Croputation
The tiny-farm side hustle for everyone

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Industries
Artificial Intelligence
Ecotourism
Agriculture

Development stage
TRL 3: Demonstration in laboratory environment under industry-relevant conditions
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Working on deployment in a test greenhouse

Team Members
Michael Saccone, PhD
Founder

Looking for
Early adopters for the first round of greenhouses

Problem and Opportunity

Agriculture is racing towards a technological future in which robotic automation, precision agriculture, and data based crop management bolster the productivity of farming. The technology and knowledge exists for anyone with a bit of extra space to grow thousands of dollars a month in high value crops. In particular, vertical farming and indoor mushroom cultivation are poised to meet growing local demand for fresh herbs and speciality mushrooms. The market for herbs is currently over 138 billion dollars and is projected to nearly triple that by 2029 (MMR 2022). However, there is no turnkey product for hobbyists looking to make a reasonable profit. With rising costs of living and uncertain job opportunities, people increasingly need a means to secure extra income.

Solution

Croputation offers tiny-farm systems that leverage AI and farm tech that anyone can use to grow high value crops year round. Our first product is a turnkey vertical farming system with computer controlled plant nutrition and climate. The techniques of aquaponics and hydroponics recirculate water and nutrients over the roots of the plants, accelerating plant growth and eliminating the need for traditional watering. The entire process is environmentally conscious, reducing water use by 95% and eliminating harmful fertilizer runoff. Our designs control their climate and nutrition using an AI to maximize profit and minimize labor. Our 120 square foot prototype systems, starting at $2,000, may produce up to $2,000 a month in produce by focusing on high value crops that grow quickly in aquaponics. The only systems with competing unique economics are cannabis, requiring complex regulatory compliance, and other aquaponic or hydroponic systems, which may cost 5x-15x for the same number of plants, not including the cost of maintaining their environment. We have stripped away everything from a grow system that doesn't directly contribute to crop productivity. A tiny-farmer can sell at their local farmer's market to cut out shipping costs and capture all the profit themselves, or dry their crop and sell back to Croputation for guaranteed sales.
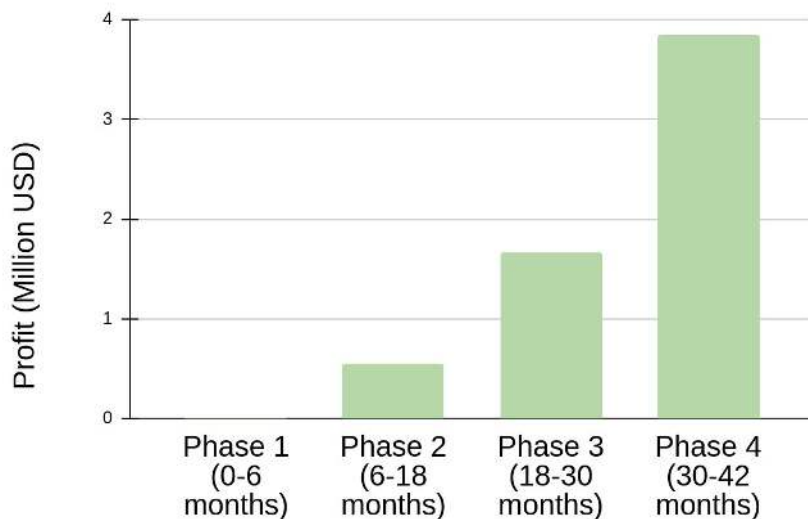
Path to market

We will develop our software and hardware over 6 months of collaboration with New Mexico farmers, then gradually ramp tiny-farm sales from 3 to 15 per month over three years. The company will provide its own seed funding by farming with prototype greenhouse units, purchasing its own property at the beginning of year 3 to host 24 highly productive, automated greenhouses. Over 42 months, the company will accrue $3.84M in profit and $548k in assets.

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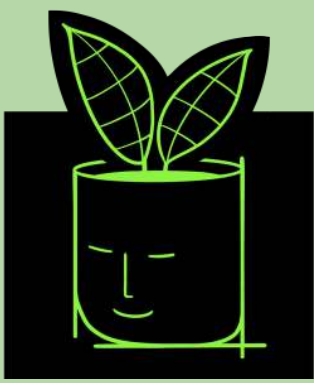
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The tiny-farms
We design low energy aquaponic tiny-farms to grow high yield cash crops such as herbs and lettuce. These are managed with transparent AI systems built from random forest and economic models to ensure high profits. Feeding, climate control, and water quality are automated, only requiring occasional adjustments.

AI Model
Our systems train a random forest model for estimating crop outcomes. The data from each greenhouse produces regression trees: flowcharts of questions about growing conditions that estimate crop outcomes. For example, a tree might ask whether water pH was above or below 6.7, then if the daily light integral is above or below 35 mol/m^2/day, etc, to the point where the tree predicts the growth rate of the plant. Given new or hypothetical growing conditions, each tree votes on what outcome it expects and the forest predicts the outcome through averaging the votes. Further data from farming develops new trees, strengthening the model's forest. The economic layer then suggests the lowest cost, highest profit recommendation.
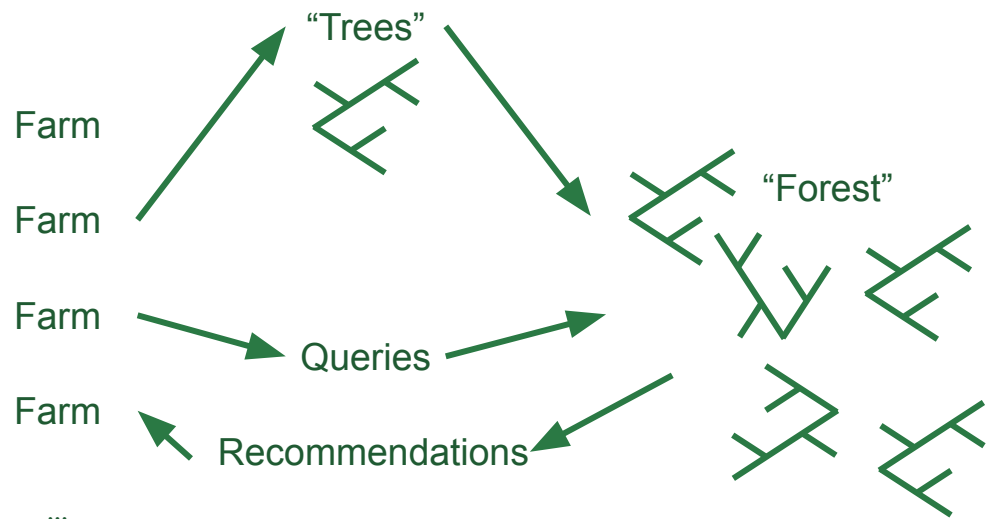
Aquaponic Greenhouses
A combination of aquaculture and hydroponics, aquaponics is a soil free growing method that uses fish waste to provide nutrients for plants. Water from fish tanks is pumped over the roots of plants and returned to the tanks. Our systems contain this process in a smart greenhouse that further limits water and heat loss. Inputs are more easily controlled through the direct monitoring and adjustment of the water and air conditions, making for rapid, efficient growth. Our greenhouses automatically change their shade, supplemental light, and air flow to foster the perfect climate for chosen species of plants and fish and cut heating and cooling costs with passive solar designs. The water containing the fish reduces fluctuations in temperature and saves heat from the sun for use when it would otherwise require costly external energy. The greenhouses in total require 100 watts of power and grow 324 plants with an average yield of 200 grams of produce per month per plant.