ASSESSMENT OF AGROMET ADVISORY SERVICES FROM THE PERSPECTIVE OF FARMERSIN NANDURBAR DISTRICT, MAHARASHTRA

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ABSTRACT

A study was undertaken in Nandurbar district, Maharashtra, by the District Agrometeorological Unit (DAMU) in 2024 to evaluate farmers' perceptions and adoption of weather forecasts and agro-advisory services. The Agromet Advisory Bulletins (AABs) were issued twice weekly (Tuesday and Friday) through Information and Communication Technologies (ICTs) to support farm-level decision-making. Survey results from 106 farmers indicated that 93.4% regularly utilized weather-based advisories. The advisories were most frequently applied to sowing and transplanting (76.4%), followed by chemical application (70.8%), harvesting and threshing (65.1%), fertilizer application (64.2%), irrigation scheduling (57.5%), and post-harvest operations (41.5%). With respect to usefulness, 62.3% of farmers rated AABs as highly useful, 35.8% as partially useful, and only 1.9% considered them not useful. The economic benefits were substantial, with farmers reporting savings ranging from ₹5,000 to over ₹1,20,000, depending on the degree of adoption and crop type. These savings were attributed to improved efficiency in resource use, reduced weather-related losses, and better crop management practices. The study underscores the critical role of agrometeorological advisories in mitigating climate-related risks, enhancing resource optimization, and improving profitability in smallholder farming systems. Broader dissemination and increased farmer engagement with AABs can further strengthen climate-resilient and sustainable agricultural development in the region.

INTRODUCTION

Indian agriculture is highly dependent on weather and climatic conditions, with substantial crop losses occurring annually due to unpredictable weather events. However, timely and accurate weather forecasts can help mitigate these losses by enabling farmers to adjust their farming practices accordingly. Weather-based forecasts play a crucial role in decision- making for crop selection, variety choice, sowing and harvesting schedules, and farm input management, including irrigation, fertilization, and pest control. Effective weather-based advisory services empower farmers to leverage favorable weather conditions and mitigate the risks posed by adverse climatic events. Agriculturally relevant forecasts not only enhance farm efficiency but also contribute to impact assessment and risk management (Venkataraman, 2004). According to Rajkumar Dhakar et al. (2016), advance information on anticipated weather conditions, combined with agrometeorological advisories, significantly improves farmers' decision-making and livelihoods when disseminated in a timely manner. In the current climate change scenario, agrometeorological advisory services (AAS) have gained importance in helping farmers manage climate risks.

The utilization of agroclimatic characterization, nowcasting for extreme weather events, and the integration of modern information and communication technologies (ICTs) are essential strategies for enhancing agricultural resilience. Several studies highlight the benefits of long-range weather predictions in guiding agricultural decisions, particularly in regions influenced by El Niño- Southern Oscillation (ENSO) (Hansen, J.W.; Harrison, M., 2007). However, research on the economic impact of medium-range weather forecasts at the farm level remains limited. While assessing the financial benefits of advisories in disaster situations is complex, their economic value can be evaluated when scientific weather-based advisories align with traditional farmer knowledge (Patt & Gwata, 2002). India's weather services for farmers began in 1945 under the India Meteorological Department (IMD) (Singh et al., 2020). Today, agromet advisory bulletins are issued at three levels, such as National Agromet Advisory Bulletin, State Agromet Advisory Bulletin and District Agromet Advisory Bulletin by Agro-met Field Units (AMFU) & District Agromet Unit (DAMU). DAMU is a joint effort of IMD and ICAR with multi organizational collaboration to implement various components (Arpitha et al., 2022) By adopting AAS in agriculture in view of weather forecasts can minimize crop losses. The District Agro-met Units (DAMU) and (AMFU) in our country provides AAS majorly as

bulletins which includes weather forecast information for five days at district and agro sub divisional level on different weather parameters i.e., rainfall (mm), maximum and minimum temperatures (°C), morning and evening relative humidity (%), wind speed (kmph), wind direction (deg.), cloud cover (octa), pest-disease outbreak and strategic management practices of crops for their respective district. AAS bulletins are prepared weekly twice on every Tuesday and Friday in bilingual (Marathi and English), disseminated to the farming community and district agriculture officers majorly through the WhatsApp groups made at block/sub divisional level. The AAS bulletins also includes agricultural activity on crop management, planning of irrigation, time and method of planting, fertilizer application, pesticide and herbicide application along with mitigation practices of weather vagaries so that, farmers can use natural resources in an effectual manner both in quantity and quality (Ray et al., 2017). The major objective of AAS is to help the farmers in capitalizing prevailing weather conditions in order to optimize the resource use and minimize loss due to harsh/aberrant weather conditions Agriculturally relevant forecast is not only useful for efficient management of farm inputs but also leads to precise impact assessment (Gadgil, 1989).

MATERIALS AND METHODS

Study Area: The study area is located in the northwest corner of Maharashtra State, India. Nandurbar district is bounded by 21^0 00' to 22^0 03' North & latitude $73^031'$ to $74^032'$ East longitude. Topographically it has much diverse condition. The district is characterized by warm & humid climate. Nandurbar district comprises six tahsils namely Akkalkuva, Nandurbar, Navapur, Shahada, Taloda, and Akrani. The district has total area of 5034.23 sq. km. The rainfall in the eastern part of the district is minimum and Shahada comes under this category. The rainfall increases in the westwards of the district Akkalkwa and Navapur comes under the major rainfall area.
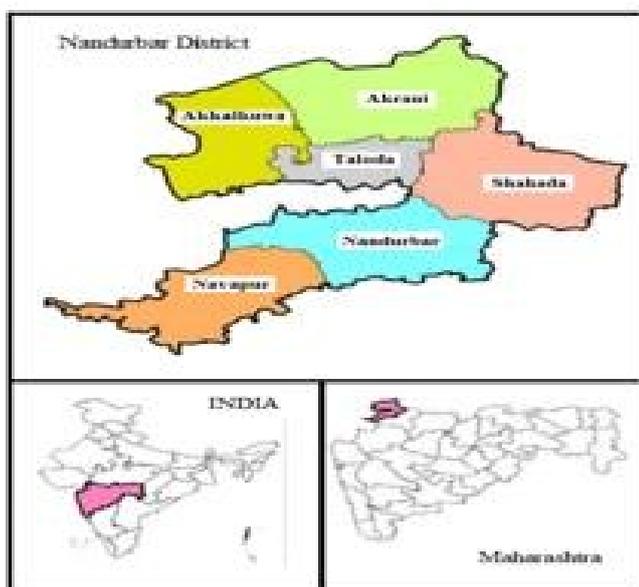

Fig. 1. Location of study area

Agrometeorological Advisory Services (AAS) in Nandurbar

The District Agro-Met Unit (DAMU), KVK, Nandurbar, operates under the Gramin Krishi Mausam Sewa (GKMS) scheme, a joint initiative of the India Meteorological Department (IMD) and the Indian Council of Agricultural Research (ICAR). The unit is responsible for providing weather- based agrometeorological advisories (AAS) at district and block levels. These advisories are prepared and disseminated to farmers through various Information and Communication Technologies (ICTs) to support climate-resilient agriculture. Additionally, the DAMU unit conducts various capacity-building programs, including:

- Farmer awareness programs
- Youth discussions and interactive sessions
- Field visits and demonstrations
- Training sessions on weather-based agro-advisories

Data Collection: A structured questionnaire was used to collect primary data from farmers regarding their socioeconomic characteristics and perceptions of AAS. The questionnaire was developed in Marathi to ensure clarity and ease of understanding among respondents. The questions were concise and straightforward, facilitating accurate responses.

Objectives of the Study

- To analyze the adoption of weather forecasts by the farming community and assess their realization in farm operations.
- To evaluate the usage, effectiveness, and potential benefits of Agromet Advisory Services.
- To formulate weather-based farming strategies based on the economic impact of AAS

RESULTS & DISCUSSION

Socio-economic features of farmers: Considering the importance of socio-economic characteristics in agricultural decision-making, a total 106 farmers were randomly selected from six blocks of district, namely Nandurbar, Navapur, Shahada, Taloda, Akkalkuwa, and Akrani.

Land Holding Patterns of Farmers: The results illustrate the distribution of farmers in Nandurbar district based on their landholdings (Table 1). The majority of respondents were found to possess small (1.01–2.00 ha) and semi-medium (2.01–4.00 ha) landholdings, each category accounting for 29.2% of the total farmers surveyed. This indicates that a significant proportion of farmers in the district operate under small-scale farming systems. A smaller proportion of farmers (17.9%) fell into the marginal category (<1.01 ha), while 19.8% of farmers belonged to the medium category (4.01–10.00 ha). Only a very limited number of farmers (3.8%) were found to hold large farms (>10 ha). The predominance of small and semi-medium landholdings suggests that most farmers in the district operate under resource-constrained conditions. This in turn influences their agricultural decision-making, particularly in terms of investment capacity, risk management, and adoption of new technologies.

Table 1. Size of land holding by responded farmers

Land Holding	% Farmers
Marginal (Below 1.01 hectare)	17.9
Small (1.01-2.00 hectare)	29.2
Semi medium (2.01-4.00 hectare)	29.2
Medium (4.01-10.00 hectare)	19.8
Large (more than 10.00 hectare)	3.8

Major Crops Grown in Nandurbar District: Crop selection plays a vital role in agricultural advisory services, as it directly influences resource utilization, input management, and farmers' vulnerability to weather risks. The survey results revealed that cotton is the dominant crop in Nandurbar district, cultivated by 60.4% of the respondent farmers (Table 2). This reflects the region's suitability for cotton production and its importance as a cash crop. The second most widely grown crop was sugarcane (32.1%), highlighting its role as another key income-generating crop in the district. Other important crops cultivated by farmers included pigeon pea (11.3%), sorghum (15.1%), soybean (15.1%), maize (14.2%), papaya (14.2%), and banana

(15.1%). Although these crops were grown by a relatively smaller proportion of farmers compared to cotton and sugarcane, they play a significant role in supporting household food security and diversification of farm income. The crop diversity observed in the district suggests that while cotton and sugarcane dominate the agricultural landscape, a considerable number of farmers are also adopting pulses, cereals, oilseeds, and horticultural crops to reduce risks and ensure year-round production.

**Table 2. Major crop grown in Nandurbar district**

Crop Name	% Farmers
Pieong pea	11.3
Sorghum	15.1
Cotton	60.4
Soybean	15.1
Maize	14.2
Sugarcane	32.1
Papaya	14.2
Banana	15.1

Farmer's Perception Towards Agrometeorological Advisory Services: A detailed analysis of farmers' responses towards Agrometeorological Advisory Bulletins (AAB) in Nandurbar district revealed a very high level of adoption. An overwhelming 93.4% of farmers reported that they regularly follow weather forecasts and advisories for farm operations, while 5.7% stated that they do not utilize them, and a very small proportion (0.9%) reported using them only occasionally. With respect to the usefulness of advisories, a majority (62.3%) of farmers rated AAB as highly useful, while 35.8% considered them partially useful. Only 1.9% of respondents found them not useful, indicating a strong overall acceptance of the service. The study also explored the preferred communication channels for receiving AAB. The results showed that WhatsApp was the most favored medium (84%), followed by television (8.5%), SMS (6.6%), and radio (0.9%). The dominance of WhatsApp highlights the increasing reliance on mobile-based digital platforms for real-time and easily accessible agricultural information. The advisories were found to significantly influence various farm operations. Farmers reported applying AAB recommendations most frequently in chemical application (70.8%), sowing/transplanting (76.4%), fertilizer application (64.2%), harvesting and threshing (65.1%), and irrigation scheduling (57.5%). Additionally, 41.5% of farmers used advisories for post-harvest operations such as storage, transportation, and marketing, reflecting the extended impact of AAB across the agricultural value chain (Table 3).

Table 3. Farmer's perception towards Agromet Advisory Services in Nandurbar district

1.	Do you follow weather forecast & AAB for your farm operation	% Farmers
	Yes	93.4
	No	5.7
	Sometime	0.9
2.	How relevant/useful is the weather forecast	
	Highly useful	62.3
	Partially useful	35.8
	Not useful	1.9
3.	Most suited and preferred medium for AAB	
	WhatsApp	84
	Television	8.5
	Radio	0.9
	SMS (text message)	6.6
4.	Farm operation for which AAB are used	
	Sowing/transplanting	76.4
	Irrigation application	57.5
	Fertilizer application	64.2
	Chemical application	70.8
	Harvesting /Threshing	65.1
	Post-Harvest Operations (Storage, Transportation, Marketing etc.)	41.5

Economic Benefits of Agrometeorological Advisory Services (AAS): Hansen (2002) emphasized that the emerging capacity to deliver timely and skillful weather forecasts has significantly enhanced agricultural production and productivity by reducing farmers' vulnerability to adverse weather conditions. In this context, Agrometeorological Advisory Services (AAS) have emerged as a vital tool to support farmers in informed decision-making, minimizing weather-related risks, and optimizing the use of agricultural resources. The District Agrometeorological Unit (DAMU) plays a key role in disseminating such advisories at the grassroots level. To assess the impact of AAS, a survey was conducted among 106 farmers in Nandurbar district, which revealed substantial economic benefits for 66 farmers who adopted and implemented these advisories effectively. The results demonstrated a wide range of positive economic impacts: 40 farmers reported savings of up to ₹5,000, attributing this to timely access to weather forecasts and advisories that guided them in making informed decisions regarding farm operations such as sowing, irrigation, and fertilizer application. 7 farmers achieved savings between ₹5,000 and ₹15,000 by consistently following agrometeorological advisories and adapting their farming practices accordingly. 6 farmers benefited from savings in the range of ₹15,000 to ₹30,000, largely due to improved allocation of resources, reduced input wastage, and optimized crop management practices. 9 farmers recorded significant savings between ₹30,000 and ₹60,000, highlighting the role of AAS in minimizing weather-related losses, enhancing crop resilience, and improving yield quality. 3 farmers experienced substantial economic gains of ₹60,000 to ₹1,20,000, which can be linked to better pest and disease management, efficient irrigation scheduling, and effective yield enhancement strategies guided by the advisories. Notably, 1 farmer reported exceptional savings exceeding ₹1,20,000, showcasing the transformative potential of AAS in achieving climate-resilient and economically viable farming when advisories are implemented effectively.
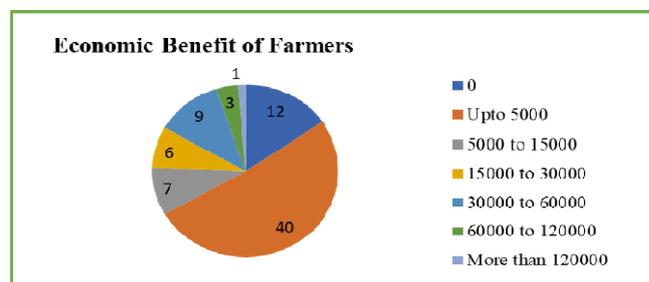
Fig 2. Economic Benefit of farmers of Nandurbar district

DISCUSSION

The survey results indicate a strong reliance on AAB for timely farm operations, with WhatsApp emerging as the most preferred dissemination platform. The increasing accessibility of smartphones and internet connectivity has significantly contributed to the shift from traditional media such as radio and newspapers to digital platforms. Additionally, the advisories play a crucial role in mitigating agricultural risks. The economic benefit observed among farmers demonstrate how integrating meteorological insights into agricultural planning can lead to cost reduction, risk mitigation, and improved overall productivity. The findings emphasize the need for continued efforts to enhance the accessibility and accuracy of Agromet advisories. The adoption of digital platforms such as WhatsApp and mobile apps should be encouraged to improve information dissemination. Furthermore, training programs should be conducted to enhance farmers' understanding of AAB and ensure that advisories are interpreted and applied effectively for better agricultural resilience and productivity.

CONCLUSION

This impact assessment clearly illustrates that Agrometeorological Advisory Services are not just an information tool, but a catalyst

for improving farm-level decision-making, risk reduction, and sustainable agricultural growth in Nandurbar district. particularly through digital platforms, it is evident that technology-driven weather information services are the future of sustainable agriculture. Policymakers and agricultural extension agencies should focus on improving digital literacy among farmers and ensuring timely and precise advisory dissemination to enhance agricultural resilience against climate variability. The varying levels of benefits across farmers also indicate that the more consistently and effectively AAS is applied, the greater the economic advantage it delivers.

Acknowledgments

REFERENCES

Arpithaa SN, Naresha NT, Munawerya A, Shambhavi Sand Rajath HP 2022. Utility and Impact of Agromet Advisory Services among Farmers in Mandya District, Karnataka. *International Journal of Environment and Climate Change.* 12(9):168-172.

Gadgil, S. 1989. Monsoon variability and its relationship with agricultural strategies. Paper presented at international symposium on climate variability and food security in developing countries. Feb 5-7, New Delhi, India, p. 249-267

Hansen, J. W. 2002. Applying seasonal climate prediction to agricultural production. Agric. Syst., 74(3): 305– 307.

Harrison, M., Kanga, A., Magrin, G. O., Hugo, G., Tarakidzwa, I., Mullen, C. and Meinke, H. 2007, Use of seasonal forecasts and climate prediction in operational agriculture. CAgM Report No. 102, WMO/TD No. 1344, World Meteorological Organization, Commission for Agricultural Meteorology, Geneva, Switzerland, p. 81.

Patt, A. and Gwata, C. 2002, Effective seasonal climate forecast applications: examining constraints for subsistence farmers in Zimbabwe. Global Environ. Change, 12, 185–195

Rajkumar Dhakar et al. 2016. Significance of Agrometeorological Services in Changing Climate Scenario, Indian farming 66 (8) 44-46

Ray, M., Patro, H., Biswasi, S., Dash, S. R. and Dash, A. C. (2017). Economic assessment of weather based agromet advisories in Keonjhar district, Odisha, Vayu Mandal, 43(1): 38-48.

Singh M, Ghanghas BS, Sharma V, Sharma BC 2020. Minimize weather risk in agricultural planning and management through agromet advisory services in Rural Areas.

Venkataraman, 2004. Climatic characterization of crop productivity and input needs for agro meteorological advisory services. *Journal of Agrometeorology,* 6(11):98-105

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