

Digital Agrometeorology: Weather Apps and Advisory Services Transforming Indian Agriculture

Prerna Sihag^{1*}, Anil Kumar¹ and Sunitha Fogat²

¹Department of Agricultural Meteorology,

²Department of Soil Science,

CCS Haryana Agricultural University Hisar-125 004, Haryana (India).

Corresponding Author: prernasihag94@gmail.com

Agriculture has always been dependent on weather and climate for deciding the crop, sowing date, scheduling irrigation, fertilizer application, and plant protection measures, every farm operation. However, increasing climate variability, erratic monsoon patterns, rising temperatures, and frequent extreme events such as heat waves, heavy rainfall, droughts, and unseasonal storms have made farming more uncertain than ever before. In this changing scenario, Digital Agrometeorology has emerged as a powerful tool to support farmers with timely, location-specific, and actionable weather-based advisories for their crops. The integration of agricultural meteorology, information and communication technology (ICT), satellite data, mobile applications, and decision-support systems is reshaping modern agriculture in India. Digital agrometeorology refers to the use of digital platforms and tools to deliver weather forecasts, crop-weather advisories, and risk warnings directly to farmers. It provides Real-time weather observations using Satellite and radar-based monitoring, Numerical weather prediction models, Crop growth and pest forecasting models and Mobile and web-based communication systems. Unlike traditional weather bulletins, digital agrometeorology provides crop-specific, location-specific, and time-sensitive advisories that farmers can immediately implement in their fields. India has one of the most structured agrometeorological advisory systems in the world. The India Meteorological Department (IMD), in collaboration with ICAR (Indian Council of Agricultural Research), State Agricultural Universities (SAUs), and Krishi Vigyan Kendras (KVKs), operates the Gramin Krishi Mausam Sewa (GKMS) program. Under this program District Agromet Units (DAMUs) prepare crop-weather advisories twice a week which are based on 5-day medium-range weather forecasts. Information is tailored to major crops and local farming practices. Advisories are translated into regional languages and Dissemination occurs through SMS, WhatsApp groups, radio, TV, newspapers, and mobile apps. This system ensures that scientific weather forecasts are converted into practical farm-level recommendations. The rapid expansion of smartphone usage in rural India has strengthened digital agrometeorology. Several mobile applications now serve as a bridge between agrometeorologists and farmers. Some Apps like Mausam App, Meghdoot App, Kisan Suvidha App

Mausam App developed by IMD, this app provides, Current weather observations, 7-day weather forecasts, Special three hourly localized warnings for rain, storm, Severe weather warnings alerts issued in different colour to indicate severity. It helps farmers anticipate rainfall events, heat waves, or storms and plan operations accordingly.

Meghdoot App specifically designed for farmers under GKMS, the Meghdoot app provides, District-level agrometeorological advisories, Shows current weather, past weather data and weather forecasts for the next few days, Offers Crop and livestock specific recommendations based on weather conditions, Pest and disease forewarnings. This app converts forecast information into practical guidance, such as whether to irrigate, spray pesticides, or postpone sowing.

Kisan Suvidha App is a smart farming app that offers weather information along with Market prices, Input dealer details, Plant protection measures, agricultural advisories and information about government schemes.

Private agri-tech companies have also developed digital platforms providing hyper-local forecasts, automatic weather station data, and precision farming tools.



Applications of Digital Agrometeorology in Farm Management

Weather forecasts help farmers choose the optimal sowing/transplanting window. For example, predicted rainfall can guide dryland farmers to initiate sowing after sufficient soil moisture is available. Irrigation advisories also prevent unnecessary watering before rainfall events, saving water and energy and avoid fertilizer application that could otherwise lead to nutrient leaching and financial loss. Weather conditions such as temperature, humidity, and rainfall influence pest and disease outbreaks. Digital advisories warn farmers in advance about favourable conditions for pests like fall armyworm, whitefly, or fungal diseases, enabling timely preventive measures. Early warnings

about heat waves, frost, hailstorms, or cyclones allow farmers to adopt protective measures such as providing irrigation before frost, covering nursery beds, Harvesting mature crops early, Securing livestock shelters.

The impact of digital agrometeorology is multidimensional it reduced crop losses due to extreme weather, efficient use of water and inputs, improved crop productivity, lower cost of cultivation, enhanced farmers' income, strengthened climate resilience. Studies indicate that farmers who regularly follow agromet advisories often achieve better yield stability and input efficiency compared to non-users.

Challenges in Implementation despite significant progress, certain challenges remain that is limited digital literacy among small and marginal farmers, inconsistent internet connectivity in remote villages, need for more localized, block-level forecasts, building trust in forecast accuracy, ensuring last-mile dissemination. Bridging these gaps requires capacity building, awareness programs, and strengthening extension networks.

Future Prospects lies in advanced technologies such as Artificial Intelligence (AI) based crop forecasting models, Drone-based crop monitoring, Big data analytics for yield prediction, Integration with precision agriculture systems. As India moves toward Climate-Smart Agriculture, digital agrometeorology will play a central role in reducing vulnerability and ensuring sustainable production.

Conclusion

Digital agrometeorology represents a paradigm shift in Indian agriculture. By transforming complex meteorological data into farmer-friendly advisories delivered through mobile apps and digital platforms, it bridges the gap between scientific forecasting and field-level application. In an era of climate uncertainty, timely weather information is no longer a luxury it is a necessity. Strengthening digital agrometeorological services will not only enhance productivity and profitability but also build a resilient agricultural system capable of withstanding future climatic challenges. The journey from "forecast to field" has begun, and digital agrometeorology is leading the way toward smarter and more sustainable farming in India.
