

Optimizing Irrigation: Comparing Oxygenation, Chemical Oxidants, and Magnetization Technologies

To compare different irrigation water treatment technologies and highlight the specific benefits of nanobubble oxygenation for soil health and crop yield.

Chemical Oxidants and Water Structure

Chemical Oxidants

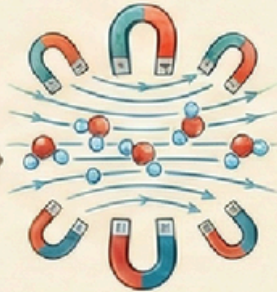
(e.g., H₂O₂)
Rapid disinfection, but risks suppressing beneficial soil microbes and lacks long-term stability.



Stability in Water: Minutes to Hours
Primary Microbial Impact: Dose-dependent suppression

Magnetized or EMF Water

Improves Soil Structure
Reduces salinity and improves nutrient uptake indirectly without providing direct oxygenation to the roots.

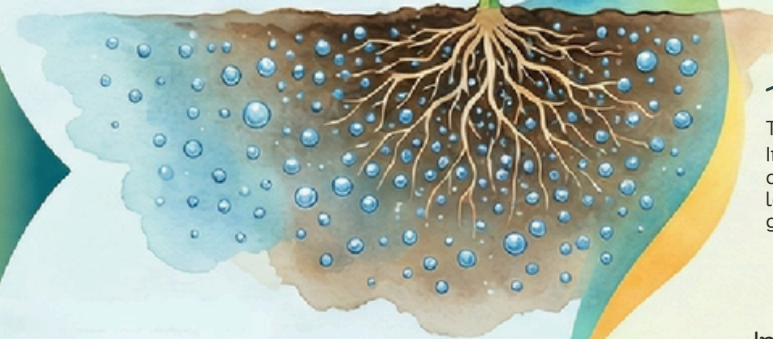


Reduces salinity and improves nutrient uptake indirectly

Stability in Water: Transient/Short-lived
Primary Microbial Impact: Minor, temporary shifts

The Nanobubble (NB) Performance Impact

Nanobubble oxygen offers Safe, Continuous Delivery. NB O₂ maintains high dissolved oxygen levels up to 30 mg/L safely without the phytotoxicity risks of chemicals.



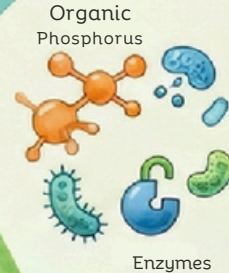
Enhanced Alkaline Phosphatase (ALP) Activity
MB treatment increases ALP activity by 15.4%, a key driver for soil phosphorus effectiveness.
Stability in Water: Days to Weeks



Primary Microbial Impact: Enhances bacterial diversity and health



NB Performance Impacts



21.3% Increase in Available Phosphorus

21.3%

NB oxygenation facilitates the mineralization of organic phosphorus in the maize rhizosphere.

18.7% Boost in Total Maize Yield
Improved enzyme activity and nutrient availability lead to significantly higher grain production.



Impact of NB Oxygenation on Maize Yield Components

Conventional Irrigation



Yield (kg/hm²)
15,118.5



100-Kernel Weight (g)
27.42



Kernels Per Ear
522.6

NB Oxygenation



Yield (kg/hm²)
17,942.7



100-Kernel Weight (g)
35.16



Kernels Per Ear
679.3