

'Everything depends on the corn': As crops wither, the Hopi fear for their way of life

For 2,000 years, the Hopi have been growing corn in an arid landscape, relying on the rains. Now climate change threatens their farming traditions.



KYKOTSMOVI — On a barren patch of sandy ground, Beatrice Norton stood beside her son examining the rows of corn.

A few of the biggest cornstalks grew waist-high. Most of the plants were knee-high or smaller. Some had shriveled, failing to produce any corn.

This year's harvest brought sadness and disappointment as they picked through the field their family has farmed for generations.

In most years, the stalks stand chest-high and the corn is bursting with plump kernels. This year, when Norton and her son pulled back the dry husks, they found the ears of corn were stunted and meager, some missing kernels in patches on the bare cobs.

"It's all dried out," Norton said, looking across the field. "It's very disheartening. It makes your heart very unhappy."

For the Hopi people, corn is much more than a staple crop. It's central to their culture, religion and way of life. They use ground corn in their prayers and ceremonies. Each family stores dry corn of all types, including blue corn, white corn and sweet corn, and plants their ancestral kernels year after year.

Each newborn baby, when welcomed to this life, is given its Corn Mother, a perfect little ear of white corn with a tip ending in four kernels, which is placed [beside the infant](#). And throughout life, in religious ceremonies, people take cornmeal in their hands and sprinkle it on the ground, laying down a blessing to the world and all life.

Members of the Hopi Tribe rely on rains to nourish their corn,

carrying on ancient traditions of dry farming in desert valleys that stretch between the mesas. The Hopis say that in their religion, they pray for all humanity and all living things, and for storm clouds that will soak the soil and give their corn plants moisture to thrive.

But this year, hardly any summer monsoon rains came. The Hopi Reservation baked in one of the hottest summers on record.

Some families still eked out a decent harvest of corn, beans, melons and squash. Others saw their crops wither.

The tribe's lands in northeastern Arizona, [like much of the Southwest](#), have been desiccated by one of the most extreme droughts in recorded history. And this drought, the latest in a series of dry spells, is being worsened by humanity's heating of the planet.



A photograph of Beatrice Norton's cornfield from years ago shows the change people are seeing in their crops.

David Wallace/The Republic

As higher temperatures intensify evaporation, the changing climate is taking away more of the precious moisture the Hopi depend on. It's eroding their ability to rely on the rain. It's threatening their connection to the corn and their way of life.

Still, Hopi people say they're determined to preserve their traditions of dryland farming.

Norton said she can't remember when the last good rain fell. But the past few years have brought less, and the occasional winter snow "is not the kind of snow that we used to get." With less moisture in the soil, she said, the crops have suffered.

Wearing a mask, Norton stood in the parched field and showed a photo of the field the way it used to be, when the cornstalks were lush and flourishing. Some stalks grew head-high, she said, but in the past few years, as it's gotten hotter, the plants have become shorter.

"The enormous heat that we've had this summer, it's really drying out the plants," Norton said. With the crops drying up earlier, that shift pushed the start of harvest, which normally would occur in October, into September.

At harvest time, families slow-roast sweet corn using underground pits as ovens. They peel off the charred husks and relish the juicy kernels.

Families dry much of the corn in the sun, then sort it by color and pile it in containers. Some corn will be finely ground and cooked to make paper-thin piki. Other corn will be served in mutton stew and other dishes.

Some of the white corn will be saved and ground to make homa for prayers and ceremonies.

Beatrice Norton, Young Corn Clan member

This is our way of life. We are dependent on this corn for our ceremonies, our way of life, to be complete.



While corn has profound significance for all Hopi, it holds a special family bond for Norton because she belongs to the Young Corn Clan. Within the tribe, her matrilineal clan is responsible for food, and she said that's part of the reason why her family "really feels the heartache" seeing the harvests decline.

Norton, who is 69, grinds corn using stones that once belonged to her mother, her grandmother and their ancestors.

She remembers the words of her elders, who encouraged young people to maintain their farming ways. They said to keep four years' worth of corn stored at home as a precaution against famine, to make sure there would be enough. Now Norton's store of corn has been dwindling, and she said she worries about the future.

"We're not building it back up to where it used to be," she said. "Because of how things have been going, we're not going to be able to have that four years' worth."

She wonders what might happen if the harvests worsen. "Once food becomes scarce, how are we going to feed our families?"

Holding dry cornhusks, Norton spoke about what's at stake for the Hopi, and about what might be lost if heat and drought persist and the harvests continue to diminish. In the shade of her hat, tears welled in her eyes.

"It makes me cry sometimes to think about all of these things that, you know, with the way that the world is, with the environment," she said. "This is our way of life. We are dependent on this corn for our ceremonies, our way of life, to

be complete. But eventually, if this is the way and the direction that this is going to go, our weather and then the environment, global heating and no rain, sooner or later we're going to be missing a big piece of what is a part of our life as Hopi.

"Everything depends on the corn," she said. "And without that corn, our ceremonies aren't going to be complete."

How climate change is impacting Hopi farmers and their way of life

Years of drought and rising temperatures are making the traditional Hopi method of dry farming ever more challenging.

David Wallace, The Republic | azcentral.com

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Over the past two decades, the American West has been ravaged by a dry spell so severe that scientists rank it among the biggest "megadroughts" of the past 1,200 years. Researchers have found that unlike the long droughts centuries ago, this one has been significantly worsened by [rising temperatures caused by climate change](#).

The Hopi Reservation, along with the rest of the Four Corners region, has grown parched during many dry years

since the late 1990s.

The reservation extends across 1.5 million acres on the Colorado Plateau and is surrounded by the Navajo Nation.

The climate of the Hopi lands swings naturally between extremes, cycling through wet and dry periods. The difference now is that the hot, dry periods are being amplified by rising global temperatures.

In a [2015 report](#) focusing on the Hopi Reservation, climate scientists at the University of Arizona wrote that the period since 2000 has been much warmer than any other period over the past 115 years.

“This warming observed at the regional level is consistent with trends related to human-caused global warming and is expected to continue,” the researchers wrote. Higher temperatures have intensified evapotranspiration, they said, putting more stress on plants and worsening drought across the Southwest.

This summer, the monsoon rains failed to materialize and the scorching heat obliterated records from Phoenix to the Pacific coast. A [strong high-pressure system](#) persisted over the Southwest, pushing away moisture and contributing to the heat.

This summer’s average temperature from June through

August in Winslow, the closest weather station with long-term data, was the second-hottest in 111 years of records, following the record-hot summer of 2018. The average high temperature during those three months was by far the hottest in history, reaching 5.3 degrees above average.

During much of the year, as the Hopi hold ceremonies in their villages, they often call upon spirits known as kachinas to bring rain.

Author Frank Waters described how the Hopi use corn in rituals in "Book of the Hopi," published in 1963.

"Paths of cornmeal are marked for approaching kachinas," Waters wrote. "Kachina dancers are welcomed with sprinkles of cornmeal. Baskets and plaques of cornmeal are common offerings during all rituals. The rising sun is greeted with cornmeal."

A central part of these spiritual traditions, Norton said, is a strong belief in everyone coming together "with one heart."

"There's this term in Hopi where your hearts become one," Norton said. "And when this happens in a ceremony, that's when us people have that strength — whether you're young, old or whatever — but if you bring all your good hearts and your good vibes together, that's when the spirits know and they bring us the rain."

In her youth, Norton remembers that when storm clouds appeared on the horizon, she knew the rains were coming and the skies would open up. But lately, she said, "you just pray hopefully that at least you get a drop or two. And sometimes it doesn't come."

Norton holds leadership positions in the Hopi Tribe. She works as manager of its [Office of Aging and Adult Services](#), which runs programs for the elderly. She is chairperson of the local board in her village, Oraibi, also called Orayvi.

The village [dates to about 1100](#) and is thought to be the [oldest continuously inhabited community](#) in the United States. Oraibi includes a mix of homes made of sandstone, modern cinderblock houses and sheds that have been adapted as living quarters, as well as three kivas — underground or partially underground chambers where religious ceremonies are held, with wooden ladders that protrude from rooftop entrances.

The village stands atop the rocky brow of Third Mesa, looking out over lowlands where cornfields are etched in patches in the desert brush.

In the fields, families plant and harvest crops using traditions that have been passed down for more than 2,000 years.

For the Hopi, their relationship to corn stretches back to the

origins of life. According to their traditional stories, when the Hopi people emerged into this world, the Fourth World, they met M^àasaw, guardian and caretaker of the Earth, who offered them a gourd filled with water, a planting stick, a bag of seeds and a short ear of blue corn.

In the book "[Footprints of Hopi History](#)," Mark Varien, Shirley Powell and Leigh Kuwanwisiwma explain the story of how the Hopi made a pact with this guardian spirit and accepted the challenge of farming the arid lands, learning a set of values referred to as "hopivötskwani," which loosely translates as "the Hopi way."

These values, they wrote, include hard work, cooperation, "a desire to live in balance and be stewards of the world that sustains all life, and perhaps foremost humility."

The Hopi still farm mostly by hand. Some may use tractors occasionally to plant corn but do most other work manually, including hoeing and tending the fields.

In their traditional clan areas, families plant fields suited to the natural contours of the land, using plots that catch runoff and collect moisture. Some fields spread out in depressions between raised berms. Many have strips of natural vegetation that act as windbreaks and help bring moisture to the crops.

After harvest, families don't uproot the corn plants but rather step on them to break the stalks, laying them down on the soil.

The following year, people will dig holes in the ground between those fallen rows. They'll drop corn kernels into the holes and cover them with soil.

The cycle will begin again.



Ronald Humeyestewa holds an ear of blue corn on Sept. 10, 2020, on his family's field at their home, located below Second Mesa on the Hopi Reservation.

David Wallace/The Republic

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The Hopi consider corn to be sacred, intertwined with the Earth and human life.

In Hopi clans, "the corn belongs to the women," Norton explained, while the men typically take care of the fields for the women. When the men plant, she said, it's like they're sowing the seeds "in our Mother Earth's womb."

At harvest time, the men turn over the corn to the women to be dried and stored.

Norton's son, Michael Koiquaptewa, has been driving down a rutted dirt road in their white Dodge pickup early in

the morning to work in the field and watch over the corn. He is 52 and previously worked at a manufacturing plant in Phoenix, helping to build power inverters for solar farms.

He returned home three years ago when his stepfather, who did much of the farming work, fell sick with cancer.

Koiaquaptewa came home partly because he wanted to help his mother and grandmother.

This spring, Koiaquaptewa began planting rows of corn by hand. He used a metal tool to dig holes several inches deep. In each, he dropped some kernels and covered them with moist soil, then dry topsoil.



Mike Koiaquaptewa holds an ear of corn from the 2019 farming season (left) and from the 2020 season.

David Wallace/The Republic

He was forced to stop planting when the coronavirus struck. In April, the virus claimed the life of Norton's mother, Treva Burton, who died a day after her 91st birthday.

Norton tested positive for COVID, as did her son, daughter and grandson. After mild symptoms including fever and body aches, they recovered.

Koiaquaptewa quarantined at home for two weeks. Then he returned to the field with a tractor and planted the rest of the corn. At the time, the ground was moist. The kernels

germinated and the plants soon sprouted from the soil.

Koiquaptewa said he felt optimistic as spring turned to summer.

The Hopi say they treat their corn plants like their own children. They nurture a connection to the plants by talking to them and singing to them.

"The whole teaching is like you're raising a child," Norton said. "You have to be there supporting. You have to be there committed to them, dedicated it to them. And you're trying to steer them in the right direction."

Norton said when she visits the field and talks to the plants, "I tell them not to give up, encourage them to have the strength to withstand whatever is coming, like the wind, the sun, the heat."

When Koiquaptewa speaks to the corn plants, he often watches the leaves waving in the breeze. "It's like they're happy and they're like dancing."

Alone in the field, he often prays.

"That's part of our religion, faithfully praying for rain," he said. "We live on prayer, our faith."

People keep small shrines in their fields. Built with stones,

the shrines face the rising sun in the east.

This summer, while Koiquaptewa hoed weeds, the cloudless skies persisted. Dry weeks became dry months. Unrelenting heat scorched the fields.

"I guess the environment, everything, really did change," Koiquaptewa said. "At 6, 7 o'clock in the morning, it's already hot. You feel the heat. ... We're hitting the 100s now, where we never used to really hit that much. And it's just dry air and winds."

Seeing the plants curling up, he would come home heavyhearted. His mother told him to have faith, that "something magical will happen" to bring a little moisture.

The few scattered rains mostly drifted around the Hopi Reservation, sprinkling elsewhere. As harvest time approached in September, smoke from the wildfires in California brought hazy skies and turned the sun red.

While the fields sweltered, the dry conditions also seemed to affect wildlife. Koiquaptewa is accustomed to scaring away crows. But this year, he also found deer and elk intruding to munch cornstalks, presumably because water sources had dried up and the animals want juices from the plants.



the side of Second Mesa on the Hopi Reservation.

David Wallace/The Republic

"I'm barely trying to save what I can," Koiyaquaptewa said, standing by a row of knee-high corn. "There's just no moisture."

He pulled an ear of corn from a dry, brown stalk. Inside, the corn was thin and paltry, with few kernels.

He bent down and dug into the earth with his hands, picking up a handful of soil, which crumbled.

"When you go underneath, it's just all dry sand," he said. "This is probably the worst I've seen."

Koiyaquaptewa's family has never irrigated their field. But this summer, he noticed some men were trucking in water collected from a well and carrying buckets in their fields.

He thought about doing the same but decided he didn't want to resort to irrigating. That would be antithetical to the traditional Hopi way, he said. And to understand how deeply tied he is to these traditions, it helps to know that his last name, Koiyaquaptewa, means Dark Gray Rainclouds, the type of dense storm clouds that roll in from the east before the rains, the type of clouds has been hoping and praying for.

"If I start bringing in water underneath our prayers, then, you

know, I might break that cycle," he said. "I kind of break the cycle of what we really believe."

Still, he hasn't ruled out the idea if the hot drought persists.

"If this doesn't improve, then I might have to start thinking of watering my own plants," he said. "But right now, I'm just going to go with what I've always done, you know, hoping things will improve."



A corn plant that died before producing ears of corn remains on a field below Second Mesa on the Hopi Reservation on Sept. 10, 2020.

David Wallace/The Republic

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After the extreme heat, an unseasonal cold snap in September froze the leaves of melon plants, leaving them wilted.

Ronald Humeyestewa hurried to pick his melons, including yellow Crenshaw melons, muskmelons and watermelons. He carried melons into his house and lined up others in his garden to give to relatives.

"I hate for my crops to go to waste. I don't want the melons to freeze," Humeyestewa said. "These are beginning to ripen, and they're very, very tasty melons."



Ronald Humeystewa uses a push-plow on July 30, 2020, to till the soil on his family's cornfield at their home below Second Mesa on the Hopi Reservation.

David Wallace/The Republic

He had watered the melons, onions and chili plants in a fenced garden. But Humeystewa didn't water his beans, squash or corn.

He tended the cornfield the way he always has. He planted the kernels by hand in the spring, taking three steps between each hole.

In July, Humeystewa tilled the field using a metal push-plow made with bicycle parts welded together. He pushed the plow between the rows, breaking through the crusty soil and uprooting weeds.

He said he prefers not to use a tractor, instead following the methods his father taught him, "using all your physical strength out there on the field — that's the Hopi way."

His daughter Rhonda and granddaughter Recca hoed weeds around the green cornstalks.

In the intense heat over the following weeks, the plants soon dried out, cutting short their growth. When a bit of rain finally fell late in the summer, it was too late.

In September, when the leaves and husks had turned golden-dry, the family began to harvest.

Humeyestewa wore gloves as he pulled a wagon behind him, its wheels squeaking as he set off on a row. His hands gripped a stalk on the tassels and he reached into the plant, the dry leaves rustling. He snapped off a corn ear and dropped it into a basket on the wagon.

As he leaned over each plant and moved to the next, he found many stalks had produced four ears. Last year, he said, the stalks were much taller and grew eight or nine ears per plant.

"This year, it's so different," Humeyestewa said.

"See how small they are?" he said, examining a waist-high blue corn plant. "The land is so dry. Just so dry."

Some stalks shriveled without producing any corn. Other farmers experienced the same thing.

"It's very, very hot this year," Humeyestewa said. "The weather we've been having is very, very strange."

Humeyestewa is 69. He is a member of the [Hopi Tribal Council](#) representing his village, Mishongnovi, and has farmed here his whole life.

He said in the past he had plentiful harvests year after year, but the rains have been diminishing and he's seeing the influence of global warming.

“Living out here for all my life,” he said, “there's a tremendous change.”

Humeyestewa said he and other people “really pray hard, hard, so that the rain clouds will come.”

Betty Humeyestewa looks over her blue corn during the harvest at her home on the Hopi Reservation on Sept. 11, 2020.

David Wallace/The Republic

Humeyestewa said he has found himself wondering lately about the dwindling rains, thinking about the stories of how the Hopi people endured severe droughts and bouts of starvation long ago.

“I always pray and hope that this will never, ever happen to our people,” Humeyestewa said. “I want them to be happy, have bountiful harvests and live a good, happy life.”

When harvest began, the whole family helped. They shucked and sorted the corn, spreading ears on plastic trays to dry in the sun. Humeyestewa's wife, Betty, took charge of the operation.

“We separate the white and blue to put them in containers when they're dry,” she said, and they also separate short and long ears.

To check if a corn ear is ready, she said, she runs her fingers over the kernels. If it makes a squeaking sound, it's still wet.

If it doesn't, it's dry.

Her daughter and granddaughter helped load the dry corn into metal cans for storage. The family saved cornhusks to cook somiviki, which are similar to tamales and made with blue corn.

Humeyestewa said he felt happy to be harvesting some corn, even if not much, and grateful that his wife had stored away plenty from previous years. Other people weren't so lucky. When his brother-in-law's field shriveled up, Humeyestewa offered to share and gave him some corn.

"I love farming," Humeyestewa said. "It's our very sustenance for our Hopi people."

And because growing corn is essential in the religion and culture, Humeyestewa said he feels certain that even in a hotter, drier future, Hopis will continue planting and carrying on these traditions.

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For many Hopi, the conviction that they're tied to dryland farming runs deep. Unlike conventional non-Native farmers who cultivate crops for profit, the Hopis have never believed in selling their crops. They never use pesticides. They describe corn as being a part of themselves, which they

offer in their prayers.

"Our traditional ways will always be there. And it's what helps us carry our people through year to year," Hopi Tribe Chairman Timothy Nuvangyaoma said in an interview. "I don't see it ever stopping. However, you know, I think we're all aware of some of the climate changes that we're all experiencing, not only here on Hopi but across the nation."

When Nuvangyaoma was growing up, he remembers there wasn't as much wind, and the winter snowstorms used to be "a lot more prevalent and a lot harder." The summer monsoons brought more rains.

"Although we still have them, they're a little bit more sparse and sporadic," he said. "We don't get the moisture that I used to see as a kid. We see some of our springs drying up. So it makes it difficult."

As parched conditions persist, Nuvangyaoma said, farmers still feel a personal attachment to their corn plants because "you treat them like your own kids."

"You go down there, you talk to them, you sing to them," Nuvangyaoma said. "And when you see them drying out at such an early age and stage in their life, it hurts because you want your kids to grow up strong and be able to produce."

The chairman acknowledged that lately some people have

resorted to hauling in water to keep their plants growing. But he said the Hopi will always have prayer and will hold on to their ways.

"In our hearts, we know this is where we live and we're going to continue surviving out here. It makes it a little bit more challenging because we rely on our mother, the corn, to sustain that life," Nuvangyaoma said. "Definitely it's hard, you know, but we're going to continue living here because we're Hopi first. And we're always going to follow who we are."

Hopi Tribe Chairman Timothy Nuvangyaoma

It's hard, you know, but we're going to continue living here because we're Hopi first. And we're always going to follow who we are.



In the November election, voters in precincts on the Hopi and Navajo reservations overwhelmingly supported Joe Biden, helping him win Arizona. During the campaign, [Biden pledged to support tribes in their efforts](#) to respond to the effects of climate change on their lands.

The hotter, drier conditions on the Hopi Reservation parallel other shifts in climate affecting farming communities all around the country. In fields and orchards, growers have been grappling with changes including less winter chill, earlier blooms and more heat waves.

Hotter temperatures not only [intensify droughts](#) but also can affect croplands in other ways. Scientists have found that [yields of many crops decline](#) when heat crosses certain

thresholds, indicating the production of both irrigated and dryland farms could suffer as temperatures continue to climb.

The authors of a 2018 [federal climate assessment](#) wrote that climate change “threatens Indigenous peoples’ livelihoods and economies, including agriculture,” and that Native American agriculture is already being affected by changing patterns of drought, dust storms, flooding and rising temperatures. They said tribes also face institutional barriers, such as limitations in government policies and programs, that “severely limit their adaptive capacities.”

Michael Kotutwa Johnson, a Hopi farmer, has studied the institutional barriers that prevent many American Indian farmers from participating in the U.S. Department of Agriculture’s programs through the Natural Resources Conservation Service (NRCS), which provides financial support to help growers implement conservation practices.

Johnson has called for expanding federal cost-share programs for farmers and ranchers on tribal lands to help them address environmental challenges and preserve their agricultural techniques.

The Natural Resources Conservation Service offers “a whole slew of soil and water conservation techniques, but they don't fit our environment,” said Johnson, a research

associate with the Native American Agriculture Fund.

“And my thing is, why do we need to prove that our techniques work when we have two thousand years of replication?” Johnson said. “There's nothing that NRCS can put up against us that is going to make us better farmers. You cannot teach a Hopi how to plant corn.”

Getting the federal agency to approve conservation methods based on Indigenous knowledge is a complicated process, Johnson said, and bureaucracy gets in the way.

Improving the federal programs to reduce barriers for participation would take changes in policy and legislation, he said, and would involve expanding a system that's geared toward conventional commodity-based agriculture to also support subsistence farmers.

Recca Lomawaima, 15, and her mother, Rhonda Humeystewa, hoe the soil around their sweet corn plants in Lower Mishongnovi on July 30, 2020.

David Wallace/The Republic

Under the 2018 Farm Bill, the USDA is required to seek out “alternative funding arrangements” with tribes for two programs (the [Conservation Stewardship Program](#) and the [Environmental Quality Incentives Program](#)), supporting conservation effort by farmers on tribal lands.

“But they haven't written regulations on that, nor have they done the outreach,” Johnson said. As a result, progress has

stalled.

Johnson previously worked for the NRCS. He later earned his doctorate in natural resources at the University of Arizona. In his dissertation, Johnson wrote that Indigenous farmers' "holistic natural resource management practices must be recognized and supported by the funding structure" of the federal programs.

Hopi farming techniques are designed to conserve soil moisture. One example, Johnson said, are the strips of vegetation that farmers use as windbreaks, which slow down the winds, reduce soil erosion and trap snow to bring moisture to the crops.

One of the great strengths of Hopi farming also lies in the corn itself, Johnson said. The drought-tolerant Hopi corn, adapted to the arid climate over centuries, can be grown with annual rainfall of only 6-10 inches a year, he said.

Johnson is optimistic that Hopi farmers, who generations ago endured long droughts, will be able to adapt to climate change. On the list of problems that could threaten Hopi farming traditions, Johnson said, climate change ranks a bit lower, after other concerns.

For one thing, he said, "we just don't have as many people farming like we used to do."

When Johnson was growing up, there were planting parties where more than a dozen people would help sow seeds in a single field.

Johnson learned to farm from his grandfather, Fred Aptvi Johnson, who told him that during the Great Depression in the 1930s, Hopis didn't feel the effects because nearly everyone was dedicated to farming.

Nowadays, Johnson said roughly 15% of tribal members on the reservation are raising crops.

"It's just waning," Johnson said. "A lot of us Hopi, we've gotten tied up into the modern conveniences of the world, like the grocery stores and everything else."

Some young people are still learning farming techniques from their elders, but Johnson said it's not happening enough.

"People just forgot their covenant that they had when they came here, that they promised to do these certain things," he said. "We need to have more people farming."



Ronald Humeyestewa collects melons in his family's garden on the Hopi Reservation on Sept 10, 2020.

David Wallace/The Republic

About 10,000 people live on the reservation, where the [per capita income](#) is about \$12,000 a year.

One of the challenges facing farmers is lack of capital, Johnson said. Some would like to buy a tractor, for instance, but find it virtually impossible to get a loan. If the federal funding programs were expanded and the Hopi could access them, Johnson said, that would help.

At the local level, there are also efforts underway to assist Hopi farmers and engage more young people in agriculture.

The [Natwani Coalition](#), a project of the Hopi Foundation that has received support from the Native American Agriculture Fund, has provided small grants to several dozen Hopi farmers to help with costs for projects related to farming.

The coalition's name, natwani, is a Hopi word with two overlapping meanings: the crops a family cultivates, and practices related to the renewal of life, such as planting.

The nonprofit group provides local schools a curriculum of lesson plans that offer children an overview of Hopi farming and encourage them to talk about it with their families.

The goal is to get young people interested so they will take up their family-oriented traditions, said Terri Honani, the Natwani Coalition's program manager, whose Hopi name is Pamösmana, or Fog Girl.

Honani has found with her own two sons, who are 16 and 18, that sometimes it's hard to get them outside taking part in

farming. But she keeps encouraging them.

“This is important to me and it’s important to you that you go out and learn,” Honani said she tells them. “It’s going to be hard work, but eventually it’s going to pay off.”



Recca Lomawaima, 15, pauses while working in the field at her family's home below Second Mesa on the Hopi Reservation on July 30, 2020.

David Wallace/The Republic

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The [Hopi villages](#) sit on three mesas, where people can see for miles across the landscape. At the bases of the mesas and on their sides lie the Hopis’ traditional water sources: natural springs that percolate out of the rocks and flow into pools.

Long ago, people built stone steps descending to springs where they could collect water. Beside these sources, people planted gardens on terraced fields. They poured water into channels running to the crops.

The water levels in many springs have declined over the years, and some have dried up.

But people continue using springs for farming, carrying buckets to water their gardens.

At a spring on the side of Second Mesa, some families this year planted corn, beans, squash and melons. They were able to harvest some of the crops, but the plants soon withered in the extreme heat.

The threats to these spring-fed gardens and to Hopi farming traditions have been some of the concerns raised by leaders of the Hopi Tribe as they've sought to clarify water rights.

Howard Dennis, Bahyouma (Water Running)

The land actually owns us when you think about it. We don't own land. We don't own water. It owns us. Because without it, we can't survive.



Representatives of the tribal government have been making

their arguments in court in a case that will quantify the tribe's rights to water in the Little Colorado River basin. The trial before the Arizona Superior Court began with virtual hearings in Phoenix in September and is scheduled to continue through January.

In preparation for the trial, two experts wrote a detailed [economic assessment](#) of the Hopi Tribe's future water needs. The report was submitted to the court last year by Michael Hanemann, a professor of economics and director of Arizona State University's Center for Environmental Economics and Sustainability Policy, and Dale Whittington, a professor of environmental sciences and engineering at the University of North Carolina, Chapel Hill.

They wrote that in the future, many traditional Hopi farming practices that rely largely on rainfall "will become increasingly tenuous." They pointed to declines in groundwater levels and springs.

"With climate change, these conditions will worsen — the Colorado River Basin will experience more severe droughts, there will be reduced surface water flows, and temperatures will be hotter," the researchers wrote. "Supplementary irrigation will become more essential as longer dry periods occur during the growing season."

Hanemann and Whittington said continuing with Hopi

farming “on the scale necessary to ensure the survival of the Hopi ceremonial and cultural traditions will require a lessening of the heavy reliance on rain-fed, dryland farming.”

They said this would be possible by bringing in water. The water allocated to the tribe would be used in new irrigated gardens around each village, they said, and individual families would take care of these plots.



Show caption Howard Dennis stands among dead corn plants on Sept. 10, 2020. Families were able to harvest some crops in gardens by the spring, but many...

David Wallace/The Republic

“Irrigation with imported surface or groundwater would supplement and partially replace the springs that have been drying up,” they wrote. Farming wouldn’t end on dryland fields, they said, but “the continuation of traditional agricultural practices at Hopi will require a shift over time towards the new irrigated family gardens.”

For now, some cornfields have continued to be productive despite the hot, dry conditions.

One morning in September, Howard Dennis visited one of his family’s fields to hoe weeds. Dennis lives in the village of Mishongnovi and his Hopi name is Bahyouma, which means Water Running.

As he walked along a row of corn, the soft powdery soil gave

way underfoot. Wind rustled in the plants. On some stalks, items intended to scare crows were hung: a black trash bag, aluminum cans, shiny pieces of aluminum foil.

"You've got to really watch your corn," Dennis said.

His relatives had erected a tent next to the field. As the harvest approached, the men often stayed long hours keeping watch, scaring away any crows or elk.

Dennis, who is a religious leader in his village, said it's important to recognize that traditional farming doesn't involve ownership of these lands.

"The land actually owns us when you think about it," Dennis said. "We don't own land. We don't own water. It owns us. Because without it, we can't survive."

Dennis said each corn plant can produce quite a lot for a family, and "as long as we eat, we're happy."

He examined one of the cornstalks.

"See the hairs out?" he said. "That mean they're almost ready."

He leaned on his hoe and chatted with a relative.

"Looking good. These ones are already getting big. They shot up," Dennis said. "This has always been a good field."

As harvest approached, people uprooted some of their best corn plants and took them to the village. The corn would once again be essential in their religious ceremonies.



Howard Dennis tends corn on a field below Second Mesa on the Hopi Reservation on Sept. 11, 2020.

David Wallace/The Republic

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The horizon had just begun to lighten when Beatrice Norton stepped out of her home before dawn. Wearing a shawl, she walked to a spot where she had a clear view of the east, facing the rising sun, and began to pray.

She held a pouch filled with homa, the ground white corn — white for purification. She took some in her hand and let it fall to the ground, making a “pathway” to the east.

She said her prayer involves giving thanks to the spirits and praying for the entire world. She prayed for peace and for an end to the pandemic.

Then she prayed for rain. And for everyone to have plenty of corn so that “we can store for the future.”



Beatrice Norton prays at sunrise while taking ground white corn in her hand in front of her home in Oraibi on the Hopi Reservation on Sept. 12, 2020.

David Wallace/The Republic

As for this year's harvest, she has told her son: "At least we got to eat some corn out of the field, and that's probably the best that we can do."

When Norton stood in the cornfield with her son, they talked about how the extreme heat and other events in the world remind them of prophecies Hopi elders used to warn about, of unknown catastrophes that could one day befall the world.

"It worries me what we're going through, even more so today because, you know, with the whole state of our world, with climate change and everything, I really feel and believe that Mother Nature is whipping us for messing with her," Norton said. "That's part of the prophecies that our elders passed down, that if we mess with her, and then if we don't have that strong belief, this is what was going to happen. And we're seeing it."

Norton said she worries the Hopi people might one day lose these farming traditions "if we don't begin to aggressively try to save what we have."

"It frightens me," she said. "And as much as I don't want to think about it, I do think about it a lot."

The thought that haunts her, as a grandmother, is what would be left for her grandchildren, and the next

generations, if the farming traditions fade and this way of life is lost.

Ian James is a reporter with The Arizona Republic who focuses on climate change, water and the environment in the Southwest. Send him story tips, comments and questions at ian.james@arizonarepublic.com and follow him on Twitter at [@BylanJames](https://twitter.com/BylanJames).

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