

"Tree of Life Vertical Urban Farm Proposal"

Rainier Square Tower, Seattle, Washington

Prepared by: Alexander Vandenberg

Date: May 14, 2025

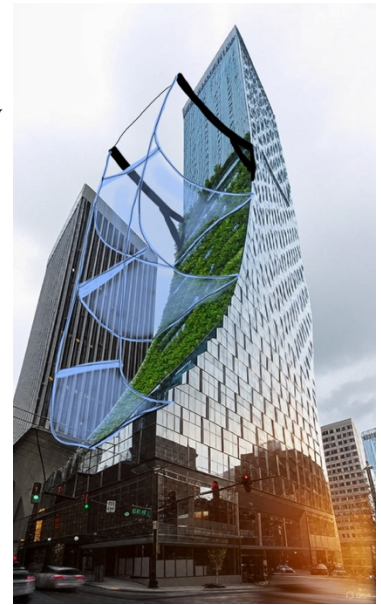
1. Executive Summary

The “Tree of Life” Vertical Farm represents a bold reimagining of Seattle's iconic Rainier Square Tower. This 58-story high-rise, currently dedicated to commercial use, will be transformed into a cutting-edge vertical farm—an urban ecosystem that fosters sustainability, food security, and community engagement. This project will dedicate nearly 1.4 million square feet to hydroponic and aeroponic agriculture, generating an estimated 23,398 metric tons of fresh produce annually, enough to meet the vegetable needs of almost 125,000 Seattle residents.

At its core, the “Tree of Life” serves as a beacon of possibility, illustrating how urban spaces can be repurposed to nourish both people and community spirit. The design symbolizes growth and regeneration, with its distinct layers reflecting the natural structure of a tree:

- **Roots:** Underground levels cultivating nutrient-rich root vegetables.
- **Trunk:** Mid-section grows dense vegetables like tomatoes and peppers.
- **Canopy:** Upper levels dedicated to leafy greens and herbs.

This transformation brings food production closer to the heart of the city, offering visibility and access to the wonders of modern farming. It will also provide educational opportunities, inviting students and community members to learn about sustainable agriculture firsthand—sparking interest in farming careers and reinforcing the connection between urban life and rural food production.



2. Building Conversion Plan & Space Allocation

Zone	Floors	Area (sq ft)	Primary Use
Below-Grade (B3–B6)	B3 – B6	300,000	Root & dense vegetables (hydro/aero)
Community Market & Gym	1 – 2	—	Market stalls & retained Equinox gym
Dense Veg (“Trunk”)	3 – 22	380,000	Cucumbers, tomatoes, peppers
Leafy Greens (“Canopy”)	23 – 53	589,000	Lettuce, spinach, herbs
Education & Rentals	54 – 58	95,000	Classrooms, labs, short-term lodging
Rooftop Café	Roof	5,000	Dining/events with panoramic city views

Each zone is engineered for optimal growth conditions, ensuring consistent yields and high volumetric efficiency. Advanced multi-tier hydroponic and aeroponic systems maximize space while reducing water usage and resource consumption.

3. Yield Estimates & Efficiency Analysis

Crop Category	Annual Yield (metric tons)	Key Efficiency Drivers
Root Veggies	500	High-density rack systems, LED-tuned light recipes
Dense Fruiting Veggies	6,068	Multi-tier hydroponics, CO ₂ enrichment, optimized photoperiods
Leafy Greens & Herbs	16,830	Rapid-growth cultivars, vertical aeroponics, recirculating water systems
Total	23,398 (~51.6M lbs)	10× land efficiency vs. field farming; optimal water efficiency

Volumetric Efficiency:

- 6–8 layers of growing trays per floor
- Real-time sensor networks for precision nutrient delivery

Water Reuse & Treatment:

- Closed-loop filtration systems recover up to 95% of water, supplemented by rainwater capture for non-food uses, ensuring the system remains highly efficient even in an urban setting where water conservation is crucial.

4. Sustainability & Environmental Impact

- **Renewable Energy Integration:**
 - Rooftop solar arrays (est. 250 kW peak capacity) and façade-integrated photovoltaics.
 - On-site battery storage for peak load shifting and enhanced microgrid resilience.
 - **Advanced Water Recycling:**
 - Rainwater capture systems, filtration for agricultural reuse, and greywater recycling.
 - Efficient drip irrigation and aeroponic misting systems drastically reduce water waste.
 - **Green Facade & Urban Greening:**
 - Living walls that purify air and regulate building temperature.
 - Vertical gardens to inspire community pride and support biodiversity.
-

5. Economic Viability & Revenue Projections

The anticipated capital expenditure ranges from **\$90 million to \$200 million**, factoring in advanced growing technology, energy-efficient retrofits, and structural modifications.

Revenue Streams:

- **Produce Sales:** Estimated at **\$30 million to \$50 million annually**, based on wholesale market pricing and local distribution contracts.
- **Equinox Membership Fees:** Generating a steady income of approximately **\$3 million per year**, leveraging its established clientele.
- **Canopy Café & Event Hosting:** Projected to bring in **\$5 million to \$8 million annually** from dining experiences and private events.
- **Short-Term Rentals:** Aimed at visiting educators and community leaders, contributing an estimated **\$2 million annually**.

Total Annual Revenue: \$50 million to \$80 million.

Payback Period: 4 to 5 years, with projected positive cash flow beginning in Year 3.

The farm's robust production and diversified revenue streams position it for sustainable profitability, even accounting for market fluctuations and seasonal demand shifts.

This project promises not only economic return but a profound social impact by bridging urban living with sustainable food production—creating a lasting legacy for Seattle.