

Case Study

Enhancing Hydroponic Crop Productivity Using NICO Nanobubble Technology



Overview

In modern hydroponic farming systems, dissolved oxygen (DO) plays a critical role in root development, nutrient uptake, and overall crop productivity. Conventional systems often struggle to maintain optimal oxygen levels, resulting in limited growth efficiency and sub-optimal yields.

This case study evaluates the impact of NICO AGNIROOT 08 in improving oxygen availability, root health, and crop yield in a controlled hydroponic environment operated by a **leading food delivery and quick commerce entity**.

Project Details

- **Application:** Hydroponic Farming (Basil Cultivation)
- **Location:** Haryana, India
- **Technology:** NICO Agniroot 08
- **Entity:** Leading Food Delivery and Quick Commerce Company
- **Deployment Timeline:** January 2025 - March 2025



Objective

It accelerates root development while increasing dissolved oxygen (DO) levels in the nutrient solution, creating a more efficient growing environment. This leads to improved crop quality and higher daily harvesting yields. At the same time, it demonstrates the scalability and effectiveness of nanobubble technology in modern agriculture.

Pre-Implementation Challenges

Prior to nanobubble integration, the hydroponic system exhibited typical constraints:

- Low dissolved oxygen levels (~4 ppm) in nutrient solution
- Slow and less dense root development, limiting nutrient uptake
- Moderate crop quality and inconsistent growth performance
- Limited daily harvesting output, affecting production efficiency
- Sub-optimal system conditions, restricting overall productivity

NICO Nanobubble Solution

The system utilized NICO AGNIROOT 08 nanobubble system to enrich hydroponic water with ultra-fine oxygen bubbles (<200 nm), enhancing oxygen availability at the root zone.

Key functional advantages:

- **Enhanced Root Oxygenation:** Promotes rapid and dense root development
- **Improved Nutrient Uptake:** Increased oxygen availability enhances absorption efficiency
- **Higher DO Levels:** Achieved significantly elevated oxygen concentration (~20 ppm)
- **Optimized Growth Conditions:** Stable and oxygen-rich environment supports plant vigor
- **Scalable Deployment:** System upgraded seamlessly to meet increased operational demand



Without NICO



With NICO

Performance Outcomes

Parameter	Unit	Without Nanobubbles	With NICO's AGNIROOT
Root Development	-	Slow growth	Rapid, dense, healthier roots
Plant Quality	-	Moderate	Improved consistency and vigor
Basil Yield	kg/day	25-30	50
Dissolved Oxygen (DO)	ppm	~4	~20
System Performance	-	Limited growth environment	Optimized oxygenation, higher productivity

Key Improvements:

2x increase in daily harvesting output

5x increase in dissolved oxygen levels

Impact Analysis

The implementation of nanobubble technology resulted in substantial agronomic and operational benefits:

- **Accelerated Root Development:** Stronger root systems improved nutrient absorption
- **Enhanced Crop Yield:** Significant increase in daily harvesting output
- **Improved Crop Quality:** Better consistency, vigor, and visual quality
- **Optimized Oxygen Environment:** Stable and high DO levels supported plant growth
- **Increased Productivity:** Improved output without increasing cultivation area
- **Scalable System Performance:** Technology adapted easily to higher capacity requirements
- **Sustainable Farming Approach:** Reduced dependency on external inputs through better efficiency

Conclusion

The deployment of NICO's AGNIROOT 08 demonstrated a clear improvement in hydroponic farming performance. By significantly enhancing dissolved oxygen levels and root zone conditions, the system enabled higher yield, improved crop quality, and optimized operational efficiency.

This case study establishes nanobubble technology as a high-impact, scalable solution for modern hydroponic agriculture, particularly in high-value crop production environments.