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# Microbial Soil Reclamation™

A strategy and product for growers challenged by water supply issues, salt-affected soils and increasing input costs.





# Grower Challenges:

## Salt-Affected Soils

- High Water Use with Limited Supplies
- Poor Nutrient Uptake with Increasing Fertilizer Expenses
- Lower Yield Potential due to Abiotic Stresses

## Reversing Soil Degradation

- Sequestering Carbon to Increase Soil Organic Matter
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# Steps for *Microbial Soil Reclamation™* with Sequester®

1. Apply product at Planting or Spring, ideally.
  - Sequester® can be applied at any time during the crop cycle.
  - Apply by spray, drench or in irrigation water
2. Post emergence, apply product foliar spray or drench over the crop.
3. Repeat these steps for each cash crop cycle.
4. For severely degraded soils requiring intensive reclamation, consider application rates of 5 – 10x Sequester® the first year.



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# Benefits of Microbial Soil Reclamation<sup>™</sup>

- Reduction in soil sodium levels
- Improved water use efficiency
- Increased nutrient uptake

## How much benefit?

Growers in the desert areas of West Texas, Arizona and S. California report sodium levels go down by 60% - 80%, which drives water savings due to improved water use efficiency, and a reduction in fertilizer costs due to increased nutrient uptake and greater nutrient cycling in the soil.



### **Definition of Reclamation:**

*British English:* "the conversion of desert, marsh, or other waste land into land suitable for cultivation."

### **Definition of Microbial Soil Reclamation<sup>™</sup>:**

Restoration of the soil's microbial ecological function to cycle carbon, nutrients and minerals for improved water penetration, water holding capacity, and nutrient retention that promote stress resilience for optimized plant growth and reproduction.

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# What is in Sequester®

Sequester® Soil Amendment, is formulated with Cyanoblend®, a proprietary blend of *Cyanobacteria* strains in a high concentration formulation. *Cyanobacteria* are nitrogen-fixing Autotrophs with the ability to survive and grow in a wide range of temperature, salinity, and pH conditions.

An Autotroph is a photosynthetic organism that produces its own energy using light, water, and carbon dioxide. Therefore, the energy provided by the *Cyanobacteria* drives the rapid increase of the soil's microbial biomass and the ability to cycle carbon and nutrients.

On the other hand, Heterotrophs (bacteria, fungi, protozoa) are organisms that consumes other organisms in the food chain to obtain the necessary energy to drive soil function. What does this mean?

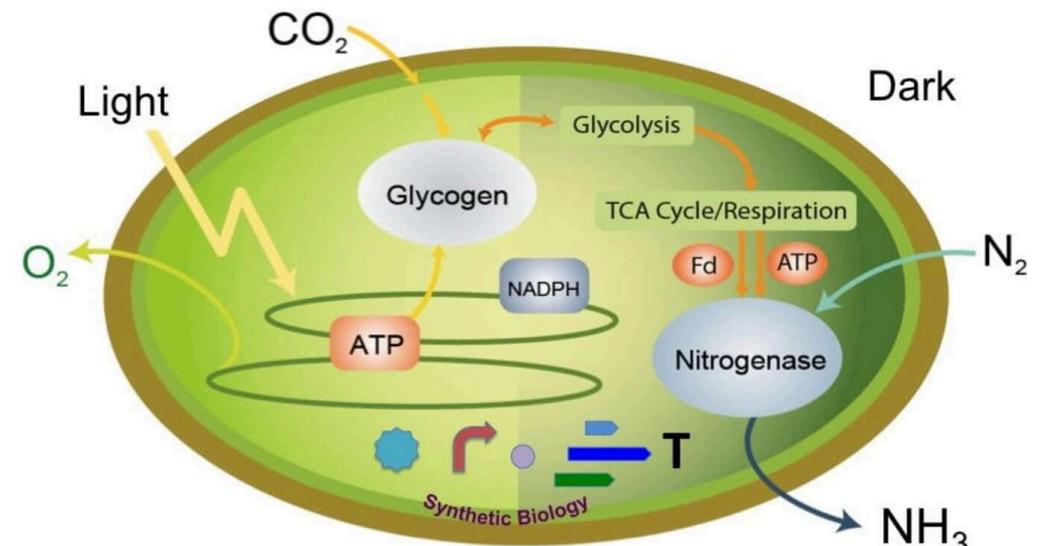
It means with Sequester®, you don't need to apply manure or compost or grow a cover crop to drive microbial functionality in depleted soils. Sequester® is a Micro Cover Crop™.



# Sequester® Uses *Cyanobacteria* Which Are Natural Nitrogen Fixers

Sequester® Soil Amendment's *Cyanobacteria* blend provides natural nitrogen fixation proven in studies around the world. They take nitrogen from the air.

*Cyanobacteria* support the conversion of phosphorous to a bioavailable form. Sequester® supports holding these nutrients in the soil in concert with the soils microbiome to have them available to the plant when needed.



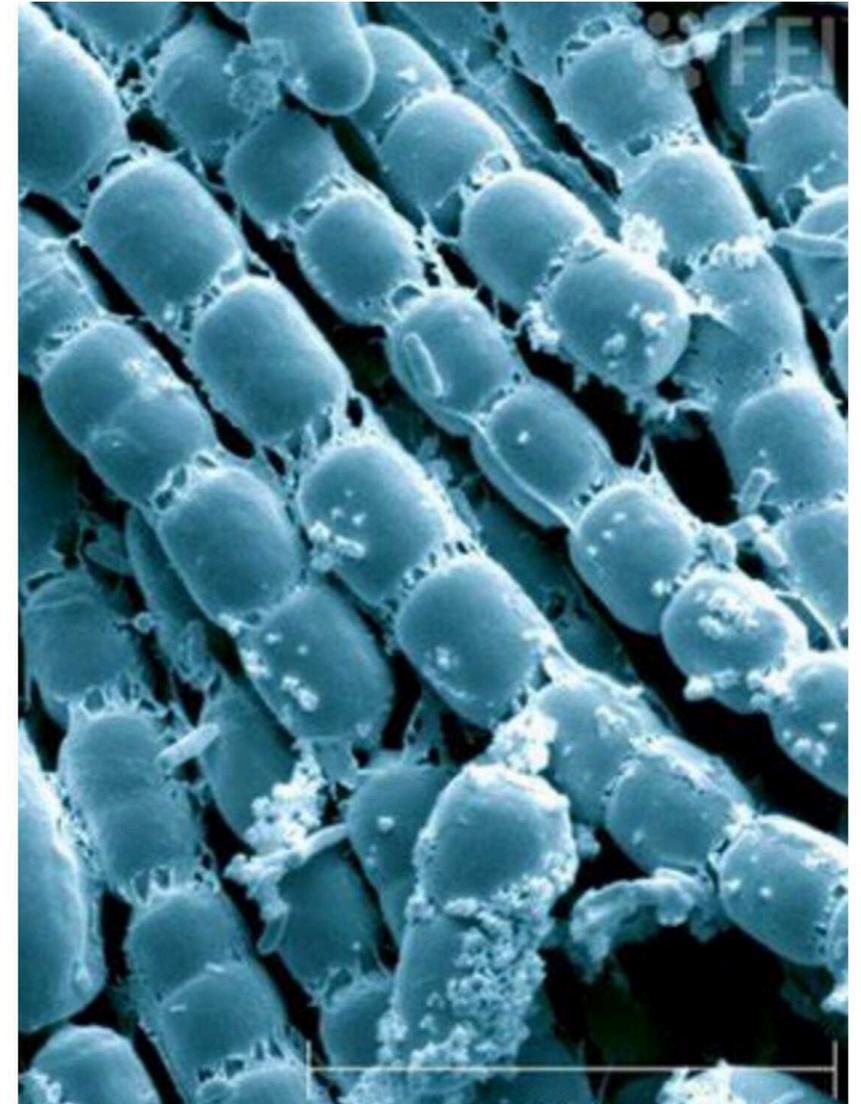
Graphic From Washington University in St. Louis.

# How is Cyanobacteria Used in Microbial Soil Reclamation™

As a photosynthetic, nitrogen-fixing autotroph, *Cyanobacteria* are the most powerful of all microorganisms, with regard to soil reclamation. They drive the soils microbial biomass to rapidly create topsoil by breaking down bedrock into sand, silt and clay particles. They shift salts into inert compounds (Na/Ca) while also elevating soil carbon sequestration to facilitate greater soil particle aggregation which increases the soils' ability to hold moisture and nutrients.

*Cyanobacteria* are multi-functional bio-agents for regenerative agriculture and environmental sustainability. Sequester® is formulated with 4-strains of *Cyanobacteria* plus naturally derived biostimulants to rapidly restore soil functionality and cycle nutrients and carbon.

Compared to growing a cover crop, or the application of manure or compost that requires applying "tons" per acre, Sequester® is economical by comparison, yet faster acting. If continued use of compost, manure or cover crops is desired the addition of Sequester® will further amplify the impact of these other regenerative practices on soil health.



University of Florence, Chamizo 2018

# Sequester® Builds Soil Carbon Why is that Important?

Sequester® supports building carbon and organic matter in soils. Carbon generated by cyanobacteria supports microbial activity in soil building plant health and increased yields. Sequester® generated carbon can provide additional income sequestering CO<sub>2</sub> into the soil by a process of mineralization.

Sequester® enhanced soil is more resilient to climate change and can provide a second environmental income benefit.



# A Unique Cover Crop To Enhance Soils

Sequester® is an easily applied soil enhancement which can be applied at any time during the growing season. With climate change stressing crops and farming operations, Sequester® provides a tool to help growers deal with these challenges.

Sequester® is simply convenient compared to a terrestrial cover crop. No concerns about the seed mix, planting, sufficient time for growth, and termination.



# Soil Reclamation Evidence

Application of Sequester® in irrigation water dramatically reduced Cation concentrations in the soil, especially Sodium. Sodium reduces the plants adsorption of water and nutrients.



Sample Name	Lab ID	pH	Calcium (Ca) ppm	Magnesium (Mg) ppm	Sodium (Na) ppm	
Turnip 1365 Untreated A	21E0246-01		7830 VH	540 VH	920 VH	75% Reduction
Turnip 1365 Treated A	21E0246-02		6560 VH	424 VH	233 H	
Turnip 1635 Untreated B	21E0246-03		6760 VH	376 H	1430 VH	82% Reduction
Turnip 1635 Treated B	21E0246-04		6250 VH	360 H	268 H	
New Spruce 7 Untreated A	21E0246-05		8430 VH	699 VH	1230 VH	75% Reduction
New Spruce 7 Treated A	21E0246-06		9060 VH	592 VH	306 VH	
New Spruce 7 Untreated B	21E0246-07		8150 VH	536 VH	1500 VH	79% Reduction
New Spruce 7 Treated B	21E0246-08		8380 VH	530 VH	309 VH	
Spruce 41 Untreated A	21E0246-09		8690 VH	786 VH	857 VH	67% Reduction
Spruce 41 Treated A	21E0246-10		9280 VH	815 VH	286 H	
Spruce 41 Untreated B	21E0246-11		9680 VH	796 VH	1230 VH	71% Reduction
Spruce 41 Treated B	21E0246-12		10000 VH	866 VH	358 VH	

Field Data, November 2021, Imperial Valley, CA. Bidel AG

# Measuring Performance

- Pre-plant Soil Analysis (SOM\*, Sodium) provides a baseline to measure performance.
- Post harvest soil analysis will show the reduction in Sodium levels and increase in SOM\*.
- Annual increases in SOM is verification of Sequester® performance and the basis for carbon credit certification.



\* SOM = Soil Organic Matter

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