TERRA NEERU Future of Agriculture





Lettuce seedlings growing in the Kaggalipura makerspace

OUR APPROACH

We are an interdisciplinary team of biologists, product designers, social changemakers, electronics and mechanical engineers working to create sustainable livelihood opportunities combining the best of both urban and rural lifestyles.

Using new appropriate technologies working with ProjectDEFY's rural Makerspace (MIT affiliated Innovation Center), we plan to establish a proof-of-concept for commercially viable, weather agnostic agricultural system. Hence, we introduce a combination of aquaculture (cultivation of fish) and hydroponics (soil-less cultivation of plants) to engineer a setup which reduces 90% of water consumption and eliminates use of harmful additives to soil.

CC Providing fresh and locally produced harvest to restaurants in Bangalore



VALUE PROPOSITION

Currently, restaurants and microbreweries in Bangalore import artificially preserved lettuce, fish and hops, greatly reducing the freshness.

We provide them with **fresh**, **exotic**, **locally produced harvest at a lower cost**.

CUSTOMER SEGMENT

Restaurants in Bangalore looking for the freedom of flexible inventory management . We select customers on basis of the importance they give to the patrons, since they would be more likely to be interested in purchasing fresher produce.

Microbreweries like Toit Brewpub prioritize purchasing locally produced fresh hops to brew beer. These establishments might also possibly be interested in showcasing a miniature aquaponics system for visitors.



Wine Bar • Restaurant • Pizzeria



Local Target Customers

WORK PLAN

Currently we're focusing on **building the team** consisting of individuals from diverse backgrounds. This includes **involving engineers**, **biologists**, **hobbyist makers**, **product designers** in execution of the production system and customer development.

First stage development of the production system focuses on contextualization, materials exploration, testing the initial prototypes and documenting plant growth in experimental conditions: all falling under R&D.

We also plan to rent a warehouse while considering space constraints for designing the racks needed for the second stage.

The following will be tested and it's design will be finalized:

The final deliverable is a modular arrangement of containers for growing lettuce hops.

- 1. Seed-grow bed racks (170 plants)
- 2. Plant-grow bed racks (170 plants)
- 3. Water cooling device
- 4. Artificial lighting setup
- 5. Plumbing pipe system with pumps

We shall introduce our harvest to restaurants and take feedback on how to go about supplying the produce.

Initial investment ; 1,00,000 INR per month



Operation	NOV '15	DEC '15	JAN '16	FEB '16	MAR '16	APRIL '16	MAY '16	JUNE '16	JULY '16	AUG '16	SEPT '16	ОСТ '16
Contextualization of Aquaponics Concept												
Structural Rack Support												
Seedling Test												
Literature Survey												
Plant Growth Test												
Find warehouse for Production												
Customer Need Validation												
Small scale Aquaponics Aquarium+4 storey rack construction												
Initiate small scale production												

WORK DONE SO FAR

Lettuce seedlings growing at Kaggalipura Rural Makerspace:



Locally produced Coco Peat used as a growing medium

First test growing 400 Lettuce seeds of varied breeds and different producers (Iceberg, Lola Rosa, Grand Rapids breeds)

We would **need to identify low cost sources of LED lights**. One we have identified one supplier, OSRAM LEDs, but need to confirm the quotation.

Since the ambient temperature here is around 33 C (91.4 F), the plants wouldn't survive due to much heat. We are **designing low cost methods of Root Zone Cooling**. Commercial Thermoelectric Cooling appliances will be tested.



Artificial Lighting (Red and Blue LEDs) with Lettuce in plastic grow pots containing hydroton. The pipes carry water to each grow pot enabling use to use ebb and flow technique to filter water through the medium. The container below the grow pots stores water.



Vertical Stackability of the modular containers is shown in diagram. Reinforcement of vertical support structure is implemented with the help of L-Slotted racks. Pipelines allow water to distribute among all the storeys. Motor is installed between the racks and fish tank compensate for the decrease the pressure.



Three Tanks for Fish's 3 Stages of Growth:

First Tank is for baby fish, second for medium fish, third for fish ready for harvest in 30 days. The water keeps circulating between the plants and fish allowing exchange of nutrients.

GROWTH STRATEGY

Second Stage will focus on producing around 5000 plants using the previously designed system, but in the rented warehouse.

We will partner with 1 restaurant for supplying the produce. Customers interested in buying our fish produce will be identified and cultivation of varieties of fish will be tested for growth. Hydroponics and aquaculture system will be combined. Value Proposition for Fish purchasing customers shall be tested. We plan to break even the running costs by lettuce production.

Third Stage will introduce a modular system for growing hops and adding the piping system, doing adjustments in the pre-established setup to accomodate. Production of Lettuce and chosen species of Fish shall be scaled up to accomodate needs of 5 restaurants. We hope to generate revenue to break even running and establishment costs.

TEAM



Arvind Badrinarayanan

Founder

Arvind is a Veterinarian and entrepreneur who is a socialist, humanist but most importantly a futurist..

Armed with 12 years of experience in Integrative Biology, Wildlife and Pisciculture, he provides insights to build the biological ecosystem in the production setup.



Ajay Gopi

Maker

He is an Innovator and a creative maker from Somanahalli, deeply interested in electronics and farming.

He adds oodles of enthusiasm to the team and leads the operations.



Mayoor Shetty

Entrepreneur

Armed with 10 years experience in customer service, he is the founder of Project DEFY's rural makerspace at Mangalore. He is working on the makerspace operations and building the aquaponics setup proof of concept at his makerspace.



Abhinav Dey

Project Co-ordinator

Abhinav has been designing hardware products working closely with the ProjectDEFY makerspace users.

He adds product design perspective to the team and makes sure operations happen in time.