Study on Economic Benefit by Following Agromet Advisory Services Received from District Agromet Unit in the Lateritic Belt of Birbhum

SAYAK MAHATO[1]*, SUBRATA MANDAL[1], F.H.RAHMAN[2]
Rathindra Krishi Vigyan Kendra, Palli Siksha Bhavana, Visva-Bharati, Sriniketan, Birbhum, West Bengal-731236, West Bengal[1].
ICAR- Agricultural Technology Application Research Institute, Bhumi Vihar Complex, Salt Lake, Kolkata- 700097, West Bengal [2].
INDIA

Abstract: At present, weather change is a burning issue throughout the world. Due to the change in climate, the agriculture sector is suffering a lot and farmers are facing various losses due to these changes. India Meteorological Department started the Agro-meteorological Advisory Services (AAS) in India to minimize the losses in agriculture due to climate change. District Agromet Unit (DAMU) in different Krishi Vigyan Kendras plays an important role in disseminating AAS blockwise though out the country. The main motto of DAMU is to enhance the farmer's income by minimizing losses by providing proper management practices against climate change at the block level. The present study was conducted in 10 different villages of the red and lateritic zone of Birbhum to get the economic benefit of adopting of AAS in farming operations by the farmers. The study was carried out during the *rabi* season for the years 2020 and 2021. Two groups of farmers were selected. One group, who were regularly following the AAS bulletins provided by DAMU, and another group was formed that were not following any AAS. The usefulness and economic impact at block level AAS has been assessed by analyzing the data collected from those farmer's groups. It was observed in the *rabi* season of 2020-21, that Rs. 6000 per ha was saved in a single season of Mustard cultivation due to rainfall forecast from DAMU, Birbhum. In this way the B: C ratio of Mustard cultivation has been increased from 3.16 to 4.60. In the 2021-22 *rabi* season farmers harvested the rice earlier as there was a cyclone warning and save 60% of crops. Farmers also got Rs. 4300 per ha extra savings in a single season of rice cultivation from non-AAS farmers by minimizing loss on irrigation and spraying operations by following AAS. i.e. they maintained the proper irrigation scheduling and applied fertilizer if there was no forecasting of heavy rainfall or adverse weather condition as it washed away the fertilizer.

Keywords: Agro Advisory Bulletin (AAB), Agro-meteorological Advisory Services (AAS), District Agromet Unit (DAMU), economic benefit, minimizing loss, extra savings.

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1 Introduction

Weather is the single largest determining factor of agriculture and allied activities as it influences crop planning from variety selection to the final stage of processing and preservation of the produce. Crops are very much vulnerable to global warming and climate change. With a little bit of difference in weather, the crop yield is reduced. Since 1980 in India, a cumulative total of 59,300 suicides can be attributed to warming, accounting for 6.8% of the national upward trend in suicide rates over this period. It was found that, by 2013, temperature trends will be responsible for over 4,000 additional deaths annually across India, accounting for 3% of annual suicides [2]. An increase in temperature, changes in rainfall patterns, and intensity of extreme weather events like floods and drought can cause severe damage to agriculture production [1] [8] [11][13]. Cereal crops yield has been severely affected due to the changes in climatic conditions, the yield loss can be up to 35% for rice, 20% for wheat, 50% for sorghum, 13% for barley, and 60% for maize depending upon location, future climate change scenario and projected year [10]. In dryland regions, farmers face severe problems due to the variability of climate [6]. The agriculturally relevant forecast is not only useful for efficient management of farm inputs but also helps with precise impact assessment [4]. Farmer's decision-making ability improved with the help of timely and accurate weather forecasts along with relevant farm management options in the form of advisories and thus the income of the farmers will

also be increased [3][5]. The main objective of Agromet Advisory Services (AAS) is to advise the farmers to adopt suitable management practices like sowing, transplanting, selection of variety, irrigation, spraying operation scheduling, etc based on weather forecasting. This service also helps to take proper risk mitigation measures not only for major horticultural crops of a district but also for livestock, fishery, etc. Weather forecast also helps to increase efficiency in the use of water and labor energy and reduce pollution with judicious use of agricultural chemicals [15]. India Meteorological Department (IMD) started District Agromet Unit (DAMU) in collaboration with the Indian Council of Agricultural Research through Krishi Vigyan Kendras (KVK) under Gramin Krishi Mausam Sewa Scheme (GKMS) to extend the benefit of AAS at the block level. The main motto of DAMU is to enhance the farmer's income by minimizing the losses by providing crop and location-specific agro-advisory at the block or village level farming community. These units will act as the nodal center of the districts to provide for the needs of agriculture and its sectors. The present study was conducted in 10 different villages in the red and lateritic zone of Birbhum district of West Bengal with the following objectives to assess the effectiveness and adaptation of block-level AAS provided through DAMU among (i) the village-level farmers and its economic impact to enhance the income of the farming community and (ii) to improvise the existing district-level Agromet Advisory Services (AAS) (iii) to deliver crop-specific and location-specific AAS to farmers at block level advisories. National Council of Applied Economic Research (NCAER) estimated in 2010 that if the whole farming community adopted the AAS in their agricultural activity then the economic benefit of these AAS at Rs. 50,000 crores per year is extrapolated to rise to Rs. 2, 11,000 crores. NCAER also revealed in a study in 2015 that only 24% of farmers are aware of AAS and if all farming households adopt the AAS on 22 major crops then the potential of generating net income benefit will be up to Rs. 3.3 lakh-crores.

2 Material and methods

The present study was conducted in randomly selected 10 different villages in the red and lateritic zone of Birbhum to get the economic benefit of adopting AAS in farming operations for the farmers. The name of the target blocks and villages are: Bolpur-Sriniketan block [Bishukhanda (V1), Jadavpur(V2), Bahadurpur (V3), Mohula (V4)], Sainthia Block [Digha (V5), Narayanpur(V6), Nitaipur (V7)], Dubrajpur block [Ramchandrapur (V8), Sahapur (V9), Meherpur(V10)] and the target crops were rice and mustard. The study was carried out during the rabi season for the years 2020 and 2021. Two groups of farmers were selected, each group having 5 farmers. One group, who were regularly following the AAS bulletins provided by DAMU, and another group was formed that was not following any AAS. The data were collected through a personal interview. Collected data from the selected farmers were analyzed. The economic impact of the present study has been assessed. The study areas represent the red and lateritic agro-climatic zone of West Bengal. The temperature varies from 12.7˚C to 28.3˚C in winter and from 25.5˚C to 41.5˚C in summer. The average rainfall is 1430 mm. The predominant soil types are old alluvial and red lateritic with low to medium organic carbon and phosphate content and medium to high in potash. The soil is acidic in nature with pH. range of 5.0 to 6.5.

3 Collection of weather data, preparation, and dissemination of AAB

3.1 Collection of weather data

The weather forecast data on maximum and minimum temperature, rainfall, wind speed and direction, maximum and minimum relative humidity, and cloud cover are collected from the IMD Agromet-DSS website (https://agromet.imd.gov.in/index.php/login/login_form). Realized weather data of the area under study were also collected from IMD, Meteorological Observatory Office, Dept. of Meteorology, Govt. of India, Sriniketan, Birbhum, West Bengal, and from Automatic Weather Station of DAMU_Birbhum, Rathindra Krishi Vigyan Kendra, Sriniketan, Birbhum.

3.2 Preparation of Agro Advisory Bulletin (AAB)

From the realized past weather data and forecast weather data, (AAB) is prepared every Tuesday and Friday, and real-time crop, livestock, etc. data from the identified villages were being collected for the *Rabi* season in the years 2020 and 2021. The AAB was prepared both in the regional language (Bengali) and English language for every 19 blocks of the Birbhum district by the engaged scientific personnel in DAMU_Birbhum and other members of the DAMU advisory board committee.

3.3 Dissemination of Agro Advisory Bulletin (AAB)

The bulletins were disseminated every Tuesday and Friday through WhatsApp, Facebook, district Agriculture Technology Management Agency offices, input dealers, village-level agriculture offices, IMD website (https://www.imdagrimet.gov.in/), and other extension personnel during the study period, i.e. from *Rabi* season for the years 2020 and 2021. Weather-based AAS helps to enhance the farmers' income by suggesting them suitable management strategies to overcome the adverse impact of forecasted weather [12].

4 Results and discussion

Agro Advisory Bulletin (AAB) bulletins gave the forecasting of the next five days i.e. medium-range weather forecasting. It helped farmers with various management practices like choosing sowing and harvesting date i.e. deciding the right time for sowing and harvesting operations, it was observed that on 12.11.2021 heavy rainfall was forecasted in AAB, so farmers harvested the mature rice crops earlier and saved 70% of crops from shattering due to heavy rainfall. (Table 1), irrigation and spraying scheduling, proper plant protection measures i.e. on 05.02.2021 farmers were advised to take precautionary measures on potato against the late blight disease and white fly, they followed the AAB and saved their crops by taking proper precautions (Table 1), selection of cultivars, etc. In table 1, examples of some forecasting and measurement practices have been sown. It is clear that AAS farmers can minimize the loss by following AAB by adopting various mitigation strategies like proper harvesting windows i.e. farmers choose the proper time for starting of planting or harvesting operation, plant protection measures, spraying operation scheduling, etc. A similar experiment was conducted in the Anand district of Gujrat state of India, on the usefulness of AAS to the farmers, and the result revealed that it helps to increase the farmer's income by 79.09% as compared to non-AAS farmers in different crops of the same region [9]. The forecasting weather data was also very much the same as the actual weather data in most cases which are also sown in Table 1. A similar type of result was also found in the Purulia district of West Bengal, in that the AAS farmers gain much more profit than the Non-AAS farmers [14].

The average yield for both the AAS farmers and Non-AAS farmers was more or less is same. In Mustard, the variety NRCHB-0101 gave the average yield varying between 12.7 q/ha to 13.2 q/ha (Table-2). The highest yield was observed in the Sahapur village of Dubrajpur block. The average yield of rice varied from 66.7 q/ha to 67.5 q/ha for both the Non-AAS and AAS farmers (Table 2). The highest yield was observed in the Jadavpur village of the Bolpur-Sriniketan block. The benefit-cost ratio (B: C) for both crops was also calculated. For farmers who are not following AAS the average B: C ratio for the 10 villages was 3.16 (Table 2) in the case of mustard and 2.09 (Table 2) in the case of rice cultivation. On the other hand, the average B: C ratio of the 10 villages of AAS farmers for the mustard crop was 4.59, which is 45.20% higher than the Non-AAS farmers. Similar results shows also sown in the case of rice cultivation. The average B: C ratio of AAS farmers for the 10 selected villages was 2.20, which is 5.30% higher than the Non-AAS farmers. It was also seen in Fig. 1, that the increasing percentage of B:C ratio is much higher in the case of AAS farmers for mustard than rice. Gandhi et al. (2018) did an experiment on paddy in the Mahasamund block and found that the Net cost: benefit ratio of AAS and non-AAS farmers was found 1:1.31 and 1:1.19 respectively. An experiment was conducted on the red gram in Bangalore, Kolar, and parts of the Tumkur district and found that the B: C ratio of AAS farmers was 3.41 whereas in the case of Non-AAS farmers it is much less i.e. 2.71 [7].

It can be concluded that farmers saved Rs. 6000 per ha in a single season of Mustard (Var: NRCHB-0101) cultivation by following AAS. In this way the B:C ratio of Mustard cultivation has increased from 3.16 to 4.60. In 2021, farmers harvested the rice earlier as there was a cyclone warning issued during the month of December and save 60% of crops. Farmers also got Rs. 4300 per ha extra savings in a single season of rice cultivation from non-AAS farmers by minimizing loss on irrigation and spraying operations by following AAS. They followed the AAB and gave irrigation when it was necessary and saved the extra cost. Besides that, they properly followed the AAB and applied fertilizer if there was no heavy rainfall or adverse weather condition as it washed away the fertilizer.

5 Conclusion

DAMU is a great initiative of IMD and ICAR as it helps the farmers at the block level. Farmers get more crop-specific and location-specific weather-

based knowledge. Weather-based advisories definitely help in decreasing the cost of cultivation. Agromet Advisory Services definitely help the farmers to get more benefits by reducing the cost of cultivation. Thus it helps to increase the farmers' income.

It is completely dependent on predicted weather data, farmers sometimes find that the weather forecast does not match. DAMU needs more accurate weather forecasting data. Sometimes the actual amount of heavy rainfall could not be predicted, hence proper care for drainage facilities cannot be taken by the farmers. Thus the farming community sometimes faces problems.

Date of issuance of forecast	Forecast given	Advisory given	Type of saving/ benefit
08.12.2020	Partly cloudy sky with no rainfall	The weather was favorable for blight disease in vegetables. So farmers were advised to apply Metalaxil + Mancozeb @ 2.5 gram/ Lof water or apply Hexaconazol @ 1.5 mili/L of water.	The severity of the disease was comparatively less due to precautions taken at right time.
05.02.2021	Partly cloudy sky with light rainfall	Precautions were advised as the weather was favorable for late blight disease and white fly attack of potato. Farmers are advised to spray Copper oxychloride @ 4 gram/L or Chlorothalonil @ 2gram /L and apply it again after 7-8 days to control late blight of potato and advised to spray Dimethoate @ 2 mili/L of water in the afternoon to control white fly.	The severity of the disease was comparatively less due to precautions taken earlier.
20.04.2021	Light rainfall is expected (Forecasted- 06 mm; Actual: 22 mm)	Harvesting of matured crops, stop spraying operation, irrigation	Saving the crop from damage due to water stagnation, saving of Irrigation, spraying, and fertilizer application cost
12.11.2021	Moderate rainfall (Forecasted- 38 mm; Actual:63 mm)	If more than 75% of the crop is already ripened, then farmers were advised to start the harvesting process as early as possible.	Saved the mature crops from shattering due to heavy rainfall.
03.12.2021	Cloudy condition with moderate to	Harvesting of matured rice crops, stop spraying operation, irrigation	Saving the crops from damage due to

	heavy rainfall (Forecasted- 35.30 mm; Actual:11 mm)	operation, tie the vegetable with logs	water stagnation, saving irrigation, spraying, and fertilizer application cost; Saving the mature crops from damage to heavy rainfall.

Table 1. Impact of AAS at Birbhum district of West Bengal

	Mustard			Rice		
Village	Yield(q/ha)	B:C		Yield(q/ha)	B:C	
		AAS farmers	Non-AAS farmers		AAS farmers	Non-AAS farmers
V1	12.7	4.6	3.2	67.3	2.19	2.07
V2	12.8	4.2	3.15	67.5	2.2	2.09
V3	13.0	4.8	3.21	67.4	2.21	2.11
V4	13.1	4.1	3.3	67.2	2.18	2.07
V5	12.9	4.8	3.13	66.7	2.2	2.1
V6	12.7	4.9	3.2	66.8	2.22	2.12
V7	12.9	4.3	3.16	67.0	2.23	2.08
V8	12.8	4.7	3.17	66.9	2.2	2.1
V9	13.2	4.8	3	67.3	2.19	2.07
V10	13.1	4.7	3.1	67.4	2.21	2.08
Total	129.2	45.9	31.6	66.8	22.03	20.89
Mean	12.9	4.59	3.16	6.68	2.20	2.09
S.D	0.17	0.07	0.08	0.28	0.01	0.02
CV (%)	1.31	1.52	2.56	0.42	0.45	0.95

Table.2- B: C ratio of Mustard and Rice for AAS and Non-AAS farmers of 10 villages

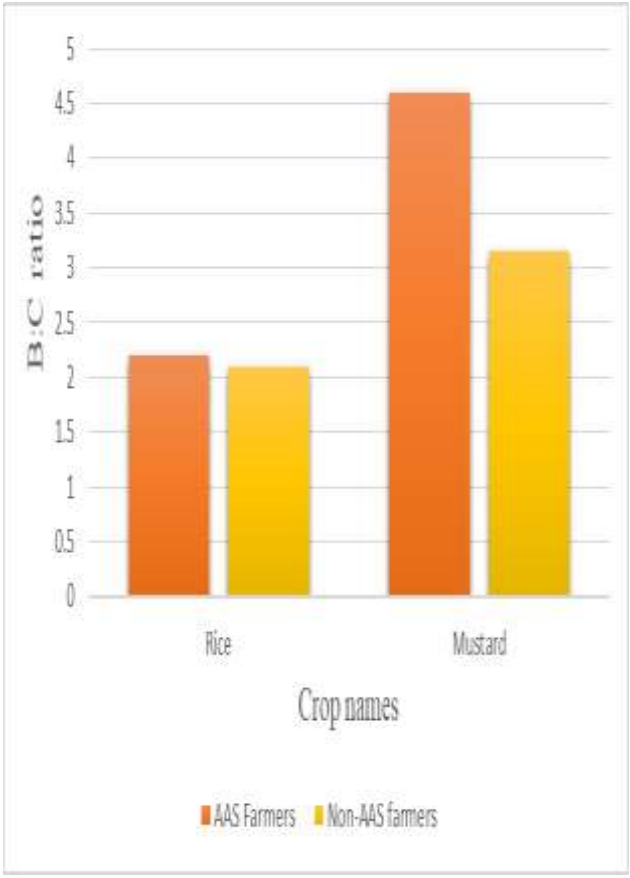

Fig. 1- Comparison of B: C ratio of two crops between AAS and Non-AAS farmers

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