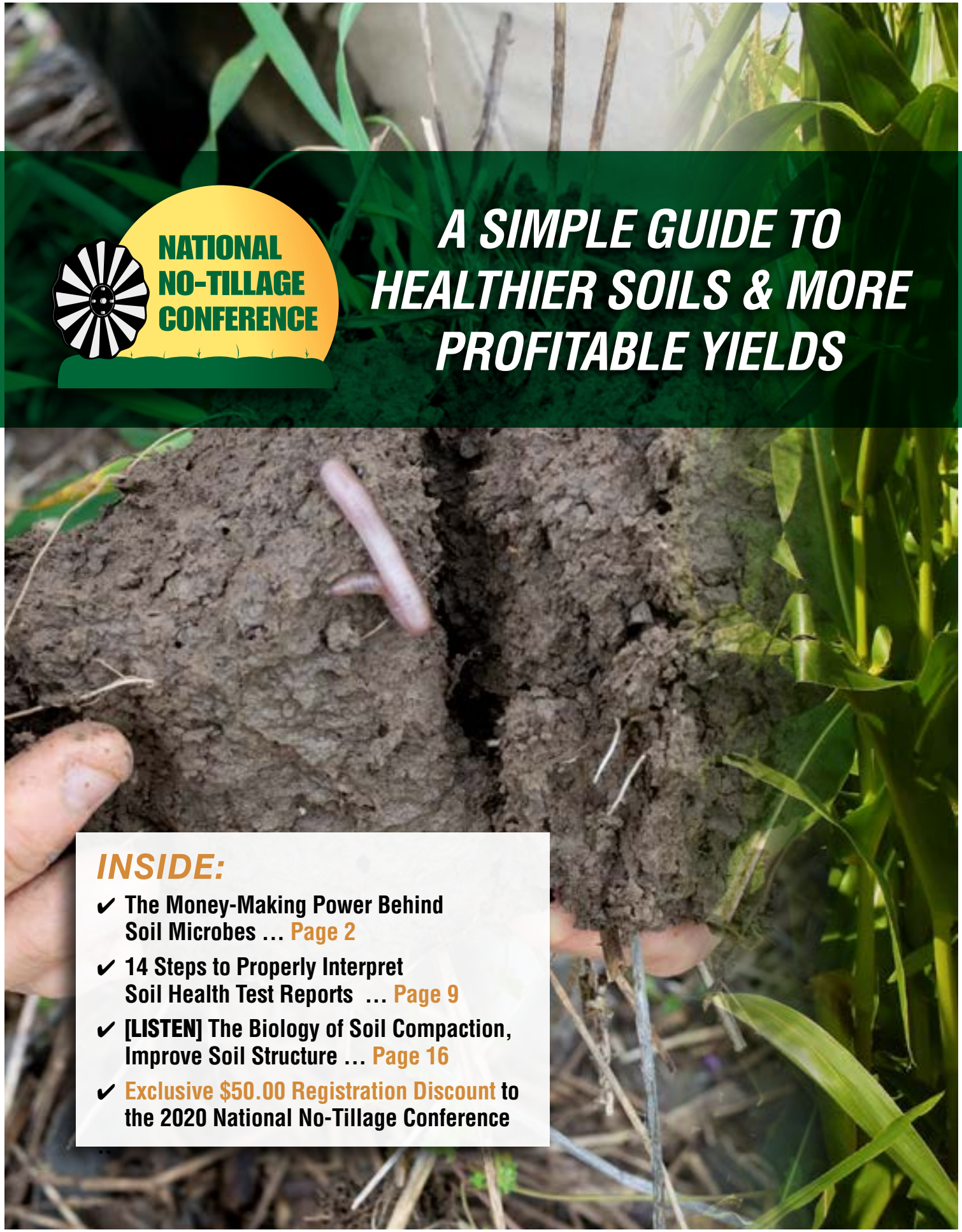


NATIONAL NO-TILLAGE CONFERENCE

A SIMPLE GUIDE TO HEALTHIER SOILS & MORE PROFITABLE YIELDS

INSIDE:

In Depth: The Money-Making Power of Soil Microbes

Reducing soil disturbance, increasing plant diversity and adding livestock to farms accelerates soil health and productivity, helping growers stay profitable, soil experts say.

The challenge ahead for farmers is to produce more food on a declining land area, with soils and ecosystems that are continually being degraded — all while using less water, energy and natural resources under difficult economic circumstances.

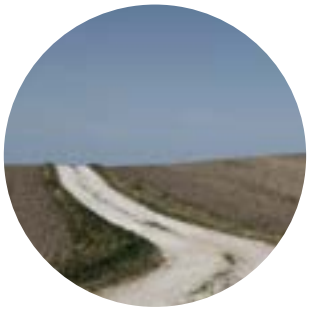
But the good news is that there are tools growers can use to meet these challenges, says David Johnson. The New Mexico State University soil researcher told 250 farmers at the Regenerative Agriculture Conference in Brandon, Manitoba, that it's going to require a very different agricultural system than what exists today.

The BEAM System

Johnson maintains that conventional agriculture over the last 70 years has damaged the microbial community structure in soils and farmers need to bring it back if they want farm ground to remain productive.

Johnson has spent the past 14 years learning what the thousands of microbes present in a well-functioning soil system actually do, and how they interact with each other and work together to maintain the system.

His journey began with a project to develop a better process to compost dairy manure and reduce its salinity. Johnson's new composting process produced a fungal-dominant, biologically diverse compost. It was the impact of that compost on plants and soil that made Johnson realize that soils can be regenerated quickly and cost effectively by using biology.



After 1 year of the composting process, the microbial community had quadrupled and the composition of the microbes changed. After doing greenhouse tests using the compost inoculant compared to a control with no compost, Johnson found that the inoculated plants had double

the growth, even though the inoculated soils had low availability of nitrogen (N), phosphorus (P) and potassium (K).

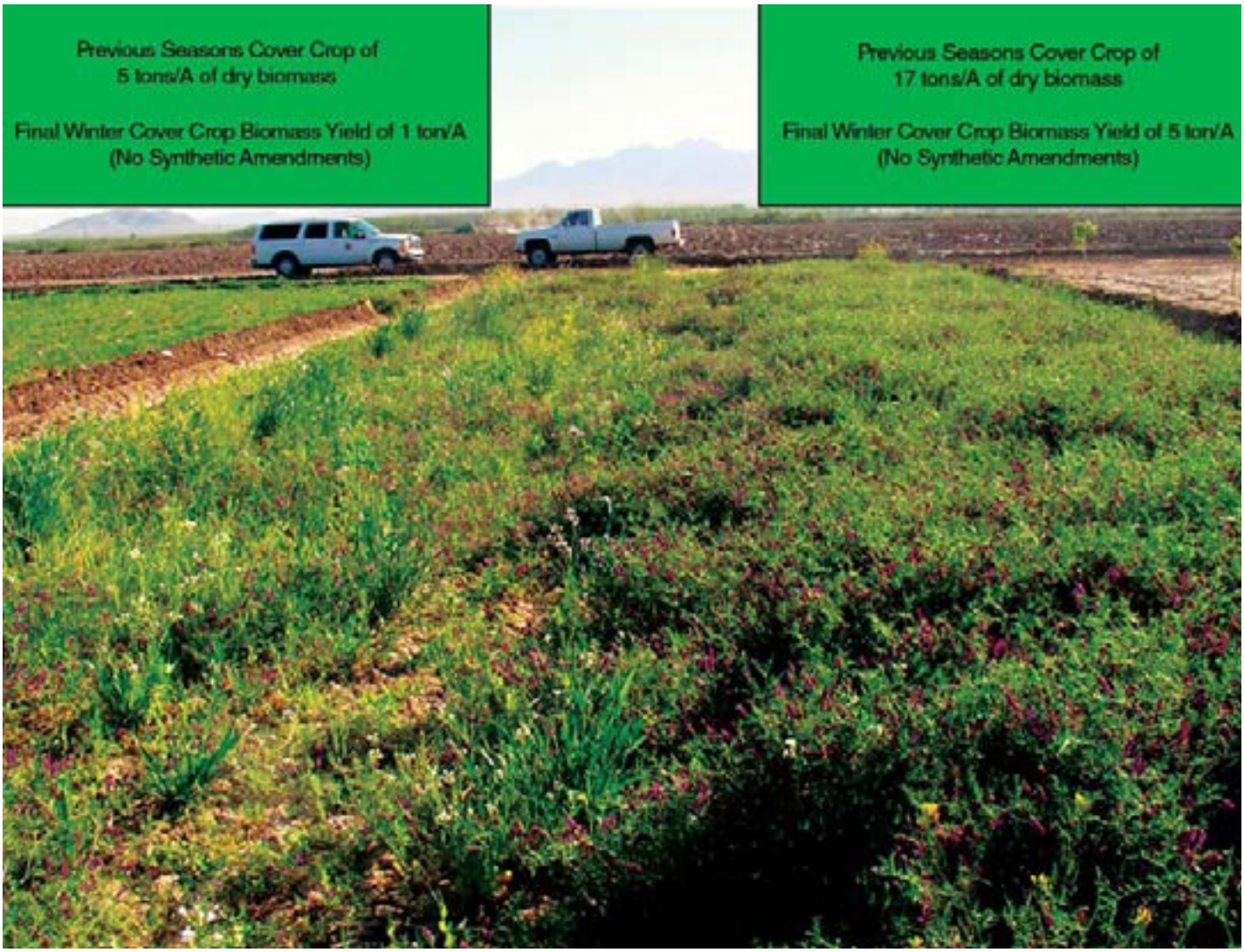
He says there was a direct correlation between plant growth and organic matter, which was higher in the inoculated soils. Organic matter is the energy resource for the thousands of microbes that each make different, but essential contributions to healthy, productive soil.

The fungal-to-bacterial ratio was higher in the inoculated soil and Johnson realized the plants grew better in a fungal-dominant soil.

Johnson experimented with different fungal-to-bacterial ratios and carbon content and found that in a low-bacterial, low-carbon system only 3% of the photosynthetic energy captured by the plant went into growth.

"For a plant to sacrifice 97% of the energy it captures and pump it into the soil, there's got to be a reason," Johnson says. As he increased the fungal ratio and carbon content in the mix, the flow of energy into the plant increased up to 56%.

Johnson says most agricultural soils are bacterial dominant with low carbon content and are only around 11% efficient when it comes to the energy plants use. He developed a Biologically Enhanced Agricultural Management (BEAM) system using his compost inoculant



MORE BIOMASS. In this New Mexico field, the previous season's cover crop with no BEAM application produced 5 tons per acre of dry biomass and a final winter biomass yield of 1 ton an acre, says soil researcher David Johnson. Cover crops that received BEAM applications for 1 year produced 17 tons of dry biomass an acre and winter biomass yield of 5 tons an acre. No synthetic amendments were applied in either case.

to jump start soil biology and increase biomass production.

After testing BEAM in degraded agricultural and extreme desert soils, he believes he's shown a shift to a fungal dominant, high-carbon system can increase crop or forage production five-fold.

Even if producers don't use an inoculant, they can still use cover crops and see great benefits to the soil, but by adding soil biology through a high-quality compost inoculant, they can speed up the process significantly.

Multi-Tasking Microbes

Johnson has learned a lot about soil biology and the function of microbes in the soil. During his research he analyzed around 2,750 species of microbes and 193 showed an actual linear correlation to plant growth.

These microbes had different functions: N fixation and N cycling, carbon cycling, metal oxidation, P solubilizing, antibiotic/antimicrobial production, biofilm and quorum sensing, CO oxidation, the ability to degrade pesticides and phytohormone production.

Essential to making the system function are free-living and symbiotic N-fixing microbes, and others that both cycle N and degrade N. "It's important these elements are cycled in this system," Johnson says. "It's like money: if we don't have a certain velocity through our economy, everything shuts down."

Johnson maintains that due to the amount of P fertilizer growers have been applying for decades there's a 40-year supply in agricultural soils that isn't accessible without the specific microbes that solubilize it so the plants can use it.

Microbes responsible for metal oxidation make just about every element — including iron, aluminum, manganese, chromium and boron — plant available, and other microbes produce antibiotics and antimicrobials in the soil to help protect plant health.

Johnson identified 34 microbes as having the capability to degrade pesticides. "For almost every chemical we have applied out there we have a microbe that can break it down," he said. "That's critical to restoring fertility back to our systems."

Some microbes secrete hormones that increase plant growth, and others engage in quorum sensing — a chemical communication system between multi-species bacteria that come together as a community and can express genes better than they can as a single organism.

"We see quorum sensing of 6 to 10 times more expression level so as we bring the biology back you start getting metabolic functions in this system that you won't see when all these microbes work as a single unit," said Johnson. "This is a synergy of systems between the plants and the microbes. They're all interested in the same thing — survival — and they all work together."

Microbes will even take care of food safety by reducing pathogens in the soil that are harmful to human health, such as e-coli. "When you bring back the health of the system, you can bring back competitive inhibition," he says. "We have most every microbe that can cause disease in us, but we have competitive inhibition. Other microbes on our skin protect us."

Another important detail Johnson discovered is the first 1% increase in soil carbon also quintupled the amount of water the soil could store.

"The more carbon you give, the more water you can store, the more efficient your system can become," he says, noting the importance of this because it provides crops more resilience to droughts and helps mitigate floods,

as well as benefitting society by preventing off-site pollution from nitrates leaching into watersheds.

Unlocking Nutrients

Because growers are used to thinking in a linear way, Johnson says it's hard to wrap their minds around the complex, dynamic systems that are happening in soils.

A functioning system is not only about bacteria and fungi, but also viruses that are just as critical to the system, he says. Around 800 million viruses fall onto every square meter of the planet surface every day, and in oceans 20% of the bacteria is attacked by viruses and cycled into the system. Without them, Johnson says, the ocean food chain collapses.

In his research, Johnson found the nutritional value of BEAM soils is greatly increased. In the first 20 months, Johnson saw huge increases (40-1,110%) in the availability of micronutrients like manganese, iron, magnesium, calcium, zinc and copper.

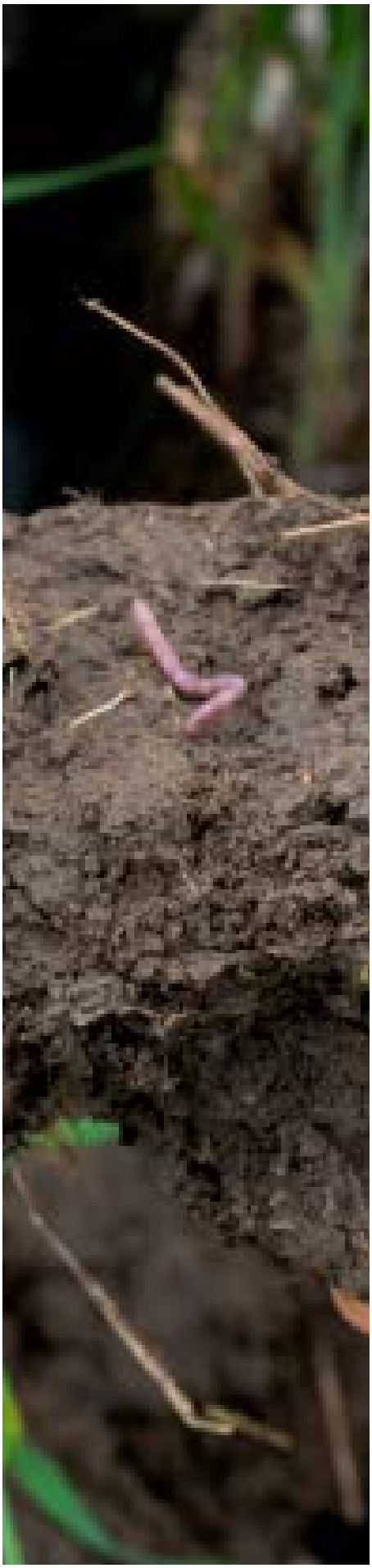
The macronutrient levels went up, too, with increases of 107% in N, 64% in P and 37% in K. "That's in a system where we only inoculated (with compost) once and didn't use any fertilizers," he says. "We use biology and we're just growing plants and putting more exudates into the soil to feed these microbes."

But what's most important to most farmers is productivity and profitability. So how much can soil biology improve these critical factors?

Comparing BEAM to a conventional system, fertilized with 180 pounds N per acre, the BEAM approach provided a 114% increase in cotton production, Johnson found, and gave twice the plant growth of the conventional system after 1½ years. By the seventh year, the cotton plants were 6 feet high and produced 5 bales per acre in a region that averages 2.5 bales per acre, and 3,300 pounds of seed — providing a gross value of $2,000 per acre.

Better Soil, Better Yields

David Montgomery, author of *Dirt: The Erosion of Civilizations*, wrote his new book, *Growing a Revolution: Bringing Our Soil Back to Life*, after taking 6 months off from teaching geology at the University of Washington to seek out farmers who are employing regenerative agricultural practices all over the world — from subsistence farmers in Africa to large-scale soybean and corn



growers in South Dakota.

In all cases, he learned they follow three simple principles to build soils and make them healthier and more productive: disturb the soil as little as possible, maintain permanent ground cover and have a diverse mix of plants.

He also found that farmers using these principles could build soil much faster than he thought, as a geologist, was possible.

"The practices that farmers used varied region to region, but they all adhered to those three basic principles of conservation agriculture, which together work to boost soil organic matter, soil life and crop health and maintain yields at the same time," Montgomery told attendees at the Regenerative Agriculture Conference. "They were matching the conventional yields of their neighbors, but they were using far less fertilizers and chemical inputs."

Dakota Lakes Research Farm, run through South Dakota State University near Pierre, S.D., is a farming cooperative owned by 500 farmers, and it works with farmers that operate up to 20,000 acres.

"By applying no-till, cover crops and complex rotations these farmers reduced their diesel, fertilizer and pesticide use by half," Montgomery says. "Their yields went up once they rebuilt organic matter, and they spend less on inputs to do it. That's a recipe for a more profitable farm."

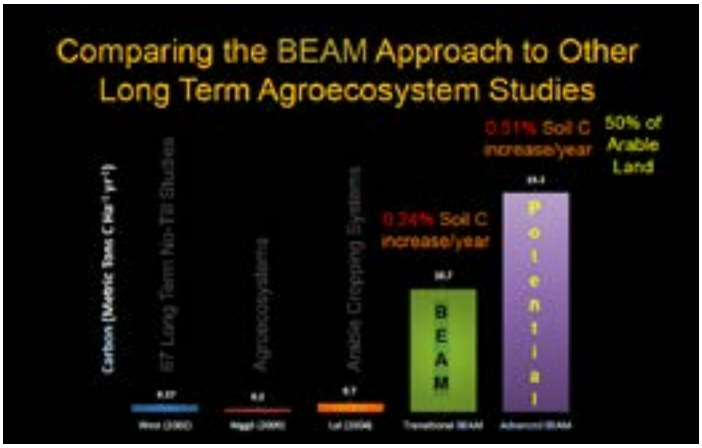
Lessons from Africa

But could this kind of regenerative agriculture work for all farmers? To find out, he went to Africa to meet Kofi Boa, who runs the No-Till Research Centre near Kumasi, Ghana.

After going to the U.S. to learn about no-till agriculture a few decades ago, Boa went back to his native village to teach them how to replace their slash-and-burn style of agriculture with no-till practices and cover crop seeding.

Farms in the region are family run, growing enough to feed themselves in small plots of land, he says. Traditional native farming practice was to slash and burn an area of forest, plant it for a couple of years and move on to a new plot once the nutrients were exhausted.

Eventually the population grew to the point where there was no new land, so repeating the practice on the same piece of land has burned away all the nutrients and the land never recovers, Montgomery says.



MORE CARBON. Soil researcher David Johnson says using the BEAM approach to boosting soil health — whether in transitional or advanced stages — resulted in bigger increases in soil carbon annually than carbon levels found in arable cropping, agroecosystems or even long-term no-till plots.

Boa taught the farmers the concept of no-till with cover crops and to have 6 or more different crops growing in a field at the same time, which they can do because they manually harvest.

The result? It cut soil erosion by a factor of 20, their corn yields tripled and their cowpea yields doubled — all with no additional inputs and no more fertilizer or herbicide, he says.

"They achieved this by a change in how they thought about their soil, how they approached the act of farming," Montgomery says. "The farmers in the village now own their own farms. When Kofi started, they all rented. It was transformative."

Money in Your Pocket

David Brandt considers himself a microbe-rancher. On his farm near Caroll, Ohio, Brandt grows corn, soybeans and wheat but he also seeds cover crops, some a mix of 10 or 12 different plant species.

It's helped him to increase yields, save money on inputs and avoid the serious issues his neighbors are having with glyphosate resistant weeds.

Brandt has been no-tilling for 44 years, and added cover crops 20 years ago. On average, he's only adding 24 pounds of N and using 1 quart of glyphosate per acre for a corn crop, and in 2015 — when Montgomery visited him — he was spending $320 an acre to grow 180-bushel corn and making $400 an acre profit on $4 corn.

By contrast, Brandt related that the Carroll County average, using 200 pounds an acre of N and 2.5 quarts of glyphosate per acre cost $500 an acre to grow a 100-bushel corn crop at a loss of $100 an acre at the same market price.

The trick, Montgomery says, was rebuilding soil fertility: in his clay soils, organic matter content is up to 8%.

"He increased the soil-carbon content of his land to higher than the native soil and he did it through intensive agriculture," Montgomery says. "If the short-term economics of regenerative farming are starting to line up, the style that David's doing is paying off well relative to his neighbors. That's the sign of an idea that might start to catch on and spread."

Ramping Up with Livestock

Longtime Bismarck, N.D., no-tiller Gabe Brown added another dimension to regenerative agriculture by integrating livestock and regenerative grazing practices, which he's using to restore native prairie, as well as boost his cropping system.

Through intensive rotational grazing, using high stock densities and frequent moves that simulate the way buffalo once grazed the plains, Brown stimulates the root system of grasses to put out more exudates that feed the soil biology and build carbon.

He's also growing mixed species of cover crops (or polycrops) that he allows his cows to graze to help cycle nutrients back into the soil.

Rather than terminating the cover crop through winter kill or spraying it with a herbicide, Brown lets the cows graze it, turning it into beef. The cows function

as self-propelled methane digesters and they convert the standing biomass into manure, a nutrient source more readily taken up by plants.

"They're basically making and distributing fertilizer out of the cover crops," Montgomery says.

When Gabe first bought his farm, soil organic matter was 2-3% and after 20 years of experimenting and building soil carbon it's up to around 6%. In his market garden, where he grazes cattle and added other materials like wood chips to the soil, it's up to 11%.

"This is doable. And to a geologist, being able to do this in 10-20 years is like a snap of the finger. That is like overnight compared to the history of soil degradation," Montgomery says. "I don't think you necessarily need livestock to restore land, but I do believe if you manage it right it can be a great accelerator to the process of restoring land."

14 Steps to Properly Interpret Soil Test Report

Ward Laboratories president Ray Ward offers a step-by-step explanation on interpreting soil test reports to aid no-till management decisions.

Most no-tillers understand the importance of soil testing, as they typically serve as the baseline for fertilizer and lime purchases and application.

Thanks to variable-rate technology, growers can even use soil test reports to draw up exactly where they're going to apply a certain rate of fertilizer or lime.

But if someone were to hand you a soil test report, would you be able to read the information and understand what it means?

Most growers would probably say no. Given that fertilizer was the biggest expense for no-tillers in 2015 — more than $75,000 on average per farm, according to this year's No-Till Operational Benchmark Study — no-tillers may want to consider learning how to read and interpret this data that can tell them what's already in their soils.

This may become especially important because of growing concerns about nutrient runoff in local waterways. It also allows no-tillers to check for any discrepancies in their results and ensure the fertilizer recommendations their agronomist or consultant is suggesting matches what each field needs.

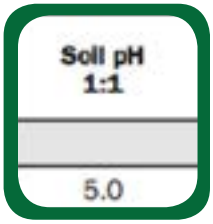
No-Till Farmer reached out to Ray Ward, founder and president of Ward Laboratories in Kearney, Neb., who shared a recent soil test report from one of his farms and took us step-by-step through the report and interpreted it for us. You can refer to the actual report photographed above to follow along from left to right.

1 Soil pH 1:1. The 1:1 means soil-to-water.

At our lab, we use 10 grams of soil and 10 milliliters of water, let it sit for half an hour and read the pH. In Nebraska, we have a state law for soil testing labs that says we have to report how we do the test. That's why the methods are identified on our report.

A pH of 7 is neutral. As the pH drops, soil becomes more acidic, whereas if it goes up it becomes more alkaline.

In most states when the pH gets below 6, we begin to think about applying lime. And for each pH unit dropped, like from 7 to 6, the hydrogen-ion concentration — which determines acidity and alkalinity — increases 10-fold.



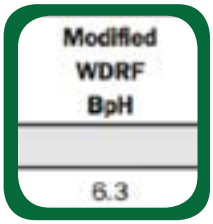
This pH is 5.0, so we've dropped 100-fold in hydrogen-ion concentration, which means it needs to be limed as soon as possible.

2 Modified WDRF BpH.

The WDRF stands for Woodruff, who was a soil scientist at the University of Missouri who developed a buffer method that we use in our laboratory because it estimates lime needs on sandy soils better than the SMP Buffer developed at Ohio State University.

The difference between the buffer pH and the soil pH is the buffer pH measures the total acidity in the soil, while soil pH gives us the active acidity.

We use the buffer pH to determine how much lime to apply. We take 7 minus the buffer pH and multiply by 4 to arrive at the lime recommendation of 2.8 tons per acre, which you can see under the fertilizer recommendations listed in the sidebar on page 35.



That recommendation is what I call 100% effective lime. Most ag lime is 60% effective lime, so you would take 2.8 and divide it by 0.6 to come up with the amount of ag lime you need to apply, which brings us to 4.7 tons per acre.

3 Soluble Salts 1:1 mmho/cm.

This is an electrical conductivity reading or EC reading. We still use the old term mmho/cm. The new term is mS/cm, but it's the same.

Because we're in the western part of the Corn Belt, there are more saline soil conditions out here, and so we run EC on every sample. Because if we have a saline problem,

we know it right away.

I also use the EC reading in reviewing the soil results because if I have a very high nitrate, sulfur, calcium or potassium (K) reading, I can look at the EC. If it's higher, then I know the soil test was run correctly. When the plant nutrient levels get too high, the soluble salt readings will increase.

If the soluble salt or EC reading is above 1.5, we have a saline condition. But if you're really low, it means you don't have much life in your soil. So you'd like to have that soluble salt reading around 0.3 to say you have a good, living soil.

If you're above 0.6 or 0.7, then you have to look around and see what's causing it to be out of whack, whether your nitrates or sulfates are too high, or something else is too high.

4 Excess Lime Rating.

This is a way of determining if you have a calcareous soil, which is one that has free lime in it. And in the Plains and mountain region, we have a lot of calcareous soils. It's just a way to let the farmer know, 'Hey, this soil may have iron deficiency chlorosis' or something like that.

In the past, when we had more triazine-type herbicides, some were very sensitive to high pH or high lime, so we needed it to adjust the triazine herbicide rates. Well, those are almost all gone now except for atrazine, so we don't worry about it too much. It still might be important in some herbicide applications, though.

The "none" indicates that the pH is probably less than 7. It's possible you could have a soil pH of 7-8 and no excess lime. But you should not have any free lime if the pH is below 7. And if I see that when I'm reviewing results, I ask that the soil tests be checked again.

5 Organic Matter LOI-%.

The LOI stands for "loss on ignition," which is how we determine how much organic matter is present. We dry the soil and weigh it, then we place it in the muffle furnace at 360 C, or 680 F, and that burns the organic matter off. Then we cool the samples and weigh them again. The difference between the two weights is the amount of organic matter that was present.

The important thing for farmers to understand is that each percent of organic matter contains at least 1,000 pounds of nitrogen (N) per acre in that 0- to 8-inch depth. This test has a 2.8%, so that's 2,800 pounds of organic N stored in the top 8 inches of soil.

We're trying to build up organic matter to make it better for the water-holding capacity, and it also helps us build

nutrient levels. All the nutrients in plants are in organic matter. In really good conditions, we can get more out of the crop because we have higher organic matter.

6 FIA Nitrate ppm N and Depth Nitrate Lbs N/A.

FIA stands for "flow-injection analysis," which is the method we use to determine the nitrates.

Nitrate is soluble, as we know, and it leaches if there is too much rain. But nitrate is available and we can quantify it. We can calculate pounds of N per acre, which we find in the next column.

FIA Nitrate ppm N	Depth Nitrate Lbs N/A
	0 - 8 in
21.8	52

We take the depth of the soil, which is 8 inches, multiply it by 21.8 ppm NO3-N and then multiply by 0.3. The 0.3 comes from the weight of the soil — each inch weighs 300,000 pounds per acre, which equals 0.3 million. This calculation gives us 52 pounds of nitrate per acre.

7 Method Phosphorus ppm P.

The M-P3 underneath stands for a phosphorus (P) extract developed by North Carolina State University soil scientist Adolf Mehlich. This test is used by many soil-testing laboratories in the Plains and to the East.

We consider anything above 25 ppm high. We can see it's above that, so you wouldn't have to apply any P for a year or two. But we do recommend a starter fertilizer application of up to 50 ppm P.

Method Phosphorus ppm P
M-P3
36

For the irrigated or really high yield potential areas, like 250-bushel corn, I'd like to see that up to 35-40 ppm.

Ammonium acetate means they're exchangeable cations.

8 Ammonium Acetate: K, Ca, Mg, Na.

K stands for potassium, Ca is calcium, Mg is magnesium and Na is sodium.

For most states, 180 ppm for K would be rated as high. Probably anything above 150 or 160 ppm K is high. If you're above 160, you can likely go without it.

But we like to see 200 ppm K for corn, which is why we recommend adding 20 pounds of K2O per acre under the fertilizer recommendations (see sidebar, page 35). We're just telling the farmer to put a little bit on to maintain the soil test where it is.

Ammonium Acetate			
K ppm	Ca ppm	Mg ppm	Na ppm
180	1466	211	9

Calcium is at 1466 and I don't have a rating for calcium.

Some people like to look at the base saturation (No. 14) on that and say it's too low. That's because the pH is very acidic. As the pH drops, normally hydrogen ions will replace calcium ions on the exchange complex and the calcium ions leach.

Magnesium is 211 ppm. We recommend magnesium application if the ppm gets less than 50 ppm. So if it's above 50, we consider that high.

And for sodium, we want low sodium. Sodium is bad for the soil. A lot of people associate sodium and salt together. Sodium is called a sodic soil and salts are called a saline soil. So there's a big difference in the terminology.

A high sodium ppm level is calculated by multiplying the CEC (No. 13) by .05 by 230. Sodium base saturation should be below 5% CEC.

9 Ca-P Sulfate ppm S.

Ca-P is a calcium phosphate solution we use to extract sulfur. Sulfate is like a nitrate; it's soluble and moves around with the water.

If we're below 12 ppm, we might consider putting sulfur on — partly because our atmosphere is so clean now we don't get much free sulfur anymore. So we recommend a little bit of sulfur on this corn (see sidebar, page 35), because we're below 12.

Ca-P Sulfate ppm S
10

10 DTPA: Zn, Fe, Mn, Cu.

DTPA is a chelate used to extract zinc (Zn), iron (Fe), manganese (Mn) and copper (Cu). Willard Lindsey at Colorado State University developed the test in the 1960s.

If you're above 1 ppm zinc, you're probably OK. Some agronomists like to go to 1.5 instead of 1, but I believe 1 is adequate.

Iron is more soluble as the pH becomes more acidic, and this is a low pH, so the iron test is very high. We want the iron test above 4.5 ppm. If it's below 4.5, and you have a pH above 7, and high excess lime, you likely have iron deficiency chlorosis (IDC) problems.

DTPA			
Zn ppm	Fe ppm	Mn ppm	Cu ppm
0.96	75.4	21.8	0.82

For manganese, I want it above 3 ppm. Willard Lindsey's was 1. I'm not as sure about manganese as the other micronutrients.

On copper, we have 0.82 ppm, and we like to see it above 0.20.

11 Hot Water Boron ppm B.

We run boron sometimes, but we didn't for this test because it has been high in the past.

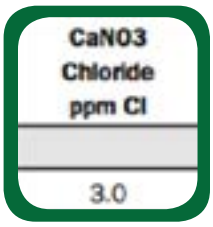
On corn and soybeans, we like to see it above 0.25 ppm. For alfalfa, sugarbeets and cotton, we go up to 0.5 ppm.

But the rest we keep at 0.25. That's based on Oklahoma State University calibrations.

12 CaNO3 Chloride ppm Cl.

This is chloride and it's an ion that has been found deficient in South Dakota and Kansas the last 20 years. In Kansas we like to see the chloride test above 6 ppm, so the 3 is a little bit low. We'd recommend some chloride.

Chloride is very important for the grasses like wheat, milo and corn, but not so important for the broadleaves like soybeans.



13 Sum of Cations me/100g (CEC).

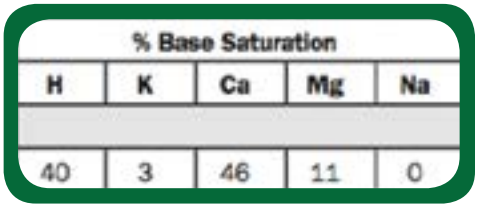
This is an indication of texture and the amount of organic matter in the soil. The clay and organic matter provide the CEC, and then the type of clay also affects the CEC or the sum of cations.

The kind of clays we have here in the Plains are much higher in cation-holding capacity than the clays in the Southeast. So you can't really tell the texture unless you know the location of the soil. But 16.1 would indicate a silt-loam soil, and this soil is in fact a Muir silt loam.

14 % Base Saturation: H, K, Ca, Mg, Na.

Now we're on the percent base saturation. H is hydrogen and it's at 40%. I'd like to see that below 30%. If it's below 30%, I'd say you can get by another year without lime. But at 40% we need to put some lime on.

For K, I'd prefer to look at the K soil test instead of the base saturation. We're just on the border with 3%. I think some



people would say it needs to be 5%.

Calcium is 46%. It's obviously low because the hydrogen is high. If we apply lime, the calcium will replace hydrogen. Some people like to see 60% or 65%.

Magnesium is at 11%. We're plenty high in magnesium at 211 ppm (No. 8). So I'm not too worried about that.

And then sodium is zero, which is great. If the sodium is above 5%, then we need to be thinking about applying gypsum to reduce it. Gypsum is calcium sulfate, and calcium replaces sodium and it moves down with the sulfate ion. Calcium replaces sodium on the exchange complex.

And because of the size of the ions — sodium is a bigger ion in the soil in hydrated conditions — it's easier to remove. So calcium kind of kicks it off the exchange complex.

Because we're in the Plains states, we run sodium on everything when we run the cations. Sometimes sodium is a problem. If it's above 5%, it begins to become a problem. And by the time it's 15%, it's a real problem.

The Biology of Soil Compaction, Improve Soil Structure

Combatting Compaction with No-Till and Cover Crops

In this 40-minute episode of the No-Till Farmer podcast, we're joined by NRCS soil health s pecialist Jim Hoorman who explains how improving soil structure with no-till and cover crops can help alleviate compaction problems.

Click the image above or button below to listen how!

With the wet weather much of the country saw in the fall of 2018 and spring of 2019, many farmers have found themselves having to get into their fields when conditions were less than ideal. Heavy combines, grain carts, tractors and tanks of manure have the potential to damage fields, creating soil compaction and deep ruts.

In this episode of the *No-Till Farmer* podcast, we hear from NRCS soil health specialist Jim Hoorman who explains how improving soil structure with no-till and cover crops can help alleviate compaction problems. He also shares his favorite cover crops for fighting soil compaction and explains why you should never go into a buckwheat field at 4:00 in the afternoon.

LISTEN NOW!

Short on time? Jump in where interest piques!

See Jim Hoorman live at the 2020 National No-Tillage Conference in St. Louis this January 7-10!

[SPECIAL WORKSHOP]

Courting the Two 'M's' that Make or Break Your Soil's Biological System

Tues, Jan. 7, 2-5 p.m.

Tiny organisms play a powerful role in building productive no-till soils, but a lot still must be learned about the specific players in the system and how to maximize their presence and effectiveness. Two of these invaluable organisms are metarhizium and mycorrhizal fungi and they're both essential to your soil resource, says Jim Hoorman.

During this special workshop, the former NRCS educator and owner of Hoorman Soil Health Services will introduce metarhizium fungi and define its role as a soil health parasite to over 200 insect species and recycler of soil nitrogen. Hoorman will also outline the importance of mycorrhizal fungi functions, report on what mycorrhizae species are present in the soil and which ones are needed to improve agricultural production, as well as discuss ag products that are harmful or helpful to establishment of these fungi in no-till systems. **This workshop has limited capacity and costs just an additional $99.00 to attend. Sign up during online conference registration or by calling (262) 432-0388 or (866) 839-8455 Mon.-Fri. 8:30 a.m. to 4:30 p.m.**

[CLASSROOM] The Biology of Soil Compaction and Safeguarding Your No-Tilled Soils

Fri., Jan. 10, 9:15-10:15 a.m.

Most no-tillers know compaction problems adversely affect soil and plant health, but avoiding it might have been a challenge for many growers last year with all the wet weather. There's a science to how compaction forms in soils and understanding that can help no-tillers handle this challenge more successfully, says Jim Hoorman. The former NRCS educator and soil health consultant will examine how soil texture and soil organic matter influences soil structure and soil compaction and review impacts of soil compaction on agricultural production and the environment. He'll also share how roots and soil biology improve aggregate stability and reduce soil compaction, and apply soil health concepts to improve aggregate stability, reduce nutrient and water runoff and improve yields.

Save $50.00 on your registration by using promo code SOILHEALTH during online registration or call (866) 839-8455 between 8:15 a.m. and 4:30 p.m. CT M-F and mention this eGuide.

REGISTER NOW!

More sessions on soil health at the 28th Annual National Tillage Conference:

Putting Dollars and Cents to the Value of Healthy No-Tilled Soils

Many no-tillers believe their farm ground should be more valuable than conventionally tilled fields because of improved soil organic matter levels, nutrient cycling, water-holding capacity and the like. But farmland appraisers typically don't see it that way. And if no-tillers believe their soils are worth more, would they pay more to rent or buy land with better soil health?

To bring this issue to the forefront, **Wolford, N.D. no-tiller Paul Overby** will share some insights from his own research and number-crunching — and a survey of hundreds of fellow farmers — while studying in the University of Wisconsin's master's program in Sustainable Management. Come with your thinking caps on — this discussion about the worth of healthy soils should be a lively one!

Banking on Soil Biology for Better No-Till Yields and Profits

Jeff Martin and family are doing a lot of adding and subtracting these days as they work to boost soil health and productivity and log a more robust balance sheet for their farm. Does raising high-yielding no-tilled corn with only 50 units of nitrogen sound unrealistic? It can be done, he says.

The **Mount Pulaski, Ill., no-tiller and strip-tiller** will outline how his family reshaped their input program with broadcast and in-furrow application of a high-performing compost-like product that helped them eliminate phosphorus and potassium applications and focus attention on micronutrient applications and other yield-responsive practices. They'll also explain how utilizing cover crops by planting green or interseeding is boosting soil biology even further as they work to improve fungi-to-bacteria ratios in their soils.

CLICK TO VIEW THE FULL SPEAKER PROGRAM

SEE WHAT THE BUZZ IS ALL ABOUT!

Click to watch the video below to take in the sights and sounds from this world-class educational event. Hear past attendees share their memorable conference moments and offer their advice for those who are considering attending.

NATIONAL NO-TILLAGE CONFERENCE

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