

Groundwater depletion may reduce winter cropping intensity by 20% in India

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India is the second-largest producer of wheat in the world, with over 30 million hectares in the country dedicated to producing this crop. But with severe groundwater depletion, the cropping intensity or the amount of land planted in the winter season may decrease by up to 20% by 2025, notes a new paper. Some of the important winter crops are wheat, barley, mustard and peas.

The international team studied India's three main irrigation types on winter cropped areas: dug wells, tube wells, canals, and also analysed the groundwater data from the Central Ground Water Board. They found that 13% of the villages in which farmers plant a winter crop are located in critically water-depleted regions. The team writes that these villages may lose 68% of their cropped area in future if access to all groundwater irrigation is lost. The results suggest that these losses will largely occur in northwest and central India.

Alternative sources

The team then looked at canals to understand if they can be promoted as an alternative irrigation source and as an adaptation strategy to falling groundwater tables. But the results showed that "switching to canal irrigation has limited adaptation potential at the national scale. We find that even if all regions that are currently using depleted groundwater for irrigation will switch to using canal irrigation, cropping intensity may decline by 7% nationally," notes the paper published in *Science Advances*.

When asked what new or additional adaptation strategies can be implemented, corresponding author Meha Jain explains: "We can conjecture based on other literature and say that adoption of water-saving technologies like a sprinkler, drip irrigation and maybe switching to less water-intensive crops may help use the limited groundwater resources more effectively," She is from the School for Environment and Sustainability at the University of Michigan.

Her team is now trying to understand how groundwater depletion has already reduced yields and cropped areas in India over the last 20 years, and also how climate change may affect the future availability of groundwater resources.

Unsuited soils

Balwinder Singh from the International Maize and Wheat Improvement Center, New Delhi, explains more about the problems wheat farmers face in our country. "There are several first-generation (productivity) and second-generation (sustainability) problems. In the green revolution era, policy-supported environment led to a large increase in rice cultivation in northwestern India mainly in Punjab and Haryana which are ecologically less suitable for rice cultivation due to predominantly light soils."

He explains that this policy-supported intensive agriculture led to unsustainable groundwater use for irrigation and in turn groundwater scarcity. There was also post-harvest residue burning to make way for the timely sowing of wheat. He is one of the authors of the paper.

Poor infrastructure

He adds that there are enough groundwater resources supported with higher monsoon rainfall in eastern Indian states like Bihar. But due to lack of enough irrigation infrastructure, farmers are not able to make use of natural resources there. "So we need better policies in eastern India to expand the irrigation and thus increase agriculture productivity. This will also release some pressure from northwestern Indian states," he concludes.
