

'We are creating new crops five-times faster'

By Suzanne Bearne, Business reporter

Like the bosses of many food companies, Jeremy Bunch is worried about the impact of climate change on his business.

"Weather and the climate are maybe the number one risk to our company," says the boss of US flour firm Shepherd's Grain.

Based in Idaho, the business sources wheat from farmers across the US Pacific northwest. As weather patterns become more unpredictable, Mr Bunch says: "I need to have a plan B, and plan C, in case plan A fails."

To help strengthen these plans, Mr Bunch's company is now using an AI-powered software system called ClimateAi.

Using current and past data, such as from satellite imagery and temperature and rainfall readings, and combining that with future projections, ClimateAi aims to give farmers the most accurate possible, locally-tailored weather forecasts, from one hour to six months ahead.

It then advises on exactly when to plant and harvest particular crops, and predicts their yields.

Shepherd's Grain only started using ClimateAi last year, but already most of its 40 plus farmers are now being guided by the app.

"They're beginning to look at ClimateAi to help them plan for crop management decisions in their wheat crops, the primary crop grown in the region," says Mr Bunch.

"A forward look at the weather helps our growers decide which crops to plant. The platform knows when to plant, and when the crop will start flowering and producing seed."

One of the biggest problems facing the seed industry is how to launch climate resilient seeds to market faster and cheaper, says Himanshu Gupta, chief executive of San Francisco-based ClimateAi.

"By the time some seed companies do this, in say 10 to 15 years, the climate has already changed," says Mr Gupta. "We are running against time to launch new seed varieties." He says that ClimateAi helps these firms to see how specific test seeds have performed in a particular region or locality. "This can help seed companies figure out the optimal locations for growing seeds."

Last year, a study published in scientific journal Nature warned of the potentially dire consequences of numerous crop failures happening at the same time around the world, as a result of the impact of climate change.

"Simultaneous harvest failures across major crop-producing regions are a threat to global food security," said the report, which was led by climate scientist Kai Kornhuber from Columbia University's Lamont-Doherty Earth Observatory.

This warning comes as the world population is expected to reach 10 billion people by 2050, up from eight billion currently, according to the United Nations.

With increased pressure on crops, at the same time as the global population continues to grow, could AI be key to developing new varieties that can better cope with extremes of weather?

In the city of Arusha in Tanzania, David Guerena, agricultural scientist at the International Center for Tropical Agriculture, is leading a project called Artemis.

Funded by the Bill and Melinda Gates Foundation, this is using AI to help breed more resilient crops. Specifically the AI is helping speed up work called phenotyping.

This is the visual studying of new crop varieties based on observations of their characteristics, such as how many flowers, pods or leaves that a plant has.

“Traditionally it takes around 10 years to develop a new crop variety,” explains Mr Guerena. “But given the pace of climate change, this timeframe is no longer viable.”

He adds that the phenotyping work traditionally relied on the human eye. “But humans are just not doing this consistently, with the high levels of precision necessary, to make subtle, yet important, plant selections,” says Mr Guerena.

“It can be over 30°C in the field. It’s just tiring, and fatigue affects data quality.”

Instead, growers involved in the project are taking photos of their crops through an app on a smartphone. The trained AI can then quickly analyse, records, and reports what it sees.

“Computers can count every flower or pod, from every plant, every day without getting tired,” says Mr Guerena. “This is really important as the number of flowers in bean plants correlate to the number of pods which directly influence yields.

“Data can be so complicated, to understand what’s happening, but AI can be used to make sense of that complicated data and pick up patterns, show where we need resources, show recommendations.

“Our plant breeders estimate that with the better data from the AI computer vision they may be able to shorten the breeding cycle to only a few years.”

In North Carolina, Avalo is an agriculture technology or “agri-tech” business also working to create climate-resilient crops. It does this by using AI to help study a crop’s genetics.

“Our process starts with genomic data about crops, for example, the sequences of various varieties,” says Rebecca White, Avalo’s chief operating officer.

“For example, with different tomatoes, there’s some small differences in genomes that give them different traits, for example different flavours, pesticide-resilient profiles. Our machine-learning programme is able to take these small differences across a number of varieties and see which genomes are important for what traits.”

Using their tech they have been able to create a broccoli that matures in a greenhouse in 37 days rather than the standard 45 to 60 days, says Ms White.

“Broccoli produced on that timescale can get additional growth cycles, and it saves carbon footprint and improves the environmental impact.”

Avalo, which works with companies in Asia and North America, is also working to make rice resistant to frost, and potatoes more tolerant to drought.

“Our core technologies can identify the genetic basis of complex traits with minimal training and, via sequencing and predictive analysis, quickly and inexpensively assess and model new plant varieties,” says Ms White.

“We are creating new varieties for diverse crops that are developed five-times faster and for a fraction of the cost compared to traditional breeding.”

However, while AI can help mitigate the impact of climate-related weather, and enhance crop resilience, there are a number of challenges when it comes to using AI in agriculture, says Kate E Jones, professor of ecology and biodiversity at University College London.

“The effectiveness of AI in ensuring food security also depends on addressing challenges such as data quality, technology accessibility... while acknowledging that AI is one tool among many in a comprehensive strategy for sustainable and resilient agriculture.”