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Food Shift

By **CHRISTOPHER D. COOK**



Tohono O'odham Community Action (TOCA) runs two farms in in southern Arizona. TOCA grows traditional corn (huñ), tepary beans (bawĩ), and squash (hal) for local schools to combat type-2 diabetes and obesity—and to bring traditional Native American food into the school lunch menu.

In perennially water-starved Patagonia, Arizona, just 18 miles from the Mexico border, Gary Nabhan, well known as an author and ethnobotanist, farms a worldly array of desert crops that could make any food lover salivate. The scrumptious and nutritious harvest, more than 120 varieties strong, includes Sonoran pomegranates, Baja California Mission guavas, Winter

Banana apples, amaranth, asparagus, globe artichokes, and even an arid-friendly Texas Mission variety of the infamously thirsty almond. This 5-acre farm, which he manages with his wife Laurie Monti, a medical anthropologist and professor of indigenous studies, grows these foods on precious little water—about 17 inches of rainfall a year, a dollop compared with the US-wide average of 28 inches.

Over the course of three decades studying and practicing a variety of approaches to horticulture, Nabhan has developed expertise in a wide range of traditions. He has written about the history and power of pepper in *Chasing Chiles*; a prescription for the future in *Growing Food in a Hotter, Drier Land*; and even explored the mysteries of the spice trail in *Cumin, Camels, and Caravans*, which is based on his own family's history in the spice trade. The eclectic combination has turned Nabhan into one of the more unusual craftsmen of the fields, because the orchards behind his Southern Arizona home invite a step back in time. They are also a perfect illustration of how the old can inform the new.

Blending thousand-year-old desert crop varieties with water-saving approaches and farming techniques inherited from Moorish Spain, Africa, and indigenous North America, Nabhan's modest arid plot offers a glimpse of how we could sustain ourselves in an era of chronic drought and increasing climate chaos.

A drought-friendly dinner “isn’t going to be any less delicious,” says Nabhan. Shifting what we eat could, in his view, mean a scrumptious revolution.

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conversation,

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off a tasty menu of drought-friendly foods that have a long history of sustaining people: arugula salads, New Zealand spinach, sea beans, Mesquite carob (good for diabetes), pistachios, pomegranates, figs, tepary beans, pigeon peas, quinoa, and soups and stews made with prickly pear cacti instead of more water-intensive bell peppers.

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In equally arid northern New Mexico, famed chef and author Deborah Madison surveys a hardscrabble terrain and sees another lush menu of possibilities. The Greens Restaurant founder, always scouting for new sustainable recipes in the garden and the kitchen, points to foods that “we are already familiar with, but haven’t tried growing as much” in recent times: Sonoran wheat. Quinoa. Red orach. Rattlesnake beans.

Zucchini in multiple varieties.

By adjusting not only what we grow but also how it's grown, in order to meet the severities of climate change, "We could potentially increase the diversity of our food," says Nabhan. One reason Nabhan is such a fan of these obscure food plants is that they're adaptable. Like any plant, they like water; but when water grows scarce, these plants have natural methods of storing it, or thriving without it. Not so with the miles and miles of lettuce, strawberries, and other crops such as wheat (at least the modern varieties) that dominate the Western diet.

THIRSTY CROPS IN A DRY LAND

While much of the American West has been squeezed dry by chronic drought in recent years, California has hogged the headlines—for a reason. The Golden State is a food-churning behemoth, and the severe drought increasingly threatens both farmers and a good portion of the nation's food supply. Farmers here produce a full two-thirds of the nation's fruits and nuts, one-third of its vegetables, and nearly 20 percent of its dairy products. The state manages this feat through a freak of nature: The annual prevalence (until recently) of prodigious snowpacks, which store water until spring, at which point it's shipped to farmers through an elaborate water canal system unrivaled almost anywhere on earth. That system is now running dry on all fronts.



In the Salinas Valley of California—a region known for water guzzling crops like lettuce and strawberries — Jim Leap and Polly Goldman farm a bounty of vegetables that require very little water. This row of garbanzo beans is an example.

As water has disappeared across huge swaths of the already semi-arid Central Valley, farmers have fallowed (removed from production) roughly half a million acres of land. More than 17,000 farmworkers, already living on the economic margins, have lost work, according to a report by the University of California at Davis Center for Watershed Sciences. Estimates of overall costs to the farm economy run more than \$5 billion. And that economy is substantial. Although agriculture represents just two percent of California's GDP, in 2013 farmers and ranchers garnered a hefty \$46 billion in total revenues.

It may not have been the smartest move to concentrate so much of the country's food production in one state, especially one so prone to drought. But we can't say we haven't been warned. In 1986, Marc Reisner famously laid out the dangers hidden in such a heavily assisted food system in a book whose title captured the problem rather succinctly: *Cadillac Desert*. On a beer budget, the nation has essentially grown accustomed to year-round champagne tastes, thanks to California's habit of growing water-intensive food.

There has been considerable ink devoted to the water-chugging almond, but this tasty (and nutritious) nut is not the worst drought scofflaw. While one almond has been estimated to require a gallon of water during its lifetime, it takes roughly 3-1/2 gallons to produce a tomato, 6-1/2 gallons to grow a potato, and 18 gallons for a single apple. A pound of beef weighs in at roughly 2,000 gallons. (For the complete context around this

issue, see “[The Water We Eat](#)” by Jessica Carew Kraft.)

Behind this basic food math lies a tricky question: How are these foods grown? Some, such as grapes and tomatoes, often get far more irrigation than is necessary—as evidenced by the small but growing prevalence of “dry-farmed” versions of these crops. A dry-farmed food relies solely on rainwater, without any extra irrigation. The method depends on farmers’ practicing a host of old and new soil-building techniques, beginning with simple mulching, which help retain water for long spells. Growing leafy shade plants amid crops can also help reduce evaporation and save water considerably. (For more detailed portraits of these practices, see the coverage in our previous issue, particularly “The Drought Fighter,” “Cuba’s Harvest of Surprises,” and “The Bug Whisperer.”)

The complexity of what’s needed in farming leads people like Nabhan to dream of systemic change. “I think we’re going to see more changes in

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the structure of our farming systems than changes in what’s on our plate,” he says. “There is no silver bullet. We need to cultivate good farming systems along with

desert crops.”

Unfortunately, a “good farming system” involves a lot more than smart methods of cultivation. It’s a concept that brushes up against the economy, the insatiable expectations of our modern food culture, and government policies, all of which collude (sometimes unwittingly) to create the highest value market they can—water or no water.

QUENCHING THE MARKET

Bespectacled and chiseled with a straight-combed silver mane, Craig McNamara, who farms organic walnuts and olives in Winters, California, bears a striking resemblance to his father Robert, the former defense secretary who steered military offensives in the Vietnam War. Craig chose a decidedly different path, into sustainable agriculture in the 1970s, when he “fell in love” with this farming area near Sacramento. Nearly 40 years later, despite success on his 450 acres, McNamara worries that California’s “critically devastating” drought could topple the state’s agricultural primacy. “For the first time, I’m tremendously worried about where we are...I’ve never felt we are closer to collapse than I do today.”

McNamara, who is also president of the California State Board of Food and Agriculture, says growers’ response to the drought has centered largely on water conservation measures such as drip irrigation—but, he argues, “We’re going to have to change what’s for

dinner.” Despite the “beyond painful” drought crisis, McNamara says the conversation about shifting crops is still at a whisper: “I’m not sure how much this is getting to farmers.”

But what are they going to do?

One dynamic holds true across the agricultural spectrum: what speaks loudest are market signals. In the absence of government policies coaxing a different path, farmers, like all

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businesses, produce the highest value items the market will bear—that is, unless something else intervenes.

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About 180 miles south of Davis, near the town of Madera in the gut of San Joaquin Valley, organic vegetable farmer Tom Willey sees the market signals pointing farmers toward more thirsty crops, not fewer. “I don’t see a headlong rush to more water-saving crops.” Even as the drought deepens and water supplies

disappear, many growers are still moving into almonds. “You’d be amazed,” Willey says. He knows farmers who have replaced grapes with almond orchards to tap the booming international market for these nuts. “It’s kind of going to hell in a handbasket.” Growers, he says, often cannot wait for new markets to develop, so they rush into existing ones. And they’re drilling ever deeper for groundwater to feed their thirsty new trees. “Most people are going after whatever they can get, as fast as they can,” Willey says. “Water is the gold now.”

Shifting to more arid-friendly crops also runs counter to the state’s entire agriculture system. For decades, California’s unique bounty has been designed (and well-promoted) for export across the U.S. and abroad. “Primarily we are not feeding just ourselves with California agriculture,” Willey says. “We’re feeding the whole nation and the world.”

To be fair, as water supplies have diminished, some farmers have shifted away from water-intensive crops —particularly ones that aren’t so lucrative. California farmers last year decreased the acreage they devote to corn and wheat by 34 percent and 53 percent respectively, according to a report by Bloomberg News citing USDA data. Nonetheless, the lure of export markets remain.



Jim Leap and Polly Goldman's corn—an heirloom variety developed by the Hopi Indians, partly because of how well it tolerates dry years.

The state's ten most valuable commodities (measured by revenue) include major water imbibers such as milk, almonds, grapes (some of which are dry-farmed) cattle, strawberries, walnuts, and lettuce. According to USDA data, California increased its water-chugging rice production from 473,000 acres in 2001, to 567,000 acres in 2013. Almonds have shot up dramatically from 570,000 acres planted in 2004, to 840,000 acres in 2013, and still rising. (It should be noted, however, that much of that acreage used to grow cotton, which is one of the plant world's biggest water hogs. So while almonds do use a lot of water, we at least traded T-

shirts for more protein.) The state also grows tons of alfalfa—900,000 acres of it—primarily the water-guzzling dairy and beef industries. What’s perhaps more surprising is that the bulk of that alfalfa is shipped out of state. Meanwhile, production of dry bean varieties, generally low water users, has declined dramatically, from an already-meager 88,000 acres in 2001, to just 50,000 in 2013.

“Are we willing to deal with the mindset that we’re supposed to feed 40 million Californians first?” Willey asks. “That is not the mindset of California agriculture, so you’d be talking about a big sea-change.” On his 75-acre patch of land, Willey has a little more flexibility due to what he has chosen to grow. He produces a “seasonal progression” of row crops—annual vegetable varieties such as squash, leafy greens, and peppers that can be shifted depending on weather, water and market demands. “We can act and react much easier than farmers with permanent crops” such as fruit and nut orchards, Willey explains. But no farmer is immune to market pressures: “As water becomes more scarce, we’re analyzing profitability. It doesn’t make sense to use water for something you can’t make money on.”

Dave Runsten, policy director for the Community Alliance with Family Farmers (CAFF), argues that it’s unfair to malign farmers as water wasters. After all, he says, they are producing the world’s food and fiber in constantly shifting markets, while navigating an array of significant embedded costs—for land, equipment, and, as in the case of the almond, long-term investment

in trees. “We produce things that require significant amounts of water,” Runsten says. “That’s what we do. If we do something else, are they going to have the income to do that?” And, he asks, who is going to organize that change? “There’s no one in a position to tell people to farm different crops,” Runsten notes. “It’s like telling restaurants to serve different foods...it’s just not what we do in this country.”

So far, there is little indication that the government will encourage a drought-friendly food shift. When approached to discuss ways to encourage more drought-friendly crops, the California Department of Food and Agriculture strangely demurred, rebuffing multiple requests for an interview. In an email reply, spokesman Steve Lyle merely stated the following: “Market forces are driving the crops that are grown... not water and/or climate change.”

In the meantime, the system seems to be spinning further out of control. Consider the issue of land prices. “The value of agricultural land is through the roof,” says Renata Brillinger, executive director of the California Climate and Agriculture Network. What brought that on? The market: As the price of farmland rises, growers increasingly turn toward higher-value crops in order to pay for that farmland. Whether or not there is enough water for those crops often becomes an after-thought. “The value of the land is essentially dependent on how much value you can create on that land,” explains Runsten. Lester Snow, executive director of the California Water Foundation, says he

hears farmers “talking of East Coast investors buying up land and putting it into almond production. Investors that don’t actually care about farming, coming in and tapping a declining resource.” The question looming over this resource is whether the government can, or will, do anything about it.



Amy Juan from the Tohono O’odham Nation harvests prickly pears on one of the tribe’s two farms. One farm is irrigated with groundwater pumped from a nearby well; the other uses only rainwater.

THE DROUGHT’S OPPORTUNITIES

On his small homestead farm in San Juan Batista, sustainable agriculture educator Jim Leap produced a prodigious harvest this year of dry-farm beans, corn, winter squash, and tomatoes on just 10 inches of rain (and no irrigation). Leap, who for 21 years managed a research farm at the UC Santa Cruz Center for Agroecology and Sustainable Food Systems, points out, “I can’t superimpose that on farmers who are trying to make a living.”

California’s harvest has not always been so water-intensive, Leap explains. Prior to the 1950s, when sprawling irrigation canal projects and increasingly

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globalized markets took hold, the Golden State produced a very different bounty—grains, sugar beets, potatoes, beans, dry-farmed apples. With the rise of California’s massive agricultural aqueducts came access to cheap irrigation water, which, coupled with lucrative new export markets, spawned an array of thirsty specialty crops. At present, there is no fast track back toward more drought-tolerant harvests.

The Sustainable Groundwater Management Act, signed

into law in 2014 by Gov. Jerry Brown, requires local water agencies to begin monitoring groundwater use for the first time—but contains no restrictions on the massive pumping underway to tap these waters. “It’s too little, too late,” says Adam Scow, California Director for Food and Water Watch. “It doesn’t regulate usage at all, it just says, ‘let’s look at this and then maybe we’ll make a plan.’ It doesn’t do anything to stop it. There need to be limits on how much groundwater is pumped each year.”

Thanks largely to federal and state irrigation subsidies, many California growers benefit from relatively cheap water, with little incentive to cut off the tap. Nationally, subsidies for irrigation equipment, intended to conserve water, have in fact led to greater water use “threatening vulnerable aquifers and streams,” a 2013 New York Times investigation found.

A dizzying complex of water rights and pricing systems has created wide disparities in access and costs, with some “senior” water districts getting “preferential treatment during shortages,” Bloomberg News reported in April, 2015. Water prices vary wildly, ranging from \$1000 per acre foot in the Santa Barbara area to \$25 an acre food in the Imperial Valley, says Snow. “It’s important in general that the price of water reflect the cost,” he argues. “I think there’s been a sense in agriculture that if we keep churning away, we’ll make up the difference with groundwater pumping.”

Leap holds hope that when the groundwater law does

phase in limits, starting in 2020, this could “level the playing field for everybody.” He predicts this change could help bring down land rents, which might encourage the production of crops that may be less remunerative but more drought tolerant.

It could also have the opposite effect. California Farm Bureau spokesman Dave Kranz points out that previous droughts have already increased water prices, and that inspires farmers to grow even higher value crops, most of which happen to be water guzzlers. The almond boom is a sorry case in point.

Something has to give. If market signals, land costs, and water pricing all inspire the farming of lucrative water-intensive crops, is there any equal force that can work in the opposite direction? The mind wanders toward some kind of subsidy for dry-farmed or desert crops, which would of course be another sea-change.

According to the Environmental Working Group, USDA farm subsidies totaling more than \$292 billion between 1995-2012 went predominantly to large-scale farming of commodities like corn and soybeans, thirsty crops that are used more for fuel, livestock feed, and processed foods than for fresh meals at the table.



In the fall, even after a spring and summer of almost no rain, the Hopi Corn is ripe and ready for harvest — as long as Polly Goldman can get a little help from her family.

In lieu of sweeping policy changes, more and more small farmers are bucking the trends and making a living on dry-farm produce and heirloom varieties. And, in this case, “the market” is leading the way. Thomas Nelson, who analyzes sustainable food markets for the UC Sustainable Agriculture Research and Education Program, notices a growing interest among chefs and farmers in harvesting drought-tolerant wild greens such as miner’s lettuce, wild mustard, bristly ox tongue, and black locust flowers. They may sound obscure, but these foods are increasingly popular among professional foragers and chefs at up-market

restaurants.

“The market has a really push-pull dynamic,” he says. “One reason almonds have grown so big is because there was a big marketing push behind them. It becomes a self-perpetuating system.” Well, the same could be true for drought-tolerant heirlooms and other dry-farm fruits and vegetables. As Nelson points out, the booming niche market for heirloom tomatoes and salad mixes was just a glimmer 25 years ago.

And farmer interest in these crops appears to be growing. With funding from the California Department of Water Resources, the Community Alliance with Family Farmers has held 20 field day workshops encouraging wine grape growers to shift to dry-farmed varieties—and “every one of them has been packed,” says executive director Diane Del Signore.

GOING DRY AND SMALL

Back in the eternally dry Southwest, famed sustainable-foods chef and author Deborah Madison sees progress on the margins. “Some people are definitely starting to look at [shifting to water-saving crops]. Every agriculture conference I go to ties into these issues,” she says—“but I don’t think it’s happening fast enough.”

Much of the solution says Madison, who founded Greens Restaurant (one of the nation’s premier vegetarian venues), lies in “hyper-local” farming systems that can provide a diverse food supply with greater adaptability to climate chaos. “The solutions

depend on lots of hands, and smaller farms,” she says, and smaller economies of scale that enable attention to detail. “A lot of the changes we need, I don’t think big agriculture can do it.”

From his rain-deprived vantage point near the Mexico border, Nabhan makes a compelling case for scaling up desert crop varieties and time-tested farming techniques. What’s especially compelling to Nabhan is that these are not new ideas. The challenge, he says, is to “make certain that we don’t grow these in monocultures as we’ve done with other crops...It’s not just about the crops, but a whole systems approach.”

***Christopher D. Cook** is freelance writer based in San Francisco and the author of *Diet for a Dead Planet*. Photos by permission of Tohono O’odham Community Action and Polly Goldman.*

A note on sources and further reading





Gary Nabhan offers more information about his farm and training opportunities on his [website](#), as well as a complete overview of all his writing about the foods of the deserts and other regions of the world. More of [California State Board of Food and Agriculture](#) President Craig McNamara’s views about farming are on his personal [website](#), along with information about his own farm, where he raises primarily organic walnuts.


The California Climate and Agriculture Network’s [fact](#)

sheets offer some helpful background about how climate change and drought affect farming as well as a **summary** of federal and state policy responses to drought. The University of California's **Sustainable Agriculture Research and Education Program** provides more information about how the state's farmers adjust to changing policies and market signals.

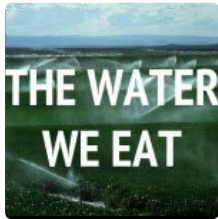
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