Regenerative Agriculture for More Nutrient-Dense Organic Produce:
A Special Interview With Gabe Brown

By Dr. Joseph Mercola

JM: Dr. Joseph Mercola
GB: Gabe Brown

JM: Hi, this is Dr. Mercola. I'm here in Bismarck, North Dakota, on location with the regenerative agriculture pioneer Gabe Brown, who actually started this a few decades ago in the last century. He purchased a farm from his wife's parents, his in-laws. He's really developed the expertise in helping people understand how to build soil. Why is it important? Because obviously, if you don't have healthy soil and healthy organisms growing in that, you can't create nutrient-dense food.

The challenge, the big challenge, is that conventional agriculture has literally decimated the topsoil because of these practices, which includes tilling and the use of synthetic fertilizers that are destroying the microbial life. The projection – Gabe, you can expand on this – is, I think, that within one or two generations, we're going to lose most of our topsoil. Now, what's going to happen? Because hydroponics doesn't cut it.

So, Gabe – The reason he's a pioneer is because he's done it. He teaches people all over the world. I think he was telling me he just travelled 140 times this year alone, and it's only like July. He has the real world practical experience on how to implement this. Why don't you share your journey with us and help people understand this process and some of the challenges that we're facing?

GB: Thank you, Dr. Mercola. It's a real pleasure to have you here in North Dakota. A little bit about myself and how this operation started. It was founded by my in-laws, as you said, in 1956. They farmed it conventionally – tillage, synthetic fertilizers, pesticides, fungicides, etc. – from 1956 until 1991, when my wife and I purchased it from them.

I have moved down here in 1983. My wife and I moved down here and ran the livestock while they grain farmed. Then we started farming also. I started farming conventionally. I learned agriculture from my father-in-law because I grew up in town. I'm from the city. I wasn't born and raised on a farm or ranch. I learned those conventional techniques – tillage, fertilizers and pesticides, etc.

What happened to us, then, in 1991, we bought the operation from them. I was farming conventionally. Then in 1993, I had a good friend of mine who was a no-tiller. No-tilling was just starting here in the Northern Plains. He convinced me to go no-till to save time and moisture. But he said, "Gabe, I'm going to give you some advice. If you're going to go no-till, sell all your tillage equipment, then you'll never be tempted to go back." I did that. At that time, I couldn't afford a no-till drill unless I sold the tillage equipment.

We went no-till in ’94, so the land that you’re going to look at here today has not had any steel ran through it since 1993. We’ve been long-term no-till.

Well, what happened to us and our story was, in 1995, my father-in-law primarily grew spring wheat, oats and barley – so, small grains. I started to diversify. There’s approximately 32,000 tons of atmospheric nitrogen above every acre. All we have to do as producers is to plant legumes and inoculate it with the rhizobia and it’ll take that nitrogen and convert it. In other words, make it available to the plant. I started growing peas, some clovers and alfalfa in order to do that. Well, we still had 1,200 acres of spring wheat in ’95.

The day before I was going to start combining, I lost 100 percent of that crop to hail. A hail storm came and took it all. I had no insurance, because it just didn’t hail here very often. Well, that was pretty devastating. 1996 came along and I started planting corn. I started planting species like triticale and vetch and trying to diversify the rotation a little bit. Unfortunately, we lost 100 percent of our crop to hail again. That was two years in a row.

But think of what was happening. I was moving into no-till and I had all these crops decimated by hail. But all that crop residue was left on the soil surface. I started noticing the earthworm showing up. I started to notice the soil felt a little better. Moisture was starting to infiltrate. We were fortunate in ’91 when we bought this place, that we had some baseline soils work done. They found that we could only infiltrate a half of an inch of rainfall per hour. In other words, if it rained an inch, half of it ran off. We weren’t infiltrating it.

Organic matter levels on the crop land were 1.7 to 1.9 percent. Now, historically speaking, soil scientists tell us it should be in the 7 to 8 percent range. In other words, three-quarters of the carbon in the soil had been lost due to farming methods. Well, we noticed this started to change. We were getting an improvement.

1997 rolls around. We dried out. There was a major drought that year. It was probably pretty similar to this year. We weren’t able to harvest any cash crops. Three years with no crop. My wife and I took off farm jobs. We were just trying to keep the banker at bay.

Well, I started, “Okay. I need feed for the livestock.” I started planting crops, like cowpeas and Sorgum-Sudangrass, and letting the livestock graze that, because I just couldn’t afford to put up the hay. I couldn’t afford the fuel, the twine and everything else. 1998 came along and we lost 80 percent of our crop to hail. Four years in a row, no crop and till. It was hell to go through, but I tell people it was the best thing that could have happened to me, because that got me moved down the path of regenerative agriculture.

Due to the changes we saw on the soil, we started growing more of these, what are known today as cover crops. Back then, I just thought of it as livestock feed. But we realized that we truly can grow topsoil. Those same soils that back in ’91 were 1.7 to 1.9 percent organic matter, today are in the 5 1/2 to 7 percent range in organic matter. Infiltration rates, where I used to only infiltrate a half of an inch per hour, we can now infiltrate an inch in 9 seconds, and the second inch in 16 seconds. We’re in a 15-inch moisture environment here in Bismarck, North Dakota. Whatever moisture falls, I’m going to be able to infiltrate and be used.

Since then, it's been a learning process over the past 20 years. How do healthy ecosystems function? We've really studied that and learned that it's all these components together. We're at the place now in our operation where we no longer use any synthetic fertilizers. We don't use pesticides. We don't use any fungicides. We do occasionally. In certain circumstances, we'll use an herbicide, but it's very selective. It's never while the crop is growing. It's always before it's growing. We do not use glyphosate. It's only in a select situation because I refuse to till, because tillage is so detrimental to the mycorrhiza, fungi and soil biology.

Now, we're at the point where we have a healthy functioning soil ecosystem. It's able to provide the nutrients that those plants need. In turn then, it provides those nutrients, not only to the plants, but to the animals, and hopefully to us as people.

JM: That's great. What are some of the biggest lessons you've learned in teaching these strategies to other farmers and helping to catalyze this really necessary transition if we're going to hope to recover topsoil?

GB: That's a great question. One of the things I've learned – and I'm fortunate in that I've had a lot of the top scientists in the world come visit my operation. They have taught me things, such as there really isn't really a deficiency in phosphorus almost anywhere in the world where there's production agriculture.

Dr. Rick Haney, down in Texas, at the Agricultural Research Service (ARS) station there, says that you cannot find a single peer-reviewed research paper that shows a positive benefit to a crop from phosphorus. For years and years, us as producers are told you have to apply phosphorus. Our soils have plenty of phosphorus. The issue is it's not in the available form for the plants. Well, how do you get that into the available form? How do you convert it from organic to inorganic?

JM: Before we go there, I think it's best to give a little background as to why this surplus synthetic, artificial phosphorus is being applied to conventional agriculture farms, why it's so damaging to the environment and to us.

GB: Yeah. The thing of it is, as you look at the current production model today, through crop insurance, the federal farm program, it's based on yields. Producers have it bombarded into them that it's all about yield and we have to get more and more yield. Because they're enrolled in the current farm program, the payments they receive from the government are all based on yield.

They can give what's called revenue insurance. They can insure their crop for x amount of dollars based on their past yields. It has nothing to do with food. It has nothing to do with nutrients. It has nothing to do with over-applying those synthetic nutrients. They just shoot for yield.

Now, you have all of your big business, you know, the chemical and fertilizer companies, telling them, "The only way to get this yield is with our improved stacked trait genetic hybrids, and then

the fertilizer, etc., that's needed on there, all these inputs," which is a total fallacy, because that's not how ecosystems function.

[-----10:00-----]

JM: But when they apply this phosphorus to the soil in trying to implement those guidelines that are recommended to them, then it runs off. It's not incorporated into the plants. I want you to discuss the consequences of this excess phosphorus to the environment.

GB: There's a lot of research out there that proves that a very small amount – they've taken radioactive isotopes and put it through this fertilizer and found very minute amounts – actually goes into the plants the year it's applied. The rest of it goes out and is leached out through groundwater or over the surface, goes into the watershed and then we have all these problems, like in the Great Lakes, Gulf of Mexico, etc. That's a problem for society. Farmers aren't really bearing the responsibility, nor are the businesses that have sold them those goods, unfortunately.

It's causing the major catastrophe to our ecosystems – a large cost to the environment and small benefit to the producer. One of the things we talk about, I try and teach and educate producers on, how do you hold those nutrients on your land? That's where cover crops come into play.

If I'm a producer, why would I want to apply these synthetics and then see it go down the watershed? You grow cover crops for a variety of reasons. One of them is to capture the nutrients that are there and hold them on your landscape. That's what's needed. The other thing those cover crops do then is they convert that organic form of these nutrients into inorganic and make it available to the plants via biology.

Cover crops are a win-win situation. We're taking $C0_2$ out of the atmosphere through photosynthesis. We're pumping out that carbon – liquid carbon, I'd like to call it – where it exudates into the soil to feed biology. It starts the whole nutrient cycling process.

JM: One that you left out and I really think is a crucial one is you capturing the energy that's falling on the land and it's going onto a crop that's doing something useful with it, as opposed to going on bare soil, which is killing the life in the soil.

GB: You're exactly right. There are five basic principles to growing topsoil and building a healthy soil ecosystem. Number one is you have to have the least amount of disturbance possible. By that I mean mechanical disturbance, tillage, herbicides, pesticides, fungicides. The least amount of disturbance possible.

JM: This is not just for commercial agriculture. This is for all you home gardeners out there. You don't have to till your soil.

GB: Exactly.

JM: It's actually highly counterproductive and wasteful of your resources.

GB: And you're going to have lower nutrient density in your foods if you till.

JM: Yeah.

GB: We want the least amount of disturbance possible. We want armor or protection on that soil's surface. For the homeowners, that can be lawn clippings, leaves and woodchips. For us in production agriculture, it's crop residue. It's cover crop residue.

JM: Or the cover crops themselves.

GB: The cover crops themselves, exactly. Because we don't want to see bare soil. If you see bare soil as the low temperatures are rising, you're actually negatively affecting biology. You're negatively affecting the water cycle. You're losing more nutrients in the atmosphere.

JM: That temperature difference is very dramatic. If you measure with infrared, there could be a 40 to 50 degrees difference.

GB: Easily. When soil temperatures are about 100 degrees Fahrenheit, you're going to start shutting that plant down. Very little of the moisture is going to go for growth. You take here today. We're at the 90 degree range here. Soil temperatures on bare soil are going to be well over 100 degrees. Your plants aren't growing. If you have good armor or residue on the soil surface, the temperature there can be in the 80 degree range. Easily 20 plus degrees difference. Those plants are growing. A huge difference in production otherwise for the producer.

The next principle is diversity. You have to have diversity. Now, so often in production agriculture today, you know, it's corn and soybeans or cotton and soybeans. They're monocultures and not a lot of diversity. That's where cover crops fit in. They allow you to get diversity. For the homeowner, they can have cover crops in their garden. It will help improve the soil. It'll attract beneficial insects. It'll capture more sunlight, more energy. Win-win-win situation.

Next thing is you have to have a living root in the ground as long as possible. Often in production agriculture, a cash crop is harvested, there's nothing out there growing collecting sunlight. We need to have something growing all the time. For the homeowners, the gardeners, they can grow cover crops also, when they're done harvesting their vegetables.

The fifth principle is we really need livestock integration and animal integration. By that, I mean it's not just beef cattle. I'm talking about the insects also. Do you have flowering plants for all the pollinators and predator insects to ward off those pests? But we need that integration. Where I'm at here in the Northern Plains, obviously hundreds of years ago, we had large herds of bison and elk moving across the landscape, being pushed by the wolves, the predators. We're mimicking that today with our livestock on our operation.

The grass-finished beef, the grass-finished lambs, the pastured pork, the free-range land hens, they're all moving across the landscape, mimicking what was done hundreds of years ago. In so doing, they're [not only] benefitting the resource, but they're benefitting the people who consume them as well, because it's a highly nutrient-dense product.

JM: Would you add the mycorrhizal fungi in there and pay specific attention to make that's there? Because it does occur over time, but you can certainly accelerate the process and increase the likelihood that you'll have it. Explain what that is for those who aren't aware of it.

GB: Mycorrhizal fungi is a fungus that grows in healthy soils. It serves several purposes. It secretes a glue that's called glomalin. It's the sticky substance that starts the formation of soil particles. It holds the soil together. It's not lost to wind erosion, water erosion, etc. What mycorrhizal fungi do also is it transfers nutrients throughout the soil. It forms symbiotic relationships with the roots of multiple plants. That plant then secretes exudates out. The mycorrhizal fungi take that exudate and they feed biology. Then in turn, they take the nutrients from that biology and transfer it to the plants.

There's some really good work done at New Mexico State University by Dr. David Johnson, where he determined what's the most critical thing in a plant's life early on. He took nitrogen, phosphorus, potassium and organic matter and did these trials. What he found out was the most critical thing for a plant early on in its life is that relationship with mycorrhizal fungi.

Now, what's done in production agriculture today that's a detriment to mycorrhizal fungi? Number one is tillage. Number two is your synthetics, whether it be fertilizer, pesticides or herbicides. We're doing those things in production agriculture. In other words, we're sending back the mycorrhizal fungi, which is the most important thing we need. It makes no sense.

JM: Yeah.

GB: We need to rectify that.

JM: If it's not obvious to some, the reason why the synthetics are an issue is because they are usually administered as salts, which essentially creates these massive pH changes that really is highly destructive to the microbial life in the soil.

GB: That's exactly right.

JM: What you can do is you can inoculate your soil with these mycorrhizal fungi. You can buy these spores and you can grow them up. It can be relatively inexpensive, because they're really easy to grow.

GB: It can. For those with gardens in the urban setting, it's very easy to get this and to propagate these mycorrhizal fungi. For large-scale production agriculture, it's easy to do. The fact that all we have to do is pay attention to those core principles, reduce the tillage and all these different synthetic inputs, mycorrhizal fungi will proliferate.

JM: Just like the earthworms.

GB: Exactly. Build it and they'll come.

JM: One of the other strategies is these cover crops, at least for home gardeners. I'm wondering if you could discuss the transition that occurs. They've harvested their crops and then they plant the cover crops. That's easy. But what's the transition from cover crops back to the garden?

GB: Yup. That's a great question. We don't want to till that garden.

JM: That's the first question.

GB: I can't understand any reason for a garden to be tilled. We will leave it there, and then you terminate the cover crop. Now, how do you terminate it? I've seen it terminated by people simply with their feet. I've seen them take a small barrel and roll it across the cover crop to kill it. That cover crop has to be starting to form a seed head in order for that to work, but you can make these small crop rollers.

Now, they'll ask, "Can we cut it down and just leave it later?" Yes. That is an option. It works better if it's rolled down or stepped down. But I've seen implements as simple as a 2 by 4 flat and then people have handles on it. You just step the cover crop down. It doesn't have to be anything large and fancy.

JM: Basically you terminate the life of that cover crop.

GB: Right.

JM: But then you have the practical challenge of planting your seeds. When you have a commercial operation like you do, you've got the equipment to do it.

GB: Yup.

[-----20:00-----]

JM: But for those gardeners, how do they do that?

GB: It's amazing. Right now there's a lot of equipment out there for small-scale gardeners who are no-till. What I tell people if you have a small garden, it's as simple as taking a hoe, turning it upside down and just parting it with a handle. Just move that cover crop aside and make a little slit and plant your seeds. Now, for a transplant, obviously you're just going to take the transplant and transplant it.

JM: Would you put the cover crop over to act as mulch?

GB: All I would do is I would gently cover it with a little soil.

JM: Okay.

GB: The cover crop, you can put it right up. Just leave a small narrow slit there where the plant's going to come through. What you'll find if you get good seed-soil contact, that vegetable plant, or whatever you planted, will come up through the cover crop.

JM: Okay.

GB: Yup.

JM: Great.

GB: As long as the mulch is in the soil.

JM: Yeah. Because, I mean, there are two strategies here. One is the pioneering efforts to really encourage and catalyze the transformation of the commercial agriculture system in the U.S. and worldwide. But then of course there's the vast majority of people who bet it's important for them philosophically, but they're growing the wrong food than they're seeking to. We're trying to inspire people to do that, because World War – was it 1 or 2? Maybe both – where they had the victory gardens.

GB: Yup.

JM: A large percentage of the food grown in this country was from those victory gardens. We can do it. I mean it is just crazy that we have all these ornamental landscaping. I mean, lawns don't feed the country. It's just crazy to put that much time, effort and energy to create a lawn.

When I moved into the house I live in now, it was 100 percent ornamental. It's probably 10 percent now, maybe 15. Some ornamentals are good. In some of the land, you actually have pollinators. I guess in your case your animals can eat those, the pollinators, but for residential gardeners, the pollinators won't be producing food, but they're going to attract the pollinators that complete the cycle.

GB: That's right. It's a good thing to have some pollinators, but I agree totally with you. Homeowners should be producing their own food. I mean even if you just have a patio. It's amazing the amount of vegetables you can produce even in that setting, just in pots. Why not do that? I'm going to show you our small garden, which produces enough vegetables for four families for the entire year. You know, it doesn't take a large area.

JM: It's in a space that many people watching this have yards that big.

GB: Exactly.

JM: It's not like radically impossible for many people to implement.

GB: Yeah.

JM: You could easily feed four families. You can basically feed yourself on your property.

GB: There's no doubt about it.

JM: Yes. For those who rent or maybe you're a college student and you live in a dormitory, you can grow sunflower seed sprouts, or you can do a community garden, which are available in most communities.

GB: Yeah.

JM: I think many people just get short-sighted or they lack the innovation gene and just don't think outside the box. It's practical. As the conditions in our economy tend to, there's a good chance it may decline radically over time. This is really good security for yourself, your family and your loved ones. It's to have a strategy to create good nutrient-dense food that you have access to.

GB: Yeah. In our household for instance, we have enough canned goods to easily last 18 months. Easily. I won't have to buy any vegetables for 18 months. It's there. It's either frozen or preserved through canning.

JM: Yeah. With the term canning, you think of the mechanical can. But in your case, I'm sure it's mason jars.

GB: Yes. It's mason jars.

JM: Yes. It's just for the clarification. We don't want [people to think] that you've got all these cans from Costco in your shelves.

GB: No. All home-raised.

JM: Yeah. That's a good strategy. That's the way our country survived, I mean prior to the 19th or 20th Century.

GB: It's interesting that we've had visitors here from 21 foreign countries and all 50 states in the last five years. The No. 1 thing I hear from visitors from overseas is, "I can't believe how poor the food is in the United States." They said there's no taste. There's no flavor. What they really mean is there's no nutrient density. They see that right away because many countries that I have visitors from, they're producing their own food in their own gardens.

JM: Yeah.

GB: Those of you listening out there, if you grow your own food, you will notice the difference in taste right away.

JM: Yeah. I'm really excited to be here also, because I'm learning lots of tips from you. I just purchased the lot next door from me. I'm in the process of developing that to optimize healthy growing environment for food. I live in Florida, so I've got much more ideal growing conditions than you have here in North Dakota.

GB: Hey, we're frost-free 120 days.

JM: But we're frost-free for 365, but yeah. We're going to document this too, but you've given me some really good ideas on how to really create this ideal environment, obviously, and all the things you talk about – clearly no synthetics, no tilling, cover crops, the mycorrhizal fungi inoculation. I'm excited to see it take place.

GB: Yeah. I'm excited to see that. That's the thing. I get people from all over the world and they say, "It'll work in North Dakota, but it won't work here." But what they need to understand is those five principles I've laid out work anywhere in the world where there's production agriculture, because I'm simply following a template that nature put forth. If you follow that template, you're going to succeed.

JM: Yeah. You actually demonstrate it in one of the harshest environments, at least in the continental United States.

GB: Yeah.

JM: I mean I guess you can go up in certain places in Alaska. But North Dakota, you're definitely being challenged here. Yet, you're doing well. If you can do it here, everywhere else is pretty easy.

GB: Yeah. Well, here in June, we froze one morning and 36 hours later, it was 98 degrees Fahrenheit.

JM: Yeah. That's a pretty significant extreme. And then those shortages of the water. There are obviously places that are drier, but not many. I mean it's interesting with this small amount of water intake that you'd think it would be more of a desert, like you see when you go up into the mountains or certain places. But there's just a lot of green out here.

GB: Yeah. We're in one of the driest years recorded here. But it all goes back to healthy functioning soil ecosystem. That's what we need. That's all about those principles. We can grow topsoil. In so doing, we can produce nutrient-dense food.

CUT [27:32] to [27:46]

JM: Alright. I really appreciate all your time, effort, energy, your pioneering work and taking time out of your busy schedule to help us document this and hopefully inspire and catalyze more people to really integrate this into their lifestyle strategy. If you can't do it now, you can always plan ahead. Life is dynamic. It's not static. You can change. You can have goals. You can implement this.

You know, I have actually implemented much of this in my life. I'm growing a significant amount of the food that I consume. I can tell you it's very rewarding to do that. It makes you a lot more self-reliant and not have to be concerned about the stores running out of food. You've got it in your backyard.

GB: That's right. Thank you, Dr. Mercola. It's a pleasure having you here.

JM: Alright.

[END]