

NUTRIGARDEN ACTIVITIES AT IITG CAMPUS - Understanding microgreens' yields and growth cycles-2023

Origin of Microgreen farming:

It has been found that the Microgreen farming was rooted back in 1980s when it first seemed on the menu of chefs in San Francisco, California (United States Department of Agriculture, 2014). Further popularity began in the southern part of California in the 1990s, such that now microgreens are regarded as "functional foods" or "Superfoods."

Techniques of Microgreen Farming:

The simple and proper techniques used for Microgreen Farming at IIT Guwahati SART are :

- **Prepare the Container / Tray :** Filled the shallow trays with soil, with a depth of about 3-4 inches, as microgreens have shallow root systems.
- **Seed Sowing:** Evenly spreaded microgreen seeds on the soil surface. There's no need for precise spacing; hand sprinkling works is done .
- **Cover and Pat Down:** Gently covered the seeds with a thin layer of soil (1 inches) and pat it down to help the seeds settle. **Moisten the Soil:** Spray water over the soil to ensure it's moist, but avoid overwatering.
- **Germination:** Placed the trays on the rack under shed with room temperature for approximately two days to allow germination.
- **Regular Watering:** Watering the growing greens one / twice a day. In 3-4 days, small leaves developed above the soil with shoots at the base.
- **Harvest:** When the microgreens reach a height of 2-3 inches, they are harvested. Used scissors/ a sharp knife to cut them, holding them vertically just above the roots.
- **Rinse and Use:** Wash the harvested microgreens with cold running water and use them immediately in your meal..

Types of Microgreen Farming:

Basically, two types of Microgreen Farming Systems can be created, either it can be Kitchen Microgreen Farming or Indoor Microgreen Farming and Hydroponic Microgreen Farming System.

We at IIT Guwahati -SART followed Indoor Microgreen Farming System .

TIME LINE : Phase 1 : Feb 23 to June 2023 ,

Phase 2 : July 2023 onwards till date

Purpose: Understanding Microgreen Yields and Growth Cycles

Major key points observed are :

1. **Researching Production Yields:** We observed yields per standard tray for each microgreens variety. For example, Brown Lentil yield is differently than radish.
2. **Factoring Growth Timing:** Each microgreen has its unique timing from seeding to harvest is being recorded . We observed the peak maturity for each variety, as harvesting too early or late could affect both yield and quality.
3. **Determining Output Capacity:** We assessed our total output capacity based on growth cycles and available space. This helped us understand how many trays we could produce in a given time, factoring in the different growth cycles of each variety.
4. **Estimating Per-Unit Production Costs:** We estimated the per-unit production costs for each microgreen using our yield data.

Methodology:

The seed are chosen for microgreen are in Phase 1

Radish, Moong Beens, Mustard, Brown Len I, Turnip, Red Amaranth, Black Chickpeas, Green peas, White peas , Coriander, Spinach, Fenugreek, Broccoli, Kholrabi, Celery, Carrot, Kabuli Channa

For Phase 2: Kitchen garden + Microgreen

Ladies nger, Bringles, carrot, Red Amaranth, Amaranth, Chilli, Red Amaranth, coriander, Kholrabi, Fenugreek, beans, tomato.

Process adopted:

Plastic trays are chosen size 1 X10" height 2.5" with holes at the bottom

No of tray : 10 nos

Soil preparation with coco pit, cow dung , small quantity of sand (only at the beginning), and mixing properly to eliminate any lumps.

Filling tray with soil and manure and watering to make soil completely wet.

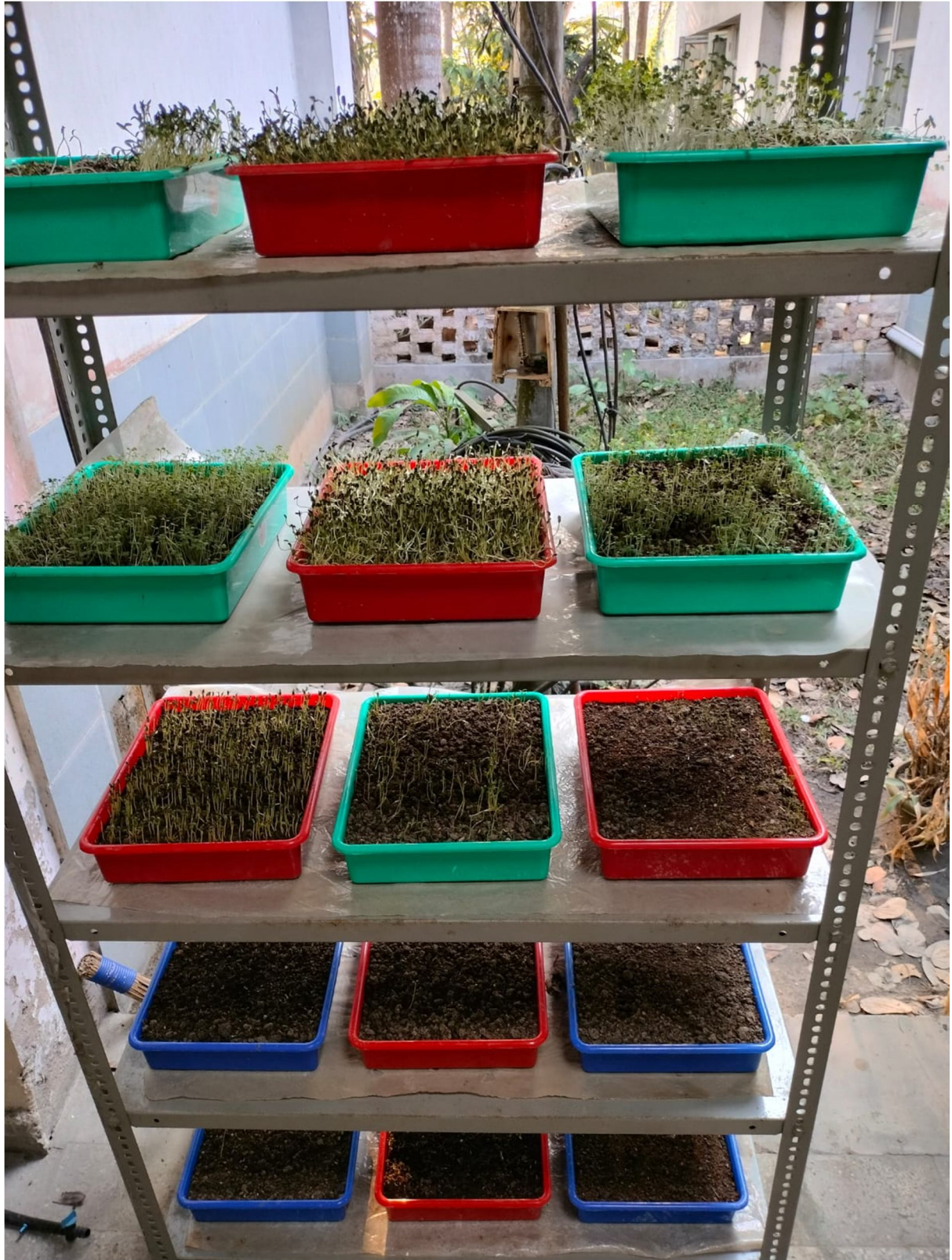
Apply seed on top and apply a thin layer of soil with manure.

A trial was done by covering the tray for a few days but it is not very unsuccessful.

After a few days observe the growth of microgreens and sprinkle water wherever needed

After growth in 2-3 days, one tray filled with water and a tray with microgreen are placed on top of it for proper water circulation















Issues observed:

1. Microgreen in Red Amaranth growth is very less in the tray
2. Celery's slow growth and yield is very less, not successful in tray
3. Carrot yield is very poor and slow growth
4. Kabuli chana is not successful in the tray as it is rotten in the soil

Recommendation:

Maximizing Yields Through Planning space utilisation, rotation schedule and harmonious flow.

Adapting to Seasonal Fluctuations ie seasonal changes that could affect growth cycles. This required constant observation and adaptation, ensuring we were always in tune with our microgreens

Benefits of Microgreen Farming:

During and after wave of COVID has remained the humans to adopt many eco friendly reminders and Microgreen farming is one of them. Microgreen farming offers a host of advantages, from sustainability and nutrition to simplicity and versatility, making it a valuable option for a variety of gardening and dietary needs.

- **Reduced Water Usage:** Microgreen farming requires significantly less water compared to traditional crops, making it an excellent choice in regions with water scarcity or for environmentally conscious individuals.
- **Short Growth Cycle:** Microgreens have a quick growth cycle, often ready for harvest in just a couple of weeks. This means enjoy fresh, nutritious greens sooner.
- **Soilless Cultivation:** Microgreens can be grown without soil, which reduces the need for large plots of land and makes them adaptable to various indoor growing systems.
- **Minimal Space Requirements:** Their compact size allows microgreens to thrive in limited spaces, making them suitable for urban dwellers or those with small gardens.
- **No Phytosanitary Treatments:** Microgreens typically don't require chemical treatments for pests and diseases, contributing to chemical-free, healthier produce.
- **Weed Control:** Microgreen farming often involves controlled environments with reduced weed competition, saving time and effort in weeding.
- **Minimal Fertilizer Needs:** They have lower fertilizer requirements compared to full-grown crops, promoting sustainable and cost-effective farming.
- **Higher Concentration of Bioactive Compounds:** Microgreens are known to contain higher concentrations of vitamins, minerals, and antioxidants compared to their mature counterparts, providing a nutrient-rich addition to your diet.
- **Dietary Diversity:** Microgreens can play a vital role in enhancing dietary diversity by introducing a wide range of flavors and nutrients to your meals.
- **Suitable for Challenging Locations:** Microgreens are versatile and can be grown in regions with limited space, remote locations, and high-altitude areas where traditional farming may face technical limitations or seasonal variability.

What's making Microgreen Farming effective & popular at the ground level?

- **Healthy Living Choice:** Incorporating microgreens into your diet can be a healthy living choice due to their high nutritional value.

- **Kitchen Balcony Beautification:** Growing microgreens can beautify your kitchen balcony, adding greenery and freshness to your living space.
- **Low Cost:** Microgreen farming is cost-effective, requiring minimal investment in terms of seeds and growing equipment.
- **Easy Handling Process:** Microgreens are easy to grow and require minimal effort and expertise, making them accessible to both beginners and experienced gardeners.
- **No Extra Efforts or Costs:** Microgreens generally don't require additional expenses like composting, fertilizers, or extensive trimming, saving you time and money.
- **Reusable and Recyclable:** After harvesting, microgreen containers and growing media are often reusable and recyclable, reducing waste and environmental impact.

Exclusive ways to add microgreen farming products to diet contents:

Microgreens, known for their high nutritional value, must be added as constitute over 30% of a diet. These nutrient-packed greens can be cultivated from cereals and legumes like rice, corn, chickpeas, and lentils. They serve as versatile garnishes, enhancing the flavor, texture, and color of dishes, such as salads, soups, flatbreads, pizzas, and sandwiches (a lettuce alternative). They can be blended into smoothies and juices, offering a health boost. Food science laboratories can create value-added products like cookies, noodles, snacks, and chips using fresh or dried microgreens.

Reacheness of Microgreen Farming In India :

In India's rapidly developing urban centres like Delhi, Bengaluru, and Mumbai, a unique farming trend is taking root, quite literally. Microgreen farming, often referred to as kitchen gardening, and what's driving this newfound popularity is a perfect blend of technology, limited space, and the quest for alternative sources of nutrients. It offer an efficient way to access natural and healthy foods without the need for an extensive garden or an abundance of time. The beauty of microgreen farming is it's a perfect fit for individuals who want to incorporate fresh, nutritious produce into their diets but face constraints when it comes to space and gardening expertise.

Microgreen farming is more than just a trend; it's a response to the need for sustainable, natural, and convenient food sources in the urban India. With a little space, some seeds, and a dash of enthusiasm, microgreens are bridging the gap between city life and the desire for healthier, greener living. More and more people are waking up to the idea of growing their own mini gardens right at home, ensuring a daily supply of fresh, flavorful, and nutrient-packed greens.

Ways to Develop Microgreen Farming Business:

- **Commercial Scale:** Expand microgreen farming to a commercial scale, supplying restaurants, local markets, and retailers. Educational Services: Offer workshops, tutorials, and training to aspiring microgreen farmers.

- **Online Sales:** Create an online platform for selling microgreens directly to consumers such as packed seeds, micro farming handling equipment's or even freshly packed crop products also.
- **Value-Added Products:** Develop and sell products such as microgreen salad mixes or condiments.
- **Sustainable Practices:** Promote organic and sustainable microgreen farming at indoor and kitchen to cater to environmentally conscious consumers.
- **Collaboration with Restaurants:** Collaborate with restaurants to grow customized microgreens for their unique culinary needs.
- **Export Opportunities:** Explore opportunities to export microgreens to international markets.

Agribusiness Promoting Microgreen Farming :

Agribusinesses are promoting microgreen farming due to its sustainability, high demand for fresh produce, and nutrient density. Strategies involve education, supply chain integration, and collaborations, benefiting both consumers and business developers. The microgreen farming business can be diversified through specialization, scaling, education, online sales, value-added products, sustainable practices, restaurant collaborations, and export opportunities, depending on market dynamics and goals.

Conclusion:

In conclusion of microgreen farming, we may say it has earned its place as an invaluable resource for fresh and sustainable nutrition in the modern world. Microgreen products are packed with essential vitamins, minerals, and numerous of bioactive compounds like carotenoids, phenols, and glucosinolates. These youthful plants offer a plethora of advantages, making them a standout choice for anyone looking to enhance their nutrition and enjoy a touch of greenery even in limited spaces. Along with all these advantages, Microgreen products can create a chain of employment opportunities from local business developers to a large-scale commercial industry.

Yield vs cost analysis - Annexure 1

TABLE 1: TIMELINE FOR MICROGREEN SEEDING TO HARVESTING

CROP SEED (inch)	QTY OF SEED gm (TRAY SIZE)	SEED SOWING DEPTH IN SOIL	SEEDING DATE	HARVESTING DATE	TOTAL DAYS
Moong Beans	90	0.2	18.05.2023	27.05.2023	10 days
Black Chickpeas	136	0.2	13.04.2023	26.04.2023	13 days

Brown Len I 24.04.2023	57 03.05.2023	10 days	0.2
White Peas 24.04.2023	150 06.05.2023	12 days	0.2
Fenugreek 21.03.2023	17 05.04.2023	14 days	0.2
Spinach 08.05.2023	15 19.05.2023	11 days	0.2
Turnips 18.05.2023	17 27.05.2023	9 days	0.2
Mustard 18.05.2023	18 26.05.2023	8 days	0.2
Radish 18.05.2023	21 26.05.2023	8 days	0.2
Coriander 25.04.2023	8 12.05.2023	17 days	0.2
Red Amaranth 21.03.2023	4 25.04.2023	5 days	0.2