THE GLOBAL
AGRICULTURAL SOLUTION

BIOCHAR AND ITS ROLE IN FEEDING PEOPLE IN **2050**

USBI BIOCHAR 2018
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ORGANILOCK

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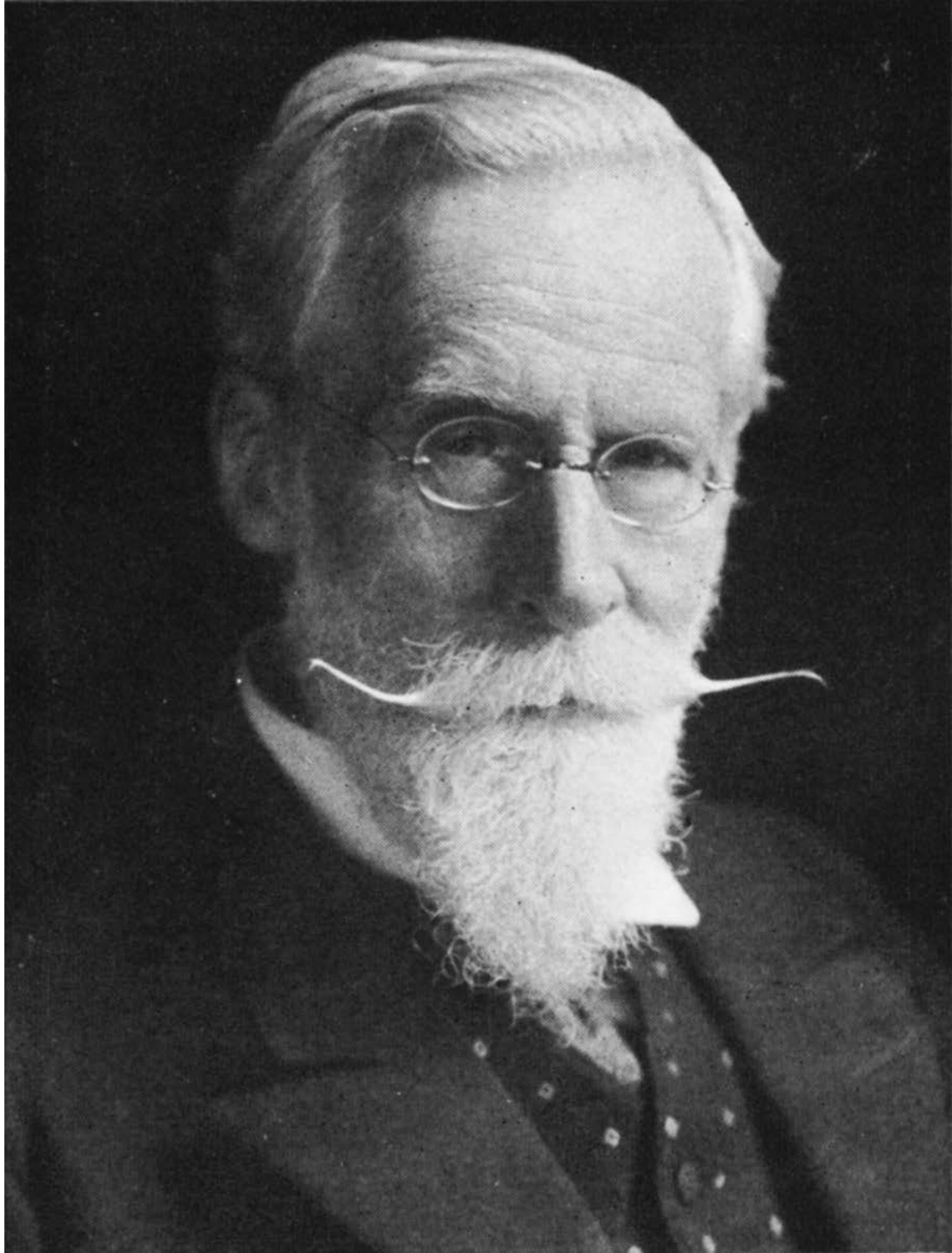
INTRODUCTION

In the fall of 1898 the incoming president of the British Academy of Sciences, Sir William Crookes, proclaimed that:

"England and all civilized nations stand in peril."

If nothing was done soon, he explained, great numbers of people, especially in the world's most advanced nations, were soon going to starve to death.

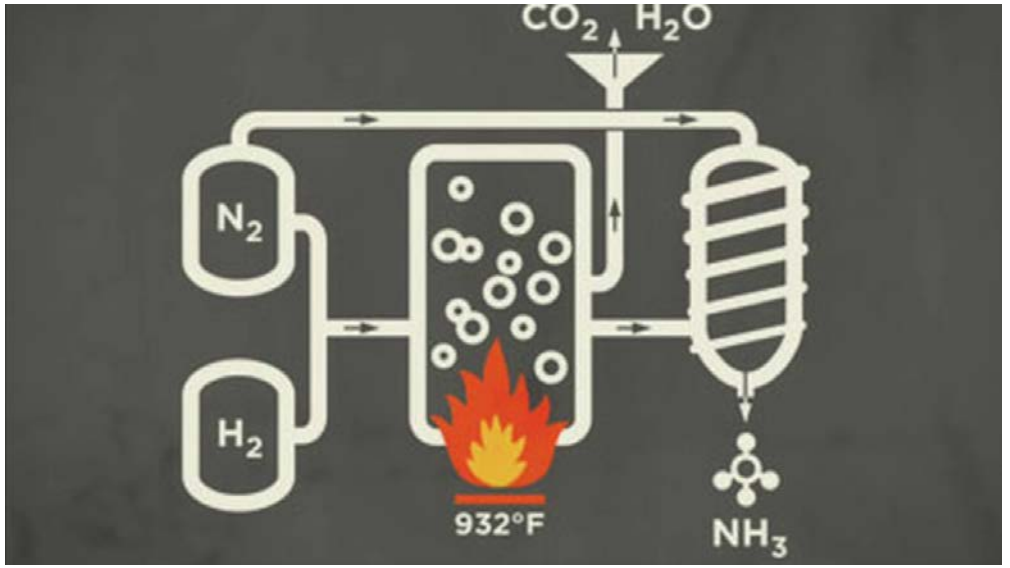


INTRODUCTION

Sir William Crookes was referring to the lack of high-quality nitrogen fertilizer.

Fast forward 120 years, thanks to Harber-Bosch technology and advances in soil sciences, and we have an obesity problem instead of starvation!

For perspective, the world population in 1900 was about 1 billion people. Today it is 7.6 billion and will likely reach 11 billion by 2050. Nitrogen from Haber-Bosch technology has fed us well for 120 years, albeit at an expense.



INTRODUCTION

Haber-Bosch technology allows farming practices that ignore the need for replacing organic carbon/humus in the soil, until now.

Unfortunately, we are now faced with the dilemma of managing soils that will continue to degrade unless we find a way to add organic carbon and nutrients back to our soil in both an environmentally and economically viable way.

INTRODUCTION

Because of declining health, tillable soils are becoming more difficult to farm due to lowering water tables, development of hardpan, and lower levels of carbon content in the soil.

This leads to serious soil health issues, loss of top soil due to erosion, and water-related problems. The Chesapeake Bay watershed is a classic example of this problem.

INTRODUCTION

Can we continue abusing our soil and feeding people at the rate our population is growing? Arguably, the answer is ‘no.’

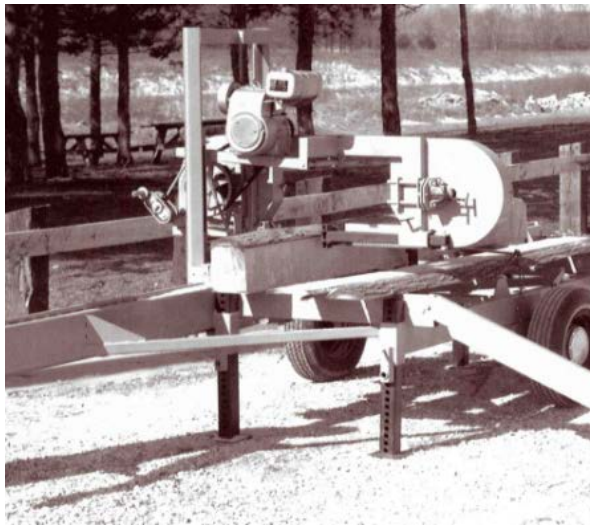
Has GMO science, synthesized fertilizers, and engineered weed killers reached their potential? Many believe so.

Are there workable solutions to these issues forthcoming? To that end, OrganiLock is introducing **NIST** – **N**utrient **I**nfusion **S**oil **T**echnology.

We will explain **NIST** later in the presentation.

Who is Scott Laskowski?

- CEO of OrganiLock in Madisonville, KY
- 35 years of R&D and Product Development experience at the family business Wood-Mizer Products Inc.
- Wood-Mizer manufactures a line of woodworking equipment most commonly known for their:
  - Bandsaw Sawmills
  - Kilns
  - Resaws
  - Bandsaw blades
- OrganiLock was founded by Scott in 2008 upon the sale of Wood-Mizer to its employees (ESOP)



The Model 2000 is a self-contained, 2000-board-foot, vacuum kiln designed to rapidly dr
thick stock with low degrade levels. The drying time of the Model 2000 is 1/10th that of
conventional kilns. The unit dries 4/4 red oak from green to 6% in approximately 5 days,
9 days, 12/4 squares in 10 days. This fast turnaround gives any user the ability to handle
specialty drying needs without tying up a high-volume conventional kiln for extended pe
The Vacu-Kiln offers unequaled drying performance and costs less than $35,000 (U.S.).

MultiHead

Who is OrganiLock?

OrganiLock specializes in innovative biomass solutions using proprietary technology with an emphasis on recycling and adding value to ‘waste’ products.

Tissue Digestion Systems

Biomass Heating Systems

Biomass Processing Systems

Biochar Production Systems

Nutrient Infused Soils & Amendments

Raised Bed Gardening Hardware

Talking Points

01 **The Nitrogen Cycle**
Improving the traditional nitrogen cycle through innovative biomass solutions

02 **Agronomy Basics & “Camps”**
A brief overview of “SLAN” & “BCSR”

03 **NIST**
Nutrient Infusion Soil Technology by OrganiLock

04 **The Hybrid Solution**
Improving SLAN & BCSR through NIST

05 **Biochar**
The role of biochar in feeding the world population in 2050

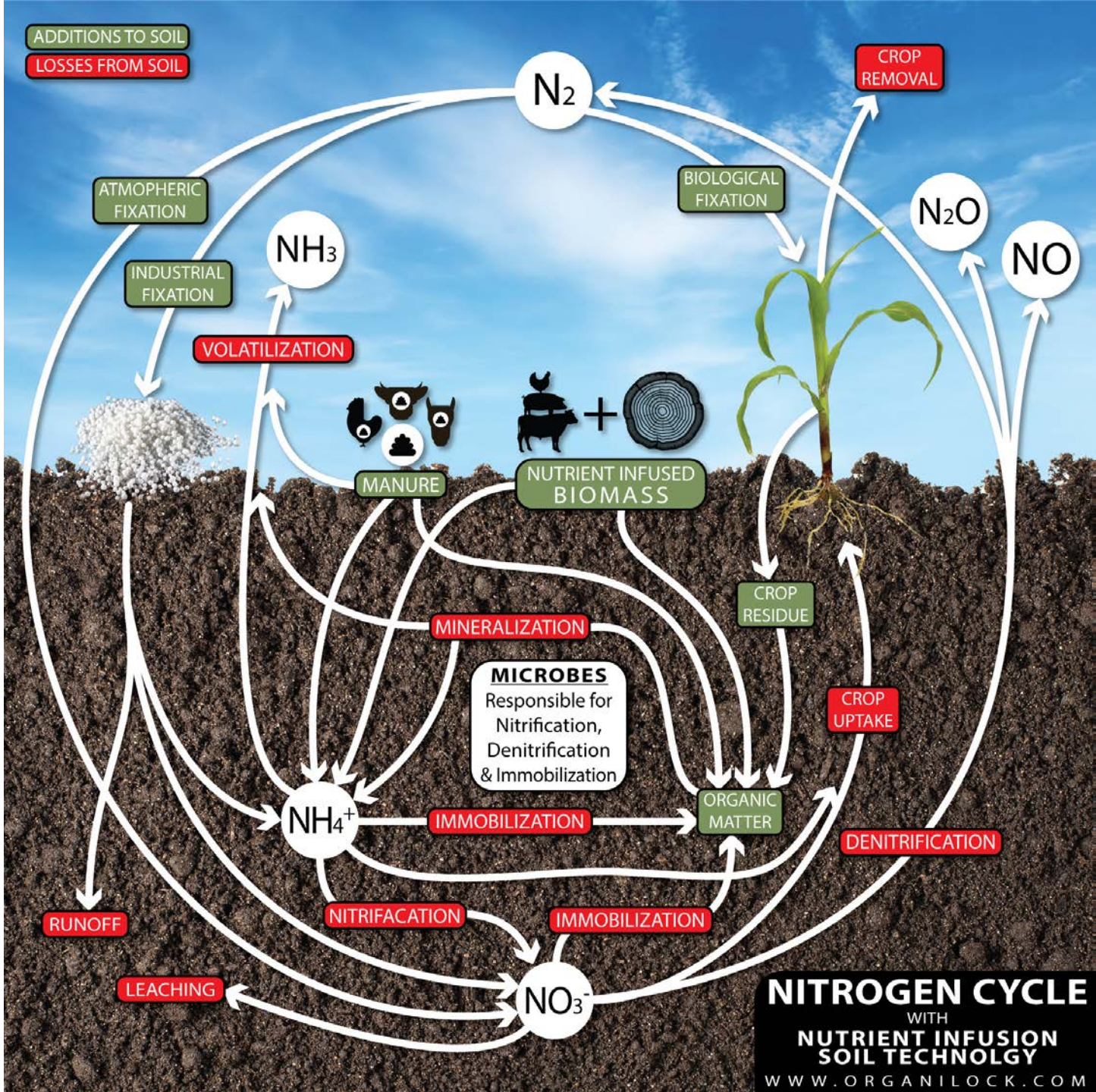
06 **Greenhouse / Garden Markets**
Putting healthy food on the tables of those who need it

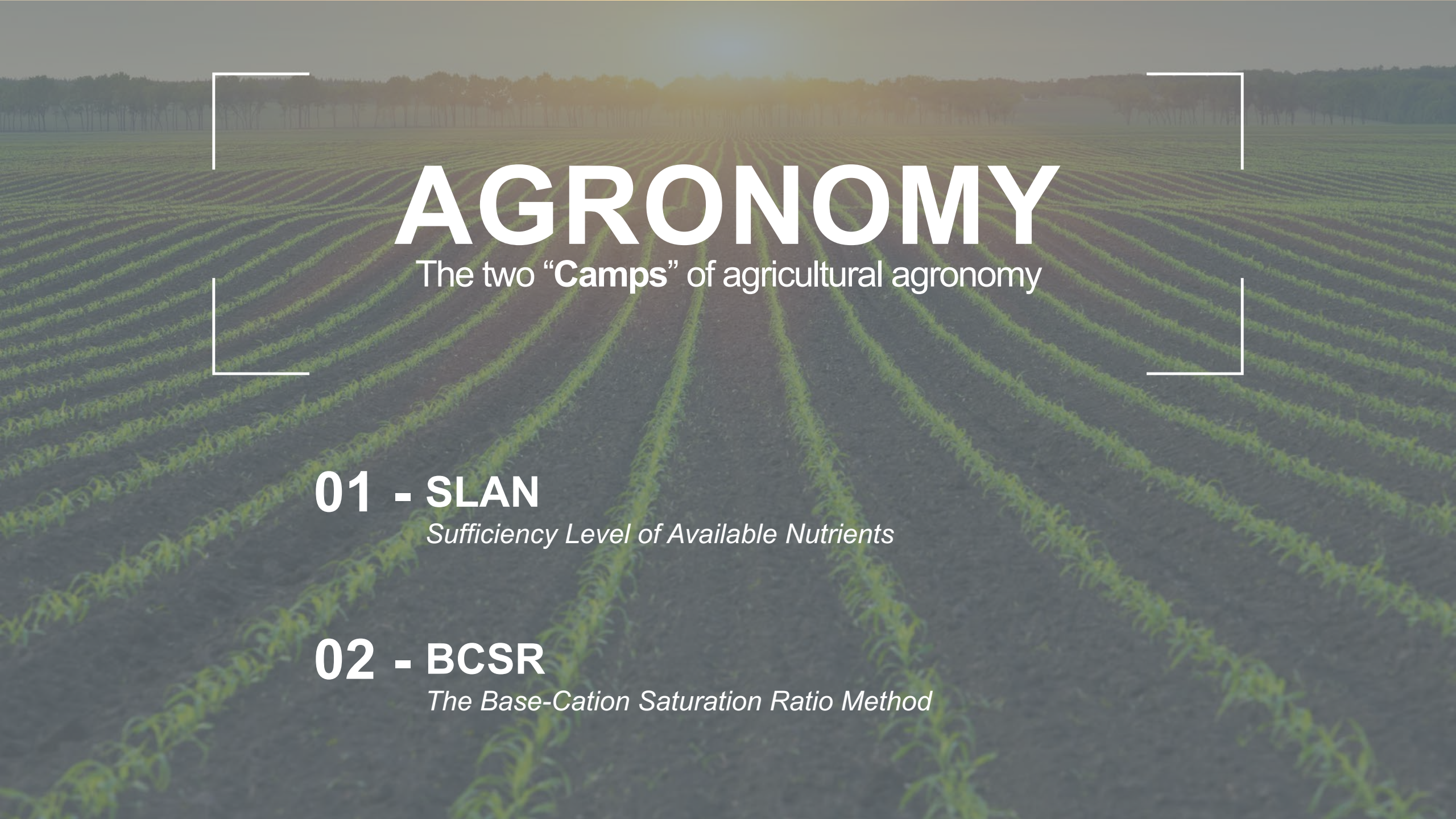
NITROGEN CYCLE

120 years ago ***industrial fixation*** forever changed the natural nitrogen cycle.

At OrganiLock we believe that it is time to modify the nitrogen cycle once again. If we expect to feed our exploding population in years to come, it is imperative that we implement changes to reclaim soil health. Is a modification of the nitrogen cycle (as we know it) possible?

To answer this question we first need to cover some agronomy basics.





AGRONOMY

The two "**Camps**" of agricultural agronomy

01 - SLAN

Sufficiency Level of Available Nutrients

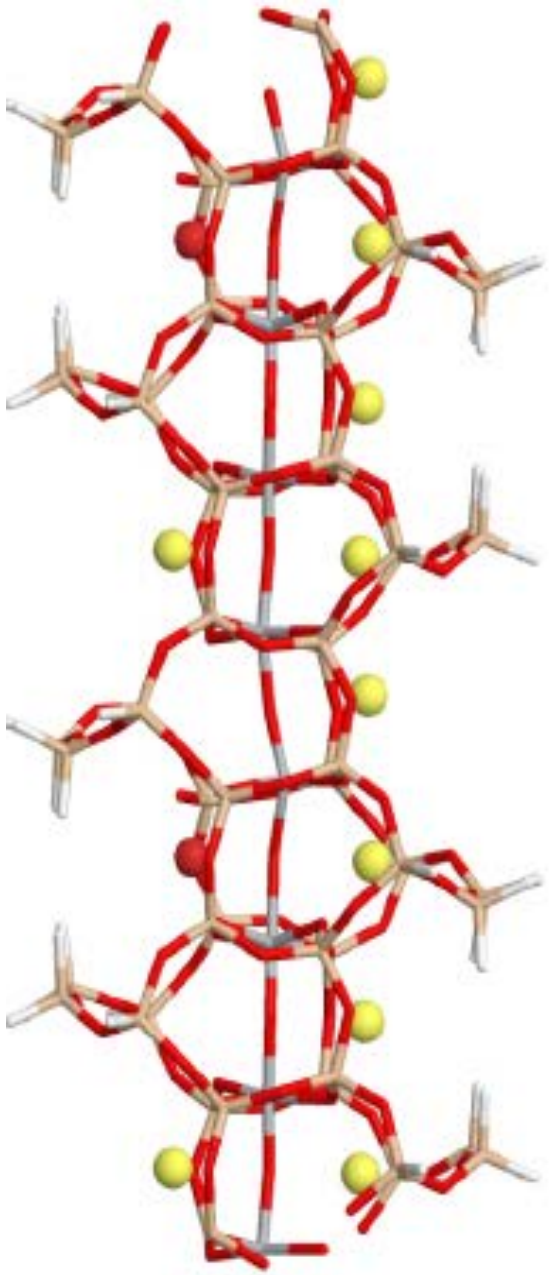
02 - BCSR

The Base-Cation Saturation Ratio Method

SLAN

“Sufficiency Level of Available Nutrients”

The predominant practice in our area is to follow recommendations from our local extension office most commonly referred to as ‘sufficiency level.’ Recommendations tend to be based on known soil characteristics of the area rather than detailed studies of the soil needs of the specific farm. This basic N-P-K method of farming has fed us well to this point but at a cost to soil health. This method is also the simplest way for a farmer to do his job. The extension office or similar service simply tells them what to do and then hope for the best. There is no serious effort to increase soil health with this method.



BCSR

“Base-Cation Saturation Ratio”

The other ‘camp’ of farmers apply the BCSR method. The Base-Cation Saturation Ratio requires a much closer study of the soil based on the saturation ratio of certain minerals/nutrients of the CEC (cation exchange capacity). This method tends to be favored by organic farmers and those concerned with overall soil health characteristics. This method requires more work and can cost more to have the analysis work done to make informed decisions on how to best amend the soil for best yield vs. cost. Many practitioners of BCSR believe that farming soil rather than crops will bring long term benefits.

THE HYBRID SOLUTION

Powered by **NIST**

Ground “Mending” Technology

We believe a third technology must be introduced and combined with either **SLAN** or **BCSR** for a sustainable, soil mending, productive, and cost-effective solution to feed people in 2050.

This technology is called “**NIST**”

Nutrient **I**nfusion **S**oil **T**echnology

THE HYBRID SOLUTION

Powered by **NIST**

Patent pending **NIST** efficiently sequesters carbon (biochar), while infusing non-humic organic carbon with non-composted animal-based fertilizers that are high in organic nitrogen. The combination can have a C:N (carbon to nitrogen) ratio in the range of 10:1 which solves the nitrogen immobilization challenge.

THE HYBRID SOLUTION

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By sequestering carbon (biochar) and combining it with repurposed readily available waste streams (non-composted organic carbon and animal tissue) we believe soil health can be mended over time while increasing soil productivity on an agricultural scale.

NIST BASICS

BIO-BURNER (heat source) → **BIOCHAR**

Heat from making biochar is sent to the processor

Pasteurized
Dehydrated
Nutrient Infused
Customizable

Sized
Microbes added
Pelletized or loose
Long term storage

Organic N, Macro and Micro Nutrients

Biomass processor

GRINDER

LIQUIDATOR

Can be land applied in liquid form

Organic Carbon
Available N
Organic N
Macro and Micro Nutrients

Non – Composted Animal Tissue

Non – Composted Biomass & Manure

THE HYBRID SOLUTION

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It will take TIME

We don't believe the solution to achieve soil health is simple. It took decades to create our soil conditions. It will take time, money, and effort to mend them.

THE HYBRID SOLUTION

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Compliments other Technologies

NIST is not a total solution. Our goal is to bring organic nitrogen, carbon, and life back to the soil while continuing to use fewer synthetic fertilizers. OrganiLock has developed an economically viable and scalable process to accomplish this.

Agronomy is multifaceted, and for that reason the following information has been compressed and abbreviated.

THE HYBRID SOLUTION

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Defining some of the challenges:

- Low carbon/humus content
- Nitrogen immobilization
- Low Organic N
- 'Use it or lose it' N
- Unavailable nutrients
- Nutrients that kill microbes
- Low microbe and bacteria activity
- Low CEC
- Hardpan / aeration
- Erosion
- Water/nutrient runoff issues
- Lack of viable solutions to the challenges


SOLUTIONS
Challenges addressed by “NIST”

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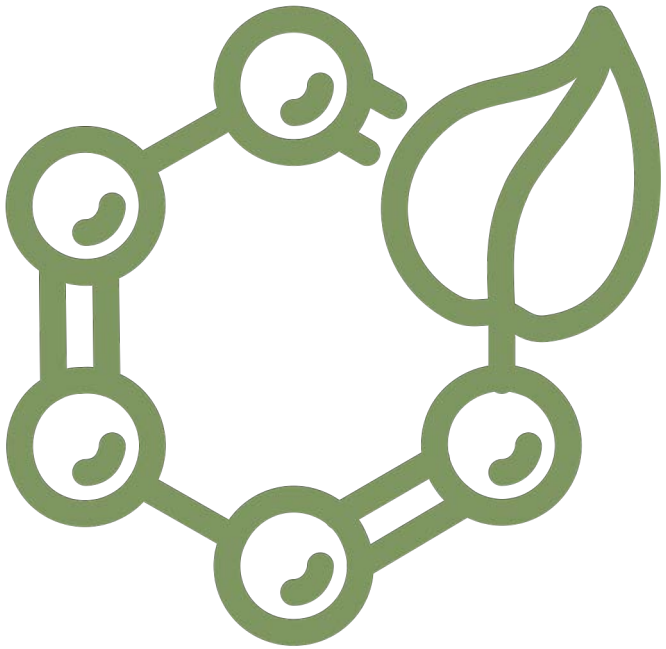
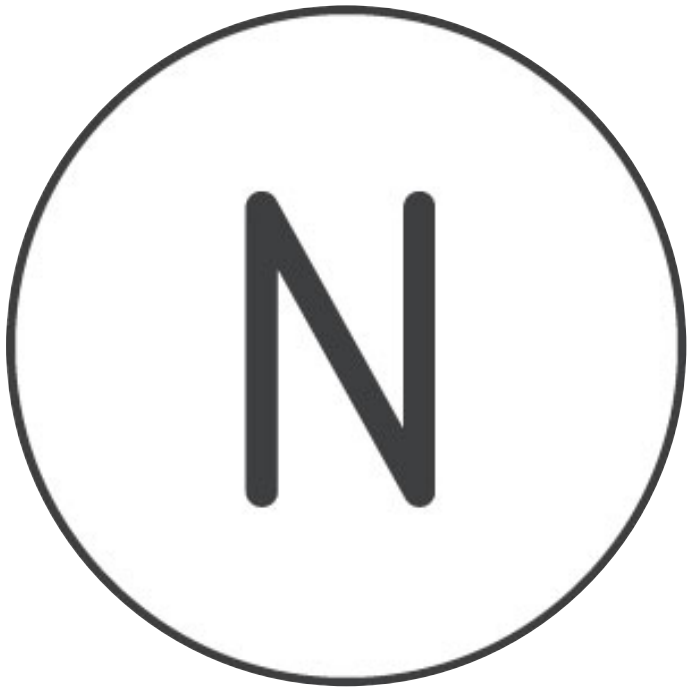


Low carbon/humus content:

- **NIST** products are rich in non-composted organic carbon that is infused with organic N and a host of other macro and micro nutrients.
- **NIST** products have a low C:N ratio. Microbes are free to 'feast' on organic C and N while simultaneously mineralizing excess N into plant available forms.
- Organic N is released over long periods of time (multiple seasons) while bacteria and microbes break organic carbon down
- Annual applications will guarantee 'perpetual' sources of C and N
- High levels of organic carbon that convert to humus over time improve soil characteristics in multiple ways

THE HYBRID SOLUTION

Powered by **NIST**



Nitrogen immobilization

- Solved by the low C:N of **NIST**

Low Organic N

- NIST uses non-composted carbon as a holder for organic N and a host of other nutrients

'Use it or lose it' N

- **NIST** 'OrganiLocks' organic N into our long-lasting organic carbon (biochar). We also use small amounts of organic, readily available N in our process. With these factors in mind we feel that synthetics will still be required to complete the needs of individual farmers' crop. However, healthier soils will result in needing less synthetics over time.

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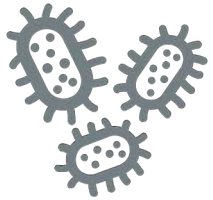
Unavailable nutrients

- Living soils created by **NIST** will make specific nutrients available that may be locked up when using the **SLAN** method of farming.

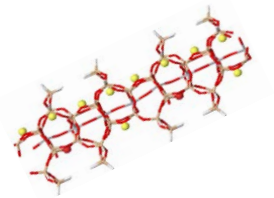
Nutrients that kill microbes

- **NIST** reduces the need for harsh nitrogen applications that kill microbes.



Low microbe and bacteria activity

- **NIST** specializes in supporting robust bacteria and microbial life in soil.



Low CEC

- Organic matter introduced by **NIST** may be the most effective way to optimize the CEC of the soil. High CEC helps make nutrients available to the plant.

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Hardpan / aeration

- Long-term use of **NIST** will add significant amounts of carbon/humus that will lower hardpan and aerate the soil. The biochar in **NIST** 'permanently' aerates soil, helps the soil hold water and provides a prime habitat for bacteria and microbes.

Erosion

- **NIST** softens and aerates soil which reduces erosion**.**

Water / nutrient runoff

- **NIST** softens and aerates soil. Water and nutrients will soak into the soil and carbon thereby reducing water/nutrient runoff.

THE HYBRID SOLUTION

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Lack of viable solutions to the challenges

We believe **NIST** represents a significant and viable companion to existing farming methods. The technology is scalable and sustainable.

BIOCHAR

The Role of Biochar in **NIST**

BIOCHAR

The Role of Biochar in **NIST**

Our Business Model

Our business model is designed around the manufacture and use of biochar in our varied NIST solutions. We are building a network of production facilities in strategic locations where raw materials and large population density are present. We have a special emphasis on reducing shipping costs.

BIOCHAR

The Role of Biochar in **NIST**

The advantages of this approach are:

- No need to find customers for our biochar – we ARE the customer with global sales potential.
- The selling price of the char is tied to the garden/soil/fertilizer markets which means the margins are high and consistent.
- Tying the need for heat to manufacturing char is significant because we get double duty from our processing equipment.

BIOCHAR

The Role of Biochar in **NIST**

- OrganiLock biochar technology is unique. Our high-quality char is made in a non-catalytic combustion chamber with **excess** air and high temperature. Independent tests show the char to be in the 85% total carbon range and up to 90% effective as compared to industrial activated charcoal.
- OrganiLock manufactures the equipment to pre-size biochar feedstock.
- Our process is continuous and automatic. The chip is small, consistent and dust free.
- OrganiLock manufactures three sizes of biochar production appliances. These units produce 6,10, and 20 gallons per hour.

Greenhouse & Garden Solutions

Putting Healthy Food on the Tables of Those Who Need It

Our Roots

- OrganiLock was initially conceived and developed for the greenhouse and garden markets.
- NIST has created a paradigm shift in the greenhouse and gardening market because we can make soils from living non-composted materials instead of '**zombie soil**' media such as peat, coir, compost, pearlite and vermiculite.
- Visit **www.zombiesoil.com** for more information.

Greenhouse & Garden Solutions

Putting Healthy Food on the Tables of Those Who Need It

We at OrganiLock believe there will be an increased need for indoor and above ground farming in the years to come.

Our goal is to impact all sectors of agriculture with world changing **NIST** and to play our part in feeding the world's population as we approach 2050.

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SIDEBAR DISCUSSION

- We are working with Kristen Evans at Sustainable Chesapeake on emissions technology related to burning poultry manure and making biochar. We are running a test in PA at a poultry farm to reduce PM and CPM. Phase I PM numbers are great, phase II is to reduce CPM (foggy emissions). Bottom line is the industry won't be able burn poultry manure until CPM is eliminated.

- We have test results from the University of North Dakota proving that our biochar is 90% effective when compared to activated biochar when filtering mercury from coal fired emissions.

SIDEBAR DISCUSSION

- We are collaborating with the Murray State University Ag department to publish results of using NIST. First harvest commences next week. Visual indicators are very positive.

- NIST testing at our onsite farm last year increased corn yield by 41%. The same area growing beans this year is growing bigger plants – without reapplying.

- The common theme I've heard in all the sessions so far has been the need for organic carbon. We believe the solution is NIST.