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Wheat yield response to input and socioeconomic factors under changing climate: Evidence from rainfed environments of Pakistan

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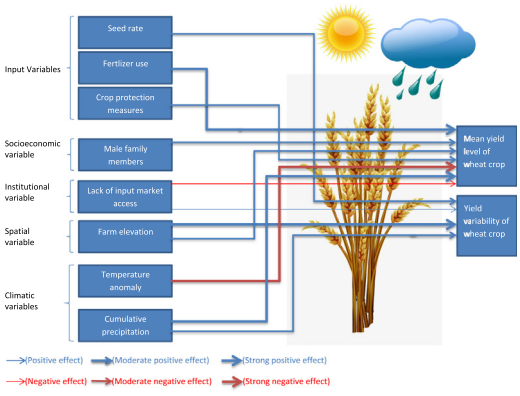
HIGHLIGHTS

- Analyzes the empirical relationship between climate variability, wheat mean yield, and yield variability
- Temperature anomaly (rise in temperature) lowers mean wheat yields.
- Cumulative precipitation increases both mean yield and yield variability.
- Lack of access to input markets causes a reduction in mean yield levels and increases yield variability.
- Timely and appropriate adaptation measures are needed to sustain and enhance wheat yields, hence food and livelihood security.

GRAPHICAL ABSTRACT



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ABSTRACT

More than three-quarters of the world's total cultivated land is under rainfed farming, producing almost 70% of total food. Most food production comes from developing and least favored nations. Pakistan, a developing country with an agro-based economy, is facing severe threats from climate change. Rainfed agriculture, especially wheat farming, is highly susceptible due to its heavy dependency on precipitation, one of the most important climatic parameters. Wheat is the main food crop, as well as a major source of calorific intake, for millions of people in Pakistan. This study aims to quantify the impacts of climate variability on mean yield levels and yield variability of wheat crop in the rainfed zone of Pakistan. Multistage random sampling technique is used for primary data collection from 400 rainfed wheat farmers during the 2016–17 crop season. The study uses primary data on crop input-output, management, socioeconomic, institutional, and historical climatic data (1980–2017). The data are analyzed employing the Just and Pope (J-P) stochastic production function approach with linear and nonlinear functional forms. The results reveal that temperature rise negatively affects observed wheat mean yields, while cumulative precipitation positively affected it. Further, input market access, seed rate, and cumulative precipitation also cause variability in yield levels, leading to yield instability. Further, farm elevation influences

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wheat mean yield positively while input market access influences it negatively. The findings of the study have important implications for climate resilient wheat farming. Timely and tailor-made adaptations need to be undertaken in the rainfed wheat farming systems of Pakistan. Creating awareness among farmers about the optimal use of agronomic inputs under changing climatic conditions could be an effective adaptation strategy that improves yields and copes with yield instability.