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Khobragade AM
PI, AICRPAM-NICRA, Department of Agril. Met, VNMKV, Parbhani, Maharashtra, India

Mane RB
Young Professional-II, AICRPAM-NICRA, VNMKV, Parbhani, Maharashtra, India

Gote GN
Assistant Professor, Department of Agril. Met, VNMKV, Parbhani, Maharashtra, India

Kadam YE
SRF, AICRPAM, VNMKV, Parbhani, Maharashtra, India

Corresponding Author:
Khobragade AM
PI, AICRPAM-NICRA, Department of Agril. Met, VNMKV, Parbhani, Maharashtra, India

Adoption of agromet-advisory services (AAS) under Aicrpam-Nicra at Parbhani district of Maharashtra for improving livelihood of rural farmers

Khobragade AM, Mane RB, Gote GN and Kadam YE

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Abstract
Present review study was conducted during in year of 2023-24. Main aim of review study to know effectiveness and usefulness of Agro Advisory Services (AAS) regarding Climate Change in selected Villages of AICRPAM-NICRA Project for Marathwada Region. Study concluded that, Agro Advisory Services (AAS) an effective communication media for transfer of technology regarding climate changes information. Agro Advisory Services (AAS) provides basic, timely and accurately pre-information of different climate and weather conditions of different crops. Agro Advisory Services (AAS) helpful to farmers for increase interest, knowledge, adoption and impact of climate changes on agricultural practices. The crop situation of these farmers was compared with nearby fields having the same crops, where forecast is not adopted in Non AAS farmers field. The data was recorded from both the farmers group particularly on crops expenditure incurred by the farmers from land preparation to harvest at every stage, has been worked out and crop growth and yields were observed regularly. The result observed that those farmers who adopted AAS information and implemented it in their field, found the better crop growth and high yield over the non-adopted AAS farmers. The net income of AAS farmers was about Rs. 56042 to 58278 for soybean and while non AAS farmers about Rs. 35690 respectively. Those farmers have adopted the Agromet Advisories on their day to day operation carried out the additional benefits of 61 to 63%.

Keywords: Agro advisory services, climate change, weather, B: C ratio

Introduction
Agromet advisory services is a vital tool which provides the valuable information about all agricultural operations starting from land preparation, sowing to harvest based on weather forecasting. The main aim of Agromet-advisory services is to conserve the natural resources effectively and call for minimizing the weather hazards. The utility of weather forecast further depends upon their reliability and applicability at micro- level. The major objective of AAS is to help the farmers in capitalizing prevailing weather conditions in order to optimize the resource use and to minimize the loss due to harsh/aberrant weather conditions (Venkataraman, 2004) [10]. The main aim of Agromet-advisory services is to conserve the natural resources effectively and call for minimizing the weather hazards. It is a fact that AAS can be modified or may be the agricultural operations can be reoriented to the forth coming weeks (3-10 days forecast).
Requirements for Agrometeorological Services need to be looked through making best use of weather as natural resource and avoiding its inclemency. The task of an agrometeorological is to apply every relevant meteorological skill to help the farmer make the most efficient use of this physical environment with the prime aim of improving agricultural production, both in quantity and quality. In order to play an efficient role for the improvement of the agricultural production, the agrometeorological service assesses the user's needs and strives to meet them. National Initiative on Climate Resilient Agriculture (NICRA) is a network project of the Indian Council of Agricultural Research (ICAR) launched in February, 2011.The project aims to enhance resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. The research on adaptation and mitigation covers crops, livestock, fisheries and natural resource management. The project consists of four components *viz*. Strategic Research, Technology, Demonstration, Capacity Building and Sponsored/ Competitive Grants. Main.

Objectives of AICRPAM-NICRA

1. To enhance the resilience of Indian agriculture covering crops, livestock and fisheries to climatic variability and climate change through development and application of improved production and risk management technologies.
2. To demonstrate site specific technology packages on farmers' fields for adapting to current climate risks.
3. To study the content of Weather based Agrometeorological Advisory Bulletin (AAB), its impact and farmers feedback.
4. Micro level (block level) Agromet advisories (success stories, validation of weather forecast etc.)
5. Monitoring and compilation of extreme weather events and its impacts on agriculture in jurisdiction.

Main activity of AICRPAM-NICRA has Weather based Agro-advisories, contingency plans and identification of best management practices through network of AICRPAM centers.
It is observed that there is not much attention in the country and state on the aspects of knowledge of Weather Forecasting and Agrometeorological Advisory Bulletin of weather condition. Hence keeping in view these facts the present review research study was undertaken.

Research Methodology

Collection of data has given Medium Range Weather Forecast (MRWF) issued by IMD, Pune and daily weather data recorded at Meteorological Observatory, Dept. of Agril. Meteorology, VNMKV, Parbhani for last year i.e. 2023-24 was collected. The study of agro- advisory bulletins issues by AMFU unit, VNMKV Parbhani collected for last year (2023-24). Selection of farmer and preparation of questionnaire has fifty progressive farmers selected from AICRPAM-NICRA Dampuri & Itlapur villages from Parbhani district and a questionnaire as suggested by NCMRWF was circulated to them.

Results and Discussion

Content of weather based Agro-meteorological Advisory Bulletin (AAB), its impact and famer feedback:

Content of Weather Based Agrometeorological Advisory Bulletin (AAB)

The content of weather based Agrometeorological Advisory Bulletin (AAB) studied by using last year Agro-Advisory Bulletins. After study the total number of AAB available from the Integrated Agromet-Advisory Services (IAAS) unit Parbhani observed that following disciplines are covered annually AAB. In the year 2023 number of AAB available and containing advice are 40 from the Agromet crop like cotton covered in 45% of AAB and soybean in 42.5% of AAB also the other crops like jowar, bajra, maize, seasamum, gram, tur, safflower, sunflower are covered. The horticultural crops, vegetable crops and fruit crops citrus and banana with animal and poultry disciplines. However, 2023 only size AAB get available. All the disciplines covered like cotton, jowar for agronomic crops, chilli, tomato, brinjal, and fenugreek, citrus for horticultural crops in 100% of available AAB. In 2023 100% bulletins covers observed rainfall, maximum and minimum temperature, wind speed and wind direction. In 2023 the available AAB covers observed maximum and minimum temperature, wind speed cloud cover and forecasted wind speed and wind direction and observed rainfall contains forecasted maximum and minimum temperature bulletin covers forecasted rainfall and local inputs respectively.

Impact of Agrometeorological Advisory Bulletin (AAB)

By the study of last year AAB and annual reports of integrated Agro-Advisory Services (AAS) the following events of economic gain or loss formulated. Usefulness of AAB enumerating selected cases when advisories were helpful or otherwise. The forecast of parameter other than wind directions match satisfactorily with actual observations and thus the advisories were quite effect in crop management. Specific instances of benefit/loses due to AAS with cultural practices, sowing, spraying, pesticides, irrigation, fertilizer application and labour saving etc. modified as per advisories.
Form the above Table it is formulated that the forecasted information through the AAB is economically useful to farmer for avoiding the losses of crop yield due to abnormal weather conditions.

Table 1: Economic impact of the AAS (2023-24)

Sr. No.	Forecasted Weather event Date	Crop cultural operations recommended in Advisory	Economic Gain/Loss
1.	Prediction of no rainfall up to 23rd June, 2023	Farmers advised for timely preparatory tillage for sowing of kharif crops. Do not sown the kharif crops. Sowing should be done after receipt of 75 to 100 mm rainfall.	Gain: Timely preparatory tillage was done by farmers for better crop production. Good germination with better growth and development of crops.
2.	Prediction of rainfall during 4-6 July, 2023.	Advised sowing of *kharif* crop.	Gain: Sufficient rainfall received during this period as per the prediction and therefore, sufficient soil moisture for sowing of kharif crops.
3.	Prediction of no rainfall during 2 to 18 Aug, 2023	Protective irrigation management should be done using micro irrigation. To spray the KNO_3.	Gain: Rainfall was not recorded during this period and which was helped to farmers for increasing crop yield. Due to spray of KNO_3 crop was sustained.
4.	Rainfall prediction during 27 Sept, 2023	Advised to drain out stagnated water from Cotton and Arhar crop fields.	Gain: good rainfall was recorded. Useful for cotton and Pigeon pea crop.
5.	Rainfall prediction during 27 Nov, 2023		Gain: good rainfall was recorded. Useful for rabi crop crops.
6.	Temperature prediction (light hot wave) during 13 to 22 May 2023.	Advised to protect banana and citrus orchard from the hot wave by adaptation of management practices.	Gain: The final yield of crop and quality was found economical to farmers.

(**Source:** Annual Progress Report of IAAS unit, Parbhani (2023-24).

Farmer feedback

In all fifity progressive farmers from selected AICRPAM-NICRA villages under Parbhani district were selected. To have farmer views about the utility of these advisories issued by University Experts, a questionnaire as suggested by NCMRWF was circulated to them. In general the result or the formation of questionnaire collection as follow.

Table 2: Types of Crops Grown by the Farmer in Different Seasons

Kharif Season	Rabi Season	Summer Season	Other Crops
Sorghum	Sorghum	Sunflower	Sugarcane
Cotton	Wheat	Groundnut	Banana
Groundnut	Gram		Papaya
Bajra	Safflower		Watermelon
Soybean			Chilli
Mung			Mango
Pigeon pea			Grape
Seasamm			Pomegranate
Black gram			citrus
Maize			
Sorghum fodder crop			

From the above Table-02 formulated that 80.2% farmers got forecast from that about 60.5%. It shows that more expose of whatapp group, direct contact, universities, newspaper to the farmer than the radio, magazine and other mass media. About 75.0% of farmer aware that the forecast published in newspapers, TV, magazines is forecasted through this IAAS unit Parbhani. As per the farmers view the grades to forecast in AAB was given from that the 26.8% farmer gives satisfactory and normal grades 21.9% good, 24.5% better, 26.8 best grades given by farmers.

All the 50 selected progressive farmers responded about IAAS unit and AAB positively. The rating in respect of plant protection, fertilizer application, management under adverse weather conditions and sowing time operations were estimated and found quite encouraging. Majority of the farmers rated highest utilities of advisories in relation to plant protection followed by advice made for management of crops under aberrant weather conditions. The overall utility of the advisories rated by the respondents were quite encouraging.

Economic benefit of AAB

During the month of August 2023 due to dry spell soybean and cotton crop was under water stress condition, hence the farmers are adviced to irrigate the crop as per availability of water by using micro irrigation system only and if water is not available then take a spray of potassium nitrate 2% (200 gm per 10 litter of water), so that the crop will survive. Advisory are also given to control Semilooper as well as sucking pests at growth and development stage, Girdle beetle at flowering stage in soybean crop and sucking pests (Aphids, Jassids, thrips and white fly) at growth and development stage, pink bollworm at flowering and boll formation stage in cotton crop as well as sucking pests and disease (Powdery mildew) on black gram crop during Kharif season of 2023. Due to which farmers are able to overcome dry spell by proper management and control pests and diseases at proper time resulting in reduction of losses. Hence, the Net profit of AAS farmers was found more than the Non AAS farmers.

The economic benefit obtained by farmers has been evaluated for Kharif seasons for the period 2023-24. Total cost of cultivation, crop yield and net returns for Soybean crop grown by the AAS Farmers and non AAS farmers during Kharif season are presented in Table 3.The total cost of cultivation was found to be lower in the case of AAS farmers, who have effectively adopted the Agromet advisory compared to non AAS farmers. Further, the net income and B: C ratio for soybean crop were 56042 & 58278 Rs/ha and 2.43 & 2.47 Dampuri & Italapur village respectively in case of AAS farmers and 35690 Rs/ha, and 1.79 in case of non-AAS farmers for Soybean crop. Those farmers have adopted the agro advisories in their day to day operation carried out the additional benefits of 63.6% & 61.2% both village in Soybean crop. From Table 3 it is observed that the AAS farmers realized good benefit than non-AAS farmers. Even here also the yield and other returns were lower in case of non-AAS farmers compared to the AAS farmers. This may be due to the advisories issued for the AAS units contain advises for crop production strategies like ploughing, sowing, pest and disease management, harvesting, threshing and post-harvest procedures, to derive maximum benefit of the benevolent weather and to mitigate the impact of malevolent weather for enhanced productivity of all crops. Similar results were also reported by Jagadeesha *et al*. (2010) [7] and Ananta *et al* (2013) [1]. Bi-weekly forecast given to the AAS farmers helped to avoid the adverse effects of weather events like heavy rain, dry spell, high wind speed which influence the growth of the crops. Most of the AAS farmers have realized higher additional benefit of 55.5% and 50.3 in soybean and cotton + black gram crops respectively. Similar observations were also reported by Singh *et al*. (2004) [9] and Venkataraman (2004) [10]. According to them, the need for Agromet advisories and input requirements for Agromet advice on field operations, crop prospects and avoidance of pest and disease under adverse environment condition is essential. 50 percent farmers are aware about the Agromet advisory bulletins, which was utilized for all farm activities, who rated the usefulness of forecast between good to excellent. Similarly, Ravindrababu *et al*., (2007) [6], reported that the forecasts were found to be encouraging and of benefit to the AAS farmers

Implemented techniques/operation/management as per AAB

- Before sowing Seed treatment with recommended fungicides.
- Balanced nutrition with recommended N, P, K and Zinc.
- Pigeon pea sown in intercrops in soybean and cotton crop (Recommended ratio)
- He changed the varieties of crop (Medium duration) to do not impact of dry spell during mid of season.
- If dry spell occurred on early stage to spray the KNO_3 on soybean crop to crops was sustained.
- Every year in Parbhani district dry spell occurred in July and August month to proper irrigation management should be done at critical growth stage.
- Sowing should be done after proper soil moisture (After 75 to 100 mm rainfall recived) as per the advisory provided through NICRA project avoided the resowing.
- All management practices carried out as per agromet advisory during adverse condition through agro-advisory platform avoided future problems through adapting some futuristic approach.
- After His intervention to Agriculture University, he has been adapted to new practices with modern plant protection methods such as the use of balanced fertilizer, weed and water management and integrated pest and disease management.
- Sowing soybeans using the BBF method.
- Foliar spray of 2% urea at pod formation stage.
- Spray KNo3 during a dry spell.
- Postponement of insecticidal/foliar spraying due to rainfall forecast.
- Mulching operations are carried out on the vegetable, cucumber & watermelon crop during summer season.

Table 3: Comparison of cost of cultivation and B: C ratio of AAS adopted and Non-Adopted soybean farmer at Dampuri, Italapur (AAS village) & Thola (Non-AAS village)

Input Details / ha	Soybean Crop		
	AAS Farmer Dampuri	AAS Farmer Italapur	Non AAS Farmer Thola
Field Preparation cost ha^{-1}	6940	7150	7445
Seed cost / ha^{-1}	5688	5310	6915
Seed treatment	316	335	218
Fertilizer cost	3380	3385	4780
Sowing	2500	2500	2500
Weed management	2765	2575	3800
Interculture operation (Hoeing/Harrowi ng)	1350	1500	1500
Cost of plant protection / ha^{-1}	5200	5405	7025
Harvesting	8763	9000	8900
Threshing	2374	2460	2070
Cost of cultivation	39275	39620	45153
Soybean yield (quintal / ha^{-1})	20	21	17
Price of soybean Rs/Qt	4707	4776	4687
Total Income	95317	97898	80842
Net profit	56042	58278	35690
Benefit cost ratio	2.43	2.47	1.79

Validation of block-level weather Forecasts

Rainfall

The block-level medium range weather forecast issued by IMD was compared with the rainfall data from Parbhani block in Parbhani district and the results are presented in Fig. 1. It is observed that during the months of the southwest monsoon season (June, July and September), there is very close between actual and predicted data, except on few dates was observed. The July & September rainfall forecast is slightly better, although the daily rainfall is under-predicted (Fig 1). The result shown in Fig 13 rainfall forecast was very close to current observed rainfall data. The onset of the monsoon started in the first week of July as per forecast. One dry spell occurred during August as per forecast. There isn't any rainfall forecast from October to the whole month. There are not any showers. During November, the actual rainfall is more than forecast rainfall.

Temperature

Data shown in Fig 2 & 3. It is observed that during the years 2023–24 years there is no difference between actual and predicted maximum temperature data. In minimum temperatures, there is no difference between actual and predicted data in the southwest monsoon season, but during the winter and summer seasons there is some difference between actual and predicted data.

Humidity

Data shown in Fig 4. It is observed that during the year 2023-24, there are a lot of differences between actual and predicted morning and afternoon humidity data.

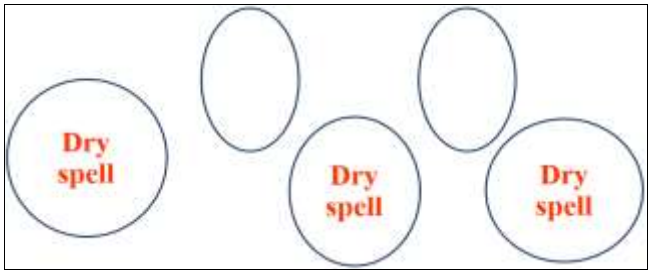

Fig 1: Comparison of Forecasted and observed daily rainfall at Parbhani block

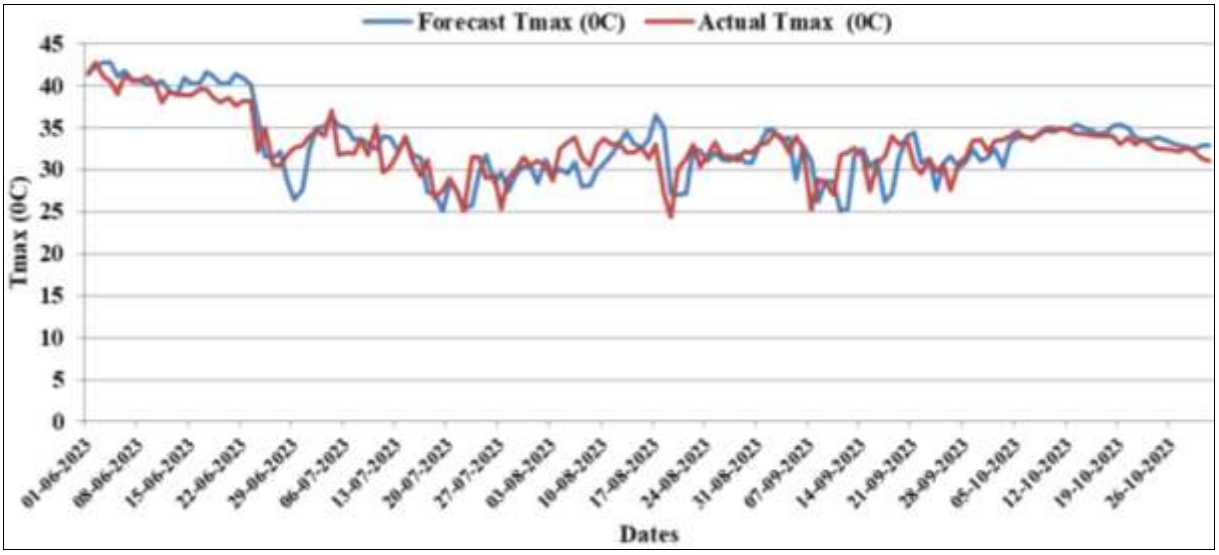

Fig 2: Comparison of predicted and observed maximum temperature at Parbhani block

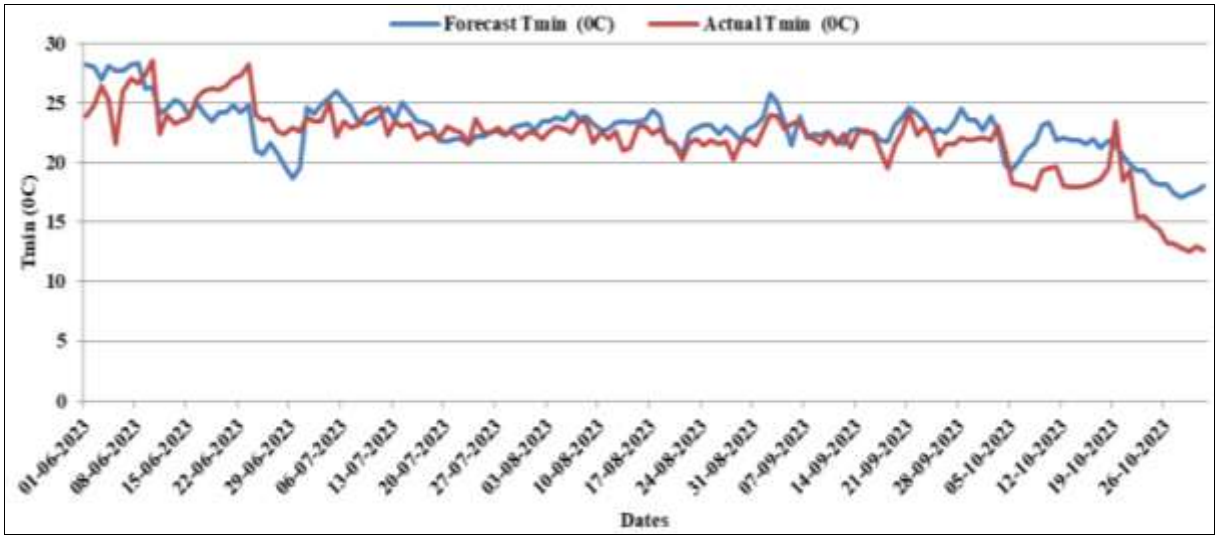

Fig 3: Comparison of predicted and observed minimum temperature at Parbhani block

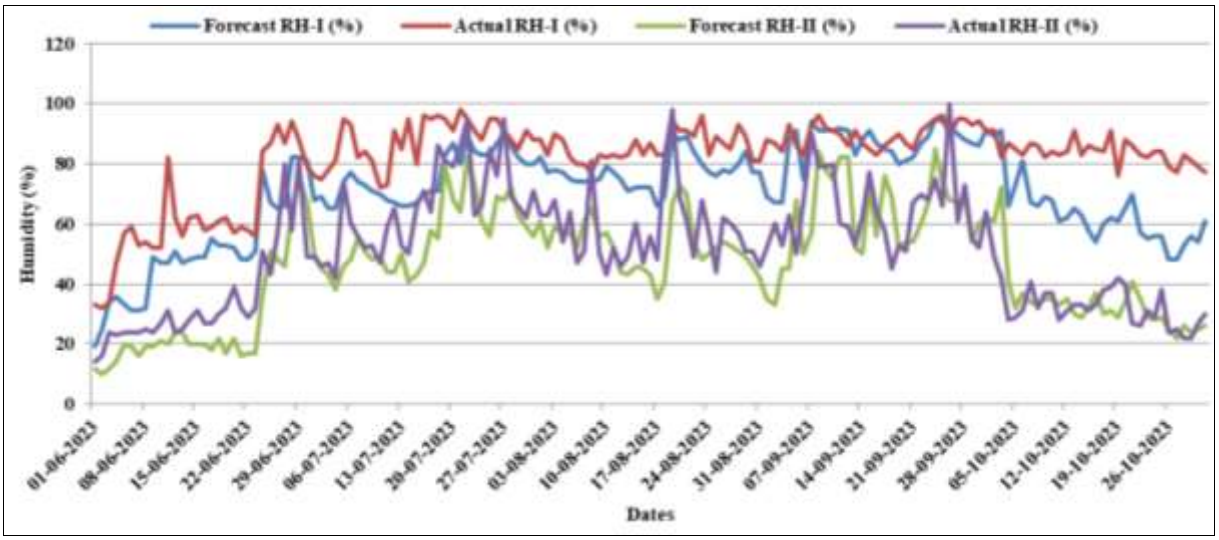

Fig 4: Comparison of predicted and observed Humidity at Parbhani block

Summary and Conclusion

The present study summarized and concluded that, Agromet Advisory Services (AAS) has effective communication media for transfer of technology for climate change as well as forecasted information through the AAB is economically useful to farmer for avoiding the losses of crop yield due to abnormal weather conditions. The studies showed that the application of Agromet Advisory Bulletin, based on current and forecasted weather, is a useful tool for enhancing the production and income. AAS farmers received weather forecast based Agromet advisories, including optimum use of inputs for different farm operations. Due to judicious and timely utilization of inputs, production cost for the AAS farmers reduced. The increased yield level and reduced cost of cultivation led to increased net returns.

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