Nutri-Nunavik
The Potential of Northern Farming

CCA Charette
Reassembling the North
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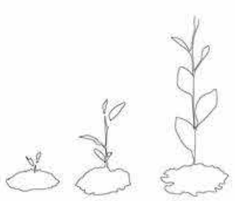
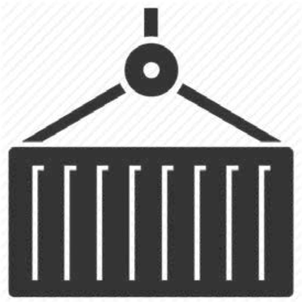




Introduction

Nutri-Nunavik is a modular sustainable farming movement with multifunctional capabilities. Designed by upper year students at the McEwen School of Architecture this proposal was made as an innovative initiative to engage and aid the Northern Quebec region of Nunavik. Through the use of aquaponics and vertical farming Nutri-Nunavik has the potential to encourage independent agricultural efforts within Inuit communities. The purpose of this project is not to forcibly implement new systems in Nunavik, but rather give the Inuit people simple solutions to utilize their current resources to create a sustainable solution to their inflated cost of Northern living.

Project Details

The concept for Nutri-Nunavik is to provide Inuit people a self-sustainable solution by growing local produce rather than depending on high priced shipped goods from far regions. A collection of modular sea-can containers that house renewable aquaponic vertical farming systems are fabricated to be fully operational upon delivery. As a final layer of the project spare wooden palettes can be lined around communities' Nutri-Nunavik structures. During the winter months snow can be packed inside and onto the palette cladding. The added snow on the structure can act as an additional layer of insulation to further protect the interior garden and fish systems in colder temperatures. resembles an igloo the narrative of the shipping container entirely covered in snow ties to the Inuit lineage as although they are becoming more modern in terms of food procurement methods, they are nonetheless remaining traditional above all else. In the summer months though, the palettes will act as exterior farming station and allow communities even greater agricultural potential.

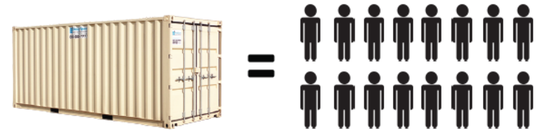
The orientation, location, and determining of window openings within the sea can structures would be left to the innovation of the Inuit people. As the people are known for their resilience and resourcefulness, this proposed system allows them to grow food their own food rather than depend on exterior sources strengthening their sense of independence and pride by contributing to their community.

Design Components

Aquaponics

Similar to hydroponics, aquaponics is the cultivation of plants by placing roots in a liquid nutrient solution without the use of soil. However, with the inclusion of fish, aquaponics has the addition of fish waste that provides an organic food source for the cultivation of plants which in turn provide a "natural filter for the water the fish live in." The use of this system offers users the unique opportunity to create an ecosystem for interior vegetation growth.

This system can easily be implemented in Nunavik in an interior heated system. Through the use of local carnivorous and scavenger fish such as arctic char, brook and lake trout , these northern communities have the opportunity to house their own locally built aquaponics system. By using fish native to the area and the water from local water sources they have the potential of saving on shipping costs required for southern species. The only cost of the aquaponics system, once locally scavenged materials are factored in, is the minimal cost of a water pump system and nutrients to increase the health of vegetation. In terms of spacing, for every single square foot of farming one gallon of fishery is required. As these modular systems range in size this allows for a variety of interspecies and variant tank compositions to be created surrounding the three above mentioned local fish.



Sea-Can Containers

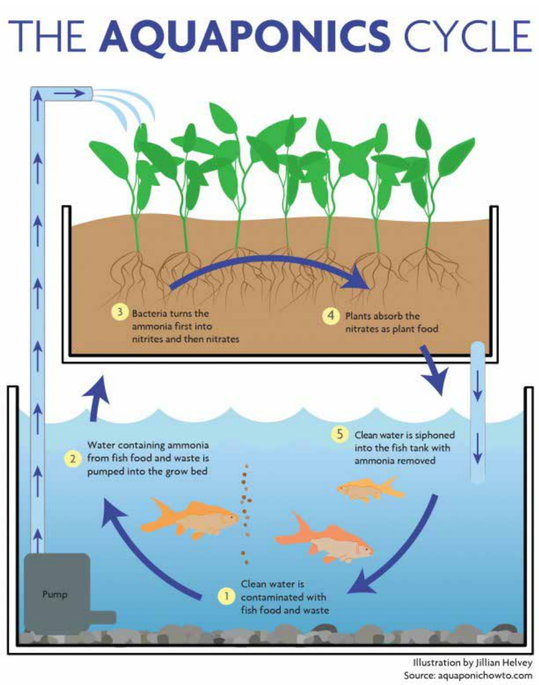
In an increasingly inflated housing market, do it yourself homes are gradually becoming more popular. The newest solution for homes, shipping or sea-can containers have been vastly used throughout northern communities as a means to affordable living. Depending on their sizes these containers can range from $1800 - $5000. In further development from this modular homes there have been advances in pop-up urban farms in these containers. Projects like GrowUP! A Kickstarter project "looking to turn a car park in central London into a sustainable urban farm using a specially modified shipping container and greenhouse" have begun to realize the potential of modular interior farming.

Utilizing 40' x 7'8" x 7'8" sea-can containers, Nutri-Nunavik offers a unique five-tiered vertically stacked farming system. Each singular row covers approximately 38^2 ft of space. Ten rows can be evenly spaced leaving a central path just under 4' to be allocated as a walkway. The only element of Nutri-Nunavik that will be pre-fabricated is the insulation of the sea-can containers. Since Indigenous people have been known to already transform received shipping containers in a variety of things such as homes and shed units, it is known that they already have the necessary skills and capabilities required to implement the necessary windows and doors required for the interior Nutri-Nunavik vertical farming system.

Vertical Farming

Vertical farming is a newly developed initiative which involves "vertically-stacked farms that produces crops twice as fast, while using 40% less power, having 80% less food waste, and using 99% less water than outdoor fields,." It's estimated that by 2050 over 75% of the world's population will reside in urban centers . As a result the technological advances of vertical farming are becoming more and more pragmatic with each passing year.

Interior vertical farming can be implemented in Nunavik as a way to grow local produce to aid the Inuit people in moving away from the need of importing produce and begin to produce their own locally. The largest community in Nunavik, Kuujjuaq with a population of 2,375 would require approximately 31,000 square feet to offer an excellent mixed selection of fresh and nutritious produce to every inhabitant . Based on the average square footage of a 40' sea-can container in conjunction with maximum utilization of space through vertically stacked farming components, Nutri-Nunavik in this village would encompass 32 containers with the smallest community needing 12, as each Nutri-Nunavik system has the capability of feeding 16 people. This may sound like a large amount, however in conjunction with the modular system of the proposal, this amount of containers will allow the community the creative opportunity to create a unique and modern aquaponics farming unit customized to their liking and specific needs.



Wind Energy

As one of the largest renewable energy producers globally, wind energy produces 65,000,000,000 kWH worldwide per year. With modern technological advances wind turbines have become nearly silent and on average "generate between 17 and 39 times as much power as they consume." In an elaborate wind study of the Nunavik region in 2003, 7 of its 14 "communities were flagged as having the capacity for wind farms." In 2014 Hydro-Québec created a proposal for a wind farm in Nunavik. The installation of an entire farm was deemed unprofitable for southern communities, however, the implementation of wind energy in Nutri-Nunavik would involve only a small system which cost significantly less than the $22 million proposed Hydro-Québec system.

To accurately light a single 40' container would require four 60W LED's which must attain 0.96kwh of power per day . To power the largest container system in Kuujjuaq (population 2,375) would take nearly 31 kwh for its 32 storage container system . One 40' storage container would require just over 3,500W of energy to heat it sufficiently for an hour. Due to the combination of necessary sunlight windows are needed for the plants, with the aid of prefabricated closed polyurethane foam insulation, the wattage required parallels that of a typical well insulated home.

Overall, one sea-can unit requires about 3.5 kwh to be adequately heated. In a typical aquaponics system 24 watts of energy per day is required to power a water and air pump with the capabilities of pumping the water 9'. This translates to approximately 0.001kwh per pump. The Nutri-Nunavik system would require approximately 10 pumps for its largest systems thus equating to 0.01kwh in aquaponics energy. The output of the small wind system would be 5kwh which is significantly more than the 4.47kwh the aquaponics, lighting and heating energy intake requires.

Conclusion

The people of Nunavik are more than capable of creating innovative solutions for housing and self contained buildings that engage their daily practices using local materials. Nutri-Nunavik aims to work with their local resources to expand the agricultural season to provide healthy organic food year round to all Nunavik communi-