THE GLOBAL AGRICULTURAL SOLUTION

BIOCHAR AND ITS ROLE IN FEEDING PEOPLE IN 2050

USBI BIOCHAR 2018
SCOTT LASKOWSKI

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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.
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 – Nutrient Infusion Soil Technology**.

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)
Who is OrganiLock?

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

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 Infusion Soil Technology
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

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 → Biomass processor

Heat from making biochar is sent to the processor

Organic N, Macro and Micro Nutrients

Can be land applied in liquid form

Pasteurized Dehydrated Nutrient Infused Customizable

Sized Microbes added Pelletized or loose Long term storage

BIOCHAR

Organic Carbon Available N Organic N Macro and Micro Nutrients

Non – Composted Animal Tissue

GRINDER LIQUIDATOR

Non – Composted Biomass & Manure

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THE HYBRID SOLUTION

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

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.
THE HYBRID SOLUTION

Powered by NIST

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”
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
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.
THE HYBRID SOLUTION
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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.
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.
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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
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.
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.
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, perlite and vermiculite.
- Visit [www.zombiesoil.com](http://www.zombiesoil.com) for more information.
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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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.
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.