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Scientists Are Racing to Protect Grass From Climate Change. Your Cheap Burger Is at Stake.

By *Mike Cherney* [Follow](#) | *Photographs by Ruth McDowall for The Wall Street Journal*

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HAMILTON, New Zealand—Scientists here are betting that a small field surrounded by cattle farms will help to solve a crucial problem threatening the global food supply: how to keep the grass and other plants that livestock eat in pastures from wilting under extreme heat and drought.

The field is part of an experiment that aims to develop new varieties of pasture plants that can tolerate high temperatures, less rain and more variability in the weather that is expected from climate change. Researchers around the world, from the U.S. to Europe, are racing to conduct similar trials with their own local grass species.

Some scientists warn there is no easy fix. A plant variety that ends up working well in one spot might not be suitable just a few miles away.

At stake is how much food prices might rise as the planet warms. Less grass growing in pastures would mean that farmers either have to spend more on buying feed for their herds, or reduce the number of animals on their farms. That could lead to more expensive food for consumers, who have already endured high prices due to disruptions to grain shipments and fertilizer exports from the war in Ukraine in recent years.

“If pasture becomes less productive, prices would be expected to rise, not just for meat, wool and dairy products but also for cereals and other food commodities that would see an increase in demand for use as feed,” said Keith Wiebe, an agricultural economist and former U.S. Department of Agriculture official who is now a senior research fellow at the International Food Policy Research Institute in Washington.



The impact of climate change on pastures is particularly important for New Zealand, the world's largest dairy exporter and one of the biggest sellers of meat to the U.S.

Predicting exactly how climate change will affect food prices over the long run is tricky, some economists say, but they expect more short-term price fluctuations as severe weather events become more common. In general, climate change is expected to be a drag on agricultural productivity, but various adaptation measures could moderate some of the impacts—making research into plants that can survive droughts or heat waves crucial.

This year, rice and sugar prices have risen amid concerns that the El Niño weather pattern—which generally brings hot and dry conditions—would hurt harvests in Asia. In the U.S., beef prices will approach record levels in 2024 and 2025 as factors including drought push farmers to reduce their herds or

consider exiting the business altogether, according to a recent report from an American Farm Bureau Federation economist.

“We always talk about average change in temperature, but really what matters the most is these extremes—these heat waves that happen for just a couple of weeks time, or this drought that will happen for a month,” said David Ubilava, an associate professor and agricultural economist at the University of Sydney. “Those factors that typically drive spikes in prices will happen more frequently.”



A pasture research site near Hamilton, New Zealand, left, is surrounded by farms.

In the U.S., one group of researchers is investigating how an alfalfa and orchard grass mix fares as temperatures rise. Preliminary findings suggest that warmer temperatures can increase the yield of the alfalfa and orchard grass combination, but only in years where there is adequate precipitation. Farmers often mix grasses with legumes in their

fields, as the legumes provide extra protein to the animals and improve soil fertility.

“A pasture in a low-lying area may be impacted very differently by a short-term drought compared to a nearby pasture on a slight rise or on a different soil type,” said Richard G. Smith, a professor who focuses on agricultural ecology at the University of New Hampshire, and who is working on the research. “What is likely needed now more than ever are efforts to develop more locally adapted cultivars.”

The impact of climate change on pastures is particularly important for New Zealand, the world’s largest dairy exporter and one of the biggest sellers of meat to the U.S. Historically, its climate of moderate temperatures and high rainfall has been ideal for growing grass. Last year, however, was New Zealand’s warmest year on record, according to government data.



Davina Keen, a sheep and alpaca farmer, struggled with paying extra money for hay and pellets to feed her animals after an intense drought. PHOTO: MIKE CHERNEY/THE WALL STREET JOURNAL

Sheep and alpaca farmer Davina Keen knows how difficult it can be to make the right bets. A few years ago, Keen seeded some of her fields in northern New Zealand with plantain and chicory—two plants that are more resistant to dry conditions than the grass that livestock typically eat. But a drought hit that was so intense that it wasn't enough to keep her animals fed. Keen and her husband had to spend the equivalent of \$6,000 on hay and food pellets, which was a big financial blow for her small farm.

“We do get regular reports, especially further north in New Zealand, of cases where heat has either knocked pastures out or severely reduced their growth and productivity, to the point that it's compromising the overall performance of the farm,” said Brent Barrett, a senior scientist in the plant genetics team

at AgResearch, a government research institute. “The projections are that this is going to be much more common in the future.”

In the New Zealand trial, government researchers such as Barrett, seed companies and other industry groups are working together to develop ryegrass and white clover—two species commonly grown together in New Zealand’s fields—that will be more resilient to climate change.



Brian Maw, a research operations manager for PGG Wrightson Seeds, said, ‘The idea is to find the best genetic combinations of the plants that give us the traits that we want.’

The researchers used a method called genomic selection, which involved gathering genetic and trait information from the plants, and then developing a computer model to predict which combination of genes are likely to have benefits. Now,

they are observing the plants in the field to see how those predictions play out.

“The idea is to find the best genetic combinations of the plants that give us the traits that we want,” said Brian Maw, a research operations manager for PGG Wrightson Seeds, as he walked through a test pasture for the project where dozens of plots of ryegrass and clover mixtures are growing.

For some pasture plants in some areas, yields might actually increase as warmer temperatures allow for longer growing seasons, and higher carbon dioxide levels in the atmosphere support more photosynthesis. But reduced rain and severe weather can outweigh those benefits, and some studies suggest that nutritional quality of pasture plants could fall.

If scientists can't develop more heat and drought-resistant pasture plants, “it's going to become very expensive to maintain herds, because the quality of the forage will just decline to the point where most of the expense of running an operation will come from supplemental feeding,” said Amber Churchill, an assistant professor of ecosystem science at Binghamton University, part of the State University of New York. “That's going to be what starts breaking those operations.”



A researcher in New Zealand demonstrates how plants in the field are observed.

In the fields at Richard Kidd’s sheep farm northwest of Auckland, New Zealand’s biggest city, standing pools of water were still visible last month, evidence of all the rain the region had recently received. A cyclone that hit earlier in the year caused landslides on the property, which Kidd said he hadn’t seen before in his decades at the farm.

Now he is preparing for a possible drought by growing chicory. If his fields become less productive, he might need to eventually consider reducing his herd size, he said.

“I’ve noticed a change in 40 years farming here. Any weather pattern event is a lot more severe,” he said. “It’s the wettest year probably I’ve ever had here, and now they’re talking it’s going to be so dry. So talk about extremes.”

Write to Mike Cherney at mike.cherney@wsj.com