

Natural Nitrogen

This is the season to work with nature to provide critical nutrients — economically.

People who have been adopting regenerative processes for a few years have already cut nitrogen inputs by 20% or more. This is possible with a deliberate focus on improving soil life, organic matter, and nutritional balance. These farms have the foundation to manage a further reduction. Many will apply little or no nitrogen this year.

Those who have taken initial steps to improving soil health can get more bold.

And people who have seen successes in other fields should be inclined to start the process.

Reducing inputs is critical for profitable farming, especially when synthetic inputs keep getting more expensive.

Farming with less nitrogen and balanced P and K and other nutrients also can

Reduce Pest and Disease Pressure

We now know that most of these challenges are due to inappropriate inputs (that create the conditions for the insects and fungi to attack the crop).

Progressive agronomists and farmers recognize that imbalanced fertilization (e.g. excess nitrogen) are often the root cause of most crop problems. Regenerative farming practices address these root causes.

The natural system manages to stay in balance.

Healthy soil biology provided with nutrients — in the right form, ratios, timing and amounts — provides sufficient plant nutrition for healthy, profitable crops.

The Critical Role of Soil Microbes

SGS MetaGrow microbial inoculants provide exceptional population counts of exceptional microbial diversity. Our approach is to flood the zone with multiple species serving each functional niche, believing that nature can sort out which species and combinations can be effective in any scenario. Microbes procure nitrogen and other nutrients for the plants, whose roots are feeding and signaling the microbes to serve their needs.

This cycle starts with the plant's photosynthesis of carbohydrates, 30% to 60% of which are translocated as root exudates to attract and feed microbes. The microbe workforce grows and adapts to conditions, and supplies what the plants need in each growth stage.



Dense and Vigorous Rhizobia grown with MetaGrow

Plant Nutrition
**Plant Directed and
Microbe Delivered**

**Sustainable
Growing
SOLUTIONS**

Plants and microbes have an intricate relationship. To obtain nitrogen (and other nutrients), plants exchange carbon through root exudates to microbes, which in turn provide nitrogen fixed from the air.

There are four types of microbial N fixation:

- N-fixing fungi which are colonized inside the roots (Endophytes)
- Rhizobia bacterial species, in legume root nodules
- Free-living N-fixing bacteria (Certain species of the Genus Azotobacter, Azospirillum, Herbaspirillum, Burkholderia, Bacillus, Frankia, Paenibacillus)
- Phyllosphere N-fixing microbes which live in plant leaf tissues

MetaGrow inoculants are produced to achieve maximum diversity of species, and also abundant metabolites produced by the microbes performing their roles in an active and live culture.

MetaGrow products have 600 to 800 named species and thousands more as yet un-named, including 100 to 250 fungi, and biodiversity scores up to 7 depending on the product.

Other inoculants are generally mixtures of lab-grown, inactive microbes which are intended to become active once in the soil. These products have much less diversity. For example, a Metagenomic analysis of one leading product (Guardian, also sold as Dominate) revealed just 244 species, including 38 fungi, and a biodiversity score of 0.6. Of the 18 species claimed on the label, only 2 were actually present.



A surprising microbial structure

MetaGrow Functional Diversity

For Nitrogen Fixation — one of many critical functions — MetaGrow inoculants contain remarkable microbial diversity and populations. This table shows the microbe counts from MetaGenomic analysis.

The diversity of species provides many pathways to provide nitrogen for the crop. We expect that some species will thrive in a given soil condition, and others will thrive in a different situation.

MetaGrow’s broad spectrum inoculants also provide many species that provide other nutrients to plants:

- Phosphorous solubilization
- Potassium solubilization
- Cation Chelation (Siderophores chelate K, Ca, Mg, Mn, Cu, Fe, Zn)

Product	Free-living N-fixation species	Rhizobia N-fixation species	Total Population N-fixation microbes
MetaGrow 5X+	6	15	1 x 10 ⁸
MetaGrow C	7	21	3 x 10 ⁸
MetaGrow G	4	13	4 x 10 ⁸
MetaGrow F	5	16	4 x 10 ⁹
MetaGrow D-Comp	6	16	2 x 10 ⁹

Guidance for Successful Microbial Application

Inoculants are most successful when applied as components of an integrated biological program. Include carbon sources (humic acid, fulvic acid, fish, molasses) and other microbe foods, like MetaGrow MFood. SGS or an agronomist can provide rates for your crop and specific situation.

When N-fixing microbes fail to provide for the crop, it’s generally due to these problems:

- Tight or compacted soil, where gas exchange is lacking (air is 78% nitrogen)
- Low soil organic matter (Low C:N ratio)
- Missing or limited nutrient and enzyme cofactors (e.g. iron and molybdenum)
- Species capable of fixing N are not epigenetically activated and the low C:N ratio environment does not trigger it.
- Excess nitrogen fertilizer shuts down the N-fixing microbes.

