

Foreword: The Age of Carbon

by Kai Hoffman-Krull

The modern age could very well be termed the age of carbon. We have increased the amount of carbon dioxide in the atmosphere by more than a third since the Industrial Revolution began.¹ A gas that keeps heat from the sun contained within the Earth's atmosphere, carbon dioxide makes up more than three-quarters of the greenhouse gas emissions in the world.² At the same time agriculture is currently experiencing a carbon crisis, with 50–70 percent of the world's carbon in farmland soils off-gassed into the atmosphere due to tillage.³ Carbon, known as the building block of life, is the single most essential element in soil fertility as it aids in soil structure development, water retention, nutrient retention, and the biological process.

The decreased fertility from our carbon loss is occurring during a changing climate, when creating resilient crops that can withstand the stress of unpredictable weather patterns will be more important than ever before. The Intergovernmental Panel on Climate Change estimates that global food production could be reduced by up to 17 percent by the year 2100 due to crop failures from increased weather variation.⁴ The population in the year 2100 is estimated to be 11.2 billion people.⁵ Finding ways to preserve the carbon in our soil is simultaneously an environmental and social piece of activism, something we can do on our farms to improve our soil health and the health of our climate.

One of the most central carbon retention practices is no-till cultivation. Tillage has contributed 792 billion tons of carbon emissions over the past 250 years.⁶ In comparison, humans contributed nearly 40 billion tons of carbon dioxide into the atmosphere last year. Tillage

introduces unnaturally large amounts of oxygen into the soil, increasing the decomposition of organic matter. As carbon from this organic tissue is freed through the decomposition process, carbon molecules bond with the abundant oxygen introduced through tillage to become CO₂, rising into the atmosphere.

If you've used tillage and seen impressive results, that's because tillage is indeed providing a biological bloom momentarily in your soil. By increasing the decomposition of soil organic matter, there is a short-term rise of available labile carbon—the form of carbon that fuels the microbial machinery. While the fungal hyphae are torn and disrupted through tillage, this available labile carbon generates a rise in soil bacteria, which increases the percentage of nutrients that are bio-available for root uptake.

The problem is that tillage is mining this organic carbon at a very quick rate that provides immediate nutrient gain but at a significant long-term cost. A research colleague, Dr. Tom DeLuca at the University of Montana, found that tillage in Midwest prairie soils decreased organic matter levels by 50 percent over a fifteen-year period. The additional concern with this decreased organic matter is that soil carbon levels operate exponentially. Higher rates of organic matter allow for increased nutrients and water to be made available, which in turn increases the production for cover crop and green manure material—two of the foundational methods of increasing soil organics. With decreased organic matter levels, production of both market crops and cover crops decreases over time, making it more difficult to regenerate from the carbon deficiency created through tillage.

My farming mentor, Steve Bensel, once told me that almost everything we do in sustainable agriculture—cover cropping, animal rotations, reduced tillage, composting—are all fundamentally about increasing organic matter in the soil. And when we speak about organic matter we are in large part speaking about carbon, which comprises 58 percent of soil organic matter.⁷ Organic matter and the carbon within it holds several key roles in soil health:

Microbiome

Carbon is the fuel source that drives the microbial network to digest minerals and make them bio-available to plant roots, also known as mineralization. Without this biological support system processing minerals, plants find it more difficult to access the nutrients available in the soil.

Soil Aggregation

The sugars from composted organic matter pull soil particles into aggregates, providing space that allows soil to store air and water. As this structure diminishes with tillage, soil compacts more and more, requiring higher amounts of disturbance for water, air, and roots to access the subsoil layers.

Water

Organic matter can absorb six times its weight in water, playing a significant role in holding moisture in the soil.⁸ In addition, the decreased compaction of no-till plots allows for water access through the soil layers, whereas compacted soil creates runoff that carries water and nutrients away. In a four-year study at the University of Nebraska, researchers found that no-till plots saved between two-and-a-half to five inches (65–130 mm) of water per year compared to tilled plots.⁹

Nutrients

Organic matter increases the soil's cation exchange capacity, a measure of the soil's ability to hold nutrients. This means less fertilizer costs each growing season.

The No-Till Solution

No-till systems operate in a manner that mimics natural soil ecosystems—the microbiome, soil animals, and root fibers develop a lattice tunnel system that aerates the ground. Through limiting the loss of organic matter in the soil, no-till methods improve these key soil areas of

biological activity, structure, and water and nutrient retention. Unlike tillage, which maximizes benefits in the short term while decreasing soil health over time, no-till systems mature in their fertility. No-till can regenerate compacted, disturbed soils and return carbon back to the ecosystem. No-till is not the only carbon solution we must explore to remediate our depleted croplands nationally and globally, but without it we should all fear for what our children and their children will eat.

If you start using no-till methods, tell your customers and friends. In a time when our government is actively removing environmental regulations, we need to find ways of inviting more of our populace to participate in climate solutions. No-till is a practice you can promote as increasing the quality of your produce, as well as storing carbon in the soil and keeping it from the atmosphere. You can see this as marketing, but also as environmental education—helping people understand the soil carbon crisis and ways they can participate in regenerating our farmlands through their purchasing decisions. And if you aren't a farmer, tell your co-ops and the farmers at the farmers market you want to buy no-till produce.

For as much as we all use the term sustainable agriculture, few of us contemplate the cost of which we are truly speaking—future famine. We have all lived through the peak of tillage agriculture, where food has been abundant as we have mined our soil resources to maximize immediate food production. Famine only exists for us in stories; it's something we read about in books, see in movies, or hear about occasionally somewhere else on the globe. Like climate change, it can feel like an abstraction. But famine may not be an abstraction to future generations. We cannot avoid the cost of what our food system has extracted, and some day that debt will need to be paid.

Copernicus started a revolution when he told us that the Earth was not the center of the universe. Today we need a new revolution, one where earth becomes the center of our human universe. We all eat. May this book, and you, be a part of that revolution.

—Kai Hoffman-Krull



The Organic
No-Till Farming
Revolution

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Introduction

Connections Between Soil Health, Climate Change, and Farm Profitability

Themes of soil health, climate change, and farm profitability came up over and over through the course of the interviews for this book. To the point you might be left wondering, is this book about no-till, or is it about climate change, or soil health, or small-farm profitability?

No-till is as much about climate change as it is about soil health as it is about farm profitability. No-till growing practices are a way to improve all three. As Kai Hoffman-Krull's foreword shows, we have to start farming more ecologically if we want to survive as a species. And small-farm profitability is important because no one will have a small farm if they can't make a living at it.

Ultimately, no-till is about the soil, and how improving soil health can also improve atmospheric health and farm bottom lines. Any one of these issues by itself is compelling enough to make us want to try no-till. The fact that no-till makes the connection between all three issues is what makes it so timely.

For example, if you only cared about farm profitability, and didn't care about soil or atmospheric health, no-till would still be worthwhile for improving farm efficiency and profitability. Growers who are happy with what they are earning, but want to grow in a more ecological method, will also be interested in no-till.

Mining the Soil, Polluting the Air

The conventional way of farming is contributing to the destruction of both our soils and our atmosphere. On the other hand, no-till farming practices build soil and sequester carbon at the same time. With conventional tillage, we've been mining the soil, breaking down soil organic matter (SOM) faster than it can be replaced.

In their book *The Hidden Half of Nature*, David R. Montgomery and Anne Biklé describe “one of the oldest problems plaguing humanity—how to grow food without depleting or destroying the soil. . . . By nurturing the microbial life below ground, we can reverse much of the damage caused by the ancient practice of plowing and the modern overuse of pesticides and fertilizers.”¹⁰

How is tilling mining the soil and polluting the air? One of the reasons tillage is effective is because it speeds up the decomposition of organic matter (OM) in the soil. This reduces the amount of OM in the soil, and means that more carbon, which is stored in the OM, gets transferred to the atmosphere as CO₂ instead. So as we are hurting our soils, we are also hurting our atmosphere.

This is a terrible situation to be in, with soil becoming so depleted and CO₂ levels so inflated that they are threatening to drastically change the planet, at best, and at worst make it unlivable. The only good news here is that the no-till practices that help the soil also help the atmosphere. So as farms adopt no-till practices that make their soil healthier, it should also help their profits and the atmosphere at the same time.

A significant amount of the Earth's surface is taken up with farming, so turning it into a carbon-building exercise instead of a carbon-releasing one would make a big difference.

Thanks to the Growers

Without them there would be no book. I love farm tours so to be able to spend the year visiting with growers pioneering systems that have the potential to revolutionize agriculture led to a magnificent journey that I'm excited to share with you. Farm after farm, I was inspired by who

I met and what they were doing, only to move on to the next farm and be inspired once again.

I hope this book conveys the excitement I experienced meeting these growers and seeing their methods. It was particularly exciting to see how many of the growers in the book cited other growers they hadn't even met as inspiration, having learned from others through writing, conferences, and social media. I hope this book furthers that process. For taking the time to meet with me during the busyness of the season, I am grateful to the growers for sharing their time and methods with us.

The Importance of Lowering Barriers to Beginning Farmers

With such a small percentage of the population in farming, the only way for us to have a more resilient, healthier food system is to get more people farming again. That is going to involve a lot of people who weren't born to it getting into farming.

"When less than two percent of the population is producing the fundamental nourishment for the rest, it requires chemical and industrial methods that are depleting the soil, polluting the water, and making us sick," said Michael Abelman in the foreword to Josh Volk's excellent book *Compact Farms*.

We need to make it easier for people to start farms. No-till complements the ideas in *Compact Farms*, by saying, not only do growers not need a lot of land to run a commercial farm, they may not even need to invest in machinery.

The thing that needs to happen to keep people in farming is that small farming has to be profitable—so not just the determined will do it for a livelihood. That's why the examples in this book give me hope. There are numerous examples of farms that were able to start small with minimal mechanization, and grow as their businesses grew and make a decent living.

I'm especially excited by the potential of no-till to encourage people to give farming a try. The barriers to starting a farm are high, including access to land and equipment. No-till makes it possible to start a farm

without a tractor or even a rototiller. I have visions of kids no-tilling up their parents' suburban yards (ask permission first, kids!), city growers making the most of vacant lots, and rural growers no-tilling whatever land they have.

How to Use This Book

The first part of the book is the quick start guide. The interviews are the detail and the supporting material. The intro is written to answer the question of what organic no-till systems are, why they were developed, and which methods should be used in which situations. The majority of the book (the interviews) show the details of how people are making these systems work with a variety of environments and crops.

I don't imagine most people reading this book straight through. I'm guessing that after looking through the methods, one (or more) will stand out from the others. Then I imagine people skipping to the interviews covering their method of interest, to decide if they want to try a particular method. Without adequate information, most people who are interested will not take the step of trying the methods. In this manner I hope to transfer knowledge from the practitioners to those who are interested, and help promote the organic no-till revolution.

It's important to note that some of the growers have their own sources of information. Conor Crickmore of Neversink Farm has extensive online courses available on his website. Bryan O'Hara of Tobacco Road Farm has a forthcoming book which I look forward to reading. Paul and Elizabeth Kaiser of Singing Frogs Farm have a number of Youtube videos on their philosophy and methods. Ricky Baruc of Seeds of Solidarity has a Youtube video and does workshops at his farm. Tony and Denise Gaetz of Bare Mountain Farm have extensive materials on Youtube and their website. Shawn Jadrnicek of Wild Hope Farm talks about his no-till methods in his excellent book, *The Bio-Integrated Farm*. And I look forward to covering the evolution of no-till in *Growing for Market* magazine. See the Resources section of the book for more details on how to find these materials.

If you already know you want to try no-till, you might want to skip straight to the methods section, and then on to the interviews. If you're

looking to understand what no-till methods are and why they're important, start at the front of the book.

Who This Book Is For

Have you ever wished you could use less machinery on your farm, and still be highly efficient and productive? Do you want to start a viable commercial farm that will pay a living wage, with minimal investment in equipment and land? Do you have a small piece of land and are wondering if it can be a commercial farm? Want to build organic matter and soil biology because of the way you grow, instead of in spite of it?

The benefits of no-till sound almost too good to be true. In this book, read about the farmers who use these systems to run profitable commercial farms, and decide if one of them is right for you.

Whether your goal is to spend less time on a tractor, burn less fossil fuel, own less equipment, be more efficient and save labor, sequester carbon, or build soil, no-till farming methods can contribute to all of these goals at the same time.

This book is for people who are getting into farming and considering what system to use. It is also for people who have wondered how they might simplify their existing systems.

What I want to make clear is that I'm a promoter, not a proselytizer. This isn't like a religion where I'm trying to get everybody to convert to doing the same things. Over the course of traveling and writing this book, in addition to no-till enthusiasts and skeptics, I've encountered many good growers who rely on tillage and are happy with their systems. I would say: If you're happy with your system, keep doing what you're doing. I'm not trying to talk people who have spent years dialing-in their systems to abandon them.

This is written for growers who are not completely happy with their tillage systems, or new growers who are thinking about starting a farm and want to take no-till methods into consideration. If this book makes growers think about the benefits of tilling less, whether they go all the way to no-till or not, then it will have done its job.

Reducing the amount of tillage has benefits for farms of all sizes. This book is about organic no-till solutions for small growers, because

the conventional no-till solutions are not compatible with organic farming. And some of the practices that work on larger organic farms don't work well for smaller farms.

I present this collection of interviews in order to offer solutions for smaller growers, because they have so much to gain from them. May it help you farm more simply, more efficiently, more profitably, and more ecologically.

The Title

No-till has the potential to be a farming revolution. Tillage has historically been such a dominant paradigm that organic no-till is disruptive technology for small farms. If you could farm without tillage, why would you keep tilling?

It wasn't until we were deep into the book process that I noticed the similarity in titles with *The One-Straw Revolution*, a book by the Japanese farmer and philosopher Masanobu Fukuoka. The similarity was not intentional but is significant because, during the interviews, multiple growers brought up *The One-Straw Revolution* as a source of inspiration.

Though growers have had difficulty directly applying Fukuoka's ideas here in North America, the current wave of no-till continues in the same spirit. As Wendell Berry wrote in his preface to *The One-Straw Revolution*, "Knowledgeable readers will be aware that Mr. Fukuoka's techniques will not be directly applicable to most American farms. But it would be a mistake to assume that the practical passages of this book are worthless to us for that reason."

The no-till methods as explained by their practitioners continue in Fukuoka's footsteps in order to farm as much as possible with natural systems.

Growing a Revolution

Another book with the word "revolution" in the title that I took a lot of inspiration from was *Growing a Revolution: Bringing Our Soil Back to Life* by David R. Montgomery. Here I want to quote a long passage from the book because I think it puts our current perilous agricultural and

human survival situation in historical perspective. But first, I want to mention that Montgomery wrote another book, called *Dirt: The Erosion of Civilizations*. The jacket description says that *Dirt* “blends natural and cultural history to show how soil erosion caused past civilizations to crumble and how modern agricultural societies face a similar fate unless they shift to more sustainable practices.” So when he talks about civilizations that collapsed due to the destruction of their soil, the guy knows what he’s talking about.

A section of *Growing a Revolution* called “A New Revolution” begins:

A look back at our agricultural past reveals a long series of innovations, and a few bona fide revolutions, that greatly reduce the amount of land it takes to feed a person. These changes led to a dramatic increase in how many people the land can support and a corresponding decrease in the proportion of people who farm. By my reckoning, we’ve already experienced four major revolutions in agriculture albeit at different times in different regions.

The first was the initial idea of cultivation and the subsequent introduction of the plow and animal labor. This allowed sedentary villages to coalesce and grow into city-states and eventually sprawling empires. The second began at different points in history around the world, as farmers adopted soil husbandry to improve their land. Chiefly, this meant rotating crops, intercropping with legumes (plants that add nitrogen to soil), and adding manure to retain or enhance soil fertility. In Europe this helped fuel changes in land tenure that pushed peasants into cities just in time to provide a ready supply of cheap urban labor to fuel the Industrial Revolution.

Agriculture’s third revolution—mechanization and industrialization—upended such practices and ushered in dependence on cheap fossil fuels and fertilizer intensive methods. Chemical fertilizers replaced organic matter-rich mineral soil as the foundation of fertility. Although this increased crop yields from already degraded fields, it took more money and required more

capital to farm. This, in turn, promoted the growth of larger farms and accelerated the exodus of families from rural to urban areas. The fourth revolution saw the technological advances behind what came to be known as the green revolution and biotechnology breakthroughs that boosted yields and consolidated corporate control of the food system through proprietary seeds, agrochemical products, and commodity crop distribution—the foundation of conventional agriculture today.

What will the future hold as we burn through the supply of cheap oil and our population continues to rise alongside ongoing soil loss and climate change? A recent study authored by hundreds of scientists from around the world concluded that modern agricultural practices must change once again if society is to avoid calamitous food shortages later this century. Just how worried should we be? Well, consider the fate of Mesopotamia, ancient Greece, or other once-great civilizations undone by their failing land. This time we need to ask what agriculture would look like if we relied on building fertile soil instead of depending on chemical substitutes. What would this new, fifth agricultural revolution look like?¹¹

Note that the first agricultural revolution was cultivation. Montgomery goes on to point out that there are different methods that offer us the “opportunity to break free from the cycle of land degradation that doomed ancient societies.”

We are going to need everything we’ve got to break the cycle of land degradation and escape the environmental doom that faces our own society. No-till can be part of the remedy for the agricultural and environmental problems made worse by tillage that threaten us. The fifth agricultural revolution has to be about undoing the damage from the previous four, if we have any hope of not joining the club of “other once-great civilizations undone by their failing land,” as Montgomery calls them.

Life on the Edge of Collapse: Sharpening the Axe to Cut Down the Last Tree

As *Dirt* shows, it's not a new thing for human societies to collapse due to environmental degradation. The novel difference in the situation we face is that we have environmental damage on not just a civilizational but a global scale (agricultural soil loss, climate change, pollution, etc.) that threatens all of the 7.6 billion and growing people on Earth.

When I hear population projections like the one in the foreword to this book—that we'll have 11.2 billion people on the Earth by the end of the century—I am skeptical we'll ever reach those numbers. At some point the human population will exceed the carrying capacity of the planet.

Just as plants' growth is limited by not having enough of just one nutrient, if human population exceeds the carrying capacity of the Earth in any single aspect (e.g., amount and quality of agricultural soils, livable climate, etc.) then it will have to stop growing. In that no-till sequesters carbon and builds soil, it can help undo some of the damage to our atmosphere and our soil at the same time.

I first learned the history of Easter Island in Jared Diamond's excellent book *Collapse*. It is an isolated sixty-square-mile island in the Pacific. The very abbreviated version of its story is that the island's population crashed from around fifteen to just two to three thousand people over the course of a century due to environmental degradation including deforestation and invasive species, among other causes.

Montgomery also looks at Easter Island in *Dirt*. Famous for its giant stone heads erected during more prosperous times, "Easter Island presented a world-class puzzle to Europeans who wondered how a few stranded cannibals could have erected all those massive heads. The question mystified visitors until archaeologists pieced together the environmental history of the island to learn how a sophisticated society descended into barbarism. Today Easter Island's story provides a striking historical parable of how environmental degradation can destroy a society."

Thinking about Easter Island, I wondered how someone could possibly have cut down the last tree. Even if they didn't know for sure it was the very last one, on such a small island they must have noticed they were getting low on trees. It boggles the mind how the people didn't make the connection between elimination of trees and their own survival.

But then I look at our current situation and once again see a population on the edge of collapse due to environmental degradation, only this time on a global scale. I would like to think that our superior technology would let us see the problem of climate change in time to take action. However at this point we seem to be in the same position as the Easter Islanders; too stuck in the way we are used to doing things to change in time to avert disaster.

One of the points Jared Diamond makes in *Collapse* is that societies often collapse shortly after their peak, because they're peaking as they're outstripping their resource base. To apply the principle to the present, as we outstrip our global resource base and overgrow our environmental carrying capacity, the present day will be viewed as the peak before a scarcity-of-resources-induced collapse unless we figure out how to solve the enormous problems we've made for ourselves.

I imagine there's a certain type of hubris in a peaking society that obscures the coming fall, which we are currently prone to. Living at the pinnacle of human potential dazzles us with what we have achieved, to the point where we think we're invincible. Something along the lines of, "I've got a computer in my pocket. I'm sure if global warming gets really bad, we'll be able to fix it." Or, "We've got self-driving cars, how could starvation be caused by anything as mundane as the degradation of our agricultural soils?"

That is the deception in the often-heard argument by chemical agriculture proponents—that organic won't feed the world. It's an argument that works because it plays into the notion of the techno fix: "Sure, we can have any number of people on the Earth. As long as we have enough people doing science we'll find a way to feed them!"

Whereas so few people have any connection to agriculture anymore

they don't realize that all of the chemicals we are raining down on our crops are actually degrading the capacity of the land to support life. This is why we need solutions like no-till—simple, accessible actions that anyone can take to produce their own or someone else's food more sustainably.

Collectively, we are that person on Easter Island, poised to cut down our last tree. I often worry that last tree has already fallen, and that climate change and environmental degradation are already past the point of no return. But we don't know that for sure, so we must do what we can to try to reverse the damage we have caused.

Have we passed a tipping point on global warming? Have we cut down the last tree already? For better or for worse, it's impossible to know. The Earth is a lot bigger than Easter Island, and it's a lot more difficult to assess whether we've passed a global tipping point on climate change.

The fact that we are even asking the question of whether we have passed the tipping point for life on Earth should be terrifying to everyone on the planet. Unfortunately for us, humans aren't very good at dealing with enormous, slow-moving problems like climate change. If we knew aliens were on the way to raise the temperature to cook all of us off of the Earth, we would be marshaling all resources in a WWII-style mobilization to defeat the invaders. But cooking ourselves off the planet seems harder to get our arms around. We get bogged down in day-to-day matters of survival today instead taking action to save ourselves tomorrow.

I can't tell you that every vegetable grower going no-till would stave off the sixth mass extinction. My passion and expertise lie in agriculture, so I look for solutions to problems in my chosen field. Even though veggie growers going no-till won't change things all by itself, veggie growers operating more sustainably, plus a lot of other changes are the only shot we've got to keep times from getting extremely tough for ourselves in the future.

Against this backdrop, there is not a lot of good news. One of the only bright spots, also from *Dirt*, is another island in the Pacific Ocean,

very similar in many ways to Easter Island, that was able to recognize its coming ecological collapse and avert it: Tikopia. “After seven centuries on the island, the islanders intensified pig production, apparently to compensate for loss of birds, mollusks, and fish. Then instead of following the path taken by the Mangaian and Easter Islanders, Tikopians adopted a very different approach,” writes Montgomery.

Realizing that their environment was losing the capacity to support them, “Tikopians began adapting their agricultural strategy.... Over many generations, Tikopians turned their world into a giant garden with an overstory of coconut and breadfruit trees and an understory of yams and giant swamp taro. Around the end of the sixteenth century, the island’s chiefs banished pigs from their world because they damaged the all-important gardens.

“In addition to their islandwide system of multistory orchards and fields, social adaptations sustained the Tikopian economy. Most important, the islanders’ religious ideology preached zero population growth.”¹²

The connection between our resource base and our population is one we seem to be having trouble making as a species. At the very least we need to be like the Tikopians and stop destroying our resource base.

The fact that the ideas in this book also contribute to farm efficiency, profitability, and lowering barriers to starting farms is what gives me the hope that they will be adopted on a large scale. No-till is one of those solutions that is better for the planet and the bottom line, which means it’s more likely to happen. Because doing the right thing is much more likely when it also makes life more efficient and profitable. It is with this in mind that I write, hoping this book will be my own little contribution to the healing of the world, the climate, and indeed to having a future at all.

I am reminded of another lesson from *Collapse*—the genocide in Rwanda was partially caused by overpopulation. Overpopulation can result from having more people than a given environment can support, or it can result from the degradation of the network that has otherwise comfortably supported people.

The question that pains me the most is not whether we survive as a species or not; resource scarcity is the last thing I want to imagine my kids having to live through. Yet every day I am confronted with the prospect that I brought children into the world only for them to see it fall apart. With a growing population's chances of feeding itself progressively diminished by both destruction of good agricultural soil and climate change, it's very difficult for me to imagine that we will not have to deal with painful resource scarcity within my lifetime.

For it's not just starving to death that we need to fear. The very real question of who dies and who lives through a period of resource scarcity is an unpleasant one to resolve. I'll direct you back to Jared Diamond's *Collapse* for a more recent example of the type of suffering that occurs during such a situation. He shows how many of the societal collapses through history have been in part due to loss of soil through erosion, salinization, or loss of fertility. Eras of resource contraction are not pleasant times to live in.

The only way for us not to become Easter Island on a global scale is to take better care of our planet. We have to save our own world. Let's get started.

How I Got Interested in No-Till, Lost It for a Decade, and Found It Again

In 2004, I worked on a 100-acre organic vegetable farm on the West Coast. Because herbicides weren't an option, and black plastic mulch wasn't used, cultivation was constant. I learned how to drive a tractor really well.

This left me thinking, there's got to be a better way to keep weeds down than cultivation. I started hearing about no-till practices as a way to get rid of the ills of tillage and weeds at the same time, but there wasn't much actionable information out there. So I started re-searching it.

If you looked up "no-till" online in 2004, a lot of the references were to the roller-crimper style no-till (see *Biodegradable Mulch Grown in Place*, p. 36). I found information from the Rodale Institute, the

USDA, and a professor at Virginia Polytechnic Institute and State University [Virginia Tech] named Ron Morse, among others.

At the time I was apprenticing on farms over the summer and coming home to Virginia to a job that would take me back every winter in order to save some money to start a farm. Since I was headed back home to Virginia anyway, I got ahold of Ron and asked him if I could come down and pick his brain about no-till.

At some point in the winter of 2004–05 I found myself in Blacksburg, VA, at Virginia Tech’s Kentland Research Farm talking with Ron Morse about his work with no-till. He offered me a job and I ended up working the 2005 farming season with Ron and his graduate student Brinkley Benson. Ron and Brinkley would design grants to explore questions related to organic no-till vegetable production, and it was my job to work with Brinkley to carry out the fieldwork for the grants. As an example, a lot of the grants would be something along the lines of comparing the inputs and productivity of organic no-tilled broccoli vs. organic clean-cultivated broccoli.

The transplanter that was modified to be no-till we used at Virginia Tech: A tank in front held water that was dribbled into the furrow that was cut through crimped cover crop residue by the large straight coulter. The shank behind the coulter loosens soil, and the boxes drop solid fertilizer into the furrow, metered by a chain attached to the wheels. The big black spools hold drip tape. Finally, two wooden seats are at the end where the two white bins hold transplants for the people to put in the transplanter.



Credit: Andrew Mefford

It was an honor and a pleasure to work with both Ron and Brinkley. I look back and think about how lucky I was to end up working with two such talented agriculturalists, and am grateful for the experience. Brinkley and I worked together on a daily basis, and I still often think of one thing he would say when our progress was much too slow on some task: “We’ve got to find another [faster] gear.”

Over my time working at Virginia Tech, I saw the roller-crimper method work really well. The next year I started a farm by leasing three acres from my grandmother in Pennsylvania. What I realized when trying to apply roller-crimper no-till to a three-acre market garden is the method is more suited to larger plantings of crops, like a field of sweet corn or tomatoes, a patch of pumpkins or squash, or other space-extensive plantings like field crops.

In the thick of starting a farm, I forgot about no-till when I realized the roller-crimper method was not well suited to the farm I was starting. I fell back on the more conventional tillage methods I had learned working on other farms: some combination of moldboard plowing, disking, harrowing, rototilling, and clean cultivation to develop a plantable seedbed and deal with weeds.

I continued on in this manner for a little over a decade until the winter of 2016–17. A few things happened that year that reinvigorated my interest in no-till.

First, in May of 2016, *Growing for Market* magazine ran an article by Jane Tanner, “The Many Benefits of No-Till Farming,” that was an overview of market farm no-till techniques, profiling Neversink, Spring Forth, Four Winds, Bare Mountain, and Foundation Farms.

Then in January of 2017 I saw Paul and Elizabeth Kaiser of Singing Frogs Farm speak at the NOFA–Massachusetts conference about no-till on their farm. The next month I saw Bryan O’Hara of Tobacco Road Farm speak about his no-till methods at the NOFA–VT conference.

I realized that these growers had figured it out. There was a critical mass of people who had developed ways of doing what I had hoped to do a decade before: run a small farm without tilling.

I wanted to put their methods to use on my own farm. I went to see what information I could find about putting them into practice. When I couldn't find more than scattered information about what people were doing for no-till on a small scale, it crystallized the idea for this book.

I wanted to answer two questions: Will this work for me, and if so, how do I do it? I wanted to prevent others from finding themselves in the same situation I had, of having learned a no-till method only to find that it wasn't compatible with their farm.

Since people were using a number of different methods, and no one person was using all of them, I knew what I needed to do was go visit as many of them as possible and write up the interviews to guide and encourage people wanting to get started with organic no-till on a small scale.

The fact that there is more than one way to do most agricultural jobs is one thing that keeps farming interesting for me. There are as many ways to farm as there are farmers. Certain methods may work better than others on any given farm, not to mention different growers' styles and preferences.

I wanted to see for myself all the no-till methods that were working on farms. I wanted to survey what people were doing, their successes and their struggles, in order to pass on the information and let growers decide for themselves which methods to use. In some cases, individual growers have their own materials that may be more in-depth than this book. See the Resources section for a directory of the individual growers' information.

In addition to sharing this information with other growers, I wanted to finally get back to what I was trying to do in the first place, and use the information I gathered to decide on the best system(s) to implement no-till on my own farm. This book is as much for myself as everyone else. I want to reconfigure my farm and complete the journey I started 15 years ago.