Latin American trial heralds methane-free rice

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The challenge of producing rice that reduces methane emissions and uses water efficiently is now a reality in Colombia. In the photo, a technician takes a sample of gases in the alternating irrigation experiments in Tolima. Credit: Cortesía de Fedearroz

New approaches to managing rice systems in Latin America are proving effective at reducing water usage and cutting back the high greenhouse gas emissions from a crop that feeds nearly half the world's population.

Using traditional rice production, paddy fields are flooded to stop weeds growing, which then produces methane as organic matter decays underwater without access to oxygen.

Methane is a potent greenhouse gas, and global rice production generates 12% of all man-made methane, contributing 1.5% of overall global warming, according to the Asian Development Bank.

Rice researchers have now found a way to adapt a method of intermittent irrigation in order to make it work in Colombia, cutting greenhouse gas emissions.

"Colombia is an agricultural country that has set out to reduce its greenhouse emissions by 50% [by 2030] and techniques such as adapted AWD can help meet that goal, at least when it comes to rice production," explains Sandra Loaiza, from the alliance between Bioversity International and the International Centre for Tropical Agriculture (CIAT), who led the research.

The approach is an adaptation of a technique known as alternate wetting and drying (AWD), where rice paddies are flooded and then left to dry.

Laughing gas

AWD was developed in Asia by the International Rice Research Institute in the 1970s. The original version reduces methane release but promotes the formation of nitrous oxide—also known as a laughing gas—a potent contributor to global warming.

Loaiza and her team faced the challenge of inhibiting both gases simultaneously.

Under standard AWD, the water level is allowed to fall to 15 cm below

the soil, whereas in the new approach, developed in the Saldaña Municipality in the Tolima region, in the west of Colombia, the water is replenished sooner, resulting in lower stress and greater yields for the variety of rice used—Fedearroz 67.

"We adjusted the AWD to allow water to descend five and ten centimeters below the soil," explains Loaiza.

Normally fertilization is carried out when the field is flooded. However, this means fertilizer is dissolved, resulting in the release of nitrous oxide.

Under the adapted method, fertilization is carried out when the soil is damp, reducing nitrous oxide emissions.

Now the National Federation of Rice Producers, Fedearroz by its acronym in Spanish, in the country is conducting additional tests to validate the outcomes on a larger scale.

The approach has the potential to be replicated in other Latin American countries, as it reduces water demand and greenhouse gas emissions, without sacrificing yields.

"The relevance of this work is that it generates local hard data," explains Edwin Barrios Gómez, from the National Institute for Forestry, Agriculture and Livestock Research in Mexico. He acknowledges that the bulk of information on rice management is primarily obtained from Asia.

He tells SciDev.Net that the experience shows that rice doesn't need to be flooded all the time and that "we could reserve water for the most critical stages of the crop."

According to the researcher, who didn't take part in the experiment, it

stands out for facilitating knowledge transfer.

"It is said that the problem with technologies like AWD is the lack of adoption, but many times it is because the solutions stay in universities or greenhouses," adds Barrios Gómez.

According to the Food and Agriculture Organization of the United Nations (FAO) database, 117 countries and territories cultivate rice, with 25 of them located in Latin America and the Caribbean.

Agriculture consumes 70% of the global freshwater supply and the rice sector hoards up to 43% of that.

"Rice is one of more attacked [crops] for its water consumption and the methane it emits," Jorge Ayala Filigrana, an agronomist engineer and former organic rice producer in Palizada, in the State of Campeche at the south-east end of Mexico, tells SciDev.Net.

"But when you use the correct production system, such paradigm can change."

Currently, between 12 and 75% of the daily calorie intake for the Latin American population comes from rice, as reported by the Alliance Bioversity International & CIAT. This emphasizes the crucial role of rice in the region, especially considering that 70 million people lack the financial means to meet their food needs.

The importance of rice for regional food security is undeniable. "It is a staple food for those with limited economic resources because, for less than a dollar a day, you can feed four people," says Eduardo Graterol Matute, Executive Director of the Latin American Fund for Irrigated Rice.

The average Latin American consumes 45 kilograms per year, but in some countries, such as Panama and the Caribbean States, consumption is as high as 70 kilograms per person annually.

This demand, although far below the 230 kilograms consumed annually per capita in South Asia, where consumption is the highest globally, is constantly increasing.

For Graterol Matute this trend keeps him awake at night. "Rice consumption is increasing as global population increases, and the main concern is how we will maintain production without depleting natural resources," he says.

"This is where science, technology and organizations have a crucial role to accomplish."

Climate change was one of the reasons why Mexican former rice producer Jorge Ayala Filigrana stopped producing rice in 2021.

"Extreme rains impacted us, and higher temperatures affected the fertility of plants," he says.

Jesús Solís, a farmer in the southern part of the state of Morelos, Mexico, is not planning to change his crop. He sows rice for three years, then switches to sugarcane for another three years, and repeats the cycle.

"Before we used pesticides, but now the cane's stubble helps us control weed growth, and after five or six months, the grains [of rice] are already mature," he says.

However, he admits that maintaining production is becoming more difficult over time. When he became a rice producer 45 years ago, there was enough water to sow 3,000 hectares. Today, he and the other

producers in the region cannot even reach a third of that amount.

"We've devastated the flora, the urban sprawl has increased, temperatures that used to be 38–40 degrees now rise to 45 degrees, and there is less rainfall," he says.

Provided by SciDev.Net

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