



DIGGING INTO SOIL SCIENCE

CREATED BY  **HOLGANIX**[®]
Soil Nourishing Root Stimulating™

**GOING BENEATH THE SOIL
SURFACE TO TARGET THE
KNOWLEDGE
NEEDED TO UNDERSTAND
OUR SOIL ECOSYSTEM**



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Introduction

The Natural Symphony of Life

Within the natural world, there exists a complex balance among living organisms known as the “**food web.**”

Plants, animals and microorganisms are all instruments in an orchestra; each plays a crucial part in the natural symphony of life.

If even one of the players is out of tune, the whole soil food web suffers. However, when everything is in order, the results are **beautiful.**

In this book, we'll explore different parts of the natural symphony of the soil including:

- 1. Beneficial microorganisms**
 - 2. The Soil Food Web**
 - 3. Soil Foundation Types**
-



Chapter 1

Hidden Helpers

More than **ONE MILLION** types of microbes live on the earth. They live almost everywhere and are so small that it would take about 30 trillion to equal 1 ounce in weight. Bacteria, fungi, protozoa, nematodes and larger life forms like earth worms are all part of the soil food web.



“Our soil teems with a multitude of organisms which provide the necessary work for healthy plants to grow free from disease, pests & infertility.”

– Elaine Ingham

*American microbiologist,
founder of Soil Foodweb Inc.*



Nature's Invisible FACTORIES

MICROBES function like Nature's invisible factories, breaking down organic matter and recycling elements like **hydrogen, oxygen, carbon, nitrogen, phosphorous, potassium, iron, and micro-nutrients**, which are essential to all plants and animals.

For example, nitrogen fixing bacteria change nitrogen gas in the soil and atmosphere into ammonia, **making nitrogen available to plants.**

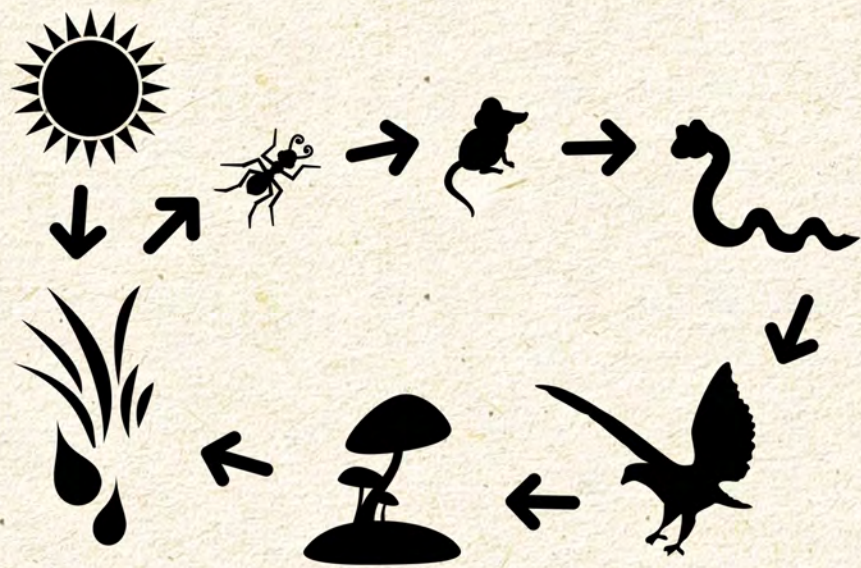
Beneficial soil bacteria and fungi allow nature to continue its endless cycle of life and renewal of what's known as "sustainable soils."

Chapter 2

The Science Behind the Soil Food Web

A **healthy soil food web** is very similar to the food web we all learned in middle school (see graphic on below).

The soil food web requires three key events to be met:



1

All the organisms that a plant requires are present in the **soil and functioning**.

2

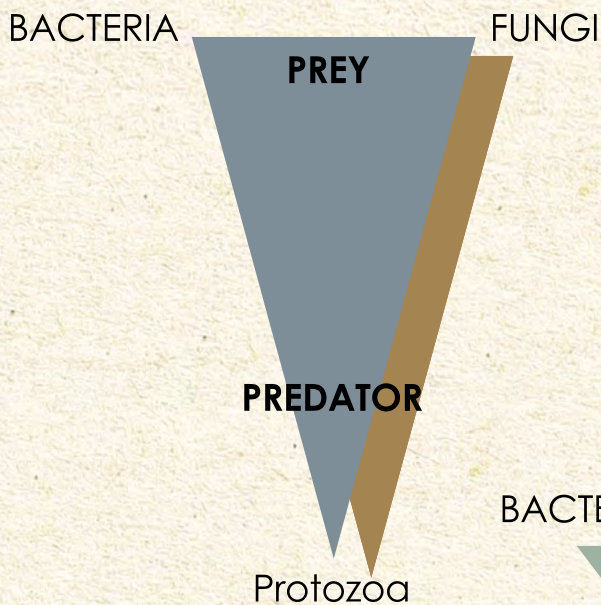
Nutrients in the soil are in their proper forms for the plant to uptake. It is one of the functions of a **healthy food web** to hold nutrients in non-leachable forms so they remain in the soil until the plant requires them. For plant uptake, nutrients must be water-soluble, but this can be wasteful as soluble nutrients can “wash out” of the soil. The trick is to have the **nutrients be soluble when needed by the plants**.

3

When the correct ratio of fungi and bacteria to protozoa (prey to predator) is present, the soil pH, **structure and nutrient cycling occur at optimum rates**, the soil food web is in balance with the requirements of growing plants.

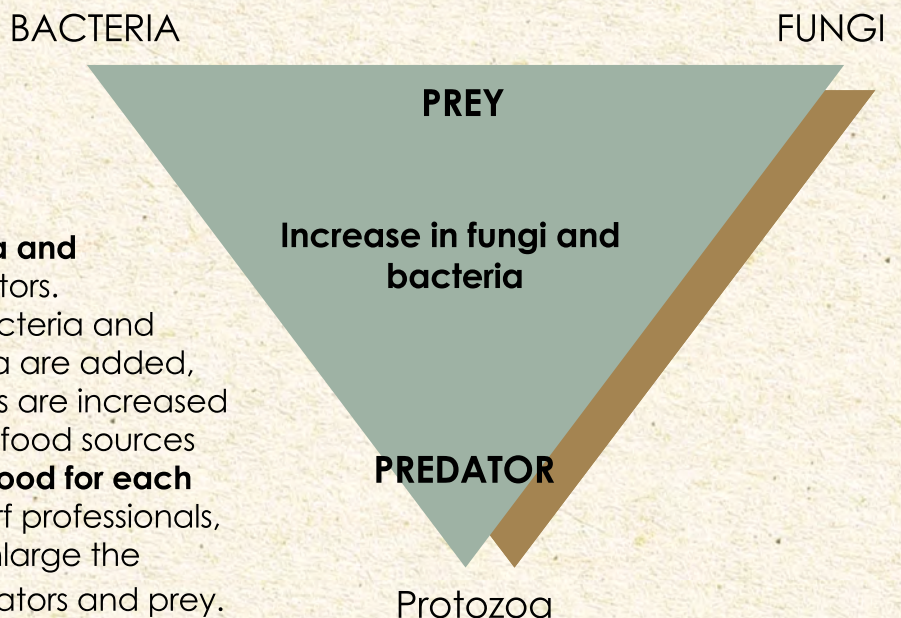
A BIG PROBLEM

soil is facing today is a poor ratio representation of predator to prey.



One of the biggest problems our soil is facing today is a **poor ratio representation of predator to prey**. When we treat lawns with synthetic products, the ratio typically appears as a narrow triangle (see figure to left). In this triangle, there aren't enough predator or prey present for balance to occur or **for plants to be healthy**.

Protozoa, nematodes, amoeba and ciliates are examples of predators. These predators feed off of bacteria and fungi. When fungi and bacteria are added, the triangle enlarges and levels are increased (see figure to right). With more food sources available, **balance in pH and food for each species occurs naturally**. As turf professionals, the best thing you can do is enlarge the triangle by "feeding" the predators and prey.



Chapter 3

The Living Soil

HAVING A SOUND FOUNDATION IS A MUST IF YOUR HOUSE IS TO LAST THROUGH THE YEARS...

Soil structure is like a house foundation; to grow plants to their full potential, you should have a sound foundation to start.

Soil structure is composed of several main components, those being sand, silt and clay.

When one or more of those components makes up too large a part of the soil, it's like a poorly constructed foundation and creates problems from the start.



Organic matter is an important component to healthy soil foundation

Organic matter is made up of decomposing plants, animals and waste.



By having a healthy level of organic matter, soils **become more porous**. The porosity of soils allows the seeds to more easily push through the surface, increase water infiltration and prevent soil sealing (where the soil crusts over and becomes compacted).

Ultimately, having organic matter present in the soil **reduces runoff and erosion** and promotes the activity of micro-organisms, other soil critters and root growth.

You can increase the amount of organic matter present in the soil by adding compost.

Chapter 4

Overcoming Foundation Types

The Soil's Cycle of Life

Look at the graphic below; you will notice all sorts of living organisms, both animal and plant. **They all play a part in the soil's cycle of life;** adding nutrients from **organic matter**, air from the movement of insects and animals moving through the soil and more.



A living soil contains both **beneficial and pathogenic microbes**. There may be hundreds or even thousands of different types found within your soil or there may be little microbial activity. It all depends on the environment within your soil. For soil to be at its full potential to promote plant growth, we need to have the **beneficial microbes working full time, all the time.**

What you can't see is the microorganisms that provide the basic means for the continued regeneration of a living soil.



Without these microorganisms, life on earth would cease to exist.





Sand-based soil

Out of all the three soil particles (sand, clay and silt), sand is the largest.

Sand-based soil does not have a natural source of nutrients and needs to be **fertilized frequently** as synthetic-based fertilizers tend to leach away quickly.

This type of soil will need **constant care** to let the turf grow to its full potential. However, the use of natural organic products aids the soil nutrient holding capacity by adding more organic matter and increasing the biological activity.



Clay-based soil

Clay-based soils are loaded with micronutrients but are very low in macronutrient nitrogen ...

...which is vital for plant growth and responsible for green color. Clay will hold applied fertilizers better than sand-based soil, but clay-based soil do not **properly drain excessive water** away from the root zone, causing roots and seed to rot during wet conditions. Another detrimental factor with clay soil is how compacted it becomes when dry.

After a couple weeks with no water, the soil will **harden like a rock**, which is good for flower pots but not for growing grass and plants. Adding organic matter helps break down the compaction of clay-based soils, allowing for more porous soil.



Silt-based soil

Silt-based soils generally contain micro and macro nutrients, drain fairly well and can produce a good root structure.

It does, however, have its drawbacks. Its light texture can blow away in high winds or wash away in heavy rains. It also tends to have a crusty surface when drying out that causes seeds to germinate poorly.

Like clay-based soils, adding organic matter to silt-based soils **helps break through soil compaction**, allowing for more porous soils. The descriptions used are very simple and each soil type has many variations and can occur anywhere in the world. The best soils are ones that are composed of sand, clay and silt.

Feeding the soil & structural changes

There has always been a natural way of providing nutrients to plants and changing soil structure by amending it with additives like gypsum to clay soils or organic matter to sandy soils.

Bio-technology has come a long way in the past 10 years.

At Holganix, our systems are designed to change both soil structure and increase soil microbial activity using state-of-the-art technology that focuses on using microbiology to promote soil and plant health.

Chapter 5

What's the Holganix Bio 800+ Secret Recipe?

Holganix Bio 800+

is filled to the brim with beneficial living microorganisms, nutrient enhancers and microbe food, allowing better utilization of fertilizers and pesticides to **create healthier, more resilient plants.**



Over 800 diverse species of **SOIL MICROBES**

HOLGANIX PERFORMS DNA FINGERPRINTING

to ensure that batches of product contain the appropriate species of microorganisms, each time it's produced. **THAT BEGS THE QUESTION,** what really is in a jug of Bio 800+? How much life can Holganix possibly stuff into a jug?

It turns out that Holganix can stuff quite a lot of life into a single jug of product... more than 800 species of microorganisms to be exact.



More than 800 species of microorganisms are in Holganix Bio 800+

Bio 800+ products (Lawn, Golf, Tree and Shrub, Bloom and the Agriculture Blends) provide the complete ecosystem of microorganisms needed for soil and plant health.

Containing more than 800 SPECIES OF BENEFICIAL MICROORGANISMS, microbe food and nutrient enhancers, Bio 800+ is **changing the soil at a fundamental level** to build strong roots and plants.

HOW DOES THE PROCESS START?



Holganix Bio 800+ products begins as a patented green compost extract from one of 11 climate zones across the United States, containing 296 genera, more than 800 species of microorganisms that foster a diverse soil ecosystem.

When it comes to **microbial products**, the microbe count is important, but diversity is even more crucial. By having a product filled with a diversity of life, you prepare the soil and plant for whatever hurdle it needs to face.

Think of it as your equivalent to a **MULTI-VITAMIN**...

Holganix Bio 800+ products parachute in an army of specialists, each of which is capable of filling in gaps to balance the biological requirements of the soil.

HOW DO HOLGANIX BIO 800+ PRODUCTS WORK?

1



Microbes, including plant growth promoting bacteria and mycorrhizae, stimulate healthy growth in plant foliage and roots.

2



Microbes convert and release nutrients (plant food) to the plant.

3



Microbes promote the plant's tolerance to stress, including weather and traffic.

4



Microbes balance the soil ecosystem, providing a happy habitat for happy plants.

BACTERIA IN HOLGANIX BIO 800⁺

1

Many of the bacteria species found in Holganix Bio 800⁺ products are plant **growth-promoting bacteria (PGPB)**. These PGPB provide plant hormones (auxin, gibberellin and cytokinin) to stimulate growth, make **nutrients available to the plant**, protect the plant from stress and produce biosurfactants (wetting agents).

FUNGI IN HOLGANIX BIO 800⁺

2

Holganix Bio 800⁺ products also include several species of fungi, including trichoderma, penicillium and endo and ecto mycorrhizae. Trichoderma fungi colonize roots, **attack fungi and induces the plant's natural defense system**. Penicillium Fungi break down organic matter, releasing organic acids and nutrients, while endo and ecto mycorrhizae assist with water, mineral and nutrient uptake.

OTHER SOURCES OF LIFE IN HOLGANIX BIO 800⁺

3

Additional types of microorganisms include **protozoa and beneficial nematodes**.

MICROBE FOOD, A KEY INGREDIENT

Just as microorganisms play an important role in plant health, so do microbe food, albeit in a more indirect way.

Microbe food provides the resources needed to nourish the soil microorganisms, creating an ideal habitat for both the microorganisms and the plant.



Examples of some of the microbe food contained in Holganix Bio 800+ include gluten, saccharomyces cerevisiae (brewer's yeast), auxins, kelp, yucca and microorganisms.



LOOKING AT NUTRIENT ENHANCERS

Nutrient enhancers stimulate better uptake of nutrients by the plant...

... allowing you to **reduce fertilizer use and contribute to less nutrient run off to the environment.**

Nutrient enhancers in Holganix Bio 800+ include Humic and Fulvic Acids, Amino Acids, Kelp and PGPB.



Many PGPB act as bio fertilizers because they can fix nitrogen, solubilize phosphorus and potassium and create chelates (solubilizing agents) of micronutrients.



Better Turf Better Ingredients

-DR. CALE BIGELOW

DR. CALE BIGELOW OF PURDUE UNIVERSITY ONCE STATED, "BETTER INGREDIENTS? BETTER TURF!" WHILE THE QUOTE WAS NOT IN REFERENCE TO HOLGANIX PRODUCTS, WE CAN'T HELP BUT STEAL THE QUOTE TO SUM UP OUR BOOK.

When looking at microbial-type products (Plant and Soil Probiotics), the better the ingredients in the product, the better the result. With the power of more than 800 species of microorganisms, microbe food and nutrient enhancers, we are willing to bet that Bio 800+ products contain the most diverse life in a single product on the market.

DIG DEEPER AND DOWNLOAD OUR HOLGANIX BIO 800+ KEY INGREDIENT LIST AT:

www.Holganix.com/Holganix-Ingredients-List

At Holganix, our mission is to *Revolutionize the Way the World Grows*. Our commitment extends to the way you grow your business, your team and of course your plants.

With a focus on biology as the solution to plant health, Holganix is continually pioneering new methods of incorporating microorganisms, microbe food and nutrient enhancers to build resilient plants and healthier soils.

Why does biology matter? Plant health begins with the soil. Having healthy soil creates a happy plant. The soil ecosystem when complete, acts as a habitat for the plant, feeds the plant with nutrients, defends the plant from pathogens and increases the plant's ability to perform under stress. That's why caring for plant health and soil health are synonymous.

Our flagship product line, Bio 800+ provides a complete ecosystem in a bottle, containing over 800 species of beneficial microorganisms, microbe food and nutrient enhancers. It's changing the soil at a fundamental level and building a support system for your plant that's going to mean huge improvements in plant resilience.

As our company evolved, so have our product lines. PB1, PreBiotic Fertilizer and ProBiotic Fertilizer all nurture plant and soil health in their own, unique way.

When used in combination with one another, the Holganix product lines nourish the soil and your plants. The result? As green industry professionals, you have the tools to do your best work and to grow the most beautiful plants possible.

Thank you for your support!
With Gratitude,

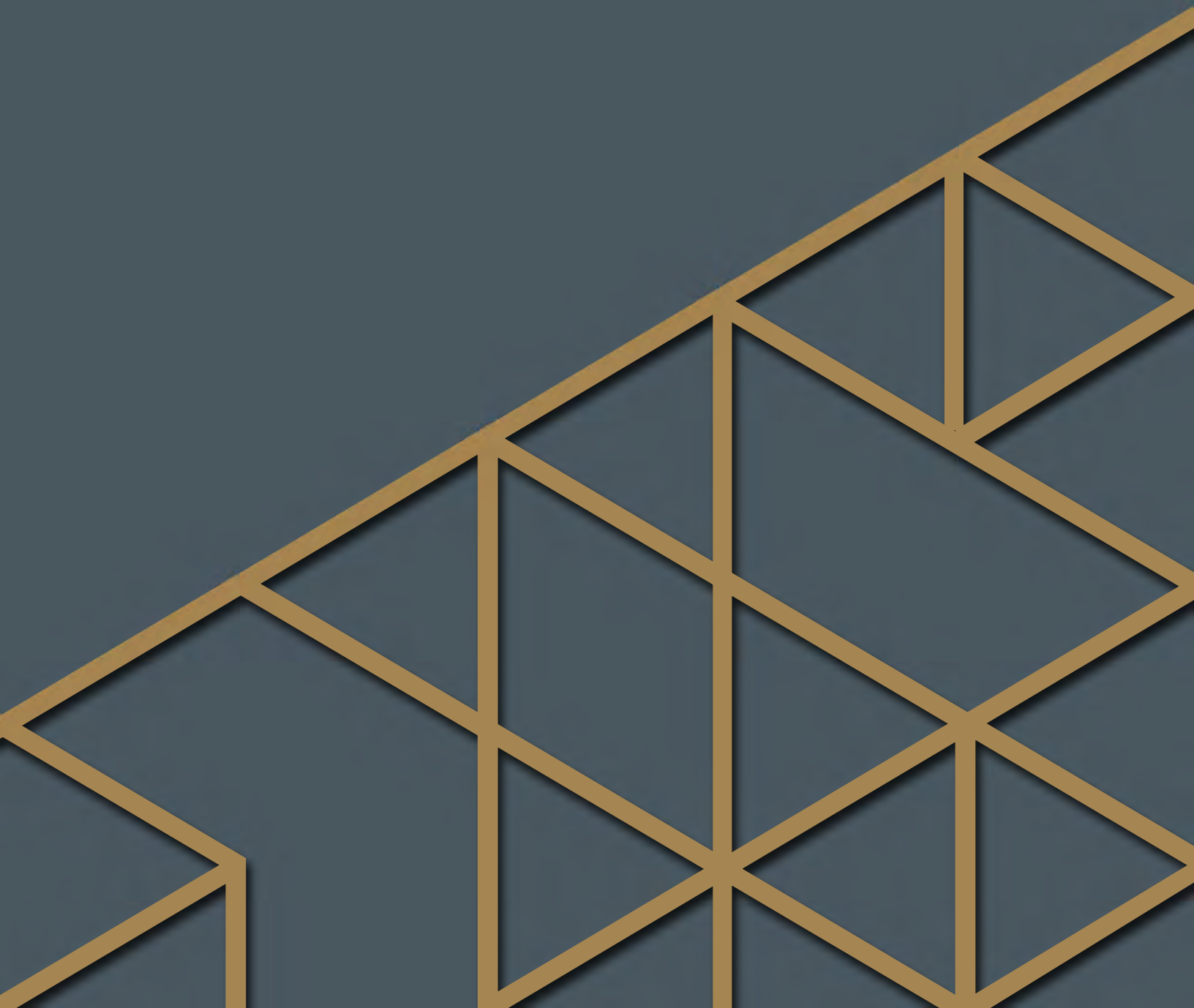


Barrett Ersek
Founder and CEO
Holganix



“HARNESS THE POWER OF MICROBES TO GROW HEALTHY PLANTS”

- BARRETT ERSEK, CEO AND FOUNDER
HOLGANIX LLC





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US \$17.99 / CA \$22.50