The author gets by with an old tractor at Creekside Farm.

Mechanize Your Small Farm

Grow more with less labor.

Story and photos by Robert Turner

I was frustrated and about to give up. What had started as a small kitchen garden had grown into 3 acres of vegetables supplying a community-supported agriculture (CSA) program for 70 families. I'd overwhelmed my own abilities, and finding reliable farm labor was a constant challenge.

As a science writer as well as a farmer, much of my writing over the past few years has covered "AgTech," or new technologies in agriculture, from fully autonomous robot tractors to laser weeders to drone-enabled field imaging. Pretty cool stuff to write about — but I was struggling to realize technology's benefits to my own farm. New, high-tech equipment is expensive, developed for larger farms that have the capital to invest in it. None of it was going to help me on my 50-acre Creekside Farm in the mountains of western North Carolina.

Then, I discovered mechanization based on the old ways — old tech — that gave me hope.

The Walk-Behind Revolution

Small-scale growers today are turning to old-world mechanization to increase productivity and reduce labor. Many of the tools that continue to do the job best are currently collecting dust in old barns across America. After all, not much technology has been developed over recent decades for market gardeners, yet these smaller growers are feeding an increasing number of households. They have the potential for big impact on local food security and food sovereignty — when they can scale appropriately.

The BCS walk-behind tractor (and its competitors) might be the most recent innovation to really help small growers expand. Two-wheeled tractors existed in the U.S. as early as 1913, when the Detroit Tractor Company advertised a tractor whose operator, riding on a carriage behind the machine, controlled the tractor with reins, like you would a horse or mule. The 1970s reintroduction of BCS two-wheeled tractor took the small-grower market by storm, proving to be a game changer for efficiency, saving hours of intense labor at a price point many could afford.

Despite the two-wheeled appeal, I discovered at my small farm that growing enough to feed a local population still

requires bigger equipment. Thankfully, more tools exist that were developed before the rise of Big Ag.

I mechanized vegetable production first by adding a couple of older attachments and implements to my small tractor, including a synchronized seeder and weed cultivator, and then by eliminating most hand tools. That simple change cut our labor in half. It also reduced the stress and hard work out in the sun and put some joy back into farming again.

What's Old Is New Again

In an era long before the rise of Big Ag and Big Chem companies, farmers of the 1930s, '40s, and '50s used mechanization for weed control on large parcels of land. During this era, all farms could've been considered "organic," because farmers killed weeds mechanically with a small tractor and cultivating attachments. Many of these old tractors and implements have been sitting in fields for decades. If you know where to look, you can find the old equipment relatively inexpensively. And fortunately, a few companies are now building equipment based on that old technology.

Refurbishable old implements can be found inexpensively.

Top 10 Implements for Farm Mechanization

A new 35-horsepower tractor costs about $26,000. When purchased new, the implements listed below should cost $10,000 to $20,000 total. Used equipment should cost half that, depending on its condition.

1. 35-to-40-horsepower tractor with three-point hitch and power takeoff
2. Two-bottom plow to break new ground
3. Disc harrow to bust up bigger clumps of soil
4. Rotary tiller (Rotavator) to create fine beds
5. One- or two-row seeder
6. Cultivator (I like spider gangs and goose sweeps for weed control)
7. Garden bedder-hiller to raise beds
8. Middle buster to harvest potatoes and for bed prep
9. Brush hog (rotary cutter) to knock down weeds and cover crops
10. Transplanter when your production warrants it

Mike Fortune finds and refurbishes the old equipment. When Fortune came on board as farm manager at my Creekside Farm, he brought a couple of old implements he'd found sitting in a pasture, unused for decades. I watched him attach a 50-year-old Lilliston Rolling Cultivator with spider gangs and goose sweeps to my little 35-horsepower John Deere tractor and proceed to weed a 1-acre field of radishes, cabbages, and carrots in about 20 minutes — something that would've previously taken us an entire day of strenuous work to accomplish with hand tools.

I watched tiny broadleaf weeds and grasses get ripped from the soil or buried, while the little 2-inch-tall crop plants remained unharmed. The weed cultivator was synchronized with rows Fortune had laid out with a 30-year-old Cole Planet Junior planter-seeder purchased on eBay for $350 along with a tractor three-point-hitch mounting bracket.

Old equipment can save days of labor for farms of a few acres or more.

"It's all or nothing," Fortune says. "To cultivate mechanically, you have to plant mechanically." When I asked him what piece of equipment he'd keep if he could only keep one, Fortune chose the Lilliston Rolling Cultivator, because the heavy-duty spider gangs were more aggressive than finger weeders or anything else, particularly if rain keeps him out of the field and weeds have a chance to establish deep roots. The Lilliston is still sold by a company called Bigham (*www.BighamAg.com*).

Several companies sell new and used cultivating equipment and implements that can attach to the rear three-point hitch on any small tractor. Fortune says a 40-horsepower tractor is the ideal size for using implements. A good place to start learning about mechanization and looking at equipment is on the Tilmor website (*www.Tilmor.com*). Check out the "Resources" tab for helpful videos on mechanization that were produced by the Brainard Lab at Michigan State University, including videos about finger weeders, basket weeders, spider gangs, sweeps, and tines. They all make work a breeze.

The original finger weeder was invented in the 1950s, used to target weeds that pop up in that narrow strip where crops are planted — close to and in between the plants in the row. Several companies now offer this useful attachment.

Researched Results

The Brainard Lab team went to France and the Netherlands to research past and current knowledge for in-row weed control. They purchased mechanical weeding implements and ran their own trials at local farms with impressive results. According to Daniel Brainard, who heads up the lab, there are three ways to kill a weed organically: slice it, bury it, or uproot it. Having the right tools and knowing how to use them are the key to mechanized weed control.

From top: The author's 1946 Farmall A tractor; an Allis-Chalmers Model G; a Lilliston rolling cultivator; and a finger weeder at work.

The team found that combing, or "stacking," multiple implements, such as finger weeders and flex-tine weeders, on tool bars in the same pass is most effective. Some conditions may call for adding gooseneck sweeps or a torsion weeder to the stack. But the researchers claim the most important aspect of using in-row cultivation tools effectively is to calibrate each tool for your specific soil and crop conditions. Adjust based on crop, weed pressure, soil type, and moisture levels.

Many small growers are happy to use a broadfork and a hand hoe. Sure, mechanization comes with a learning curve and some trial and error to get started, but the time and labor savings for growers, especially those working 3 acres or more, is well worth it.

Back at my farm, Fortune adjusted the old Lilliston to rip tiny weeds and soil away from the plants in a single pass. A couple of weeks later, when the crops grew taller, he adjusted the implement to throw soil back up against the plants and bury the little weeds next to them. In fall, he swapped out attachments to plant cover crops. It'll take time to understand each tool and make the adjustments, but after we've got everything dialed in, we can move quickly through a field — faster than we'd be able to walk it. Then, I'll take the rest of the day off.

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