Ancient farming practice makes a comeback as climate change puts pressure on crops

Farmers used to plant "cover crops" to rejuvenate fields in the off season. As those were replaced with chemicals, the soil of America's farms suffered. Bringing back the old practice has surprising benefits for the planet — and for farmers.
Fred Yoder in Ohio plants rye and winter peas he never harvests. Larkin Martin in Alabama plants radishes she’ll never eat. A.G. Kawamura in California plants barley that rots in the fields.

Each is part of a small but growing movement to bring back an ancient agricultural practice called cover cropping that was once used to rejuvenate soil but now also likely comes with the added benefits of both **mitigating climate change** and protecting against its ravages.

It’s increasingly getting a push from Department of Agriculture programs and even companies that buy commodities. But mostly, farmers say it saves them money and protects their land.

“Our soils keep getting better and better. You take a shovel out and dig deep down and you see the earthworms and the absence of a hard pan. That soil is just mellow all the way through,” said Yoder, a fourth-generation family farmer in Plain City, Ohio.

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For him, planting rye in his fields after he’s harvested his cash crops of corn and soybeans is no altruistic effort. It’s about economics and making his farm profitable.

“My biggest driver is trying to save money,” he said. “I’ve cut our fertilizer use by 20%, we’re skipping a herbicide application and my fields hold more water.”
Cover cropping is no panacea to the many struggles farmers face as they operate within the razor-thin margins of agriculture. It can be costly — as much as $35 an acre, takes several years to really make a difference, requires new timing and sometimes new equipment and can increase pest infestations.

But after a few years, fields planted in cover crops store thousands more gallons of water than bare fields during torrential rains, resist weeds' encroachment more, hold together better against erosion, survive droughts better and capture more carbon in their soils. Increasingly, farmers are turning to it as a way to protect against erratic weather and to decrease costs from chemical inputs. The hope, eventually, is that these climate-smart crop practices might get a premium in the marketplace, reimbursing farmers for the climate work their fields do for the nation by returning carbon to the soil.

Ten years ago only about 10 million acres in the US were planted with cover crops. Today that’s up to about 22 million acres and it’s increasing by about 8% annually, said Rob Myers, director of the Center for Regenerative Agriculture at the University of Missouri.
A study last month by researchers at the University of Illinois found in the Midwest cover cropped acreage increased four times from 2011 to 2021.

This heralds the return of very old agricultural practice, said Myers. “George Washington and Thomas Jefferson would write letters to each other about what cover crops they were planting.”

What are cover crops?

“A cover crop is a plant used to protect and improve the soil, typically when no other plant is growing in the field,” said Myers, who has been studying sustainable farming methods for 20 years.

What’s planted varies but can include grains such as rye, barley and oats, vegetables such as radishes, and peas and nitrogen-fixing plants like crimson clover.
As soon as the cash crop, usually soybeans, corn, wheat or cotton, is harvested, the farmer plants the cover crop – often directly into the left-over stubble.

The cover crop grows up just a few inches before winter comes and then goes dormant. In the spring it starts growing again while the fields are warming and drying before farmers plant. All this time it keeps weeds down by out-competing them and helps the soil absorb heavy rains.

When it’s time to plant, the farmer kills off the cover crop, either by running a heavy “crimp roller” over it or spraying herbicide. The cash crop is then seeded straight into what to a traditional farming eye might look like a messy field.

But that litter of dry and rotting corn stalks, ryegrass, clover and radishes is actually creating amazing soil.

“If you have living roots in the soil year-round, that keeps feeding the soil microbes,” said Myers. “A teaspoon of soil, if it’s healthy, can have as many microbes as there are people on the planet Earth.”

Farmers have used cover crops for eons. The Romans planted beans in their vineyards to improve yields. But in the 1950s they came to be seen as no longer necessary as the U.S. shifted to new forms of farming.

“With cheap fertilizers, particularly nitrogen having been developed as an offshoot of World War II efforts, cover crops were no longer viewed as necessary for improving soil fertility,” said Myers. “They definitely fell out of favor starting in the 1950s and continuing to decline through the early 1970s.”

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Those new technologies were adopted because they worked. New chemical fertilizers, herbicides and insecticides along with constantly improving seed tripled U.S.
agricultural output between 1948 and 2015 even as the amount of labor required declined by 75% and land by 25%, according to the Economic Research Service of the Department of Agriculture.

Farmers who previously would have used the “green manure” of cover crops to bolster their soil instead poured on fertilizer and left fields bare for much of the year, fearful that any plants beyond the crops they wanted to grow would suck up water and nutrients.

The next big innovation in US agriculture came in the 1980s and 90s with no-till farming. It was a revolutionary agriculture technique that virtually ended tilling the soil. Farmers would spray a herbicide in the spring to cut down the weeds, then use specially designed seed drills to plant without plowing.

“All you’re doing is cutting a slot, the slot is about an inch wide you’ve got a V in the back that closes it and puts dirt back on the seed,” said Yoder, who switched to no-till thirty years ago.

No-till works because genetically modified seeds for feed corn, soybeans, cotton and other crops can be sprayed with herbicides that don’t affect them. Today about 90% of these crops are GMO and when USDA did its last agricultural survey, it found that 37% of U.S. farm acreage uses no-till farming, mostly in the Northeast, the mid-Atlantic states and the Midwest.

That helped with erosion and soil retention. But increasingly erratic weather, including torrential rains and longer dry periods, have made farmers realize more resiliency was needed.

Also, chemical run-off from over-fertilized conventionally-farmed fields also began to cause dead-zones in the Gulf of Mexico and large bodies of water when excess fertilizer was washed out of fields and into rivers and streams.

It wasn’t until around 2010 that cover crops began trending nationally, though some areas got on the cover crop bandwagon earlier, including Maryland due to concerns about water quality in the Chesapeake Bay during the 1990s.
Agronomists began to realize that modern post-war practices hurt soil ecosystems. They looked for ways to mimic conditions when the Midwest was covered in prairies, said Myers. Those were soils that had living roots in them all year that supported a complex system of soil microbes, bacteria, fungi and nematodes.

Without cover crops, the microbes in farm soil died out in fall and winter, meaning there were fewer nutrients to give crops and less structure to hold water.

Cover crops create climate change resilience

Cover cropping is a rare practice that worked in the past, works especially well now amid climate change's effects and will help prevent climate change from worsening, said USDA’s Farm Production and Conservation Undersecretary Robert Bonnie.
“We’re conditioned to think about environmental issues where you’ve always got conflicts, but in this case, you’ve got alignments,” he said.

The rewards of cover cropping are numerous, say farmers. The soil has more organic matter so it requires less fertilizer. It’s also got channels where the roots of the cover crop have rotted away, along with those made by earthworms, that allow water to infiltrate deep in the soil rather than running off the top.

In California, Kawamura’s family runs Orange County Produce. They take over “ugly, abandoned pieces of ground where nothing wants to grow,” he said.

These fields often have bare ground so compacted it’s like cement. They plow it once to open up the soil and then start planting cover crops with deep, penetrating roots like radishes or mustards or barley.

“We’re able to turn them around in three years,” he said. Those fields go on to the Kawamura’s signature crop, a wide variety of green beans that includes Blue Lakes, Yellow Wax, Romano, Purple and Kentucky Wonder.

“Good soil makes a farmer look good,” he said.

For Ray Gaesser, the changes in his soil are helping as climate change shifts weather patterns to heavier more intense rainfall.

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He’s farmed in Corning, Iowa for 45 years. “We have never seen 4 inches of rain in an hour before but that’s what we got in 2010. In the six years after that, we had at least one of those every year.”

They put in waterways and terraces and drains in the fields and thought they were doing a good job of protecting the soil.

“But when you get 4 inches of rain in an hour, you can’t build a big enough terrace. The water just washes everything away,” he said.

Since he started planting cover crops he’s seen “huge benefits.”
When they tested, they found their soil absorbed an inch of water in 2 to 3 seconds. "When we went a half mile away, to the next farm over which had a recent history of tillage, it took 7 to 8 minutes to absorb that inch of water."

**Building up the soil**

For any farmer who’s done mainstream agriculture, planting cover crops is something of a leap of faith. Residue from the cover crops builds up on the soil at first and neighbors look askance.

“My neighbor next to me, he’s 90 years old and he thinks I’m nuts,” said Yoder.

It’s not a neat and tidy sight the first couple of years. Beginning with cover crops can be a nail-biter for farmers who’ve been trained to prize nice, clean, well-tilled black fields.

Instead, they’re seeing a lot of stubble and crop-residue build up in their fields and not necessarily breaking down quickly. But as the microbes and the worms come back, all that residue just melds back into the soil, said Mitchell Hora, a seventh-generation Iowa farmer. His family farm began planting cover crops in 2013.

“Over time, your systems start working better, your soil’s in better shape and now we’re rocking and rolling,” Hora said.

This year his area was "super dry," but he still had above-average soybean yields. The organic matter that the rye left on his fields “that’s the armor for now for our soil. It’s basically a sponge.”

Research data shows that for every percentage of organic matter in soil, an acre can hold 25,000 more gallons of water.

Hora’s been so impressed with the change he’s seen in his fields that he launched a consulting company, Continuum Ag, to help coach other farmers as they make the shift.
Cover crops aren't a silver bullet

After seven generations of farming in Alabama, Martin’s family has seen a lot happen in agriculture. She now has 7,000 acres of cotton, soybeans and corn and has worked hard to build up what she’s honest in describing as degraded soil.

“All the plowing that took place during the twentieth century, it loosened up the soil so the roots could grow but it caused an awful lot of erosion,” she said.

For her farm, no-till was a game changer and cover cropping adds further resiliency on top of that – but it’s not a magic bullet.

“It’s not perfect,” she said. It’s both an added expense and more trips across her fields, which means getting the economics right is key. “I wouldn’t call it profitable, I’d say cost-effective.”
“And now we have slugs, which we didn’t have before,” she said. “On balance it’s positive but it’s a new set of problems to solve.”

There are also open questions about whether cover cropping could lower yields. Some studies have found that for corn and soybeans it can, depending on field management. That could be offset by greater resiliency during droughts or intense rains but requires further study, scientists say.

**USDA working to get farmers to try cover crops**

The Department of Agriculture is encouraging farmers to try cover crops through various incentive programs. This isn’t something that can be done by regulations, it’s got to make sense for farmers economically, said Farm Production and Conservation Undersecretary Bonnie.

In September the agency rolled out $2.8 billion towards supporting climate-smart farming, some of which will go to cover crop support. There’s also a $5 an acre rebate for farmers using cover crops off their crop insurance.
It’s part of “de-risking” the shift. “At the end of the day, these practices are all going to have to pencil out for the farmer,” Bonnie said.

USDA efforts such as Environmental Quality Incentives Program and the Conservation Stewardship Program have increased farmer participation in cover cropping. Researchers in Illinois found a strong correlation between such funding and adoption.

The payments only last for a few years and are meant to be enough to tip farmers over into giving it a try, not underwriting the entire cost.

“We’re not going to subsidize everything. But the first year, we’re offering to pay $25 an acre. Second year, $15 an acre. Third year, $10 an acre,” said John Johnson, a farmer and coordinator at Farmers for Soil Health, a newly-created partnership between soybean, corn and pork groups to encourage farmer-led cover crop programs. The group will be giving grants to farmers to try cover crops.

The hope is that the benefits to the farmers, and the climate, will be big.

“If we’re going to make a significant gain on the agricultural side, and we can, there’s a lot of opportunities for us to reduce greenhouse gas emissions,” said Bonnie.

**Someday, farmers might be paid to store carbon**

The hope is that someday farmers will be paid for the work of creating more robust soils that sequester larger amounts of carbon in them, as a way to combat climate change.

That said, large-scale data on cover crops and carbon sequestration is lacking and more research is needed, say scientists. Some research has found large amounts of carbon being sequestered while others have found less.

While some companies have already begun to offer farmers a few dollars an acre for their efforts, the system is still in its earliest – and unregulated – days.

“Carbon is like the wild, wild west right now in agriculture,” said Johnson.
Being able to prove that a given farmer or a given field has taken a certain amount of carbon out of the atmosphere and put it back into the soil isn’t easy and it isn’t cheap, but eventually should be possible, say experts.

“The big, hairy, audacious goal” is that farmers will be able to sell, at a premium, crops they grow with sustainable and carbon-fixing practices said Grey Montgomery, who heads agricultural products and operations for DTN, a data and technology firm in Tennessee. That will mean on-farm visits, satellite tracking and soil testing and probes.

“It’s all going to be about measurement, reporting and verification,” he said.

In Alabama, Martin just wants to make her farm a little more resilient, a little more profitable and a little better every year. Over the past few years she’s seen more and more of her neighbors start to plant cover crops in the winter.

“We drive along and look at somebody else’s fields and think, ‘Hm, I wonder what they planted this year?’"

It’s become a big conversation in her area, at least for those putting their toes in the water, she said. “The ones that think we’re crazy, they don’t tell me.”