

EnSoil Algae™ Cheat Sheet

EnSoil Algae™ is a liquid concentration of a living freshwater microalgae called *Chlorella vulgaris*. Producers consistently report that it boosts plant health, increases yield, and allows for reduction of chemical inputs, thus raising the grower's ROI.

Boost Stress Adaptation: Drought, Heat, Salinity & Alkalinity

EnSoil Algae™ optimizes soil conditions to tolerate stress such as drought, heat, or salinity and stimulates plants to release enzymes that help the plant survive changes in conditions. Additionally, application of EnSoil Algae™ supports balancing of soils too acidic or too alkaline.

Increase Nutrient Availability, Cycling, Uptake, & Density

EnSoil Algae™ attracts soil microbes to the plant and stimulates nutrient cycling pathways, thus increasing bioavailable nutrients for uptake and storage in the plant tissue (nutrient density).

- Application rate: 8oz./acre or 5mL/gallon of water

- Tank Mix Compatible

Compatible with standard grower inputs including but not limited to herbicide, NPK, primer, fungicide, biologicals, etc.

- Compatible with all irrigation and application equipment

Including but not limited to drip, micro injection, sprinkler, pivot, furrow, boom sprayer, drone, Y-drop, knife, backpack sprayer, watering can, etc.

- 3 applications per season



Enhance Chlorophyll

Leaves treated with EnSoil Algae™ show increased chlorophyll (deeper green pigments) and can more efficiently use energy (sunlight) during photosynthesis.

Maximize Water Holding Capacity

EnSoil Algae™ boosts soil microbial activity and increases biomass leading to more soil organic matter. The soil structure and porosity are improved and thus is able to hold more water.

Stimulate Diverse Soil Microbes

EnSoil Algae™ releases signaling molecules that stimulate and grow diversity and populations of microbes, resulting in increased soil respiration, water extractable carbon, water extractable nitrogen, and balanced bacteria/fungi ratios. The healthier the microbial community, the less dependent a crop is on synthetic nutrients and inputs.

How EnSoil Algae™ Works

EnSoil Algae™ (*C. vulgaris*) works as a powerful bio-stimulant and encourages natural processes of nutrient cycling and soil microbial activity to stimulate and accelerate plant growth. EnSoil Algae can be applied to the leaves of a plant and to the roots and soil and results in the following benefits:

1) Stimulates and grows microbial population and diversity

EnSoil Algae™ releases signaling molecules that stimulate and grow diversity and populations of microbial populations. Application of EnSoil Algae™ results in increased soil respiration, water extractable carbon, water extractable nitrogen, and soil organic matter, and balanced bacteria/fungi ratios. The healthier the microbial community, the less dependent a crop is on synthetic nutrients and crop protection inputs.

2) Increases plant nutrient uptake and improves overall plant health

Plants do not have the ability to use nitrogen directly from the atmosphere. Microbial bacteria convert nitrogen into usable forms for the plants, a process called nitrogen fixation. EnSoil Algae™ attracts soil microbes to the plant, thus increasing the availability of nutrients (like Nitrogen) for the plants to take up and use. We believe the algae improves metabolic function and is serving to increase utilization of nutrients in the plant.

3) Enhances chlorophyll and improves photosynthetic capacity

Leaves treated with EnSoil Algae™ show increased chlorophyll (deeper green pigments) and can more efficiently use energy (sunlight) during photosynthesis. Also, there is a greater release of carbon to the soil which now houses a stimulated, growing microbial community.

4) Increases plant tolerance to stress and soil water retention capacity

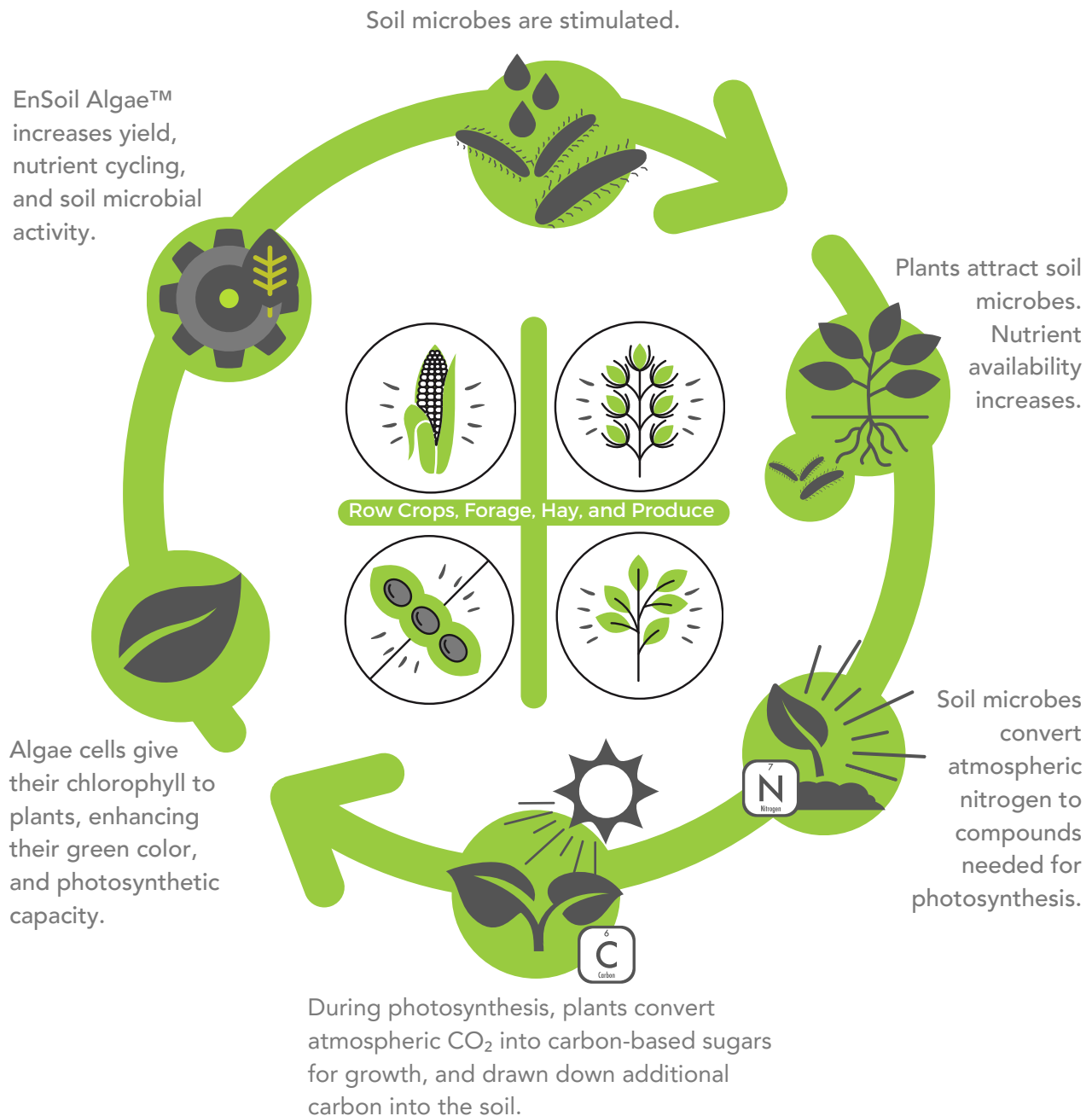
EnSoil Algae™ optimizes soil conditions to tolerate stress such as drought or salinity and stimulates plants to release enzymes that help the plant survive changes in conditions. The increased organic soil matter from the work of microbes and plants increases and the soil grows stronger in structure and is able to retain more water. Additionally, EnSoil has shown to increase bactericide and fungicide agents in plants, likely boosting the plant's immunity to pathogens.

Growing Process for EnSoil Algae™

EnSoil Algae™ works because we have developed a growing process that allows algae to live in the dark. Green algae and other plants are autotrophic: they make their own food with photosynthesis, without consuming organic material. Animals and bacteria are heterotrophic: we eat other organic material. Algae are capable of heterotrophic metabolism, and we have developed a new growing process that induces *Chlorella vulgaris* to consume organic material and continue growing in the dark, while using photosynthesis in the light. This development allows EnSoil Algae™ to live in dark storage for the length of a growing season, at least 6 months.

How EnSoil Algae™ Works

EnSoil Algae™ (living *Chlorella vulgaris*) reduces dependency on synthetic inputs, increases yields, maintains healthy herds, stimulates the soil microbiome, and improves return on investment.



Application Protocols

All applications are 8 oz. / acre.

Compatible in tank mixes with standard grower inputs including but not limited to herbicide, NPK, primer, fungicide, biologicals etc.

Compatible with all irrigation systems and application equipment including but not limited to drip, micro injection, sprinkler, pivot, furrow, boom sprayer, drone, Y-drop, knife, backpack sprayer, watering can, etc.

Corn

In-Furrow

V3-V6

V8-R2

Soybeans

In-Furrow

V8

R1-R2

Pasture / Hay

3-4 times per season after
each cutting / grazing

**livestock do not need
to be removed from
pasture to apply**

Veggies

At Seed

Post Emergence

Flower/Fruit

With Cover Crop

Permanent Crops

Bud Break

Fruit Set

Fruit Fill

Before Stress

Home, Lawn, & Garden

For potted plants and house plants: Once a week for two weeks, then once every two weeks.

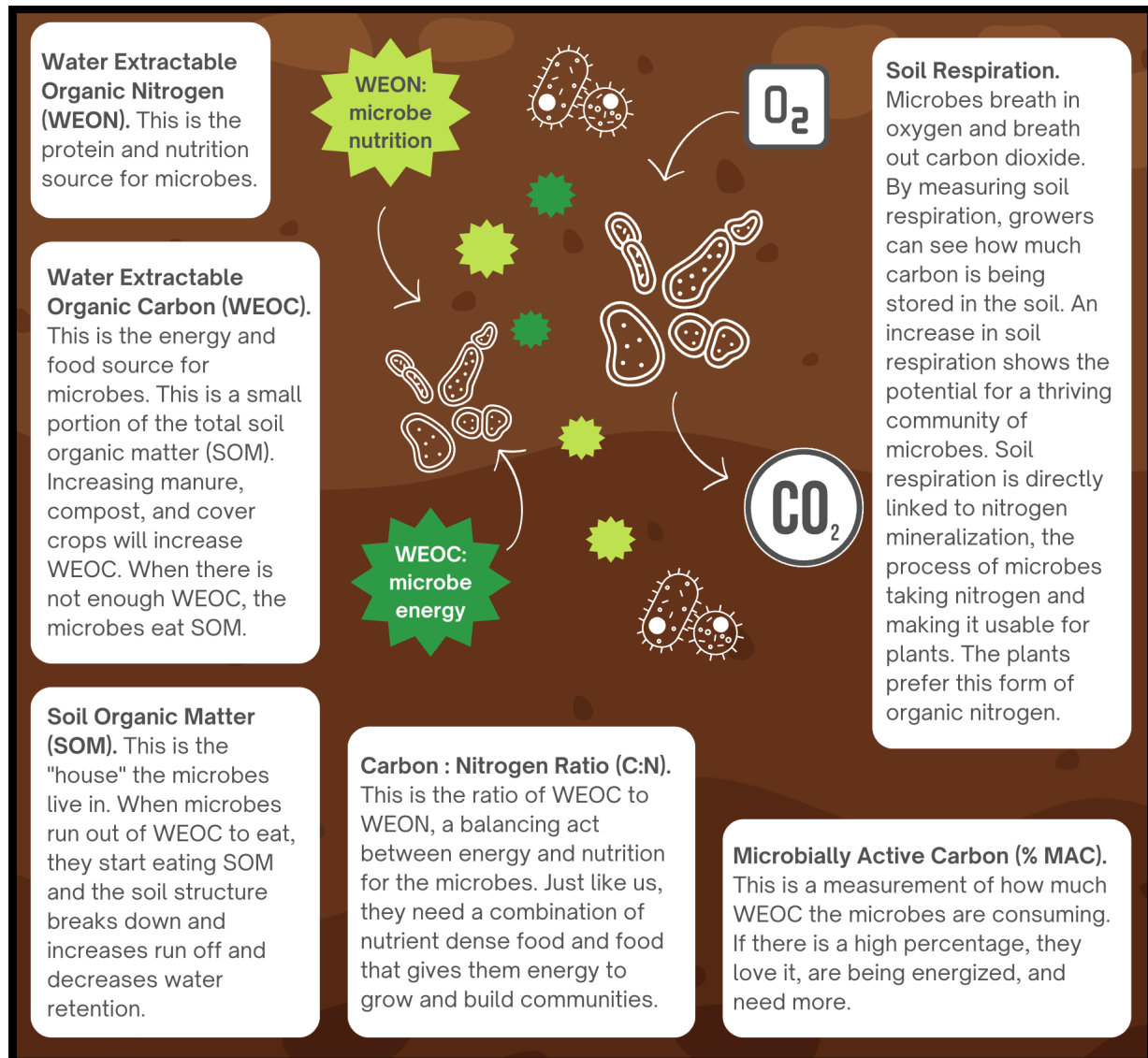
For gardens, raised beds, and lawns: Once a week for two weeks, then once every four weeks.

How We Measure Efficacy

Enlightened Soil Corp uses the following to measure efficacy of EnSoil Algae™. We integrate various combinations of recommended testing and industry standards into the grower's sampling protocol to gather data pertinent to our growers success.

Haney Soil Test

The Haney Soil Test mimics biological activity in the soil and provides nutrient recommendations by measuring dynamic carbon, a nutrient that cycles through the following forms: Soil Organic Matter (SOM), Water Extractable Organic Carbon (WEOC) and carbon dioxide gas (CO₂). Haney tests use an extract to test soils called H3A, which has a neutral pH to prevent harm or disruption to the soil microbes and structure. Soil samples are dried and ground to a standard grain size, then wet and dried to mimic a standard cycle of rain/watering and drying. Growers benefit from Haney soil testing by receiving data on active nutrient cycling to inform goals such as long term soil health, water infiltration and retention, and cost reduction of fertilizer.



How We Measure Efficacy

VISUAL PLANT OBSERVATIONS:

- Color / vibrancy
- Uniformity / lack of variation
- Thicker stems
- Increase in flower/fruit
- Larger root mass

VISUAL SOIL OBSERVATIONS:

- Soil structure / porosity
- Fine aggregates
- Color/smell (dark and sweet)
- Increase in earthworm counts
- Deeper rooting depth

PLFA Test

PLFAs (phospholipid fatty acids) are essential parts of microbial cell membranes. This test indicates the microbial community structure and biomass, which are heavily influenced by the biological community of microbes and plants, environmental conditions (humidity, temperature, pH, etc.), soil type, organic matter, management practices, and nutrient cycling in the soil. PLFA testing provides data on gram positive and negative bacteria, arbuscular mycorrhizae and saprophytic fungi, protozoa, and other microbial groups.

Rhize Bio

Rhize Bio uses advanced metagenomic technology and sequencing platforms to measure biodiversity and predict soil functionality. This type of soil testing provides raw soil DNA sequencing data in a user-friendly report including data on number of microbial species, community evenness, resistance to drought and disease, disturbance ratings, and nutrient cycling potential, thus supporting growers in making informed management decisions.

Plant Tissue Analysis

Plant tissue analysis shows the nutritional content in the sampled part of the plant. Typically growers will sample varying parts of the plant and at varying points in the plant's life cycle depending on the crop.

Brix Analysis

Brix measures the level of soluble solids in a plant including sugars, proteins, vitamins, and minerals. A Brix reading indicates the nutrient level in a crop, specifically the sugar content, indicative of photosynthetic capacity. Brix sap analysis measures the light refraction of the plant's sap.

Spectrometer

Spectrometers record and measure electromagnetic radiation (light) waves interacting with a plant sample, specifically how the sample reflects/absorbs/transmits light.

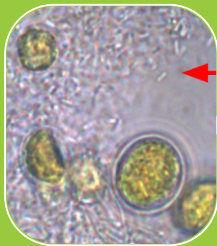
Chlorophyll Meter

Chlorophyll meters measure the amount of chlorophyll in the plant and can indicate the condition and quality of leaves, and the plant's ability to photosynthesize.

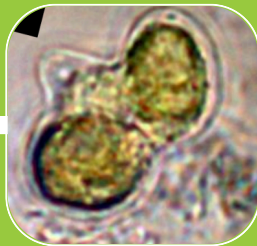
Why Live Cell Algae?

EnSoil Algae™ is living *Chlorella vulgaris*, a freshwater, green microalgae, that is optimized by Enlightened Soil Corp's patent pending growing process. The live cells act as transportation vehicles for soil microbes and nutrients (see green box). There is a symbiotic relationship between EnSoil Algae™, plants, and endophytic soil bacteria. The algae cells attract and carry bacteria and nutrients into plant roots - thus promoting growth of root hairs.

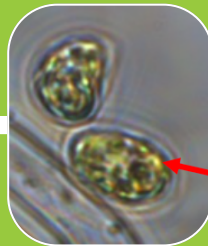
Mechanism of live cell Chlorella vulgaris from Rutgers University study.



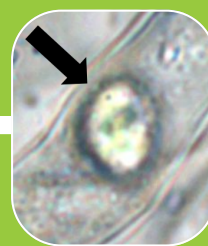
Algae surrounded by soil bacteria.



Bacteria enter algae cells...



...filling algae cells like bus passengers.



Algae cells enter plant root hairs & release bacteria & nutrients inside.



Root hairs fill with bacteria. Plant absorbs chlorophyll from algae cell.



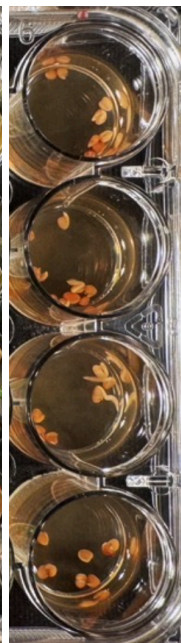
EnSoil Algae product



Commercial Broth



EnSoil Algae product



Commercial Broth

How do live cells differ from commercial broth?

EnSoil Algae™ works differently than commercial broth because the living algae cells actively participate in the soil ecosystem as transport vehicles for microbes and chlorophyll. Commercial broth only contains phytohormones and no live cells.

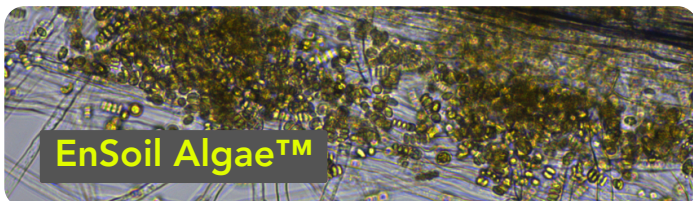
At Rutgers University, EnSoil Algae™ stimulates germination and growth in clover seeds at day 4 (left) and day 12 (right).

Comparing Live Cell EnSoil Algae™ with Seaweed, Algal, & Kelp Extracts

	EnSoil Algae	Extracts
Contains Live Cells	✓	✗
Phytohormone Availability	Extended	Brief
Improves Nutrient Cycling	✓	✓
Actively Participates in Nutrient Cycling	✓	✗
Improves Long Term Fertility Storage	✓	✗
Is Endophytic (taken in by plants)	✓	✗
Recommended Application Frequency	1 - 4x per season	every 2 - 4 weeks

Production Comparison:

- Growing EnSoil Algae™ is a regenerative, carbon-neutral process. It is grown in photobioreactors with artificial light, and a production facility uses no more power than a 3200 sq foot home. There is no industrial waste, **since growing algae requires only light, water and CO2 production is unlimited.**
- Wild seaweed is extracted from the ocean, and the supply is finite. Growing it is difficult and can affect the ocean's ecological balance.



EnSoil Algae™ outperforms commercial algae broth containing phytohormones but not live cells (Rutgers University Study phase 2).

EnSoil Algae™ on Corn

"EnSoil Algae™ has been an enhancer for our farm. It has enhanced our soil biology, foliar spray uptakes, and we have seen consistent yield increases versus the check strips. The ROI is there to use algae across all of our acres."

--Russell Hedrick, JRH Grain Farms | NC

"We applied the EnSoil Algae™ to our corn right after burn down in June and then again in mid July. We had excellent precipitation this year and we believe the rain plus the algae made a huge difference. We harvested 19.5 tons of silage corn on ground with a proven yield of 8 tons and a previous best of 12 tons. The yield on the millet was also outstanding. We certainly got a return on our investment and we will look to expand our use of EnSoil Algae™ next year."

--Cletus Miller, Miller Angus Ranch | ND

Increased
Yield

Stronger
Stress
Adaptation

Increased
Return on
Investment

Improved
Soil Health



"I will be applying EnSoil Algae™ on every acre I farm next year."

Jay put 43 units of Nitrogen on all his corn. He saw an increase of 26 bu/acre on his corn where he used EnSoil Algae™. In this photo the lighter tint on the control field (no EnSoil Algae™) shows a nitrogen deficiency at V10 and was corrected with additional synthetic nitrogen.

--Jay Lane, Bayside Farms | NC

"I inoculated the seed with EnSoil Algae™ immediately before planting my corn. I also implemented some test trials in the starter fertilizer. I could not witness any difference in those trials to the plants, nor was there any measurable difference in the root growth at the early stage that I checked. I also applied on 40 acres a rate of 13 oz per acre as a foliar at V6 to V8. There was a noticeable difference in the growth of these plants compared to the 40 acres beside them. The stalks at harvest time were thicker and the leaves remained greener for about 3 days longer than the 40 acres of non-treated as we suffered no rain and high heat for the months of July and August and into September. I believe the treatment at that stage helped the plants maintain longer through that significant stress. The yield on the treated acres was 9.7% higher than non-treated acres."

--Steve Tucker, Tucker Farms | NE

EnSoil Algae™ on Soybeans

"EnSoil Algae™ has been an enhancer for our farm. It has enhanced our soil biology, foliar spray uptakes, and we have seen consistent yield increases versus the check strips. The ROI is there to use algae across all of our acres."

Overall, EnSoil Algae™ optimized plant nutrient uptake, energy value, stress adaptation, and improved plant health everywhere it was applied. The farm average was a difference of 2.1% in moisture content. EnSoil Algae™ delivered a yield bump of 6-8 bushels ('22) when added to a late season fungicide pass compared to fields that received the fungicide without EnSoil Algae™. Overall 90% rate of profitability based on yield. Farm average was 12.5 bpa gain. Largest gain was a 17 bpa in a field where EnSoil Algae™ was applied in furrow at planting and twice more over the top in season.



Russell's EnSoil Algae™-treated beans @ 1359 seeds/ lb, compared to 2841 seeds/lb (with his normal fertility program) and 1736 seeds/lb with his deep injection fertility program.

--Russell Hedrick, JRH Grain Farms | NC

Increased
Yield

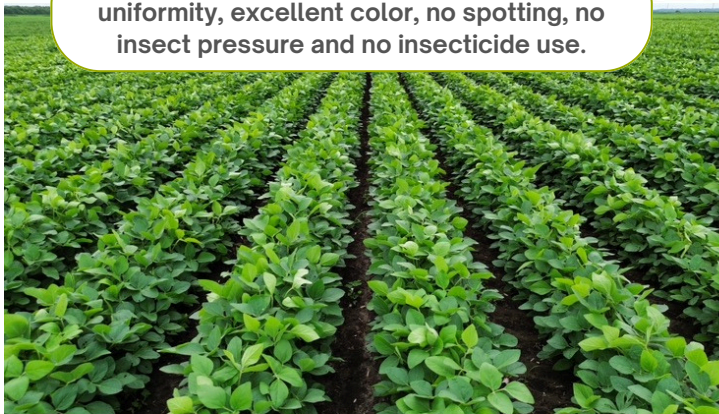
Stronger
Stress
Adaptation

Increased
Return on
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Improved
Soil Health

In 2022, Jay lane applied EnSoil Algae™ at R1 and noticed "obvious late season drought and stress tolerance." In 2023, he applied on 250 acres in furrow, at V8 and R1, resulting in a 13 bu/acre increase and an additional \$175.24 per acre where he used EnSoil Algae™. This is Jay's 3rd year without any fertilizer on his beans. His macroindexes on fertility and available NPK have improved.

Soybeans: tops of plants are bigger, better uniformity, excellent color, no spotting, no insect pressure and no insecticide use.



This EnSoil Algae™-treated soybean plant is maturing faster than untreated soybeans. It is nodulating at its second trifoliate, already fixing its own nitrogen!

--Jay Lane
Bayside Farms | NC

EnSoil Algae™ on Vegetables

"In the EnSoil Algae™ treated block, highly statistically significant increases occurred in microbial populations activating key nutrients (N, P, S and Fe,) microbial hormonal activity and heavy metal resistance, and all of the microbes responsible for fighting pathogens and nematodes were turned on. These powerful changes in the soil, chemically and biologically, were confirmed by a yield increase in the EnSoil Algae™ block of 13% over the ten harvest timings. This translated to nearly six thousand lbs per acre increase in yield (5,908) which at the average price of \$0.68/lbs is a return of over \$4,000 per acre."

--Herb Young, Southern Valley | GA



A consistent result is that EnSoil Algae™—when compared with the control—effectively promoted squash yield when measured by number of fruits or total weight of the crop. This was true when it was used alone or in combination with synthetic fertilizer. A winning combination was 25% of the usual fertilizer input plus foliar application of algae (a 46% increase in crop weight). However, soil application of algae alone looked quite good as well (a 40% increase).

--Clemson University Squash Study | SC

**Increased
Yield**

**Stronger
Stress
Adaptation**

**Increased
Return on
Investment**

**Improved
Soil Health**

"We've had very exciting production on strawberries and radishes when incorporating EnSoil Algae™ into our fertility program. We only grow organically. We love that EnSoil Algae™ is an OMRI listed biological solution for improving soil health and plant production. The plants we've grown using EnSoil Algae™ are some of the prettiest we have ever grown."

--Jimmy Livingston
WabiSabi Farms | SC

When EnSoil Algae™ was added to poorer soil (Control), tomato yield per plant was increased 45%. Likewise, treating rich soil with algae boosted yield per plant by 16%. Thus, algae boosted yield regardless of baseline fertility.

-- Jennifer Wicker
Sweetgrass Gardens | SC

"We saw significant visual evidence in improved root mass and plant height plus the increase in copper uptake from the plant tissue analysis. Before harvest in the field, we saw less evidence of disease and more fruiting and flowers on plants [onions, potatoes, peppers, cucumbers, apples, cabbage, broccoli, tomatoes, melons and more] treated with EnSoil Algae™."

-- The Plant Company | GA

EnSoil Algae™

on Livestock & Forage



"The only difference in pasture management this year than previous years was the application of EnSoil Algae™. The heifers were noticeably fatter, fleshier, shinier, and cycled better. The heifers bred up more than in the past three years. Conception rates were level with a 17 day shorter breeding period. Finally, mineral intake dropped from 19 bags to 1 bag over a 90 day period. We grazed our cattle on the fields [with 3 applications of EnSoil Algae™ and no fertilizer] 30 days longer than previous years."

-- Reminisce Angus Ranch | MT

"Due to the growth and visual appearance of the pastures where EnSoil Algae™ was applied, the owner and barn manager of The Stables at Iron Horse made the decision to not use NPK in 2023 and will not in 2024, reducing the fertilizer costs by \$492.00 annually. A reduction of the grass seed cost by \$3,211.00 resulted from the initiation of the application of EnSoil Algae™. By switching to EnSoil Algae™, The Stables at Iron Horse has reduced the annual budget by \$3,700.00."

--Iron Horse Farm | SC

Healthier
Livestock

Stronger
Forage
Growth

Increased
Return on
Investment

Improved
Soil Health

"These cover crop trials are only being irrigated once in late July throughout the entire season. At the end of November, the algae treated field has an average of 5 feet of the vegetation height whereas all other treatments have an average of 3.5 feet of the vegetation height (sheep mob grazed fields do not apply in this evaluation). Against all other treatments, Haney's analysis shows EnSoil Algae™-treated plots have significantly higher soil respiration, and water soluble organic carbon. Though the oxidized nitrogen group, such as nitrate amount is limited, both organic nitrogen to inorganic nitrogen ratio and organic nitrogen release are higher."

--Dr. Yadi Wang | AZ

"After using EnSoil Algae™ we saw significant regrowth on pasture post-grazing, extraordinary cow health, and our cows chase the sprayer with the Algae".

--Crane Dance Farm | MI



"For the two years of EnSoil Algae™ use, we've not had to deal with any health issues in the herd. They have great looking coats and they are happy and healthy. We are going to include our pasture in the EnSoil Algae™ program in 2024."

--Our Cows LLC | VA

EnSoil Algae™ on Hay

"We ended up with 280 round bales on a target of 150. We filled the barn and had a lot of hay to sell. We did not use any fertilizer again this year. Additionally, one of our hay clients asked to buy all of our hay. His horses have been devouring it."

--Our Cows LLC | VA

"We did two applications of EnSoil Algae™ [on Alfalfa], one 3 weeks before the first cut and one about a week after the first cut. We ended up getting 6 cuttings this year instead of our normal 4, and it was dry late summer."

--Kornegay Farms | NC

Healthier
Feed for
Livestock

Increased
Yield and
uniformity

Increased
Return on
Investment

Improved
Soil Health



50 days after cutting hay and treating with one application of EnSoil.

"We are very encouraged by what we saw this year with EnSoil Algae™. We made three applications on two, 130 acre circles of sorghum. The crop showed outstanding uniformity and health. The circles with EnSoil Algae™ produced an extra 1.5 tons per acre while reducing fertilizer by 30%. It is a solid return on the investment."

--Crane Dance Farm | MI

--Wes Lundeen | KS

"Billy Creek Ranch is a small cow/calf operation and alfalfa producer near the Crazy Mountains. We conducted a trial of EnSoil Algae™ on 60 acres of alfalfa. We made three applications of EnSoil Algae™ between late May and early August. We did not fertilize the 60 acres that received algae. We had a good weather year with precipitation and temperature. The alfalfa treated with EnSoil Algae™ was more productive than our conventionally farmed ground. We saw an increase of 15 bales per 20 acre section for a net gain of 45 bales. The results are very encouraging."

--Billy Creek Ranch | MT