AgroScience Today

Popular Article

e-ISSN: 2583-0147

Volume 7 Issue 6
Page: 1284 - 1289

Rains, Risks and Rewards - Managing Kharif Crops Wisely

Yashi Singh[1]*, Raj Kumar Pal[2]

[1]Ph.D. Scholar, Department of Climate Change and Agricultural Meteorology, Punjab Agricultural University, Ludhiana, Punjab, India.

[2]Assistant Professor (Agrometeorology), Department of Climate Change and Agricultural Meteorology, Punjab Agricultural University, Ludhiana, Punjab, India.

*Corresponding author's e-mail: *1yashisingh99@gmail.com*

Published on: June 30, 2026

ABSTRACT

Punjab's Kharif agriculture is highly dependent on the southwest monsoon, which is becoming increasingly erratic due to climate change. Recent trends indicate a decline in the number of rainy days along with a rise in the frequency of short-duration, high-intensity rainfall events. These changes are leading to waterlogging, nutrient losses and crop stress in major Kharif crops such as paddy, cotton, maize and pulses. This article highlights the importance of shifting from traditional rainfall-based farming decisions to weather-informed agricultural management. It emphasizes the role of short and medium range weather forecasts and agrometeorological advisories in improving farm decisions related to irrigation, fertilizer application, pesticide spraying and field operations. Furthermore, it underlines the increased risk of pest and disease outbreaks under humid monsoon conditions and the importance of Integrated Pest Management (IPM). Efficient water management during intermittent dry spells is also stressed, considering declining groundwater resources in Punjab. Overall, it advises for a weather-smart, climate-resilient farming approach to enhance productivity, reduce risks and ensure sustainable Kharif crop production under changing monsoon conditions.

INTRODUCTION

The southwest monsoon is the lifeline of Kharif agriculture in Punjab, supplying nearly 70–80% of the annual rainfall and directly determining the productivity of major crops such as paddy, cotton, maize and pulses. In recent years, however, the monsoon has become increasingly erratic, with delayed onset, uneven spatial distribution, longer dry spells and frequent short-duration high-intensity rainfall events. These changes have intensified production risks through waterlogging, nutrient leaching, pest outbreaks, and moisture stress at critical crop stages. The India Meteorological Department (IMD) reports an increasing tendency of extreme rainfall events in northwest India, particularly concentrated over fewer rainy days, thereby amplifying hydrological and agricultural risks (IMD, 2024). The Intergovernmental Panel on Climate Change (IPCC) further confirms that South Asia is experiencing rising climate variability and more frequent extremes, significantly affecting crop yields and farm stability (IPCC, 2023).

At the same time, agriculture in Punjab faces compounding stress due to groundwater depletion and rising input costs, making efficient use of monsoon rainfall even more critical. The Food and Agriculture Organization (FAO) emphasizes that climate-smart agricultural practices and weather-informed decision-making are essential for sustaining productivity under increasing climate uncertainty (FAO, 2023). Similarly, the World Bank highlights that improved climate information services can substantially reduce agricultural losses in South Asia by enabling timely farm decisions (World Bank, 2023). In this context, integrating agrometeorological advisories with farm operations is becoming a key strategy for resilient Kharif crop management in Punjab.

PUNJAB'S MONSOON: MORE RAIN IN FEWER DAYS

Punjab's agriculture is highly dependent on the southwest monsoon, which contributes nearly 70–80% of the annual rainfall during July–September. However, recent climatic trends indicate a significant shift in rainfall distribution patterns. Studies and meteorological observations show that while the total seasonal rainfall has not drastically changed in many years, the number of rainy days is declining, and the frequency of intense rainfall events is increasing (India Meteorological Department, 2024; IPCC, 2023).

This change has serious implications for Kharif agriculture. Instead of gentle, well-distributed rainfall, farmers increasingly face short-duration, high-intensity rainfall events that often exceed the soil's infiltration capacity. As a result, temporary flooding, surface runoff and waterlogging have become more common in low-lying agricultural fields of Punjab.

Long-term analyses from Punjab Agricultural University (PAU) show significant intra-seasonal variability in monsoon rainfall across agro-climatic zones, highlighting increasing uncertainty in rainfall distribution (Chand & Dhaliwal, 2020). Similarly, trend-based studies covering 1951–2021 reveal spatial and temporal inconsistencies in monsoon rainfall, with emerging signals of concentration of rainfall in fewer days (Madane et al., 2023).

Recent assessments further link rainfall variability with groundwater stress and crop yield fluctuations, particularly in water-intensive rice-based systems (Chand & Dhaliwal, 2024). In addition, climate variability assessments for Punjab indicate increasing precipitation extremes and higher inter-annual fluctuations over the last four decades (Bhardwaj et al., 2025). Therefore, understanding rainfall behaviour and integrating agrometeorological advisories into farm

decision-making has become essential for building climate-resilient Kharif production systems in Punjab.

MAKE WEATHER YOUR FARMING PARTNER

Modern agriculture is increasingly becoming information-driven. Weather forecasting has emerged as a critical decision-support tool for farm management. Short and medium range weather forecasts issued by IMD can significantly improve on-farm decision-making (Figure 1). Timely forecasts help farmers optimize:

- Irrigation scheduling
- Fertilizer application
- Plant protection measures
- Field operations such as sowing and weeding

According to ICAR (2023), weather-based agro-advisories can reduce input costs by 10–20% while improving yield stability under climate variability.

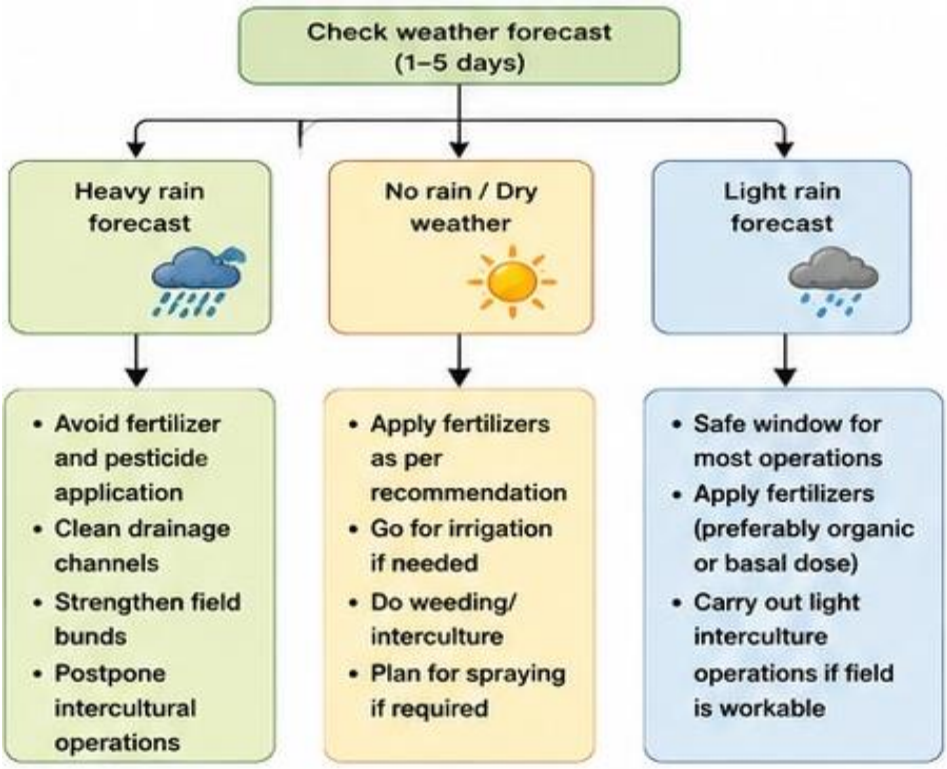

Figure 1. Weather based farm decision

PADDY AND COTTON NEED DIFFERENT MONSOON MANAGEMENT

Kharif crops respond differently to excess rainfall depending on their physiology and water requirements (Figure 2).

PADDY: TOLERANT BUT NOT IMMUNE

Rice is semi-aquatic and requires standing water during certain growth stages. However, excessive and continuous flooding due to heavy rainfall events is not always beneficial. Prolonged water stagnation can:

- Reduce root oxygen availability
- Increase nitrogen losses through denitrification
- Increase fungal and bacterial diseases
- Delay tillering and grain development

Therefore, proper field levelling and drainage management are essential even in paddy fields, especially after heavy rainfall events.

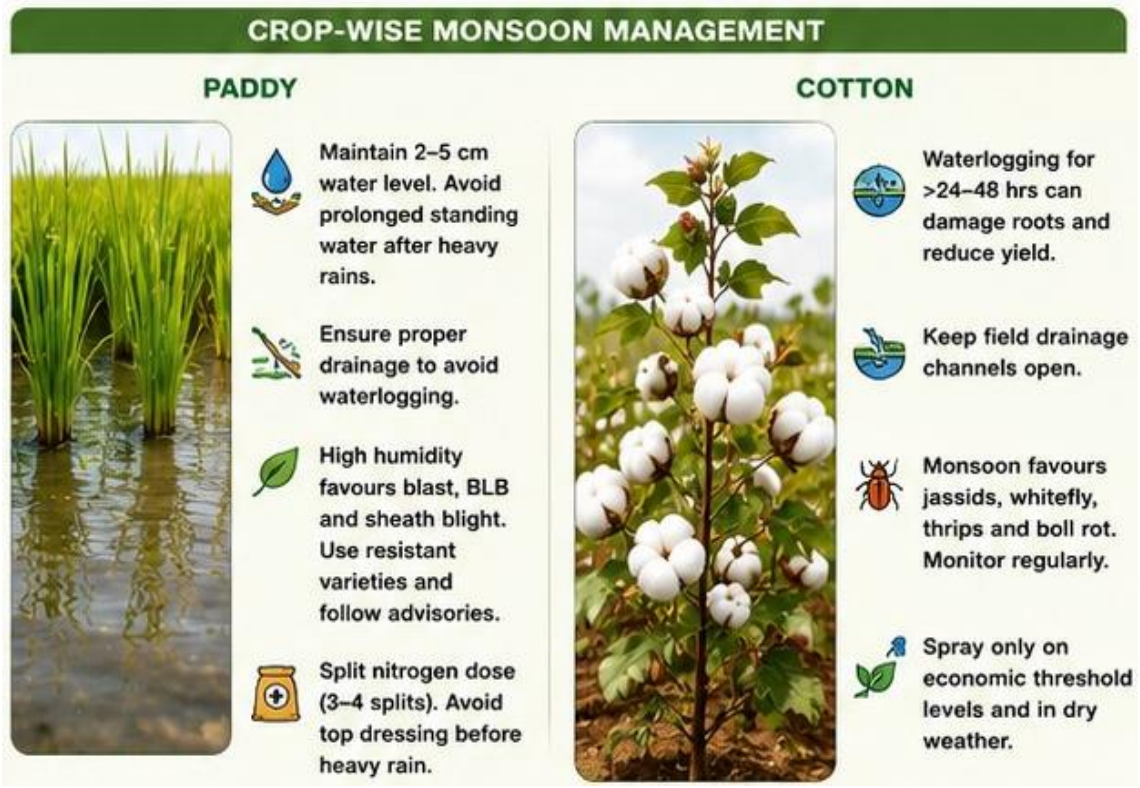

Figure 2. Monsoon management in Paddy and Cotton

COTTON: HIGHLY SENSITIVE TO WATERLOGGING

Cotton is particularly vulnerable to excess soil moisture. Waterlogging for even 24–48 hours can lead to:

- Root suffocation
- Yellowing and wilting of leaves
- Shedding of squares and bolls
- Severe yield reduction

Hence, field drainage channels and raised beds are highly recommended for cotton cultivation in Punjab.

MONSOON WEATHER ALSO FAVOURS PESTS AND DISEASES

High humidity (often above 80–90%), warm temperatures and cloudy conditions during the monsoon create a highly favourable environment for insect pests and crop diseases. According to FAO (2023), IPM-based approaches can reduce pesticide use by 25–40% without compromising yield.

Common monsoon-related threats in Punjab include:

- Bollworm complex in cotton
- Sheath blight and bacterial blight in rice
- Aphids and jassids in multiple Kharif crops
- Fungal diseases like downy mildew and leaf spots

SAVE WATER DURING DRY SPELLS

Interestingly, even during monsoon months, Punjab often experiences dry spells lasting 7–15 days. These intermittent dry periods can cause moisture stress, especially in crops like maize, cotton and pulses.

In many cases, farmers either over-irrigate or irrigate on a fixed schedule, which leads to inefficient water use. Instead, irrigation should be based on:

- Soil moisture status
- Crop growth stage
- Weather forecast
- Evapotranspiration demand

Given the alarming decline in groundwater levels across Punjab, efficient irrigation scheduling is no longer optional but essential (CGWB, 2023).

THE FUTURE OF FARMING IS WEATHER-SMART

Agriculture is transitioning from traditional intuition-based practices to data-driven and climate-smart farming systems. Agrometeorological advisory services now provide location-specific guidance based on real-time weather models, satellite data and crop simulation tools.

Digital platforms, mobile-based advisories and district-level agro-meteorological units are helping farmers make informed decisions. These services contribute to:

- Reduced production risk
- Improved input efficiency
- Better resilience to climate extremes
- Higher and more stable yields

CONCLUSION

The monsoon will always remain both a blessing and a challenge for Punjab agriculture. However, its impact is no longer predictable in traditional terms. Climate change has altered rainfall intensity, timing, and distribution, making scientific weather interpretation a key part of modern farming. Farmers who actively integrate weather forecasts into their decision-making by adjusting sowing, irrigation, fertilizer use and plant protection practices can significantly reduce risks and improve productivity. In the evolving agricultural landscape, success will not depend only on inputs like seeds and fertilizers, but on how effectively farmers read and respond to the sky above them.

REFERENCES

Bhardwaj, M., Kumar, P., & Verma, B. (2025). Dynamic assessment of precipitation and temperature shifts in Punjab using a VAR model. *Discover Applied Sciences*.

Central Ground Water Board. (2023). *Annual groundwater year book: Punjab State*. Ministry of Jal Shakti, Government of India.

Chand, S., & Dhaliwal, L. K. (2020). Analysis of intra-seasonal rainfall variability, number of rainy days and extreme rainfall events at different locations of Punjab. *Agricultural Research Journal, 57*(4), 536–544.

Chand, S., & Dhaliwal, L. K. (2024). Rainfall variability and rice production: An assessment based on monsoon variability and groundwater level of Punjab. *International Journal of Plant & Soil Science, 36*(4), 156–164.

Food and Agriculture Organization. (2023). *Climate-smart agriculture and integrated pest management practices*. FAO.

India Meteorological Department. (2024). *Climate variability and rainfall trends over India*. Ministry of Earth Sciences, Government of India.

Indian Council of Agricultural Research. (2023). *Agrometeorological advisory services for climate-resilient agriculture*. ICAR.

Intergovernmental Panel on Climate Change. (2023). *Climate change 2023: Synthesis report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.

Madane, D. A., Waghaye, A., et al. (2023). Spatio-temporal variations of rainfall using innovative trend analysis during 1951–2021 in Punjab State, India. *MAUSAM, 74*(3), 651–662. https://doi.org/10.54302/mausam.v74i3.5331

World Bank. (2023). *Climate risk and adaptation in South Asia: Strengthening resilience in agriculture*. World Bank.