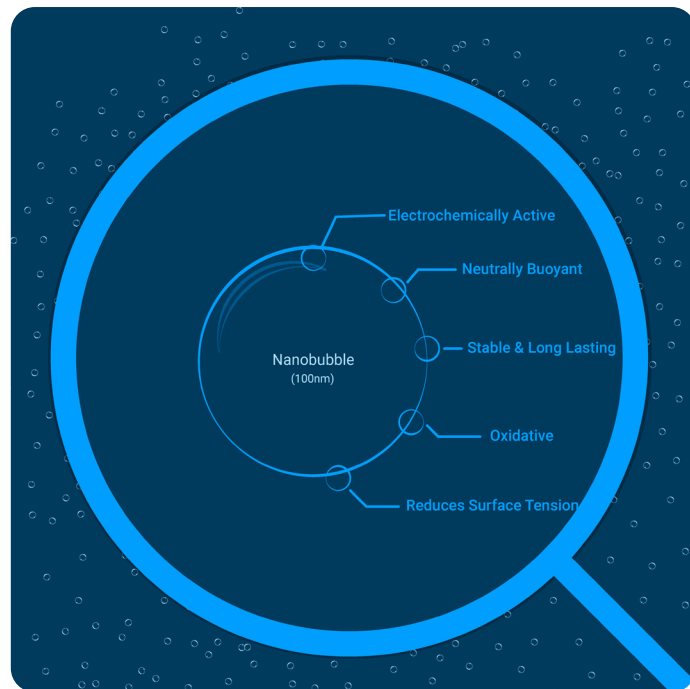


Introduction to Nanobubbles

Nanobubbles are microscopic gas bubbles that remain suspended in liquids. These ultra-fine bubbles offer a sustainable and chemical-free solution for enhancing water quality, soil health, and plant growth in agricultural applications.

Nanoporex, leveraging cutting-edge nanobubble technology, provides cost-effective solutions to enhance agricultural productivity while minimizing environmental impact.



Benefits of Nanobubbles

Nanoporex's nanobubble technology delivers significant advantages across the agricultural water cycle:



Water Quality

- Enhanced removal of biofilms and scale in irrigation systems.
- Reduced blockages and improved emitter uniformity.
- Algae and pathogen reduction, leading to better water clarity.



Soil Health:

- Efficient oxygenation of the soil and root zone.
- Improved wettability, infiltration, and soil microbiology.
- Enhanced nutrient conversion and availability.



Plant Health

- Increased harvest yields with better fruit size and quality.
- Healthy root development and improved heat tolerance.
- Reduced environmental stress and higher nutrient uptake.

Nanobubble Effects on Agriculture



Improved Seed Germination

Numerous studies demonstrate the positive impact of NBs on seed germination rates, ensuring healthier crop establishment.



Enhanced Nutrient Uptake

By oxygenating irrigation water, NBs facilitate stronger root development and nutrient absorption, leading to more resilient plants.



Reduction in Agrochemical Use

Nanobubbles aid in water quality improvement, reducing pathogen load and the need for pesticides.

Their use prevents root rot and other diseases by maintaining aerobic conditions in the soil.



Sustainability

The technology minimizes energy and water consumption, aligning with decarbonization and ESG (Environmental, Social, and Governance) goals.



Soil Health Maintenance

Nanobubbles improve soil oxygenation, which supports beneficial microbial activity, fostering a healthier ecosystem for crops.



Reduced Hypoxic Stress

Nanobubbles mitigate oxygen deficiency, reducing metabolic inhibitors and the incidence of fungal diseases.



Optimal Oxygen Levels

Nanobubbles provide a stable vehicle for oxygen enrichment, ensuring optimal dissolved oxygen (DO) levels in water and soil.



Improved Root Functionality

Nanobubbles maintain oxygen saturation in irrigation water, enabling deeper root penetration

Applications of Nanobubble Technology



Improved Irrigation Systems:

- Anti-biofouling: Nanobubbles scour surfaces, preventing biofilm buildup in pipes and emitters, ensuring uniform irrigation.
- Scale Inhibition: Effective removal and prevention of mineral deposits like calcium improve system efficiency.

Enhanced Soil and Water Management:

- Reduced surface tension improves infiltration rates and soil moisture levels.
- Improved soil aeration promotes beneficial microbial activity.



Disease Control:

- Nanobubbles disrupt environments conducive to disease-causing bacteria.
- Promoted aerobic microbial activity outcompetes harmful anaerobic bacteria.



Why Choose Nanoporex?

Nanoporex's indigenous nanobubble technology is a result of collaboration between CSIR-NML, MG University-Kottayam, Kerala, and Diva Envitec. With its unique physicochemical properties, this innovation is poised to revolutionize agriculture, aquaculture, and horticulture by:

Concentration Capability:

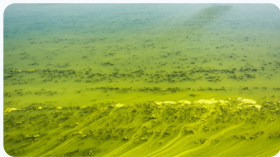
Nanobubble generators like those of Diva can achieve concentrations up to 1 billion NBs per milliliter, enhancing their efficacy in agricultural applications.

Safe and Scalable:

The technology is adaptable to diverse water qualities, including saline conditions, and has shown compatibility with aquaculture and irrigation systems.

Cost Efficiency:

Unlike traditional methods, Nanoporex require lower energy input and eliminate excess chemical application.

	Challenge	Nanoporex Solution
	Low oxygen in water	Increase DO levels for root zone oxygenation
	Biofilm and harmful pathogens	Remove biofilm and reduce chemical usage
	Algae and turbid water	Oxidation to reduce algae and improve clarity

"Make in India" Innovation

Nanoporex exemplifies the synergy of cutting-edge science and sustainability.

By addressing critical challenges in agriculture, aquaculture, and horticulture, this cost-effective and eco-friendly solution paves the way for sustainable development and environmental conservation.

