



UNDER THE WEATHER

BY ALEXANDRA JONES



Pennsylvania farmers are reeling after the wettest season in more than a century. Here's how they're coping, how they're working to keep us all fed, and how they just might be able to help put the brakes on climate catastrophe.

If you live in Pennsylvania, you know it rained — a lot — last summer. You probably missed out on some days you planned to spend at the beach or by the lake. Maybe you even had trouble getting to work or school because the roads near you flooded. *Well*, you may have thought for the umpteenth time that season, *at least I don't have to water the garden today.*

But for farmers across the Keystone State, 2018 wasn't just a bummer. It was borderline cataclysmic. Heavy rains washed away seeds and seedlings — if farmers were able to plant in their soaked, muddy fields in the first place. Fruits and vegetables rotted from the roots when the sun didn't dry soil fast enough between each deluge. Floods washed out roads and fences, causing untold damage to crops and property. In many parts of Pennsylvania, it was a year that broke records. For many farmers across the state, it was the year that nearly broke them.

"It wasn't a hurricane, high winds, or hailstorms. It was just rain — too much of it and too frequent," says Jim Crawford, proprietor of New Morning Farm in Hustontown, about 90 minutes south of State College. "One, two, three inches here and there was devastating to us."

In 46 years of farming, Crawford had never seen anything like 2018's sustained sog. While communities on the West Coast suffered from extreme heat, drought conditions and wildfires, the Northeast experienced rainfall far above average, with parts of Pennsylvania receiving 200% over typical precipitation amounts in June and July. According to the National Weather Service, May through July 2018 was the rainiest period in Pennsylvania since 1894, the earliest year for which the state has records, coupled with above-average temperatures, too.

Crawford estimates that the rains destroyed a full third of New Morning's total annual production of around 50 kinds of organic vegetables. In a good year, revenue is around \$800,000, but net profits are only around 5% of that. The farm has had lean years before, with the oper-



Above and at right: Emma Cunniff of Kneehigh Farm

ation netting only around \$10,000 or \$20,000 in profit. But in 2018, "we had a loss of \$100,000," Crawford says. "Drastically worse than any other year we've had."

After this dramatic loss, Crawford is simply cutting out nearly a quarter of his 40 acres from production — the poorest-drained fields that get too wet and don't dry out quickly enough. He simply can't risk another year like that.

On March 25, Pennsylvania Gov. Tom Wolf announced that farmers in 61 counties — out of 67 in the state — would be eligible for USDA disaster relief assistance in the form of low-interest emergency loans, administered through the Farm Service Agency, to help

them bounce back from 2018's losses. Crawford is one of them. "It's the first time we've done that in at least 20 years," he says.



We're slowly learning that the only thing we can predict about weather in the Anthropocene is that it's unpredictable. But there are some long-term trends climate scientists have identified, and those point in one direction for the Northeast United States: warm and wet.

The Northeast is experiencing the most significant intensification of rainfall over time; between 1958 and 2012 there was a 71% increase in the amount of precipitation that falls during downpours. That's according to the 2014 National Climate Assessment, a congressionally mandated report by the U.S. Global Change Research Program. And if carbon emissions remain at their current rate of increase, temperatures in Pennsylvania will rise between 1.9°C and 4.3°C (3.4°F and 7.74°F) higher by midcentury (2041-2070) than what we experienced from 1971-2000, according to the 2015 Pennsylvania Climate Impact Assessment Update. That means that as early as 2041, Philadelphia could resemble Orlando in heat and humidity.



Harrisburg will feel like Alabama, while the climate in Erie, the state's northernmost city, will resemble that of eastern Tennessee today.

In the short term, experts say, this trend may present some opportunities: Extended growing seasons due to shorter winters could benefit the rural economies that make up much of the state. But long term, the shift is far from ideal.

It's not just vegetable growers who have been hurting due to recent weather extremes. At Three Springs Fruit Farm in Aspers, just north of Gettysburg, seventh-generation farmer Ben Wenk and his family grow tree fruit like cherries, peaches and apples, plus vegetables to complement their fruit at markets in Philadelphia, Maryland and Washington, D.C.

For Wenk, 2018 meant fruit rotting on the tree before his crews could harvest it, a proliferation of pathogens like bacteria and mold that can cause cosmetic damage to fruit, and an inability to get into his fields with machines to plant and pick. The prior year had some of the same problems, he says — "but not in a 'how are we going to possibly farm and pay people and keep the lights on' way."

That was just one year, you might think — but rain isn't the only extreme the state's farmers have experienced in recent seasons. In 2016, Wenk suffered severe losses due to drought conditions. Multigenerational memory shows that things are changing, too: In his grandfather's lifetime, hail only hit Three Springs once. But since Wenk returned to the family farm from Penn State 13 years ago, he says, hailstorms have damaged his crops in at least half those years.

Growers are worried about temperature fluctuations, too. In recent years, waves of warmth in early spring have caused fruit trees to bloom, making them vulnerable to late-season killing frosts. Fruit farmers across the state marshaled resources to spray blossoms with water in hopes that a layer of ice would protect them. (It might seem counterintuitive, but enough heat is released as liquid water turns to ice that delicate blooms and buds can be kept from dipping below freezing.) Others set bonfires between rows of trees in hopes that warm rising air would protect the future fruit. Some hired helicopter pilots to hover over their fields in hopes the whirling blades would push warm air down to keep the freeze at bay.

"Volatility is the key word," Wenk says. "We've experienced weather in all the extremes."



Last year's rains pooled in the fields at Kneehigh Farm (left) and New Morning Farm (right).

Luckily, there are methods that farmers can use — and many are already using — to build resilience for their farms and their businesses. And these methods may be a big part of a long-term solution not only for individual producers, but for the planet as a whole.

“As a climate adaptation strategy, soil health is really important,” says Franklin Egan, director of education for the Pennsylvania Association for Sustainable Agriculture. “On a large scale, it’s an important sink for carbon... A lot of farmers are interested in doing something to be a part of the solution.”

Healthy, productive farms use regenerative techniques to boost organic matter in their soils; that process sequesters carbon from the atmosphere. Carbon-rich soils are able to absorb much more water than those with less organic matter.

“We find that if we can continue to enhance soil resources, we’re able to handle more extreme weather events like heavy rainfall if we increase the infiltration of our soil,” says Denise Coleman, conservationist for the state office of USDA’s National Resources Conservation Service. That means the soil can hold onto more water during a deluge, reducing runoff and damage caused by water pooling on fields, as well as during drought conditions. Better water infiltration also means less agricultural runoff into streams, rivers and lakes.

Cover cropping fallow fields reduces erosion and boosts soil health season over season in addition to breaking up tough soils and building carbon. Planting perennial grasses and legumes can fix nitrogen, another greenhouse gas that functions as plant food, in soil. Farmers can also increase their soil’s water infiltration

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by using cover crops like daikon radish to break up the hard pan, the tough, low-nutrient layer of soil beneath the topsoil, so that water can penetrate more deeply. For farmers growing crops like grains, soybeans and corn, Coleman also recommends avoiding tillage, which releases the carbon that’s trapped in the soil into the atmosphere. Instead, she teaches farmers to keep stubble on the fields after crops have been harvested — another tactic

for reducing erosion, holding moisture, and building organic matter in soils.

While animal farming in a time of climate change has its own unique challenges, grass-based dairy and livestock farmers already have a leg up on many of these methods. Because of this, season over season, these “grass farmers” often run more resilient agricultural operations than farmers who plant each season.

“There’s an old saying that a dry year will scare you to death, but a wet year will starve you to death,” says Kim Seeley, farmer and owner of Milky Way Farm near Troy, in Pennsylvania’s northern tier, when asked how he fared in 2018.

Seeley’s family has been on Milky Way’s 450 acres since his grandparents purchased the farm in 1928. In his 41 years running things, he transitioned from the high-input conventional farming he was taught at Penn State to a grass-based system — what he sees as a way for agriculture to be a solution to climate change rather than a contributor.

“Soil is the sponge to recapture carbon back down here if we go back to farming techniques that are safe and healthy,” Seeley says.

A farmer like Seeley doesn’t have to worry about the

kinds of things that conventional dairy farmers might, like manure lagoons overflowing with heavy rains. But extreme conditions can wreak havoc on grass, the foundation of his operation.

In a wet season like 2018, the grass might grow more quickly, but it's likely to be lower in nutrients than in an ideal year. Lower nutrients in summer's fresh grass and the hay he relies on to feed his cows through winter can result in less nutritious milk and less of it. Wet weather also makes it hard to get enough cuttings of hay. In drought years, the grass won't grow fast enough to get enough cuttings, and farmers may have to buy hay from outside sources before the grazing season is over in the fall. That cuts into the nonexistent profit margins for producers who may still sell their milk on the commodity market, for which milk prices are currently set below the cost of production.

The challenging economics of dairy farming are part of what put Seeley onto grass-based systems in the first place. "My degree is in agricultural economics. The price of milk is so atrocious," he says. "I came up with a slogan: We need to reduce moving parts. The moving parts are a tractor, plow, planter, chopper, all that stuff. We went back to making people and animals the moving parts."



It's easy to feel overwhelmed, panicked, even hopeless about climate change. But speaking with farmers about a problem that seems to be staring humanity in the face was surprisingly heartening. Though farmers only made up just over 1% of the population nationally, according to the 2012 agricultural census, the other 320-plus million of us (up from 314 million in 2012) rely on their hard work. As long as they're able and there are people to feed, they're going to adapt and endure as best they can — even in times of suffocating stress.

Kneehigh Farm owner and operator Emma Cunliffe spent much of 2018 watching helplessly as clay-heavy soils on the 7 acres she leases near Pottstown pooled with water from frequent heavy rains. She had panic attacks. She and her small team of organic vegetable farmers struggled to salvage what they could for their 60 CSA members, high-end chef customers in Philadelphia and two suburban farmers markets. By all accounts, it was a terrible year.

At the same time, Cunliffe says, as physically, mentally and emotionally draining as farming can be — espe-

cially in adverse conditions — pushing herself to keep doing her best work is what helps her keep it together.

"Presence is a hot word right now, but farming really settles you into that. It's a form of meditation," she says. Farming has made her feel "crazy" because there is so much, like the weather, that's out of her control. At the same time, there's a life lesson in that, she says, that is both humbling and calming.

Cunliffe takes heart in the small-scale farming movements that have bloomed after natural disasters in places like Haiti, Puerto Rico and Cuba, with food supplies becoming more atomized, locally based and community-oriented. She also gets strength from her community of fellow farmers and from her CSA members, who can see the condition her fields are in when they come to the farm for pickup each week during the growing season.



A late-season apple at Three Springs Fruit Farm

But what's given Cunliffe and others the drive to push forward, to learn how to keep going, to feed themselves and each other and all of us, is that they really see no other option.

"We have 12 years," she says, referring to the report by the UN Intergovernmental Panel on Climate Change (IPCC) that stated current planned greenhouse gas emission mitigation efforts under the Paris Agreement would not be enough to limit global warming to 1.5°C by 2030. "If we say, 'This is what matters, I'm alive, what a blessing! What kind of good work can I be doing in the time given?' There's really nothing else you can do." ●