary of the common lessons amongst all is provided to better understand the links between various enterprises and operations.

Case Studies

Aerofarms, New Jersey

Operates three vertical farms in the US and three overseas. Their market is focused on their locale and they also supply White Foods in Fresh Direct.

Rocket Greens, Churchill

Operates a hydroponic farm in a shipping container. Their market serves the community of Churchill.

Lulu Farms, Montreal

Operates a rooftop greenhouse that total over 300,000 ft2 that use hydroponic technology. Their market is Greater Montreal with delivery/pickup available from containers engaged from other local producers.

The Plant, Chicago

Collaborative small business incubator for urban agricultural enterprises. Currently, there are over 20 operations within the two buildings that offer a range of products and services.

Research Questions

1. What techniques and operations are commonly used for indoor farming?
2. What are the planning considerations to better accommodate indoor farming in Winnipeg?
3. How can Winnipeg adapt its regulatory framework to enable indoor farming?

Possible Indoor Farming Sites in Winnipeg’s Inner City

Chinatown

Integrating indoor farming operations into vacant or underused space in Chinatown could help to revitalize the area and other new patrons for restaurants as well as a local food supply.

Exchange District

Partnering with Red River College to establish a food hub adjacent to the new Innovation Centre and place their culinary arts program could spur innovation in local indoor farming.

Mission Industrial Park

Large vacant lots and underused warehouse spaces could be repurposed for indoor farming. Operations like cold attached greenhouses or plant factory.

Types of Indoor Farming Operations

Modular Farm—completely controlled indoor growing environment within a building that can be relatively move around or between sites.

Plant Factory—completely controlled indoor growing environment within a large warehouse that can be relatively move around or between sites.

Rooftop Greenhouse—partially controlled indoor growing environment that is supplemented with artificial lighting at times of day or season where incoming light is insufficient for plant growth. HVAC and water systems can be integrated with the building to benefit both spaces.

Attached or Detached Greenhouse—a partially controlled indoor growing environment that is supplemented with artificial lighting at times of day or season where incoming solar gain is insufficient for plant growth. Structural components of the building are flexible meaning it could be attached to a building or standalone however the operation is well insulated and able to produce food year-round.

Types of Indoor Farming Techniques

Hydroponics—growing plants in a nutrient solution rather than soil.

Aeroponics—similar to hydroponics using aerated water.

Aquaponics—integration of hydroponics and aquaculture (raising fish in tanks).

Case Studies: Lessons for Winnipeg

• Amending the zoning bylaw to include indoor farming as a permissible use facilitates the establishment of indoor farming operations.
• Permissible uses should also include the allowance of agricultural buildings as a permissible use or structure.
• Common urban areas sought by indoor farming operations were industrial, big box commercial or office parks. These areas are:
  • Well connected by the transportation network
  • Back lanes or loading bay areas
  • Large warehouses, factories or flat areas suitable for (de)attached or rooftop greenhouses, vertical farms or plant factories
  • Less consequences for light pollution
• Often located in industrial or commercial locations within the larger parts of the city.
• Enterprises often join forces working in partnership, collaboration or with investors. Winnipeg had the Food Council, post-secondary institutions, not-for-profit organizations, emerging urban agriculturalists, and an economicucker that could provide a framework for success.
• Innovative approaches like onsite composting or greywater recycling were difficult to obtain financing for especially permitting … the planning design and installation of district facilities that benefit multiple operations could be an opportunity to create an indoor farming district that operates with principles of waste reuse and recycling inherent in a circular economy approach.
• Identifying areas in the city where these types of enterprises exist and could be studied could spur interest by fostering activities and investment.

Recommendations

Key recommendations include continuing the collaborative work between the Winnipeg Food Council and existing urban agriculturalists, establishing parts of the city where indoor farming could be encouraged, defining indoor farming within the zoning bylaw and amending the zoning bylaw to include indoor farming as a permissible use in select areas of the city.

Conclusion

This research examined indoor farming techniques and operations and developed a typology of essential and secondary considerations that provided a basis for some potential changes to the regulatory framework in Winnipeg. Recommendations were made on city-wide, site-specific, minimizing the indoor farming industry and creative partnerships with other local organizations such as local government institutions and private enterprises. This is not an exhaustive list but rather a starting point for enabling this sector. As the City of Winnipeg begins to adapt its regulations and policies, so too will the needs of the sector. Consideration of this the City could welcome industry feedback and receive its regulatory framework and change its policies as necessary.

There are some short term and long-term approaches that the Winnipeg Food Council and the City Departments like Water & Waste Planning Property & Development can do to encourage urban indoor farming. A successful project, administration and political champions are crucial.