

# VOLCANO

Iceland's unlikely agricultural success



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# POWER

by Daniela Weil

Iceland is appropriately named. Massive glaciers cover approximately 10 percent of the country. During its frigid winters, the sun peeks above the horizon for only about five hours a day. And if the cold and dark weren't enough, rocky lava fields and a mountainous terrain stretch as far as the eye can see. Just under 20 percent of the land is used to grow crops or raise animals. Iceland seems to be one of the most unlikely places on Earth for farming. But bubbling just beneath the surface is a secret ingredient that has changed the country's food landscape.

## With a Little Help from Geysers

Pall Olafsson walks to work on his remote farm in northern Iceland. It is 11:00 a.m. in December, below freezing, and the sun has yet to rise. He opens the door to a long glass house, and steps into another world. A tropical jungle of towering vines hovers over him as bumblebees buzz all around. He's in a bright and warm tomato greenhouse. Pall hangs his coat and walks along the rows of tomato plants, checking the plump red fruits that dot the bright green leaves. How are these greenhouse plants thriving?

Atop the hill just beyond the farm, a burbling geyser spews a tower of steam up into the dark sky. Geysers and hot springs happen when a hole or crack through Earth's crust provides magma-heated water a path to the surface. The Olafsson family saw the potential for using the heat from the geyser for farming. "My great-grandfather started this farm. I am the fourth generation here," he explains. "He had the hot water in the ground and wanted to do something with it. He didn't know exactly what." Pall Olafsson's great-grandfather decided to plant potatoes. He piped the geyser's boiling water along a ditch by the plants. The hot water melted the snow and prevented the delicate greens from freezing.

Soon, the family began to rent their land to other farmers too.

In 1933, the Olafssons channeled hot water into their first greenhouse. It was a small space, and they planted some tomato seeds purchased in Holland. When they brought their first harvest to the market, curious neighbors stared at the mysterious red fruit, without the slightest idea what they were. The family saw a similar reaction in the 1950s, when they brought their first harvest of cucumbers to the market.

Today, magma-heated water from Olafsson's geyser travels through a pipe down a hill and into ten greenhouses. There, it flows up and down a network of thin white pipes close to the base of the plants, like a big, horizontal radiator, warming up the nearby air.

On the ceiling, hundreds of orange-hued lights trick plants into thinking it is summer year-round. Greenhouses in Iceland consume enough electricity to power a town of 3,000 people every day. Fortunately, geysers are also one of the sources of electricity in Iceland, allowing farmers to harvest regularly.

Thanks to a geyser and a natural hot spring, Hveravellir Farm is one of the largest producers of tomatoes in Iceland. Olafsson delivers over a million pounds a year of tomatoes, cucumbers, and peppers to Icelandic supermarkets and



A geyser heats the greenhouses at Hveravellir Farm.





Visitors enjoy a scrumptious tomato soup buffet at Fridhaimar Farm.



restaurants. “If you eat a tomato in a restaurant in Iceland, there’s a good chance it’s from us,” he says.

Knutur Rafn Armann inspects tomatoes at his farm.



### Land of Fire and Ice

For decades, most produce arrived at this remote island by ship and plane from far corners of the world. This made fresh food very expensive.

Between 2008 and 2010, Iceland experienced a double whammy. First, the country lost most of its money during a global economic crisis. So many people couldn’t afford imported food. Then, the historic eruption of Eyjafjallajökull Volcano in 2010 isolated the island from its food sources for many weeks. Many Icelandic farmers realized they had to make greater efforts to grow their own food.

Today, Icelandic greenhouses produce about 60 percent of the tomatoes and lettuce, and almost every cucumber in the country, thanks to the power of volcanic activity.

Iceland sits smack in the middle of the Mid-Atlantic Ridge, a fault line that separates two giant tectonic plates. About half of the island lies on the North American side of the plate and the other half on the



Sterilizing shoes before entering an Icelandic greenhouse keeps crops safe from outside diseases.

the ridge’s icy peaks sustain hundreds of glaciers. In some places along the ridge in Iceland, magma and gases continue to escape through cracks and fissures, creating about 130 volcanoes. It is an incredible amount of both fire and ice sharing a landmass the size of Virginia.

In addition to the volcanoes, around 30 geysers and countless hot springs gurgle across the island, particularly along the ridge. Early settlers used these hot springs for cooking, heating, and washing. Today, magma-heated water provides Iceland with another benefit: geothermal energy, which provides



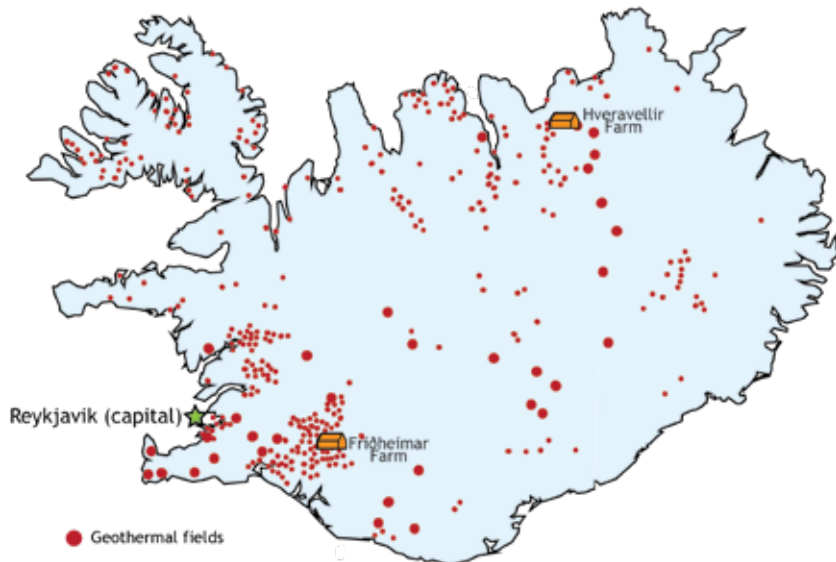
Tourists relax in a hot lagoon. Its water is a byproduct of the world’s first power plant that generates energy from Earth’s inner heat—a system known as geothermal.



Pipes transport geothermal energy across the island nation.



## Map of Geothermal Fields in Iceland



both heat and electricity. Pipes transport water from thermal pools around the island to heat the air and water of most homes, businesses, and greenhouses. Iceland's six geothermal plants use steam from geysers to spin turbines and provide about a quarter of the islands' electricity needs. The rest comes from turbines spun by powerful waterfalls and wind. In Iceland, 100 percent of the electricity is green, compared to about 17 percent in the United States.

### When Life Gives You Tomatoes, Make Tomato Soup

It's lunchtime at Fríðheimar Farm. The parking lot is packed with cars. Tourists from all over the world stop at this sleek glass greenhouse to eat a very special bowl of Icelandic tomato soup.

In 1995, the farm's married owners, Knutur Rafn Armann and Helena Hermundardottir, eagerly searched for a place to put their agriculture and horticulture degrees into practice. They found an old, abandoned greenhouse located on a small farm. Warm steam rising from the ground with the odd smell of rotten eggs (common near hot springs) gave them hope for success.

Over the years, the couple and their five kids built Fríðheimar into a successful tomato farm. In 2008, they took another risk. "We opened up our greenhouses so people could see how it's possible to grow tomatoes every day of the year here in Iceland," Armann recounts. When they noticed tourists



were fascinated by volcano-powered farming, the family created a restaurant nestled right among the rows of tomato plants. Their bottomless buffet of fresh tomato soup, green tomato pie, and tomato ice cream became famous around the world.

Armann wanted Fríðheimar to be a food experience, where guests could understand the story of their food. "People can see everything from the menu is growing right here beside them. When people see the food growing, it tastes a little bit different," he says.

Technology also has a hand in Icelandic farming's success story. Greenhouse computers link to weather stations and the wireless network. Wherever he goes, Armann can control the watering, temperature, light, minerals . . . all from his phone. "With the good help from our nature and technology, we can make a perfect day for the plants every day of the year. Iceland becomes a perfect country to grow any vegetables year-round," says Armann.

Volcanoes can be a blessing or a curse. "You know the geothermal energy is a gift when you have it. But one earthquake can change all the systems, and the hot water can stop or go somewhere else," admits Olafsson. But for now, at least, Iceland's greenhouses are harvesting their blessings.

**Daniela Weil** (left) is a biologist, author, illustrator, and foodie who loves to travel and write about the cool things she learns. She would never have passed up the opportunity to eat a juicy Icelandic tomato inside a geyser-powered greenhouse during her summer vacation.