Contents

Introduction

There's something particularly lonely about attending to the minutiae of daily life while the planet is burning. You take your child to day care. The ocean warms to unprecedented temperatures. You drive to work. Your city sets another heat record. It feels like everything that really matters is somehow out of reach.

But all around us are fellow beings whose very metabolic nature proclaims their ongoing allegiance to the living world. Mussels filtering water. Bees pollinating wildflowers. Sheltering trees bearing fruit. This begs the question, Why can't we humans sustain ourselves in ways that sustain others too?

Right now, our food systems often function like the agricultural equivalent of fast fashion. Plants are only in the ground for this season. A handful of these annuals—corn, soy, wheat, and the like—dominate the landscape. Commodity crops are shipped out in tremendous volume, harvested and processed by people whose work puts their health and livelihood at risk. These crops are hurriedly assembled into cheap, low-quality products. Fossil fuels are squandered at every stage

of the process, and it all ends in a stupefying amount of waste. Indeed, our food systems are currently responsible for a third of global greenhouse gas emissions, from the carbon dioxide lost when clearing land to the methane emitted from all that wasted food in the landfill.

As environmental scholars and educators, we found ourselves wondering, How do we build a food system that is made to last?

In both of our places, we started to learn about the diversity of food systems that flourished a few hundred years ago. In coastal California, where Liz lives and works, acorns featured as a staple food, alongside holly leaf cherries and elderberries. Chumash and other Indigenous peoples tended these prolific food forests with fire and an epic collective pruning effort. In the central Great Plains, where Aubrey lives and works, grasslands have been stewarded by the Kaw, Pawnee, Osage, Omaha, and other Indigenous nations. Prairies fed bison, elk, rabbits, prairie chickens, and the many people who relied on these creatures along with plums, berries, and a bevy of tasty roots.

The key to both of these food systems is that they worked with, rather than against, the creativity of the plants that evolved to live most abundantly across Earth's landscapes: perennials.

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Perennials, roughly speaking, are plants that live for more than one year. You're probably familiar with many perennial plants already: Trees and bushes are perennial, as are the long-lived grasses you might see out in the rural parts of the country where we are from. You might have even eaten some perennial foods today: Tree nuts and tree fruits are obvious ones, but grass-finished meat raised on perennial pasture might be a candidate for this designation as well. What these foods all have in common is that they come from farms where plants stay in the ground for multiple seasons. Which means their roots can go to work.

Perennials stay in place for decades—and sometimes centuries—precisely because their roots are so active. Roots seek and exchange; they push and pull, tense and release; they brace, rub, infiltrate; they decay and turn over. Roots go deep, sometimes dozens of meters. Critically, they take sunlight energy harvested by the plants' leaves and deliver it into the ground to provide food for microbes, with which they form a sort of belowground superorganism. Microbes gather nutrients and water needed by the plants, while plants feed microbes the sugars they need to survive. Year after year, perennial plants allocate a quarter to a third of their solar harvest to their microbial mutualists, pulling carbon down out of the atmosphere and building up the terrestrial life support system commonly known as soil.

This rooting movement of matter and energy happens in the dark, mostly out of sight. But it is integral to how sunlight powers precious cycles of life.

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You may know this story: An empathic teenage girl convenes a community and navigates a path forward amid water scarcity, political crisis, economic collapse, and acute climate change. It's the story of Lauren Olamina, the main character of Octavia Butler's prescient and enduring science fiction classic *The Parable of the Sower*, set in California in the 2020s.

In her journey, Lauren relies on seeds. Seeds as inspiration for her worldview and seeds as literal food stocked in her survival pack. Eventually Lauren and her community make it to a place they name Acorn, where they bury their dead and plant oak trees. In the face of apocalyptic devastation, Lauren's dreams of future life are made possible by her alliance with these deep-rooted old friends who have been with humanity through thick and thin.

Now more than ever, humans need both perennial foods and the living roots required to grow them. At this advanced hour, perennial plants can't avert the climate crisis. People must slow and stop the burning of fossil fuels. But where and how we grow perennial foods will help shape what human futures are possible. Perennials can help us significantly mitigate emissions, so the climate crisis doesn't get worse. They can provision a growing buffet of foods and medicines that help us navigate hard realities and limits, and they can supply meaningful relationships that inspire us to create better place-based communities. These hardy survivors can help us weather the heat, drought, and storms that are coming our way with increasing frequency.

Perennials play the long game, spreading the wealth both above and below ground to find a durable balance. This is how they deal with carbon. Whereas annual plants like wheat and corn allocate only 15 to 30 percent of their total carbon stores underground, native perennial grasses and forbs allocate 50 to 67 percent of fixed carbon in root or rootlike tissues below the soil surface. Conversion of these perennial landscapes to annual cropland has resulted in 35 petagrams of carbon escaping to the atmosphere, roughly equivalent to three to four years' worth of worldwide emissions from fossil fuels and cement. Just imagine if we began to bring these perennial ecosystems back.

Likewise, nitrogen has historically been carefully stewarded by perennial plants. This element gets less press than carbon, since carbon dioxide is so much more prevalent in the atmosphere than its nitrogenous greenhouse gas cousin. But nitrous oxide has 300 times the warming power of its more famous fellow greenhouse gas, so it's worth paying attention to. Some 55 percent of it comes from agriculture, due to overuse of synthetic fertilizer and fields being left bare for much of the year. All this excess nitrogen from crop fields also escapes into the watershed, which is why agriculture is this country's largest source of

water pollution and there are over four hundred marine dead zones around the globe.

The good news is, perennial plants can help us clean up this mess. By restoring them where they belong, we can replace at least some of the carbon lost from these landscapes, drawing it back down from the atmosphere. Perennial plants don't need to be replanted each year, so they can alleviate the need for tillage and instead hold soil and its carbon in place. They can be grown with little or no fossil fuel–based fertilizer. And they can scavenge much of the nitrogen currently running off farm fields, intercepting potential pollution and recycling it into food for microbes—and eventually people too.

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But in order to revive these critical climate allies when humanity needs them most, we will need to reciprocate, to come to the aid of perennial plants as they have come to ours. We will need to restore rightful land access for Indigenous communities who have long stewarded plant relatives. Those of us who have been disconnected from land for generations must take care not to appropriate the traditions of Indigenous communities but instead rekindle our own friendships with photosynthesizers. It will take all of us working in concert, which is where you come in. It might start with a new recipe or a new sapling tucked into your backyard. You and your neighbors might plant a food forest or volunteer to help a local farmer establish a hedgerow. One way or another, we can all nurture the living roots of primarily perennial food systems.

Humans stand on top of the ground; unlike roots, we can bask in the sun. But our lives are interdependent with our fellow beings, with perennial plants whose trunks and stems can tower over us, whose rooting depths can outreach us. And like roots we live in the dark when

it comes to knowing much about the future. What we do know is our powerful propensity for seeking, making, learning. Our technology and labor—not to mention other animals and tools—are woven into the fate of our homeland on Earth. What we do now matters.

The tricky beauty of our reality is that as a species we know how to do many things. Many of us live in societies built through the burning of fossil fuels, but selecting seeds, pruning trees, and singing songs are human enterprises as well. People are constantly solving problems and getting ourselves into trouble. We know how to fertilize wheat and breed perennial grains, scroll social media and pluck serviceberries, drive cars and run long distances. We wage wars, but we can also extend olive branches. Perhaps we must now discern which of these activities can endure, tell the truth about which of these we want to persist and grow. Are we willing to try to live? What gifts do we each have to bring for the benefit of all?

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From the earliest days of civilization, many communities developed intimate knowledge about the perennial plants they harvested to feed their families, fuel their hearths, and weave the tools of everyday living. Eighty thousand years ago, people in what is now southern China were likely eating carbohydrate-rich nuts as part of a varied diet. Sixty-five thousand years ago, people in what is now Australia were grinding the grainy seeds of native perennial grasses. These plants helped people develop ways of life that fit their places, rich with stories and skills passed down to children and grandchildren.

Perennial foods have been the cornerstones of cuisines and cultures. Remember acorns, aptly highlighted in *Parable of the Sower* as a staple food for many peoples around the world. Or the nutrient-dense quartet of olives, dates, chestnuts, and carob, which have nourished people of the Mediterranean basin for millennia. Walnuts and pistachios

in Kyrgyzstan. Oil palms in the tropics. Camas bulbs in western North America. Protein-rich and drought-tolerant mesquite in the Mesoamerican desert.

And yet, today, some 60 to 80 percent of global cropland is dedicated to annuals, just four of which (corn, wheat, rice, and soybeans) account for 75 percent of the calories consumed by people.

There are deep-seated reasons for this dramatic shift toward a handful of annual foods, entrenched political and economic forces that have pushed agriculture toward short-term profits rather than long-term human and environmental health. Building robust perennial food systems means challenging these forces and the corporations and decades of received wisdom arrayed behind them. We'll also need to repair the damage already wrought by extractive annual agriculture, regenerating soils and social bonds so we can sustain people and the land. And we'll need to build systems to ensure that the ecological and economic benefits of more perennial landscapes will be fairly distributed. A bold movement into a more just, perennial food future is no small task. It will require badgering our elected officials, having courageous conversations with our neighbors, and embracing new flavors and rural aesthetics.

And yet we think people are up for it. Already, in fact, many thousands of people are standing up for perennials and the lifeways that can go with them. In this book, you'll hear from Indigenous scientists and community leaders who are working to restore buffalo prairies and traditions of berry gathering. You'll also hear from urban visionaries planting food forests. Farmers planting fruit and nut trees between their crops and hedgerows at the edges of their fields. Ranchers learning to graze their livestock in patterns that mimic the behavior of native herbivores, so as to steward healthier grasslands. And you'll hear from scientists and farmers who are developing and stewarding perennial grains, from sorghum to silphium.

These efforts are wildly diverse, much like a healthy forest or prairie. People don't all have the same life histories and strategies. And yet we do share a common home planet, and we will have to work with perennial plants to care for it.

We, the contributors to this book, are willing to devote our lives to this work, to realizing new and renewed access to perennial foods and landscapes. We share a vision for a food system that can sustain us and our descendants and their descendants and their descendants, for generations into the future. A food system that doesn't leave anyone out, that relieves the climate chaos and the burden of anyone with polluted water or exploitive working conditions. A food system in which both plants and people nurture the sustaining collective power of living roots.

Some of the stillness I have found is bound to last
Some of the restlessness will live on
Some of the pain I've always known is hard to pass
But a mutual blessing takes the game on

Summer seed become my perennial bloom
Summer's healing coming soon

—Lukas Nelson & Promise of the Real
(lyrics from "Perennial Bloom (Back to You)")

Wildness. . . . It is perennially within us, dormant as a hard-shelled seed, awaiting the fire or flood that awakes it again.

—Gary Snyder
(from *The Practice of the Wild: Essays*)

the profound change
has come upon them: rooted, they
grip down and begin to awaken

—William Carlos Williams
(from "Spring and All")

It is only when we are fully rooted that we are really able to move.

—Madeleine L'Engle
(from *A Wind in the Door*)

Index