Weather Satellite.

WEATHER SYSTEM REVAMP HOPES TO BRING SUNSHINE TO US ECONOMY

Debbie Carlson
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Farmers have been obsessed with weather for thousands of years. Ancient Greeks and Babylonians sought guidance on planting and harvest by surveying the sky for patterns in clouds and stars and by communing with gods – through prayers and animal sacrifices. Modern-day farmers, such as Steve Pitstick, a fifth-generation farmer in Illinois, count on sophisticated instruments for predicting the weather instead.

During the planting season, Pitstick says, he checks the weather forecast three or four times a day. Too much rain means he can't plant because the heavy machinery will compact the wet soil, smothering the seeds; too little and the seeds won't germinate.

"Weather is huge in our business. We use the forecast during planting season to get a sense of what we're doing and to know the level of urgency to get the crops planted," says Pitstick, who grows corn and soybeans.

Weather is big business in many other industries, too, and an ambitious plan is underway to revamp the country's weather forecast system. It's the Weather Research and Forecasting Innovation Act of 2017, the first major weather legislation that Congress has passed since the early 1990s.

The legislation empowers the National Oceanic Atmospheric Administration (NOAA) to boost its ability to predict major weather-related events, such as hurricanes, droughts, floods and wildfires. To accomplish that, NOAA plans to use new technology and data and to work more closely with academic and industry groups. It will also aim to improve the public warning system, such as issuing alerts earlier or using new technology for broadcasting those messages.

NOAA, which runs the National Weather Service, is the primary government agency that collects and analyzes weather data. It holds the world's largest archive of weather and climate data, which is widely used by other public agencies, businesses and academic institutions. For example, solar and wind farm operators rely on weather data to help them forecast their electricity generation. Some tech and insurance companies rely on NOAA data to develop the software for predicting crop yields or flood risks.

The forces of nature can cause a heavy financial toll. Even routine weather such as rain and cooler-than-average days can have an annual economic impact of as much as $485bn in the US, as it affects every economic sector, the National Center for Atmospheric Research says.

Some industries see more impact than others. For airlines, weather caused 32.05% of flight delays, according to March data from the Bureau of Transportation statistics. One minute of a delayed flight costs airlines $65 on average, according to Airlines for America, an advocacy group. Already, the US experienced five weather and climate disasters where losses exceeded $1bn between 1 January and 6 April this year, says the National Centers for Environmental Information.

"I think the whole economy is going to benefit" from the new law, says Barry Lee Myers, chief executive officer of Accuweather. Industries such as transportation, which may see fewer delays in moving goods to stores and less food spoilage, he notes.

The new law doesn't inject more money into NOAA's budget; it simply directs NOAA to prioritize weather research, says Keith Seitter, executive director of the American Meteorological Society. Congress will have to decide whether to fully fund the research over the next five years.

Weather prediction has improved since humans began methodically catalog and analyze their observations. Five-day forecasts today are as accurate as four-day forecasts were 10 years ago. Using faster, more powerful computers and more detailed data of weather patterns could increase the accuracy, Seitter says.

"If you look back through time and look at the improvements in our forecasting capabilities, it tracks pretty tightly with bigger, faster computers. Every time there's an upgrade in computing power, the models become better and more accurate and that improves the forecasting process," he says.

NOAA already collects massive amounts of data from sources including its own satellites. But lawmakers want the agency to save money by paying for private data rather than launching new satellites, especially when an increasing number of private satellites have be dispatched in recent years, some capturing different or richer sets of data than those from government satellites.

"I think using the data from private satellite sources and private instrumentation, we can perhaps make in a relatively short period some nice advances in tech and nice advances in our forecasting ability," says House Republican Frank Lucas of Oklahoma, a sponsor of the weather legislation.

The new law directs NOAA to improve forecasts ranging from two weeks to two years, which has traditionally been a benchmark for weather prediction for farmers.

The current atmospheric models provide highly accurate forecasts for up to 10 days, says Antonio Busalacchi, president of the University Corporation for Atmospheric Research, a consortium of more than 100 colleges and universities in North America. To extend that, meteorologists will start including measurements such as heat stored in the oceans and soil moisture levels on land.

Heat influences the intensity of storms and rainfalls and moves slower through oceans than it does in the air. Using additional heat data will help meteorologists better understand how earth interacts with its atmosphere. The resulting longer-term weather cycles will then help them build computer models that create more accurate seasonal forecasts, Busalacchi says.

"It's something we don't do routinely right now. That's why it's a whole new era of forecasting capability," he says.

Results from closer research collaboration could have significant business impacts.

Jeff Waters, a climate expert and product manager at RMS, which assesses risks of catastrophic events from hurricanes to terrorism, says the new research can help his

firm to better calculate risks and design more effective responses for his customers, which include insurance companies.

Waters notes that after Hurricane Andrew hit Florida in 1992, more than 10 insurance companies became insolvent because they weren't prepared to handle the severity of the damage caused by the storm.

Businesses have been able to access accurate, customizable weather forecasting online only in the last decade or so, says Bill Gail, chief technology officer at private forecaster Global Weather Corporation. Xcel Energy, who uses Gail's firm to anticipate wind energy production, improved its wind forecasting accuracy by nearly 35% from 2009 to 2015. That improvement contributed to $60.6m in fuel savings (fuels that would otherwise be needed to keep natural gas power plants ready in case the wind farms didn't produce enough to meet demand).

Weather forecasting data is still underused, Gail says, citing a study by the US Department of Transportation showing weather-related delays adds $3.4bn to freight costs annually. Even "if you could only reduce the impact of severe weather by 5 or 10%, the economy will grow in a noticeable way. It's huge," Gail says.