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Evaluating the Impacts of Projected Yield Changes on India's Wheat and Rice Markets

Kayode Ajewole, Ethan Sabala, and Jayson Beckman

What Is the Issue?

India recently became the most populated country in the world, and the United Nations predicts the country's population will continue to grow and reach 1.65 billion people by 2040. In addition, USDA macroeconomic projections show that incomes in India are expected to grow by 67 percent in the next decade. These two factors, population growth and rising incomes, will increase food demand. However, India has a limited amount of arable land to produce food to meet this increased demand, especially for major staples such as rice and wheat. While India is an important exporter of wheat and rice, volatile weather trends could impact yields, affecting production and, thus, trade of these major food crops. Anticipation of potential production shortages in rice and wheat due to changing long-term weather patterns has led to restrictive policies on exports of these two major crops to suppress domestic prices and mitigate food insecurity. Under both low and high carbon concentration scenarios, estimates indicate there will be yield increases for rice and wheat in India. This report addresses whether this positive impact on yield will be sufficient to continue to meet domestic food demand and maintain India's exports.

What Did the Study Find?

Yield changes induced by altered long-term weather trends indicate a potential increase of average yields in India for both rice and wheat in the next two to three decades. The increase in yields is partly due to an expected increase in the higher carbon concentration across rice- and wheat-growing regions of India. The yield increase for both crops occurs under two scenarios: one that is considered business as usual and another that projects higher carbon concentration. This report's major findings include:

- Using a computable general equilibrium model, we found that, by 2040, projected higher yields under the higher carbon concentration scenario (known as SSP585) are expected to lead to an increase in rice production but a decrease in wheat production. Thus, more land is expected to be allocated to rice production than wheat production.

- Despite average yield improvements for rice and wheat under the SSP585 scenario, the projected increase in production of rice is not expected to meet the increase in demand for rice and wheat in India, leading to increases in domestic prices by 2040. Prices are estimated to increase by 232 percent for rice and 201 percent for wheat by 2040.
- Greater demand for rice and wheat in India is expected to lead to a decrease in exports and an increase in international wheat and rice prices.
- Countries in South Asia and Southeast Asia are expected to have the largest increase in imports of rice and wheat while concurrently having the largest decrease in imports from India. Thus, these regions are expected to turn to other major rice and wheat suppliers to meet their grain demands.

How Was the Study Conducted?

The study uses projected yield changes across Agro-Ecological Zones (a way of classifying land by moisture and temperature conditions) of India from the Agricultural Model Intercomparison and Improvement Project's (AgMIP) Global Gridded Crop Model Intercomparison to evaluate the impact of more volatile weather trends on India's rice and wheat markets. To analyze the possible impact of potential future changes in weather trends on domestic and international rice and wheat markets, yield changes for 2040 that account for altered weather trends were used in a computable general equilibrium model. In addition, we accounted for projected changes to gross domestic product and population for India and all the countries and regions in this report's models.