



Economic efficiency of rainfed wheat farmers under changing climate: evidence from Pakistan

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Abstract

Rainfed wheat farming directly depends upon climatic indicators and is mostly at the mercy of climatic extremes. This study analyzed the relationship between the economic efficiency of rainfed wheat farmers and indicators of climate variability in Pakistan employing a two-stage methodological framework. We used farm household level crop input-output and management data and secondary data on climate. In the first stage, a stochastic production frontier (SPF) approach was used to calculate economic efficiency. Then, in the second stage, the calculated economic efficiency scores were regressed against the temperature threshold, temperature anomaly, and total rainfall, in addition to socioeconomic, institutional, and farm variables, using OLS and quantile regression models. The results showed that temperature anomaly and the number of days when temperatures exceed 30 °C have negative and significant impacts on the economic efficiency of rainfed wheat farmers. Total rainfall showed positive and significant impacts across both OLS and quantile regression models. Further, we modeled a novel and very important variable in the context of rainfed wheat production in Pakistan, that is, farmers' participation in trainings in climate-resilient crop farming. This variable showed a positive and highly significant impact on economic efficiency of wheat farmers across all regression models. Our findings call for important policy implications, including developing up-to-date climate resilient adaptation strategies that are particularly focused on rainfed wheat farming. Establishing strong linkages between extension departments and rainfed wheat farmers could help sustain and improve the efficiency of rainfed wheat farmers and hence food and livelihood security.

Keywords Climate variability · Economic efficiency · Rainfed wheat · Stochastic production frontier · Quantile regression · Climate resilient crop farming