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Original Article**Contemporary developments in agrometeorological services in india****Hridayesh Harsha Sarma¹ and Mriganko Kakoti ^{2*}**¹MSc. (Agriculture), Department of Agronomy, Assam Agricultural University, Jorhat, Assam²MSc. (Agriculture), Department of Agro Meteorology, Assam Agricultural University, Jorhat, AssamCorresponding author: Mriganko.kakoti.official@gmail.com

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INTRODUCTION

Established in 1875, the India Meteorological Department (IMD) serves as the country's primary national meteorological service and the leading governmental authority overseeing meteorology and related fields. Its mandate includes the provision of meteorological observations and forecasts essential for optimizing weather-sensitive operations such as agriculture, irrigation, shipping, aviation, and offshore oil exploration. Additionally, IMD issues warnings for severe weather events like tropical cyclones, dust storms, heavy rains, snowfall, cold and heat waves, which pose threats to life and property. The department also generates meteorological data crucial for sectors like agriculture, water resource management, industries, and oil exploration, supporting national development initiatives. Further, IMD conducts and promotes research in meteorology and allied disciplines to enhance scientific understanding and forecasting capabilities.

Some of the recent developments in the field of Agrometeorological Advisory Services (AAS) are as follows:

- 1. Distribution of District and Block level AAS Bulletins:** Currently, a five-day medium-range weather forecast is generated for districts and local blocks, which serves as the basis for creating specific agrometeorological advisories. These advisories are formulated by 130 Agromet Field Units (AMFUs) situated in various institutions like State Agricultural Universities, ICAR Institutes, and IITs, as well as by 199 District Agromet Units (DAMUs) at Krishi Vigyan Kendras (KVKs) under the ICAR network. They are then communicated to farmers every Tuesday and Friday. The advisories cover approximately 3100 blocks across the country. In addition to these biweekly bulletins, the Regional and State Meteorological centers of IMD disseminate daily weather forecasts and nowcast information to farmers.
- 2. Establishment of DAMUs:** Following the successful implementation of District level Agromet Advisory Services (AAS) through the network of 130 AMFUs, the GKMS organizational setup is

now being strengthened. This involves the establishment of DAMUs within KVK premises in collaboration with IMD and ICAR. These DAMUs are tasked with preparing advisory services at the sub-district/block level and expanding service outreach. To facilitate these efforts, each KVK now includes two additional staff members: one Subject Matter Specialist in Agrometeorology and one Agromet Observer. Together, they manage DAMU activities. Each DAMU forms an expert panel comprising KVK experts and district-level agriculture officers. This panel utilizes comprehensive weather information including historical, current, and forecasted data, along with location-specific and satellite-based inputs to formulate tailored advisories for farmers. As of now, 199 DAMUs have been established, significantly enhancing the availability of block-level AAS to farmers at a micro-level.

3. Installation of Agro-AWS: Each newly established DAMU is being equipped with an Agro-AWS to monitor changes in weather conditions. Currently, 200 Agro-AWS units are in the process of being installed, out of which 198 are already operational. An additional batch of 330 Agro-AWS units is in advanced stages of procurement.

These Agro-AWS units are equipped with sensors for soil moisture and soil temperature up to a depth of one meter. These parameters play a crucial role in making informed decisions for farm-level risk management. The installation of these units aims to establish a comprehensive district-level network for monitoring soil moisture and temperature across the country, meeting the nation's requirements effectively.

4. Products Development: Generating Agromet advisories that integrate current and forecasted weather conditions with crop status and growth stages poses significant challenges. To enhance the analytical capabilities of scientists and experts, it is essential to develop and utilize various agrometeorological products. These products utilize real-time weather, crop, and satellite data. In line with this objective, agrometeorological products such as spatial distribution maps of weather parameters, Normalized Difference Vegetation Index (NDVI), Vegetation Condition Index (VCI), Temperature Condition Index (TCI), and Standardized Precipitation Index (SPI) are generated on a daily and weekly basis. These products are then communicated to AMFUs and DAMUs. They enable the preparation of more precise and context-specific Agromet advisories, tailored to the needs of farmers.

5. Decision Support System launched by Agromet : A specialized platform known as 'Agromet DSS' has been created to streamline the exchange of data and information among relevant organizations. This initiative aims to enhance objectivity, timeliness, transparency, and effectiveness in service delivery. Agromet-DSS provides scientists and institutions with tailored tools to seamlessly integrate weather and crop data. This integration enables the rapid preparation of agrometeorological advisories at more detailed levels, thereby benefiting farming communities at the grassroots level.

6. Real-time monitoring dashboard: IMD has introduced a 'Real Time Monitoring Dashboard' to oversee the creation of Agromet advisory Bulletins at both district and block levels, as well as to monitor the Farmers Awareness Programmes (FAPs) conducted by each DAMU.

7. Inception of new techniques and tools: Farmers and policymakers at both central and state levels receive Nowcast (up to 3 hours), medium-range forecast (up to 5 days), and extended-range forecast advisories with a 15-day lead time. Additionally, a very short-range forecast is introduced for severe weather events like thunderstorms and lightning. Special advisories for these events are disseminated via the mKisan portal and other social media platforms. There has been an increased focus on national collaboration for research and development, as well as expanding the outreach of agrometeorological advisories. Satellite-based products have been introduced as additional decision-making tools for Agromet Experts. To enhance effectiveness, dynamic feedback mechanisms are developed, including real-time weekly, fortnightly, and end-of-season assessments. Furthermore, weather data from manual agrometeorological observatories is now received online in near real-time, improving data accessibility and utilization.

8. Outreach and Dissemination: Agrometeorological advisories are delivered to farmers through a diverse array of communication channels, including print and electronic media, Door Darshan, radio, and the internet. These advisories also utilize SMS via the Kisan Portal and are distributed through private companies under Public-Private Partnership (PPP) arrangements. The practice of sending SMS directly to farmers through private companies continues.

In addition to regular district and block level advisories, Impact Based Forecasts (IBF) are issued for severe weather events that pose risks to crops. These forecasts include specific measures to mitigate potential damage and are issued promptly as situations arise in various districts across states. Weather warnings for events such as heavy rainfall, hailstorms, cold waves, frost, heatwaves, and high winds are issued at the district level by Regional Meteorological Centers (RMCs) and Meteorological Centers (MCs) of respective states. Based on these warnings, AMFUs and DAMUs prepare appropriate agricultural strategies to safeguard crops.

Consolidated IBF reports are compiled by RMCs and MCs of IMD and disseminated to district collectors and agricultural officers in the respective districts to ensure timely and effective response to weather-related risks. Social media platforms play a crucial role in swiftly disseminating forecasts and advisories to farmers. Currently, a network of 15,240 WhatsApp groups covers farmers in 1,16,427 villages across 3,505 blocks. These groups include officials from State Agriculture Departments at the district and block levels. Agromet advisories are also shared through YouTube channels operated by AMFUs and DAMUs nationwide, where farmers' feedback is collected and uploaded.

Additionally, advisories are circulated through multiple Facebook pages managed by AMFUs and DAMUs. Collaborative efforts with state governments have integrated weather forecasts and agrometeorological advisories into state government mobile apps and websites. Integration has been successfully completed for states like Bihar, Chhattisgarh, Gujarat, Haryana, Madhya Pradesh, Nagaland, Rajasthan, and Tamil Nadu, benefiting approximately 6.2 million farmers.

Advancements in Information and Communication Technology (ICT) have facilitated farmers' access to weather information, alerts, and agromet advisories tailored to their districts through mobile apps like 'Meghdoot' by the Ministry of Earth Sciences and 'KisanSuvidha' by the Ministry of Agriculture & Farmers Welfare. Several AMFUs have also developed their own mobile apps to ensure rapid dissemination of agromet advisories to farmers in their regions.

- Meghdoot App:** *Meghdoot* is a user-friendly mobile application designed to offer farmers timely crop advisories based on weather forecasts, a collaborative effort between the India Meteorological Department (IMD), Indian Institute of Tropical Meteorology (IITM), and Indian Council of Agricultural Research (ICAR). Users can easily access advisories in both English and local languages after downloading the *Meghdoot* app and signing in with their mobile number and preferred language. The application delivers district-specific guidance on crop and livestock management twice a week—every Tuesday and Friday—through insights from Agro Met Field Units (AMFU). These advisories are crafted using comprehensive weather data, including historical records and future projections. They assist farmers in making informed decisions crucial to agriculture, such as crop planting, timing of pesticide and fertilizer applications, irrigation planning, and livestock vaccination schedules.

In addition to crop advisories, *Meghdoot* provides comprehensive weather updates including current conditions and forecasts for the next five days. This information covers key parameters such as rainfall, temperature variations, humidity levels, wind speed, and wind direction, all of which are pivotal for effective agricultural planning and management.



Fig. 1: Meghdoot Application

- KisanSuvidha:** The *KisanSuvidha* Mobile App, launched during the '*KrishiUnnatiMela*' in New Delhi on 19th March 2016 by the Hon'ble Prime Minister, caters directly to farmers by consolidating essential agricultural information into one accessible platform. Currently boasting around 300,000 active users, the app supports multiple languages including Hindi, English, Punjabi, Tamil, and Gujarati. Its user-friendly interface is tailored to provide comprehensive details across six vital aspects of farming: weather updates, dealer contacts, market prices, plant protection measures, agricultural advisories, and direct access to the Kisan Call Centre (KCC). This initiative ensures that farmers have quick and convenient access to crucial information necessary for informed decision-making and improved agricultural practices.

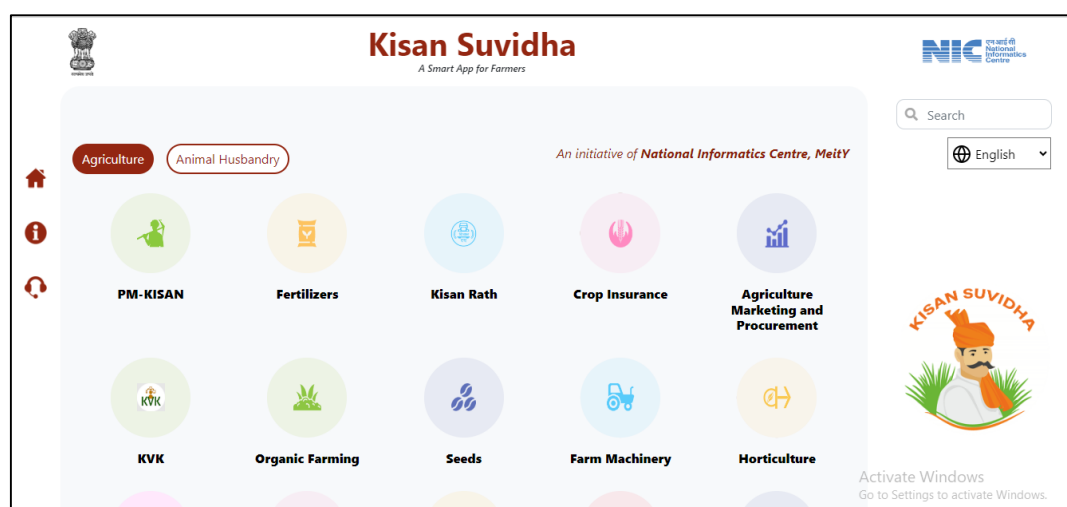


Fig. 2: Kisan Suvidha Application

- Mausam App:** The India Meteorological Department (IMD), under the Ministry of Earth Sciences, has undertaken significant efforts in recent years to enhance the dissemination of weather forecasts and warnings through advanced tools and technologies. As a testament to this commitment, the Ministry is proud to introduce the "Mausam" mobile app for IMD. This app offers five key services: Current Weather updates for 200 cities with temperature, humidity, wind speed, and direction updated eight times daily, including sunrise/sunset and moonrise/moonset times; Nowcast providing three-hourly warnings on localized weather phenomena for approximately 800 stations and districts across India; City Forecast offering 24-hour and 7-day weather forecasts for about 450 cities; Warnings issued twice daily with color-coded alerts (Red, Orange, Yellow) indicating severity of approaching dangerous weather, prompting appropriate actions from authorities and the public; and Radar products delivering real-time updates every 10 minutes. Developed collaboratively by ICRISAT's Digital Agriculture & Youth (DAY) team, Indian Institute of Tropical Meteorology (IITM), Pune, and IMD, the Mausam app serves as a crucial tool for delivering weather information and alerts in a user-friendly manner, meeting the diverse needs of the public.



Fig. 3: Mausam Application

- Umang App:** The UMANG mobile app, an integrated platform for governance by the Government of India, now incorporates services from the India Meteorological Department (IMD) to bolster the Digital India Programme. Hosted on the <http://mausam.imd.gov.in> website, these seven essential services have been seamlessly integrated into UMANG: Current Weather updates for 150 cities with temperature, humidity, wind speed, and direction refreshed eight times daily, including sunrise/sunset and moonrise/moonset times; Nowcast offering three-hourly warnings on localized weather phenomena for approximately 800 stations and districts, with impacts detailed for severe weather events; City Forecast providing 24-hour and 7-day weather predictions for 450 cities across India; Rainfall Information offering daily, weekly, monthly, and cumulative data for all districts in India; Tourism Forecast presenting weather forecasts for 100 tourist cities over 24 hours and 7 days; Warnings issued twice daily using a color-coded system (Red, Orange, Yellow) to alert citizens about approaching hazardous weather conditions; and Cyclone warnings tracking cyclonic storms, predicting their path, expected coast crossing time, and issuing impact-based alerts by area/district to facilitate necessary preparations, including potential evacuations. This integration enhances accessibility to critical weather information

through UMANG, catering to diverse needs across the country in a user-friendly and comprehensive manner.

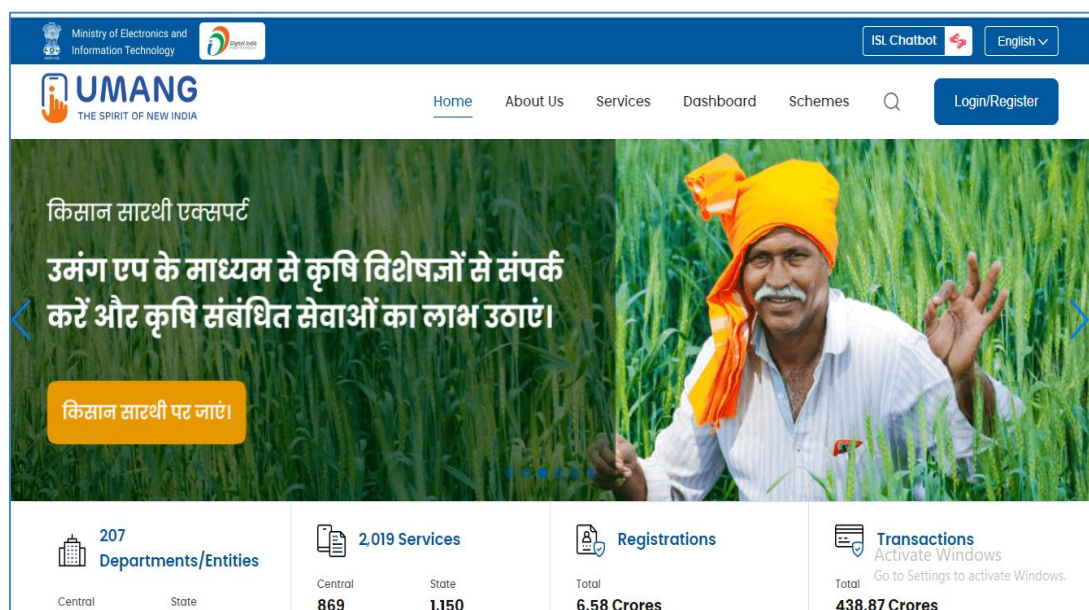


Fig. 4: Umang Application

IMD continues to promote these services extensively among the farming community through Farmers' Awareness Programmes (FAPs) conducted in collaboration with AMFUs and DAMUs nationwide. Participation in events like Kisan Melas and Farmers' Day further enhances awareness about these services, ensuring more farmers can benefit from timely and relevant agrometeorological information.

IMD is currently implementing several plans to modernize, expand, and enhance Weather & Climate services through the Central Sector Scheme ACROSS. Under ACROSS, IMD has established four sub-schemes, namely Atmospheric Observation Network (AON), Upgradation of Forecast System (UFS), Weather & Climate Services (WCS), and Commissioning of Polarimetric Doppler Weather Radars (DWR). The primary activities of these sub-schemes include:

- a. Atmospheric Observations Network (AON):** Continued maintenance and expansion of observational networks are focused on integrating Doppler Weather Radars (DWRs), Automatic Rain Gauges (ARGs), Automatic Weather Stations (AWSs), Upper Air, Surface, and Environmental Observatories. Efforts are aimed at enhancing both the geographic coverage and frequency of radar observations, particularly in areas across the country that currently have significant gaps in data availability. To enhance and modernize weather and climate services in the northeastern region, efforts include setting up advanced surface and upper air observatories to enable real-time observations.

Additionally, there are plans to maintain and establish facilities for multi-processing, computing, and communication specifically designed for satellite meteorological applications.

b. Upgradation of Forecast System (UFS): Efforts are underway to enhance and sustain communication systems crucial for the transmission of weather data and related products. Additionally, there is a dedicated initiative aimed at developing an advanced operational forecast system and an efficient delivery mechanism for forecasts and associated services. Special campaigns are being organized to improve the forecasting of cyclones, thunderstorms, and fog through the deployment of additional observational resources. A comprehensive Integrated Himalayan Meteorological Programme is being implemented, focusing on the Western and Central Himalayan regions. Moreover, there is a strong emphasis on capacity building, outreach activities, and the effective planning and maintenance of specific observational systems across different parts of India. These initiatives are part of broader efforts to modernize and strengthen weather and climate services throughout the country.

c. Weather & Climate Services (WCS): Plans include the establishment of District Agro-Met Units (DAMUs) across all districts in conjunction with existing Agromet Field Units (AMFUs) nationwide, aimed at expanding Agromet Advisory Services (AAS). Significant upgrades are also planned for meteorological facilities at all airports through the installation of advanced Integrated Aviation Weather Observing Systems (AWOS), HAWOS, Microwave Radiometers, Doppler LIDARs, and Wind Profilers, crucial for supporting Aeronautical MET Services. Furthermore, a modern Climate Data Centre equipped with an integrated portal for advanced Climate Data Services will be established to provide national and regional climate-related services. Additionally, efforts will focus on enhancing the training infrastructure and facilities to bolster the capacity of training institutions in the field. These initiatives are designed to modernize and enhance weather, climate, and agricultural advisory services across the country.

d. Commissioning of Polarimetric Doppler Weather Radars (PDWR) : The "Commissioning of Polarimetric Doppler Weather Radars (DWRs)" scheme aims to expand the DWR network across the country, addressing gaps in the meteorological radar observational network by installing eleven C-Band dual polarized DWRs. Significant advancements have already been achieved under this scheme, particularly benefiting Agricultural Weather Services. Approximately 198 Agro-Automatic Weather Stations (Agro-AWS) equipped with soil moisture and soil temperature sensors have been installed at District Agromet Units (DAMUs) located within Krishi Vigyan Kendras (KVKs). Currently, experimental agromet advisories are issued for about 3000 blocks covering approximately 355 districts nationwide. The issuance of block-level weather forecasts and Agromet Advisory Service Bulletins is projected to expand to 5000 blocks by 2022 and eventually reach the panchayat level by 2024. These efforts aim to enhance the precision and coverage of agrometeorological services across India.

CONCLUSION

In conclusion, the Indian Meteorological Department (IMD) stands as a cornerstone of national resilience against weather-related challenges, with a legacy dating back to 1875. Through its steadfast commitment to advancing meteorological science, IMD not only provides essential forecasts and warnings but also fosters crucial partnerships across sectors to ensure the effective

management of weather-sensitive activities. As India navigates a dynamic climate landscape, IMD's role remains indispensable in shaping informed decisions, safeguarding livelihoods, and promoting sustainable development across the country. With ongoing advancements in technology and research, IMD continues to uphold its mission of serving the nation with excellence in meteorological services for the benefit of all.

REFERENCES

1. <https://pib.gov.in/PressReleasePage.aspx?PRID=1626146>
2. <https://pib.gov.in/PressReleasePage.aspx?PRID=1641501>
3. Singh, J. (2022, April 6). Government of India Ministry of Earth Sciences Lok Sabha Unstarred Question No. 5575.