



NorthWest Fresh: Farming for the Future

Vertical Farming of Microgreens

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Background

Northwest Fresh is a start-up agriculture company created by John Toler, who has served five years as a board member of the Tacoma Farmer's Market and is a founding board member of the Tacoma Food Co-Op. The goal of Northwest Fresh is to provide fresh, local and sustainable foods to institutions, schools, restaurants and grocers while also improving the health and economy of the local communities in the process. The company will focus solely on growing microgreens and herbs year round, while also incorporating and growing other products of agriculture as the market presents itself. Within five years of production, Northwest Fresh will be growing microgreens through the integration of Tilapia fish within the aquaponic growing system, and distributing fresh mushrooms within the area.

Objectives

- To design a successful agricultural start-up company and facility that has year round growing and is able to be run by one sole proprietor
- To create a business and financial plan that is attractive and feasible to investors and potential customers
- To implement sustainable agricultural practices within the business model

What are Microgreens?

Microgreens are described as fresh, nutritious, colorful, and very tasty with interesting textures, vibrant colors and intense flavors. These tiny, tender gourmet plants are big on flavor and have been recently popularized by chefs in big cities. You can find microgreens at upscale restaurants and in many farmer's markets. Most people "eat with their eyes" first, and microgreens are able to elevate a dish into something unique and delicious, not only in flavor, but in presentation as well.

Benefits for Growers:

- Year-round production = steady cash flow
- Short Crop Cycle
- Minimal space requirements
- \$30-50 per pound of microgreen

Benefits for Consumers:

- Instantaneous boost of nutritional value to meal
- Rich in phytonutrients and other health-promoting compounds
- More nutrient-dense than their mature counterparts
- Supporting local farms and reducing carbon footprint of food

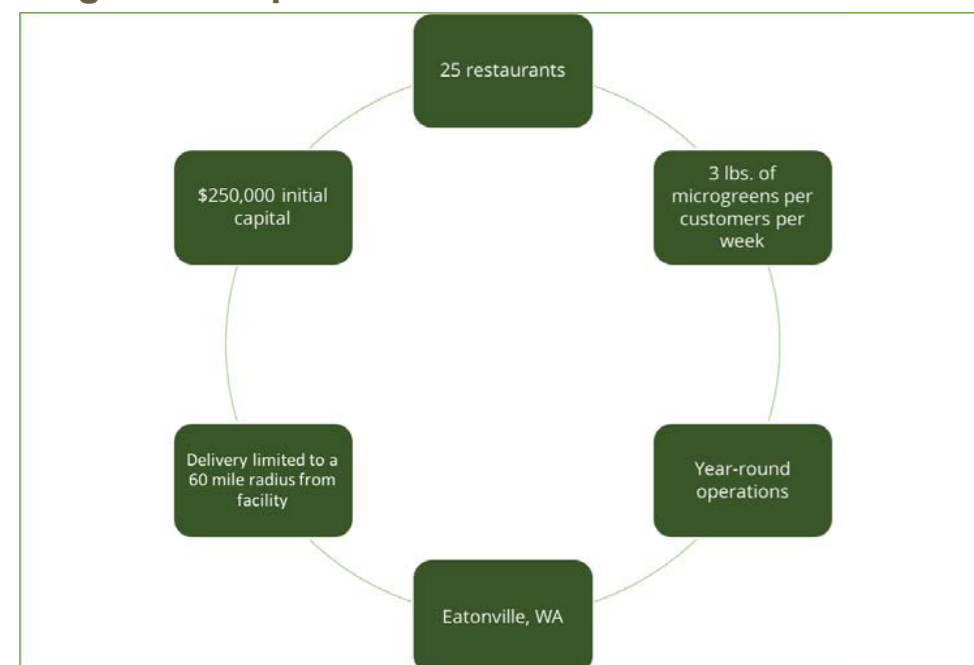
Selected Microgreen Product Line



Microgreens listed from left to right:

- 'HONG VIT' RADISH** Spicy-flavored. Attractive pink stems and green leaves. Radishes are lofty and add weight and volume to micro mixes.
- 'BRIGHT LIGHTS' SWISS CHARD** Mild chard flavor. Light green, gold, pink, orange, purple, red, and white stems.
- 'GARNET GIANT' MUSTARD** Mildly spicy flavor. Darkest purple mustard.
- PARSLEY** Intricately lobed leaves with mild parsley flavor. Medium-green parsley color.
- CILANTRO** Frilly leaves. Clean, fresh aroma. Flavor more subtle than that of mature cilantro.

Design Assumptions and Constraints



Standardized Processes

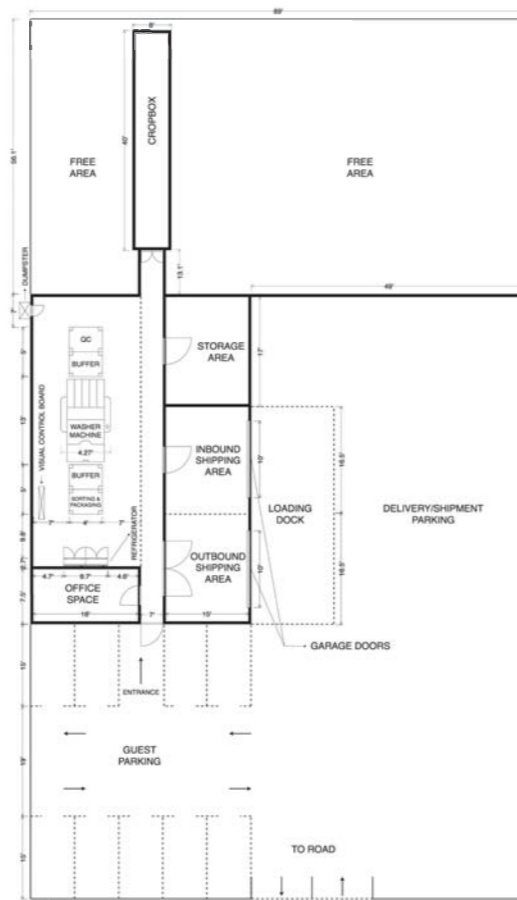
By creating and implementing flows for the business model, it creates a standardized work process that:

- Removes the eight six sigma waste
- Improves consistent quality
- Improves productivity
- Creates a stable work process
- Increases employee safety

The standardized processes we designed for implementation:

- Daily Flow
 - Maintenance
- Weekly Flow
 - Maintenance
 - Packaging and Delivery
 - Harvesting
- Monthly Flow
 - Maintenance
- Proper Cleaning Process
- Quality Assurance Process
- Inventory Management
- Kanbans
- Kaizens

Design of Facility



Handling System Design

- Receiving Items
- Microgreens Production: Planting, Maintenance, Harvest
- Quality Control
- Washing the Microgreens
- Sorting & Packaging
- Storing packaged Microgreens
- Reset System
- Re-Planting
- Delivering Items

Material Handling Requirements

A minimum of

- Pallet Jacks
- 3 Wooden Pallet
- 15 medium sized baskets
- Scissors/cutters/tools
- A small ruler
- small shovels
- 2000 small pots and 1000 medium sized pots
- 80 Cubic feet of Planting soil in storage at all times
- 120 Cubic feet of plant fertilizers in storage at all times

CropBox vs. Traditional Greenhouse

A CropBox is a highly engineered modular and mobile vertical production environment.

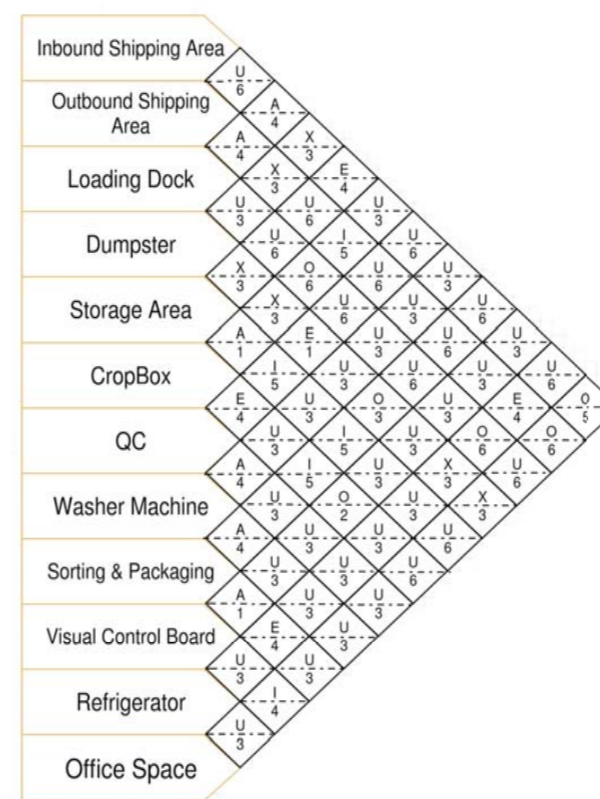
- Yields 150 times greater than traditional agricultural methods
- Up to 90% reduction in water use, 80% reduction in fertilizer, and no fertilizer runoff
- Consistency in produce due to highly controlled environment



From the trade study we can find CropBox is more profitable and more efficient for farming.

	Weight	Greenhouse	CropBox
Rate of Production	30%	3	5
Price	25%	4	5
Dimension	20%	5	3
No. of plants grown	15%	4	5
Other costs	10%	3	5
Final Score		3.8	4.6

Activity Relationship Chart

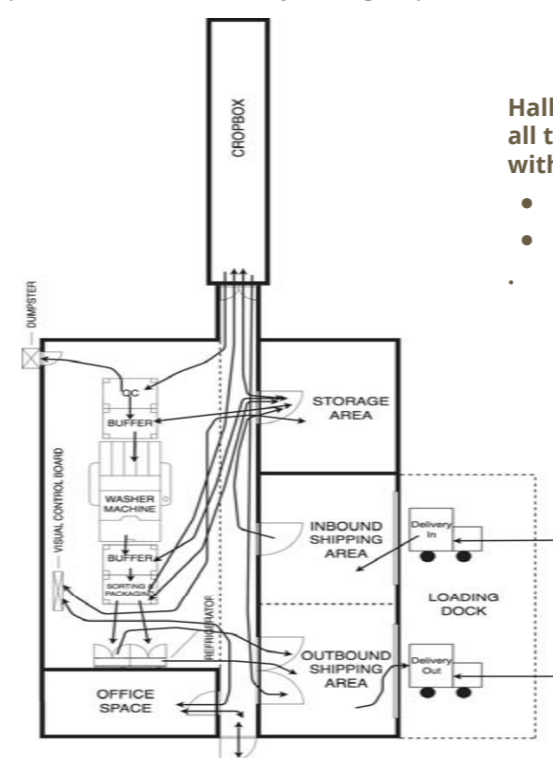


Value	Closeness
A	Absolutely necessary
E	Especially important
I	Important
O	Ordinary closeness okay
U	Unimportant
X	Not desirable

Code	Reason
1	Frequency of use high
2	Frequency of use medium
3	Frequency of use low
4	Information flow high
5	Information flow medium
6	Information flow low

Spaghetti Diagram

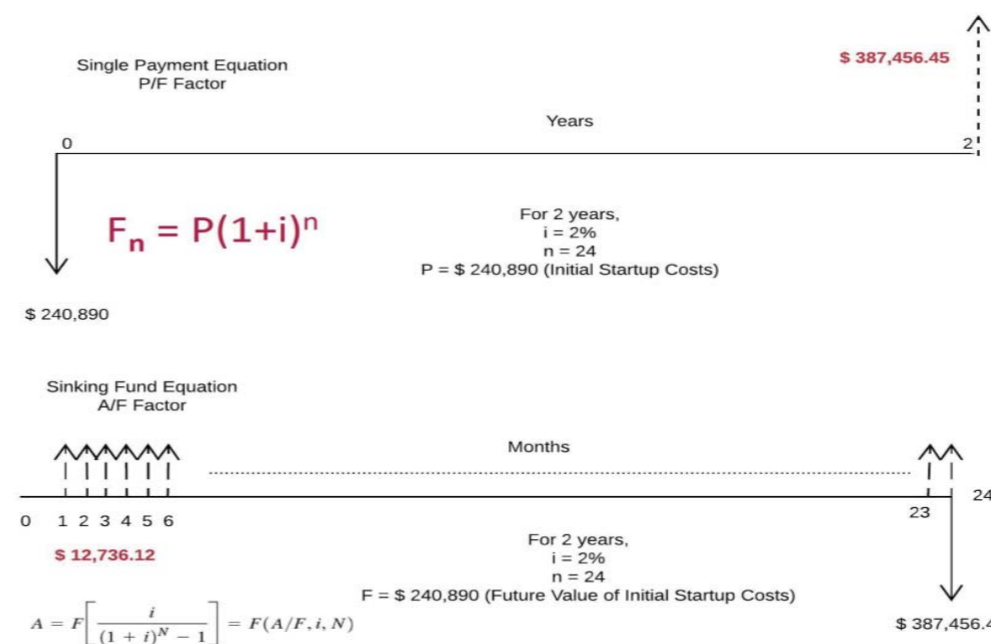
A spaghetti diagram is a visual representation using a continuous flow line tracing the path of an item or activity through a process.



Hallway outside the Storage Area doors, all the way to the CropBox, are crowded with flow lines

- Hallway must be kept clear OR
- Make the Storage Area 'doorless'

Breakeven Analysis



Breakeven Analysis

Monthly Revenue to Breakeven within 2 years
 = Future Value of Initial Startup Costs (FV ISC) + Monthly Overhead Costs (MSC)
 = \$12736.12 + \$2208.06
 = \$14944.18

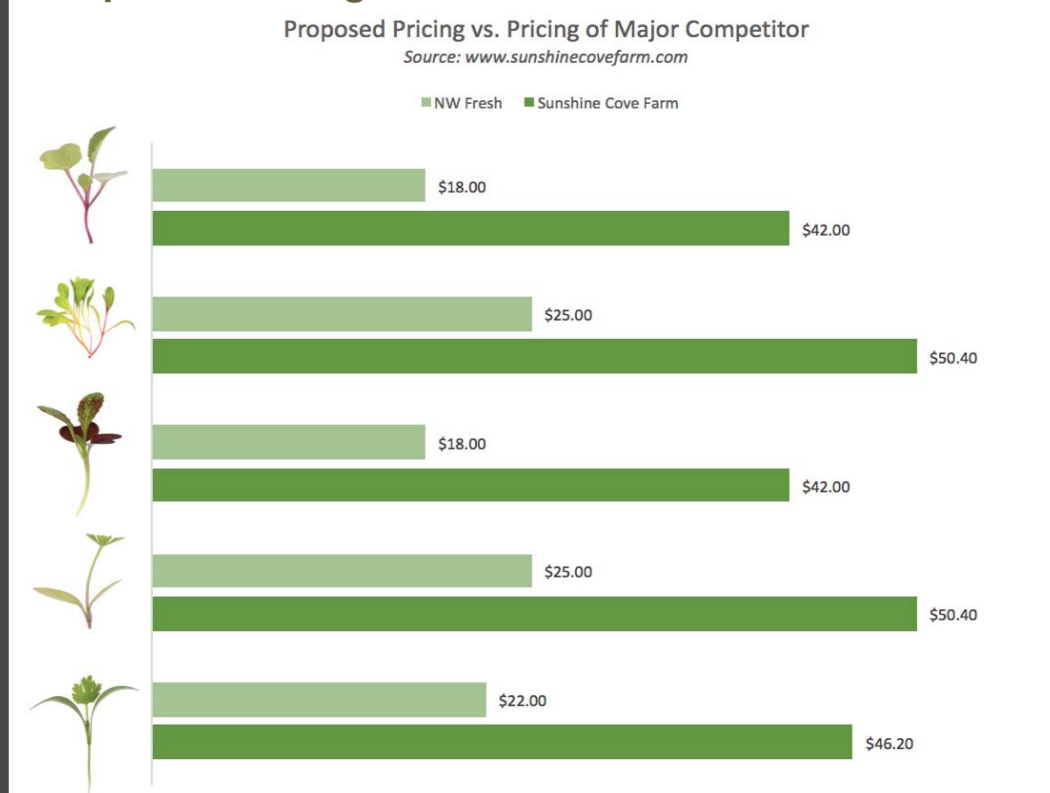
Assumption(s)?

- Supply and demand is at 900 lbs. per month
- Container operates at a 27% capacity

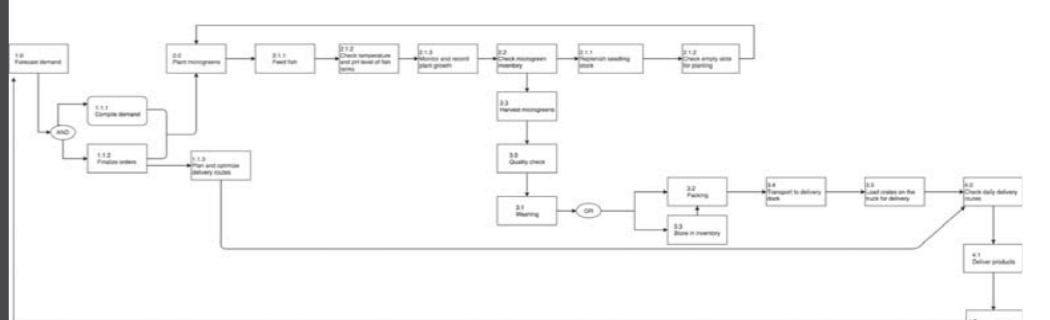
Preliminary Findings

Therefore, in order to breakeven within 2 years, we have established that the minimum price of any one of the produce per pound is \$16.60.

Proposed Pricing of Produce



Future State Functional Diagram : 2 Years Later



- Forecast demand
 - Compile Demand
 - Finalize Orders
 - Plan and Optimize Routes
- Plant microgreens
 - Feed Fish
 - Check temperature and pH level of fish tank
 - Monitor and record plant growth
- Quality check
 - Check microgreen inventory
 - Harvest microgreens
- Washing
 - Washing
 - Packing
 - Store in inventory
 - Transport to delivery dock
 - Load crates in the truck for delivery
- Check daily delivery routes
 - Deliver products
 - Return to facility

Accomplishments

In the past six months, we further refined and developed recommendations that can help Northwest Fresh launch a business plan that will gain investor support and capital funding. Our primary deliverables from this work include standard process guides for major business operations, the warehouse design based on our equipment recommendations, a list of our equipment recommendations, and a detailed financial analysis of the business. Through the use of objective selection tools and engineering analysis methods, we provide our recommendations for use by Northwest Fresh to whatever end is deemed appropriate.

Acknowledgements

This Senior Capstone project is completed with help from John Toler and Christina Mastrangelo. We would like to show our utmost gratitude for everyone involved in guiding, providing feedback, verifying assumptions, and this opportunity to work with