

Technological spillover in Japanese rice productivity under long term climate change: Evidence from the spatial econometric model

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Abstract

Rice productivity will be affected by climate conditions not only in own region but also in neighboring regions through technological spillover. Measuring such direct and indirect influence of future climate change is important for policy making. This study analyzes socio-economic and climate factors in rice total factor productivity (TFP) and evaluates technological spillover effects by using the spatial econometric model. To consider geographical situation, we use hydrological model in addition to crop-yield and crop-quality model. Results show that spatial autoregressive tendencies were observed in rice TFP, even though the influences of climate factors were removed. Such spatial dependence brings about synergistic effects among neighboring prefectures in northern Japan and depression effects, like a spatial trap, from neighbors in southern Japan. Substantial impacts of climate change were as high as socio-economic factors but different in degrees by regions. Also, future climate change estimated by the global climate model enlarged fluctuation degree in rice TFP because accumulative or cancel out effects of temperature and precipitation occurred year by year. Therefore, technological development in rice production and provision of precise climate prediction to farmers are important in order to ease and mitigate these influences.