

Delayed GMO Bt rice approval costs China \$12 billion annually, study finds

To maintain self-sufficiency in rice production and national food security, the Chinese government strongly supports research that aims at increasing the productivity of rice cultivation. Rice with genetic material from *Bacillus thuringiensis* (Bt rice) is transgenic rice that can reduce lepidopteran pest damage and the use of insecticides. It was developed in the 1990s and earned biosafety certificates in 2009. However, because of political reasons, its commercialization in China has been postponed, and, to date, Bt rice is not grown in China.

We assess the opportunity cost of postponement of Bt rice commercialization in China between the years 2009 and 2019 and consider the external costs of pesticide use and potential technology spill-overs of Bt rice. We estimate the cost of postponement of Bt rice over the analyzed period to be 12 billion United States (US) dollars per year.

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Chinese rice farmers apply more pesticides than farmers in most other countries Huang et al. (2005) show, however, that Bt rice requires 80% less pesticide than conventional rice and reduces labor input. The simultaneous increase in production and reduction of input both contribute to the absolute increase of the total factor productivity of Bt rice, which is about 15% higher than conventional rice.

The adoption of Bt rice can also improve farmers' health due to lower exposure to pesticides. Bt rice is also compatible with biological control and soil health management, although it should be noted that, to the best of the authors' knowledge, no study examines its environmental effects at a larger scale or for a longer period.

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The postponement of Bt rice commercialization is largely due to low public acceptance, like other genetically modified (GM) crops. Most Chinese business managers oppose food derived from GM crops because they fear lower profits. Although almost half of consumers know little about GM food, they believe it has adverse effects on human health and the environment. In addition, Chinese scientists do not show higher acceptance of GM food than non-scientists.

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