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Agromet advisory services to mitigate

the effect of adverse weather conditions and enhance farmers' income

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Agriculture sector is the foundation of the Indian economy. Weather variability plays a vital role in year-to-year fluctuation in agricultural production and productivity; both in rainfed as well as irrigated agriculture. In order to address this, India Meteorological Department (IMD) took initiative to issue block level Agromet Advisory Services (AAS) to farmers through District Agromet Unit (DAMU) established at KVKs. Agromet advisory service is the single window solution for all the queries related to fluctuating weather conditions and management in agricultural operations. The agromet advisory bulletins contain all possible risk mitigation measures for the major crops and livestock. Based on the weather forecast, a group of interdisciplinary and agromet scientists at DAMU prepared district and block level agromet advisory bulletins. These bulletins are sent to the farmers and other stakeholders of the corresponding district. The right weather information at the right time facilitates the farmers to plan agricultural operations from selection of crops to post harvest in order to avoid crop losses and ultimately increase farmers' income.

Keywords: Agromet Advisory Service, District Agromet Unit, Economic impact, Weather forecast

ECONOMY of India, like other tropical countries, depends on agriculture and it is sensitive to weather. Climate and weather still remain the major factors determining success or failure of agricultural production of the country. The main objective of weather forecasting is to provide advice to the farmers on the actual and expected weather and its influence on the various day-to-day farming operations i.e. sowing, weeding, timing of pesticide spray, scheduling irrigation, fertilizer application etc. In order to provide direct services to the farming community of the country, the Division of Agricultural Meteorology was set up in 1932 under the umbrella of India Meteorological Department at Pune. IMD started national and state level AAS during 1945 and 1976, respectively, through its state meteorological centers, in collaboration with agriculture departments of the respective state Governments.

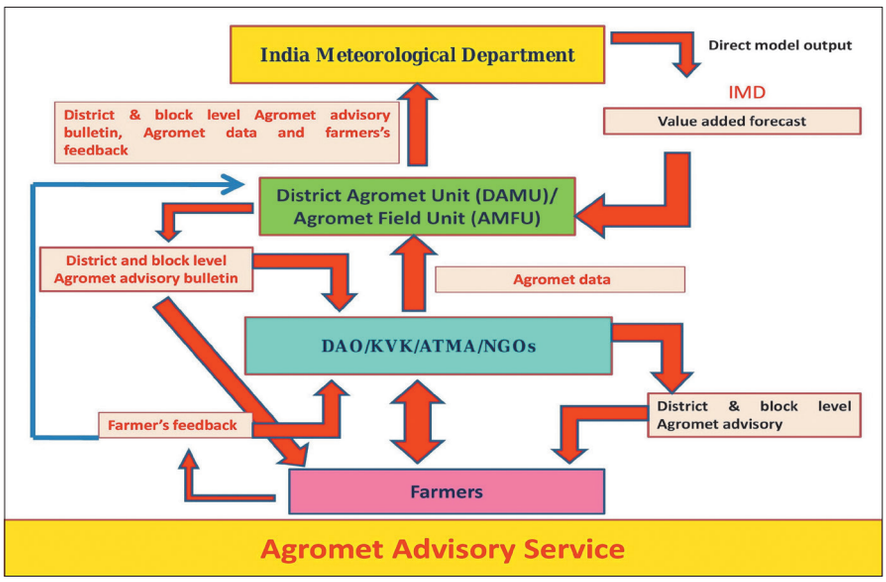
IMD has a network of 130 agromet field units (AMFU) at district level for disseminating weather-based advisories. Efforts are being made to establish District Agromet Unit (DAMU) in 530 additional districts of India under the Gramin Krishi Mausam Sewa at Krishi Vigyan Kendra's (KVKs), which would provide localized weather prediction to all 6,500 blocks across 660 districts in the country. It will help nearly 9.5 crore farmers to cope with the vagaries of weather through adoption of agromet advisories prepared for the district considering all weather data and crops by expert panel consisting of 8–9 members including all subject matter specialists of KVK, scientists of SAU and district level agriculture officers.

Agromet Advisory Services (AAS)

AAS aims to advise the farming community about adoption of suitable management practices in their farming operation like selection of variety, sowing, irrigation scheduling, fertilizer application, plant protection measures, harvesting of crop etc. based on forecasted weather and to provide information on actual weather conditions. AAS provides very special kind of inputs to the farmers as advisories that can make a tremendous difference to the agriculture production by taking the advantage of good weather and minimize the impact of adverse weather conditions.

Preparation of Agromet Advisory Bulletin

The main emphasis of the existing AAS system is to collect and organize climate/weather, soil and crop information, and to integrate them with the weather forecast information to assist farmers in their management decisions. Before the establishment of DAMU, all districts were covered by 130 AMFUs. Of the targeted 530 DAMUs, at present, as many as 200 DAMUs are functional in addition to existing AMFUs. The value added weather



Mechanism of Agromet Advisory Service

prediction of each district are sent to the corresponding AMFU and DAMU by the concerned Regional Meteorological Centre (RMC) or Meteorological Centre (MC) of IMD. The agromet experts at AMFU and DAMU prepare an agromet bulletin for each district following the given steps.

(i) Weather prediction by IMD (input): The input to the system is the medium range weather forecast at district level from the IMD, which is received twice a week on tuesday and friday, for a 5 days period. The AMFU and DAMU receive weather forecasts for each district covered by it. Weather forecast may be defined as a declaration in advance of the likelihood of occurrence of future weather event or condition in a specified area at a given period on the basis of a rational study of synoptic, three-dimensional and time series data of sufficient spatial coverage of weather parameters, and analyses of correlated meteorological conditions. Weather forecasting now has a wide range of operational products that traditionally are classified under the following groups: (a) Now casting (NC: less than 24 h); (b) Short-range forecast (SRF: 1-3 days); (c) Medium-range forecast (MRF: 4-10 days); (d) Long-range forecast (LRF: more than 10 days).

(ii) Preparation of agromet advisory bulletin: An expert committee consisting of scientists (specialists) from different agriculture disciplines meets on tuesday and friday, and prepares the agro advisories for major crops based on the weather forecast, and existing weather conditions, keeping in view the crop status. Agromet advice for livestock is also prepared. The agromet bulletin contains agromet advice for major crops, fisheries and livestock.

(iii) Dissemination to stakeholders: The agromet bulletins are uploaded on websites of IMD and circulated to the press. In addition, the bulletins are disseminated to farmers through private television and radio channels, newspapers, mobile phone/text messages SMS, internet, farmer portal, non-governmental organizations, Kisan Call Centres (KCC), Indian Council of Agricultural Research and other related Institutes/state agricultural universities/state extension networks and Krishi Vigyan Kendra (KVKs).

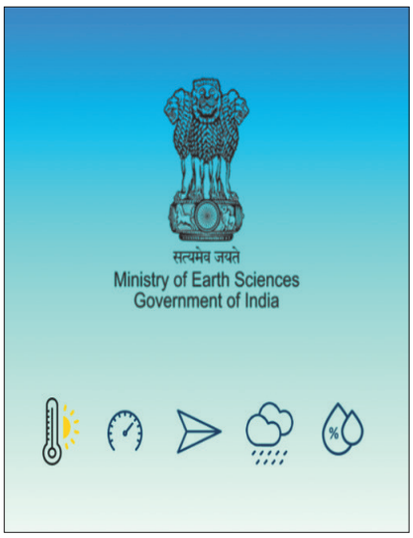
Information and communication technology (ICT) is a key technology that not only helps in advanced weather forecasting and climate monitoring, but is very essential in information circulation to a large audience through mobile devices. Mobile allows for customized information to be sent to farmers in text, graphic, audio or visual formats. It enhances user control and interaction, allows farmers to raise queries and receive specific responses of weather forecast information they are interested in, provides a mechanism to collect crowd sourced feedback that can be used to improve the weather information services and promote timely and easy access to weather information. The Indian government has developed three main weather based mobile applications which play a very vital role in the agriculture sector, viz. Mausam app, Meghdoot app and Damini app.

- Mausam is a mobile app of the India Meteorological Department (IMD), Ministry of Earth Sciences (MoES), Government of India to provide seamless and user-friendly access to weather products available on https://mausam.imd.gov.in/. Users can access observed weather, forecasts and radar images, and be proactively warned of impending weather events.
- Meghdoot is a joint initiative of the Indian Meteorological Department (IMD) and Indian Council for Agriculture Research (ICAR) to bring high resolution weather forecast based agro advisories to farmers in vernacular language. This app allows farmers and interested users to access these advisories in a user-friendly manner. Apart from the crop advisory, the app also makes available observed weather and weather forecasts.
- Damini Lightning app has been developed by IITM-Pune and ESSO for India. The app monitors all lightning activities and alerts if lightning is happening nearby by GPS notification under 20-40 km.

(iv) Feedback from stakeholders and scientists: A group of scientists interacts regularly with the farmers to get feedback which may be used to refine the agromet advice.

Automatic Weather Station at DAMU (KVK Valsad, Gujarat)

A District Agromet Unit (DAMU) has been sanctioned to Gujarat Vidyapith Krishi Vigyan Kendra for Valsad district. The district is characterized by heavy rainfall, tribal dominated, hilly terrain region of Gujarat state. DAMU



Meghdoot mobile application

Mausam mobile application

Damini mobile application

started functioning from 2018–19. It has delivered advisories twice a week on a regular basis to >40,000 farmers of 6 blocks of the district through various media such as All India Radio (AIR), TV channels, newspapers, mobile text messages etc. KVK also developed a feedback mechanism with a view to make the advisory more meaningful and understandable to the tribal farmers. To assess the impact of agromet advisory services, study was conducted by DAMU, Valsad for paddy crop as it is grown over 71,000 ha during *kharif*. Both AAS users and non-user farmers were selected (n=200) at random from all the blocks of the district. The result of the study with respect to the paddy crop shows that non-AAS farmers and AAS farmers spent ₹16130 and ₹13088 per hectare under the given head, respectively (Table 1). Thus, those farmers who have not followed the advisory had spent ₹3042 per hectare more as compared to AAS farmers. Net return of the AAS farmers was more than non-AAS farmers by ₹7700 per hectare. The benefit:cost ratio for AAS farmers and non-AAS farmers was 1.82 and 1.47, respectively. The non-AAS farmers spent ₹1092 more for the fertilizer. Similarly for the pigeon pea crop, cost of seeds, fertilizer and plant protection was ₹4707 and ₹6260 per hectare for AAS farmers and non-AAS farmers, respectively. As advised by the scientist, timely application and right dose of fertilizer application has saved a considerable money of AAS farmers. It is clearly reflected in the net profit earned by the farmers.

Table 1. Economic impact of agromet advisory in respect to AAS and non AAS farmers.

Farm operation	AAS farmer (₹/ha)	Non AAS farmers (₹/ha)
Paddy		
Seed	900	1200
Fertilizer	11638	12730
Plant protection	550	1200
Cost	13088	16130
Yield (per ha)	57.4	51.2
Gross return	57700	50000
Net return	25912	15970
B:C ratio	1.82	1.47
Pigeon pea		
Seed	1800	2100
Seed treatment	200	00
Fertilizer	2307	2840
Plant protection	600	1320
Cost	4907	6260
Yield (per ha)	13	11.7
Gross returns	45500	37300
Net returns	17900	15120
B:C ratio	2.03	1.76

Economic impact of Agromet Advisories

In Gujarat 8 AMFUs (Agromet Field Unit) and 9 DAMUs (District Agromet Unit) are functioning under the State Agricultural Universities and Krishi Vigyan Kendras, respectively. These units cover all 33 districts of the state. IMD established AWS system at each of these units to collect the weather parameters such as maximum and minimum temperature, rainfall, bright sunshine hours, wind speed, wind direction, relative humidity, Soil moisture etc. This enables the farming community in taking decisions regarding various farming operations like timely sowing, fertilizer application, irrigation, harvesting, pest and disease incidence, pesticide application etc. which ultimately assists them to

Automatic weather station at DAMU (KVK Valsad, Gujarat)

minimize the losses due to adverse weather conditions.

SUMMARY

Agromet Advisory Service for agriculture is the provision of accurate and locally-appropriate climate and weather information that plays a significant role for increasing the resilience of communities to climate change and variability. Establishment of DAMU at KVK to prepare customized advisory at block level enables small and marginal farmers to cope with the vagaries of weather through adoption of agromet advisories and it leads to enhancement in the income by reducing cost of cultivation.

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