How America's Diet Is Feeding the Groundwater Crisis

UNCHARTED WATERS

As dinner tables and snack menus feature far more chicken and cheese, farms are expanding where water is scarce.

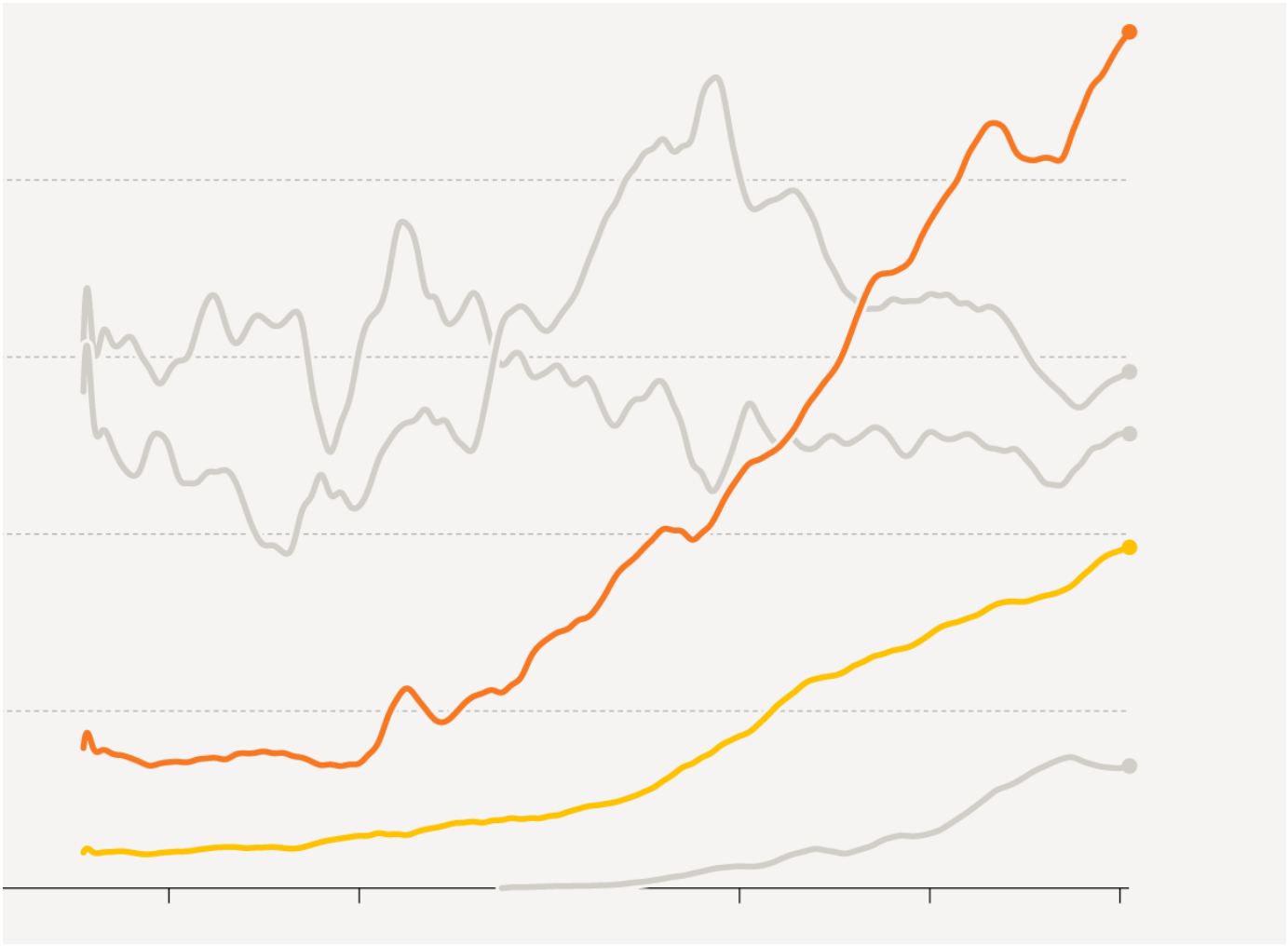
America's striking dietary shift in recent decades, toward far more chicken and cheese, has not only contributed to concerns about American health but has taken a major, undocumented toll on underground water supplies.

The effects are being felt in key agricultural regions nationwide as farmers have drained groundwater to grow animal feed.

In Arkansas for example, where cotton was once king, the land is now ruled by fields of soybeans to feed the chickens, a billion or so of them, that have come to dominate the region's economy. And Idaho, long famous for potatoes, is now America's largest producer of alfalfa to feed the cows that supply the state's huge cheese factories.

Today alfalfa, a particularly water-intensive crop used largely for animal feed, covers 6 million acres of irrigated land, much of it in the driest parts of the American West.

These transformations are tied to the changing American diet. Since the early 1980s, America's per-person cheese consumption has doubled, largely in the form of mozzarella-covered pizza pies. And last year, for the first time, the average American ate 100 pounds of chicken, twice the amount 40 years ago.



It's not just Americans eating more American-made meat and cheese. Exports of poultry and dairy have risen more than tenfold since 1980, thanks to America's farming efficiency, combined with government subsidies and rising demand from countries like China. Exports of animal feed itself have soared, too, industry data show.

Most of America's irrigated farmland grows crops that don't directly feed humans but instead are used to feed animals or to produce ethanol for fuel. And most of that irrigation water comes from aquifers.

Those crops have expanded into areas that don't have enough water to sustain them, affecting some important aquifers across the country by contributing to groundwater overuse. Aquifer depletion for animal feed is occurring in places including Texas, the Central Valley of California, the High Plains in Kansas, Arizona and other areas that lack enough water from rivers and streams to irrigate the crops.

Irrigated acreage for corn, about half of which goes toward animal feed, jumped sixfold between 1964 and 2017, federal numbers show. Irrigated acres for soybean, mostly used for animals, has jumped eightfold.

Cheese delivery system.

Eric Helgas for The New York Times

Alfalfa in Idaho.

Matthew Hamon for The New York Times

"The seemingly simple task of deciding what to eat is, in reality, intricately woven into a complex tapestry of interconnected factors," said Mesfin Mekonnen, a professor of environmental engineering at the University of Alabama who studies the water footprint of food. While there's been growing awareness of issues like greenhouse gas emissions from ranching and agriculture, he said, "water usage in food production is still an aspect that is not widely discussed."

The toll on aquifers, which supply 90 percent of America's water systems, has been devastating. A Times investigation this year revealed that many of those aquifers are being severely overtaxed by agriculture and industry, and that the federal government has left oversight to the states, where tangles of rules are failing to protect those aquifers.

Food choices have long led to debates not only about personal health, but also animal welfare, cultural expectations and the role of government regulations in shaping people's diets. The damage that animal agriculture is doing to fragile aquifers, while less documented, is particularly important: The decline of the aquifers could affect what Americans eat, and potentially become a threat to America's food supply.

Dairy Farmers Head to the Desert

In the early 1990s, dairy farmers in California found themselves increasingly squeezed by suburban sprawl, rising costs and regulations. Some began looking for a new place to set up shop, and the criteria were simple: Cheap, wide open land. Fewer rules. And access to plenty of water.

For many farmers, the answer was easy.

"We liked Idaho," said Arie Roeloffs, who left California. He opened a dairy farm with his in-laws a hundred miles from Boise and is now vice president of the Idaho Dairymen's Association.

Idaho now has about 700,000 dairy cattle, more than any other state save California and Wisconsin. That shift has transformed the countryside. Drive across the high desert of southern Idaho, a mostly barren landscape of pale-brown sagebrush, and you'll find sprawling cattle yards and emerald-green fields of alfalfa, grown to support one of the largest collections of dairy farms and cheese factories in the United States.

The transformation is all the more striking for the harshness of the land. This part of Idaho, where the Snake River curves south and west around the Sawtooth Mountains, gets just 10 inches of rain a year. Pumping groundwater has helped Idaho accommodate the influx of dairy farms and feed crops.

Idahoans call this area the Magic Valley. "You put water to it," said Steve Stuebner, spokesman for the Idaho Department of Water Resources, "and everything grows."

But more than four-fifths of monitoring wells in Idaho have shown a significant decrease in water levels since 1980, according to data compiled by The New York Times. Some 79 percent of monitoring wells hit record lows in the past decade alone. Both figures are the highest in the country.

The interplay between the Snake River and groundwater is complex, and there are several reasons that aquifer levels have been declining in recent decades, including not only overpumping but also changes in the way that farmers irrigate their fields. Nevertheless, today aquifer levels are far below where they were 50 years ago. And they continue to fall.

"We've been using more water than we've been putting back into the aquifer," said Brian E. Olmstead, a member of the Idaho Water Resource Board and a former farmer. "Everybody thought, this was such a huge resource, we can't ever deplete it."

Since the 1990s, major international cheese producers like Glanbia of Ireland, Lactalis of France and Agropur of Canada have all bought or built processing plants in Idaho. Glanbia has four plants in the state, which use 4.3 billion pounds of milk a year.

In a statement, a spokeswoman for Glanbia, Martha Kavanagh, said, "We are very conscious of the significance of the Magic Valley aquifer to our supply chain," adding that the company is working with suppliers to reduce its environmental impact.

Idaho recently joined Wisconsin and California in an elite club: States that produce at least 1 billion pounds of cheese annually. If all the cheese made in Idaho were eaten in Idaho, the average Idahoan would need to consume more than 500 pounds a year.

The valley's biggest city is Twin Falls, bordered on the north by the Snake River Canyon, which Evel Knievel tried to jump in 1974 riding what resembled a rocket. (He was not successful.) Now the city has a new claim to fame: It is the center of Idaho's dairy industry. Chobani opened one of the country's largest yogurt factories there in 2012. Glanbia, too, has a cheese processing plant in the city.

But each pound of cheese produced requires, on average, 10 pounds of milk. And the cows producing that milk need to eat high-protein foods, including alfalfa. In the Magic Valley, growing alfalfa can consume significantly more water than potatoes, barley or wheat, according to data compiled by the University of Idaho.

As the dairy industry has exploded through the Magic Valley, "it's changed the crop rotation from low-water-use crops to high-water-use crops," said Dean Stevenson, a farmer and member of the Idaho Water Resource Board.

Brian E. Olmstead in a Twin Falls tunnel carrying aquifer water.

Matthew Hamon for The New York Times

Springwater near Twin Falls.

Matthew Hamon for The New York Times

When asked about the dairy industry's role in groundwater overuse, Rick Nearabout, chief executive officer of the Idaho Dairymen's Association, said his industry wasn't Idaho's only source of demand for alfalfa. Some is fed to beef cattle and some is exported.

He also said there were economic arguments for Idaho having a large dairy industry. The state's relatively temperate climate is more comfortable for cows than places like Wisconsin, a fact that reduces costs because cattle can be kept in open lots instead of barns.

And low-cost dairy products have a social benefit, said Marissa Watson, vice president of sustainability for Dairy West, which represents farmers in Idaho and Utah. Dairy is "a really affordable protein," particularly compared to less water-intensive but far costlier dairy alternatives like oat milk, she said. When food insecurity is part of the equation, Ms. Watson said, "you're having a very different conversation."

The Idaho State Department of Agriculture did not respond to a request for comment. A spokesman for the Idaho Farm Bureau Federation, Sean Ellis, said that "using our natural resources, including water, to produce an abundance of crops makes a lot of sense."

Water regulators are struggling to respond to the decline in the state's aquifer. The state has invested millions of dollars to direct more water into the aquifer, especially during wet years. But it's not enough. This past April, officials said farmers had to reduce groundwater use or risk mandatory cuts.

"There's two kinds of people in the desert: those that fought for their water, and those that don't have any water," Mr. Olmstead of the water board said. "We can't keep using more than we have."

The Chicken Industrial Complex

Arkansas is America's chicken headquarters.

It is home to the world's biggest chicken company, Tyson, and also to thousands of producers that get baby chicks and feed from Tyson and fatten them up for Tyson to turn into chicken breasts, chicken nuggets and chicken patties.

Overall, chickens are the state's largest agricultural commodity, valued at an estimated $6.3 billion last year, more than double the value just a decade ago.

As a result, soybean acres have soared over the decades, becoming the state's largest row crop, nearly all grown on land irrigated with groundwater. Corn acreage has increased as well, also using groundwater. Taken together, corn, soybean, and water for poultry operations account for more than half the state's water use. Then there's the state's most famous crop: rice, also grown with groundwater.

That has stressed what was once a bountiful aquifer.

In fact, when Scott Matthews's ancestors settled here a century ago, there was so much water under the ground that you could drive a pipe into the earth and strike water.

No more. He now describes the area as "ground zero" of the state's groundwater woes. "Our aquifer is slowly depleting every year," he said. "It's going away."

Almost two-thirds of the state's aquifer-monitoring wells show a decrease in water levels since 1980, one of the worst rates in the country.

This part of the Mississippi River Valley is not a dry, arid place. It rains plenty, but in winter. Not when the crops need it. Rivers lace the land, but farms have popped up far from rivers.

So, farmers have long relied on the shallow Alluvial Aquifer for water in the scorching summers. They've flooded rice fields some years, rotated with corn and soy the following years.

It adds up to hundreds of gallons of water used to produce each grocery-store rotisserie bird. Though beef remains the most water intensive meat, the huge increase in consumption of less expensive chicken contributes to the high water intensity of the American diet.

The Eat Lancet Commission, a global panel of health and climate experts that has recommended modifying people's diets in order to reduce health risks and to help protect the environment, suggests roughly 25 pounds of chicken consumption a year, about a fourth of what the average American eats.

Industrially grown chicken has a number of environmental issues, including the vast amounts of chicken waste it produces, which can contribute to water pollution. The industry, however, correctly points out that the effects of chicken production on climate emissions and water use are far lower, per calorie, than those of beef, lamb and dairy.

"We are proud of our state's livestock and poultry industry," Wes Ward, the Arkansas secretary of agriculture, said in response to questions about the effects of the industry on groundwater. He also noted the industry's role in "a healthy human diet."

Drive across the Mississippi River to Western Tennessee and the land turns to softly undulating hills. Oak trees cluster together. The houses stand apart. There are small pastures of sheep and cattle. "God knows your thoughts," reads a yard sign.

Scott Matthews and a deep-water pump on his land.

Rory Doyle for The New York Times

A new reservoir on Mr. Matthews's property.

Rory Doyle for The New York Times

Turn left on a narrow road, and the landscape changes. Eight airplane-hangar-size barns stand in a row, and eight more across the road. A Tyson sign at the entry reads, "No admittance." "Bio secure area," reads another. Tyson is expanding in the state.

"It's not a farm" said Thomas Gorden, who lives less than a mile away. "It's a factory." Sometimes the air is thick with the smell of chicken manure, an odor that Mr. Gorden described as "stout."

In a Tennessee court, the Southern Environmental Law Center, which litigates on environmental issues, is challenging some of the federal benefits that chicken farming receives, such as loan guarantees, asserting that they are illegally "subsidizing industrial chicken operations." Tyson didn't respond to requests for comment.

For his part, Mr. Matthews, the Arkansas farmer, said he was taking steps to conserve groundwater, with financial support from the government. He has turned some of his farmland into a pond to catch the rains and built narrow ditches along his fields to catch what water runs off.

All this because there may not be enough free water left underground for long. "You can always look in hindsight and say things should have been done different. But who actually knew?" he said. "It's a business."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Additional sources:

Water Use in the United States, U.S. Geological Survey (2023); Aquifer shapefiles from U.S. Geological Survey and Idaho Department of Water Resources.

"The Cost in Water of Popular Foods" data from Mekonnen, Neale, Chittaranjan, Erickson, and Hoekstra, Water productivity in meat and milk production in the U.S. from 1960 to 2016, Environment International (2019), and a study under preparation from Mekonnen on the water footprint of major crops in the U.S.