

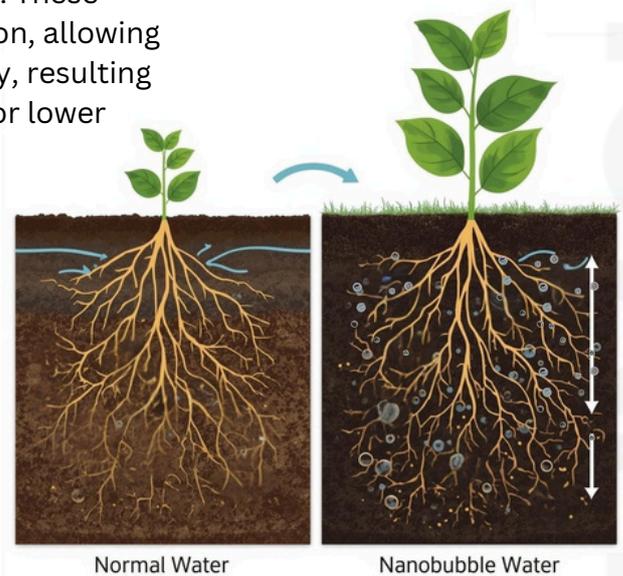
# Nanobubble Technology in Agriculture

*Healthier crops, improved soil conditions, and higher yields*

Two fields can receive the same water and fertilizer, yet the one with better root-zone conditions can deliver yields **20–30%** higher. The difference lies in oxygen availability, water penetration, and nutrient efficiency at the roots. Nanobubble-enriched irrigation enhances water penetration into the soil, ensuring uniform moisture distribution around the roots. At the same time, it delivers a steady and sustained oxygen supply, supporting healthy root respiration. These conditions enhance nutrient delivery and absorption, allowing plants to grow faster, stronger, and more efficiently, resulting in healthier crops and higher yields with the same or lower inputs.

Nanobubbles improve agriculture by enriching irrigation water with stable dissolved oxygen, ensuring better oxygen supply to roots, improved water penetration in soil, and enhanced nutrient delivery. This leads to stronger root respiration, higher fertilizer efficiency, healthier soil microbes, and reduced plant stress from heat and waterlogging. As a result, crops grow stronger with fewer chemical inputs, delivering higher yields and more sustainable farming.

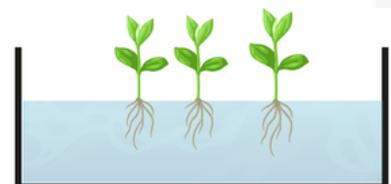
Grow **15–40%** More and Healthier Plants with Nanobubbles



Improved water penetration



Better Oxygen supply



Nanobubbles potentially saves **25% fertilizers**

Enhances nutrient delivery

# Our Results

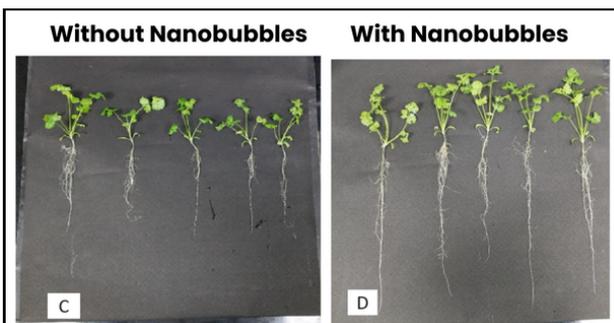
## 1. IIT Ropar Lab Trials - Hydroponics

### Lettuce, Coriander

*(Controlled lab trials under monitored conditions to evaluate plant response to nanobubble-enriched water.)*

We conducted controlled laboratory trials on lettuce and coriander using two identical hydroponic setups, one with normal water and the other equipped with our nanobubble generator.

All environmental and nutrient parameters were closely monitored and kept consistent across both systems



These trials demonstrate that nanobubble-enriched water significantly enhances growth and root development in hydroponic lettuce and coriander, confirming nanobubbles as an effective solution for soilless cultivation systems.

Number of leaves increased by

**21.5%**

in the lettuce hydroponic setup compared to the control.

Root length increased by

**19%**

in the lettuce hydroponic setup compared to the control.

Fresh weight increased by

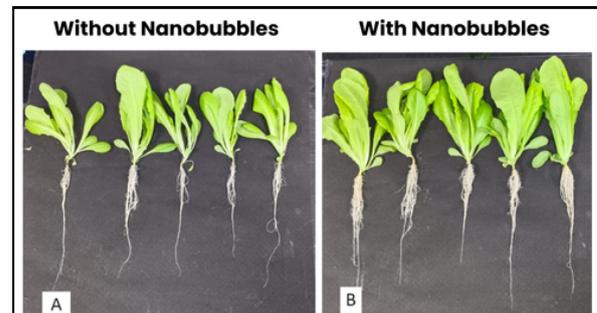
**45%**

in the lettuce hydroponic setup compared to the control.

Dry weight increased by

**84%**

in the lettuce hydroponic setup compared to the control.



Number of leaves increased by

**38%**

in the coriander hydroponic setup compared to the control.

Root length increased by

**23%**

in the coriander hydroponic setup compared to the control.

Fresh weight increased by

**34%**

in the coriander hydroponic setup compared to the control.

Dry weight increased by

**48%**

in the coriander hydroponic setup compared to the control.

# Our Results

## 2. Eeki Foods installation (Aeroponics - Tomatoes and Cucumbers)

*(On-field validation in a commercial aeroponic setup with one of India's leading agritech companies.)*

We collaborated with Eeki Foods, India's leading aeroponics company, to evaluate nanobubbles in a controlled aeroponic setup. Two identical systems were used:

1. DO-NB System: Oxygen Nanobubble water
2. Control System: Standard water, no nanobubbles

All other conditions (nutrient dosing, temperature, light, airflow, spacing) were kept identical.



Total yield increased by

**13%**

in the cucumber aeroponic setup

Grade A yield increased by

**15%**

in the cucumber aeroponic setup



Grade A tomato yield increased by

**11%**

in the tomato aeroponic setup

Number of flowers per plant increased by

**15.5%**

in the tomato aeroponic setup

Fruit yield per plant increased by

**6.7%**

in the tomato aeroponic setup

These results show that oxygen nanobubbles improve yield and fruit quality under optimized aeroponic conditions. With identical growing parameters, the DO-NB system outperformed the control. Improved root oxygenation led to higher productivity and more Grade A produce. This confirms nanobubbles as an effective, scalable solution for protected cultivation.

# Why Nanobubbles in agriculture ?

Nanobubbles are extremely small, stable gas bubbles (<200 nm) that remain suspended in water, delivering sustained oxygen to the root zone and supporting healthier plant growth.

## Oxygen-rich root zone

Plant roots require oxygen for respiration. Nanobubbles remain suspended in water and dissolve oxygen efficiently. This prevents root suffocation and improves respiration. Stronger, longer roots with higher fresh and dry biomass develop.

## Higher nutrient efficiency

Healthy, oxygenated roots absorb nutrients more effectively. Nanobubbles enhance root membrane activity and ion transport. Uptake of N, P, and K improves significantly. This results in faster growth with reduced fertilizer loss.

## Healthier soil biology

Soil health depends on active aerobic microbes. Nanobubbles promote beneficial microbial growth and organic matter breakdown. Nutrient cycling in the root zone improves. Soil structure and fertility increase over time.

## Increase yield and crop quality

Better oxygenation enhances overall plant metabolism. Plants produce more leaves and higher biomass. Chlorophyll content and stress tolerance improve. Yield and produce quality increase consistently.

## Suppress root diseases and pathogens

Low oxygen favors harmful root pathogens. Nanobubbles increase dissolved oxygen and inhibit anaerobic microbes. Beneficial aerobic organisms thrive in the root zone. Root health improves with reduced chemical use.



# NanoAqua

*Designed for continuous operation in agricultural environments with minimal maintenance.*

NanoAqua is an oxygen-based nanobubble generator with an in-built oxygen concentrator designed to improve irrigation water quality and boost crop productivity.

It delivers high-purity oxygen nanobubbles that enhance root aeration, nutrient uptake, and overall plant growth. With a plug-and-play design and durable SS304 stainless steel construction, NanoAqua is easy to install, low-maintenance, energy-efficient, and consistently maintains high dissolved oxygen (DO) levels in irrigation water



## Technical Specifications

Model	NanoAqua C3	NanoAqua C15
Flow rate (m <sup>3</sup> /hr)	2-3	10 – 15
Power rating (kW)	1.25	2.2
Oxygen capacity (LPM)	5	5
Oxygen concentration (%)	93	93
Suction (inch)	1	2
Discharge (inch)	1	2
Height (ft)	2	4
Width (ft)	2.1	1.5
Length (ft)	2	4
Pump type	Centrifugal Pump	Centrifugal Pump
Material of construction	SS304	SS304

\*\*Specifications may change due to constant improvements

## Applications in Agriculture



Irrigation Systems



Hydroponics & Polyhouses



Open-Field Farming



Nursery & Seed Germination

## Why Nanokriti

Nanokriti is an IIT Ropar-incubated startup founded in 2022, working to improve system efficiency using nanobubble technology.

- Proven Results in Lab & Field
- Science-Backed, Cost-Effective Technology
- Scalable & Easy to Integrate systems



## Sectors we transform



Agriculture



Aquaculture



Lake and Pond Rejuvenations



Wastewater Treatment

| Interested in improving crop performance using nanobubbles?

### CONTACT US

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