Indian Journal of Extension Education
Vol. 56, No. 3 (July-September), 2020, (10-16)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Perception and Economic Impact of Agromet Advisory Services: A Case Study of Thrissur AICRPAM Centre of Kerala State

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ABSTRACT

This research explored the awareness, perception and economic impact of micro-level Agromet Advisory Services (AAS) issued by All India Coordinated Research Project on Agrometeorology of Indian Council of Agricultural Research through its 25 cooperating centres located across the country. Micro-level advisory based on weather forecast is the innovative and first of its kind in the country. Studies on economic impact of these micro-level advisories were uncommon. The study was conducted using field survey to assess the perception and economic impact of micro-level AAS at Thrissur AICRPAM centre on pilot basis. Two categories viz. AAS and non-AAS farmers, consisting of 40 farmers in each category were selected through multi-stage stratified random sampling technique. The probit regression model was employed to assess the factors determining willingness to pay (WTP) for AAS. The results revealed that 55% of AAS farmers rated the advisories as 'very good' on the scale of very poor to very good. Non-AAS farmers lagged in both awareness and adoption of services when compared to AAS farmers. Farmers' age, education and land holding size were found to be most important factors influencing farmer's willingness for pay-based services. Economic impact revealed that there was increase of 19-34 percent of income for AAS farmers in comparison to non-AAS farmers.

Keywords: Advisory service, Economic impact, Micro-level Agromet, Perception, Weather forecast

INTRODUCTION

Weather is one of the most important factor determining success and failure of agricultural production in India. It manifests its influence on agricultural operations and farm production through its effects on soil and plant growth. Weather through various atmospheric factors plays a significant role in reaping good agricultural output (Bal and Minhas, 2017). Variable and uncertain weather is a pervasive fact that farmers have to cope up and this has bearing on the livelihoods of farmers. Lack of timely and reliable agrometeorological information is a serious limitation for effective farm planning operations (Prasad Rao and Manikandan, 2008) and could lead to significant crop losses. The loss in agricultural production could be minimized through timely and accurate weather forecast. An agriculturally relevant forecast is not only useful for efficient management of farm inputs but also leads to precise impact assessment (Gadgil, 1989). Hence, improved weather based Agromet Advisory Services (AAS) greatly helps farmers to take advantage of favourable weather and mitigate the impacts of external weather situation. The AAS provide a very special kind of inputs to farmers as advisories that can make tremendous difference to the agricultural production by taking the advantage of benevolent weather and minimize

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the adverse impact of malevolent weather. Further, weather forecast and weather based agromet advisories also help in increasing the economic benefit to the farmers with appropriate crop management practices (Ramachandrappa, 2018). Weather forecast and advisories helps to increase the crop production, reduce losses, reduce risks, reduce cost of inputs, improve the quality of yields, increase resource use efficiency and reduce pollution as a result of judicious use of agricultural chemicals.

The collaboration of India Meteorological Department (IMD) with National Centre for Medium Range Weather Forecasting (NCMRWF) has adopted district level AAS for disseminating medium range weather forecast information to farmers. However, validity of such services disseminated to district level has some limitations, particularly in view of large variability in terms of crops, varieties and spatial weather anomalies at this level. Considering the variability of weather, climate and soil, the Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad pioneered in starting flagship research programme of the Indian Council of Agricultural Research (ICAR) named National Innovations in Climate Resilient Agriculture (NICRA). As part of this project, the All India Coordinated Research Project on Agrometeorology (AICRPAM) took up a pilot project during 2010 to develop and disseminate micro-level AAS through its 25 cooperating centres spread across the country towards enabling capacity building of farmers for climate resilience (Vijayakumar *et al.,* 2017). The key attributes of micro-level AAS include preparation and dissemination of bi-weekly advisories to farmers based on the forecasted weather data of IMD in consultation with KVK Subject Matter Specialists (SMS) and Field Information Facilitators (FIF) at village level. It has been critical in instrumentalising the farmers to adjust their production plan in favour of optimum production. The studies on economic impact assessment of these micro-level advisories are uncommon. Therefore, the present study was conducted through field survey to assess the economic impact of micro-level AAS at Thrissur centre of AICRPAM on pilot basis.

METHODOLOGY

The study was based on primary data collected from 80 farm households chosen through multi-stage random sampling technique. The primary data was collected from farmers through a pre-tested interview schedule. District to which AICRPAM centre was catering AAS services was the first stage of sampling unit and taluka within the district was the second stage of sampling unit. Villages within the taluka were divided into two groups' viz., villages with AAS and village without AAS adoption for the comparative study. The final selection units i.e. farmers were divided into three groups (strata) based on size of land holding (small, medium and large**).** Out of 25 AICRPAM centres located across the country, Thrissur centre was selected for present study on pilot basis. In Thrissur AICRPAM centre, Mukundapuram taluka was randomly selected under which two villages namely *Puthenchira* as an AAS adopted village and *Vellangallur* as AAS non-adopted village was selected. For the study purpose, 40 adopter and 40 non-adopter in two different villages were selected. Further, care was also taken for selection of villages to ensure the similar socio-economic condition and resource base in the villages for comparison purpose. The analytical tool used includes descriptive statistics such as frequency; percentage and tabular analysis. The perception of farmers about AAS was measured on very poor to very good scale. The probit regression model was employed to assess the factors determining the willingness to pay for AAS services. With the objective of estimating the farmers willingness to pay (*WTP*) for AAS services and factors influencing decision of farmer, a probit regression model was used for the study. In the binary probit model, willingness to pay for service was taken as 'one', while unwillingness to pay as 'zero'. The independent variables considered in the study were age of the farmers, family size, educational level, farming experience, land holding size, income and gender of the farmers.

Probit regression model was presented as follows;

$$WTP = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + e_i$$

Where,

b_0 = Intercept, X_1 = Age of the farmer (years), X_2 = Size of the family (number of members), X_3 = Dummy variable for education level (Educated =1, Not educated =2), X_4 = Farming experience (years), X_5 = Land holding size (ha), X_6 = Level of income in percentage, X_7 = Dummy variable for gender (male =1, female =2), e_i = Error term.

RESULTS AND DISCUSSION

The socio-economic characteristics of the farm households have differential impact on farmers' perception about AAS and his/her capacity to adopt to it (Table 1). The results of socio-economic characteristics of respondents revealed that 60 per cent of AAS farmers were old aged while more than half of sample farmers

Table 1: Socio-economic characteristics of farm households in study area (n=80)

S.No.	Particulars	Category	AAS Farmers		Non-AAS Farmers	
			f	%	*f*	%
1.	Age (years)	Young (<35)	06	15.0	12	30.0
		Middle (36-45)	10	25.0	22	55.0
		Old (> 46)	24	60.0	06	15.0
2.	Education	Illiterate	03	7.5	15	37.5
		Primary	16	40.0	09	22.5
		Higher secondary	13	32.5	11	27.5
		Graduation	08	20.0	05	12.5
3.	Gender	Male	29	72.5	27	67.5
		Female	11	27.5	13	32.5
4.	Family size	Small (up to 5)	19	47.5	09	22.5
		Medium (6 to 8)	13	32.5	20	50.0
		Large (> 9)	08	20.0	11	27.5
5.	Family type	Nuclear family	30	75.0	26	65.0
		Joint family	10	25.0	14	35.0
6.	Farming experience	Low (up to 15 years)	12	30.0	13	32.5
		Middle (16-25 years)	10	25.0	16	40.0
		High (> 25 years)	18	45.0	11	27.5
7.	Social participation	Yes	16	40.0	09	22.5
		No	24	60.0	31	77.5
8.	Land holding (ha)	Marginal & small	13	32.5	17	42.5
		Medium	17	42.5	16	40.0
		Large	10	25.0	07	17.5
9.	Access to irrigation	Yes	23	57.5	20	50.0
		No	17	42.5	20	50.0
10.	Farmers' income (Rs)	Less than 50,000	09	22.5	13	32.5
		50,000 -100,000	14	35.0	11	27.5
		Above 100,000	17	42.5	16	40.0
11.	Off-farm occupation	Yes	15	37.5	17	42.5
		No	25	62.5	23	57.5
12.	Institutional credit	Yes	19	47.5	14	35.0
		No	21	52.5	26	65.0

Source: Field survey data

were in middle aged in non-AAS category. The age of farmers usually represents his experience in farming and old aged farmers are expected to have high experience and knowledge about farming and associated risks involved in it. Nearly one-third of AAS farmers possessed higher secondary education while more than one-third of non-AAS farmers possessed primary education in the study area. Farming experience was higher in case of AAS farmers (45%) as compared to non-AAS farmers (27.5%). The access to irrigation water was marginally higher among AAS farmers (57.5%) in comparison to non-AAS farmers (50%). Agriculture was the primary source of income to both the categories of farmers. More than one-third of farmers in both categories were engaged in off-farm employment for their alternative source of income. More than half of the AAS and two-third of non-AAS farmers did not have access to institutional credit.

The results of farmer's awareness about AAS at Thrissur AICRPAM centre shown in Figure 1 reveals that nearly 73 per cent of AAS farmers were fully aware about the AAS services and 20 per cent of farmers were partially aware about the services while only around seven percent of AAS farmers were unaware about the services. On the other hand, more than half (52.5%) of non-AAS farmers were unaware about the AAS disseminated by the centre while less than one-fourth of non-AAS farmers fully aware about the service. It was also revealed from the results that farmers availed the AAS services through different mode of communication (Figure 2). The major source of information were AAS

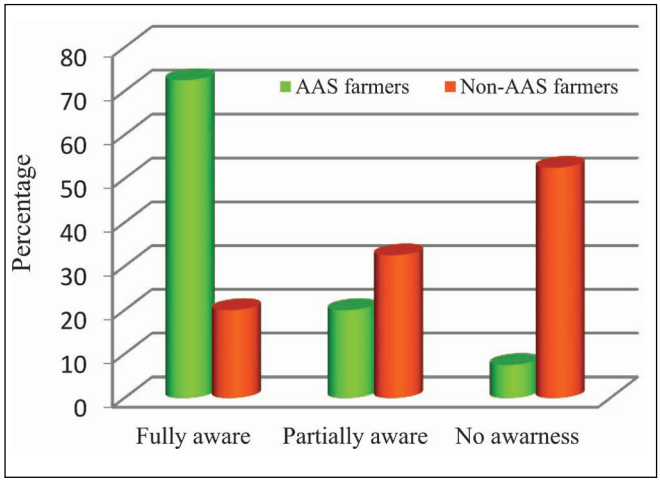

Figure 1: Awareness about AAS among respondent farmers

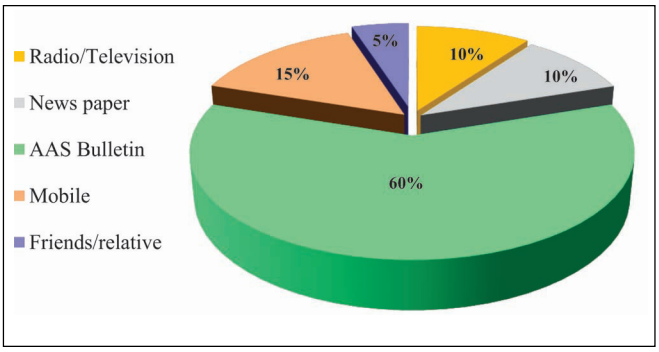

Figure 2: Source of information for AAS

bulletin published and issued by the centre (60%) followed by mobile communication (15%). AAS bulletins were published in regional language (Malayalam) which helped the farming community to understand and follow easily. In addition, Farmers also got registered their mobile number at AICRPAM centre for dissemination of need based advisories through their mobiles.

From the Table 2, it is inferred that more than half of AAS farmers (55%) rated the agromet advisory services as 'very good' on the scale of very poor to very good. Rana *et al.* (2005) reported that 38 per cent of farmers rated agromet advisories as excellent and 29 per cent of farmers rated good in mid hill region of Himachal Pradesh. About 85 per cent of farmers agreed on essentiality of AAS and believed that advisories based on predicted rainfall event is very much helpful in their farm activities followed by advisories based on the predicted temperature. These results are in conformity with studies of Maddison (2006). More than 75 per cent of farmers perceived that AAS was beneficial and it helped in reducing the costs in agricultural production and more than two-third of farmers perceived that AAS was useful in reducing irrigation charges as AAS helps to plan farm activities timely as per the weather and rainfall advisory issued by the centre well in advance. 60 per cent of farmers also perceived that AAS was helpful in managing pest and diseases during cropping season. Majority of farmers (82.5%) opined that real time AAS was critical at sowing stage as dissemination of need based weather advisories prior to cropping season particularly information on timely rainfall, temperature and humidity helped farmers to plan their farm activities timely and accurately. About 75 per cent of farmers perceived that micro-level

Table 2: AAS farmer's perception about agromet advisories issued by AICRPAM centre

Farmers perception	*f*	%
Perception about AAS		
Very poor	03	7.5
Poor	06	15.0
Good	09	22.5
Very good	22	55.0
Necessity of AAS		
Yes	34	85
No	06	15
For which weather parameter AAS is essential		
Rainfall	36	90.0
Temperature	30	75.0
RH	19	47.5
Wind velocity	10	25.0
Benefit of AAS		
Yes	32	80
No	08	20
Which way you are benefited from AAS		
Reducing cost during sowing	30	75.0
Managing pest and disease	24	60.0
Avoid post-harvest losses	16	40.0
Reducing irrigation charges	27	67.5
At what stage of crop AAS is essential		
Sowing stage	33	82.5
Flowering stage	25	62.5
Harvesting stage	20	50.0
Quality of AAS information disseminated		
Good	32	80.0
Average	05	12.5
Poor	03	7.5
Frequency of forecasting		
Daily	02	05.0
Weekly	10	25.0
Bi-weekly	28	70.0
Monthly	00	00.00
Willingness for pay based services		
Yes	12	30
No	24	60
Undecided	04	10
Overall satisfaction from AAS		
Yes	30	75
No	10	25

AAS disseminated through AICRPAM centres was accurate, timely available and 70 per cent of farmers opined that bi-weekly forecast information was good as it is helped to take short term decision on farming activities. Further, farmers' willingness to pay for AAS indicates that less than one-third of farmers were willing to pay for services as majority of respondents were small and marginal farmers with scarce farm resource and not in position to pay for service. From results, it is also revealed that 75 per cent of AAS farmers were presently satisfied with micro-level AAS issued by the AICRPAM centre.

The results of economic impact indicated that there was a considerable benefit to farmers who adopted and followed weather advisories from time to time issued by the Thrissur AICRPAM centre. The percent gain in income from different crops by the AAS farmers was to the tune of 34 percent in case of paddy to 19 per cent in coconut crop over non-AAS farmers (Table 3). The net income realized by AAS farmers was more as compared to non-AAS farmers which was mainly attributed to timely adoption of weather advisories and better crop management practices. The actual yield increased due to adoption of advisories was to the extent of 2.31 q/ha in paddy and 400 nuts/ha in case of coconut. A study conducted at Uttara Kannada district of Karnataka indicated that actual yield increased due to adoption of advisories was to the extent of 2 to 3 q/ha in crops like paddy, arecanut and banana and the yield increased in case of mango was 25 q/ha (Manjappa and Yeledalli, 2013). The higher net income and reduced cost of different crops under AAS category was also evident from the benefit cost ratios arrived from the results. Further, larger income and lower cost of production in case of AAS farmers was also due to judicious use of farm inputs based on the real time agromet advisories. Therefore, it can be concluded that timely weather forecast and related advisories issued by the centre benefitted the farming community. Rajegowda *et al*. (2008) reported that farmers who adopted the agromet advisories have realized an average economic benefit of 31.4, 24.7, 16.2 and 20.6 per cent in finger millet, red gram, field bean and tomato respectively in the Eastern dry zone of Karnataka.

Table 3: Economics impact of micro level AAS on crop productivity and income

Particulars	Paddy		Coconut	
	AAS farmers	Non-AAS farmers	AAS farmers	Non-AAS farmers
Variable Cost (Rs/ha)				
Seed	1640	1720	1580	1525
FYM and Fertilizers	3070	3725	12662	15330
Pesticides	1095	1876	1692	1965
Intercultural operations	-	-	1300	1700
Weedicide	900	1200	24725	25840
Human labour	16657	16140		
Bullock labour	250	290	-	-
Mechanical/Tractor	4185	4150	-	-
Harvesting	1000	1150	1895	2325
Other expenses	-	-	2150	2930
Cost of Cultivation (Rs/ha)	28797	30251	46004	51615
Returns				
Yield of main crop (q/ha)	25.37	23.06	6500*	6100*
Yield of inter crop (q/ha)	-	-	-	-
Price of main crop (Rs/q)	1800	1800	15**	15**
Price of inter crop (Rs/q)	-	-	-	-
Value of the main product (Rs/ha)	45666	41508	97500	91500
Value of the by-product (Rs/ha)	4375	4582	4225	6940
Gross returns	50041	46090	101725	98440
Net Returns	21244	15839	55721	46825
B:C Ratio	**1.74**	**1.52**	**2.21**	**1.91**

*Number of nuts per ha, ** Rupees per nut

The factors influencing the farmers' willingness to pay (WTP) for AAS were determined through probit regression model. The results indicated that age of farmer; education level and size of land holding were important factors that significantly influenced the farmers' willingness to pay for the services (Table 4). Further, all the three socio-economic variables such as age of farmer, education level and land holding size positively affected WTP for the services as evident from significant and positive coefficient (slope) of regression model and also demonstrated one to one relationship which denotes that higher the age, education level and size of land holding, then higher will be the WTP for the services.

Table 4: Probit model for factors determining farmer's willingness-to-pay (WTP) for AAS

Variable	Estimated coefficient	Std error	t-ratio
Constant	1.760	1.060	1.660
Age	0.458	0.145	3.158***
Gender	-0.056	0.030	-1.866
Education level	0.984	0.402	2.447**
Family size	0.023	0.170	0.135
Land holding size	0.217	0.094	2.308**
Farming experience	-0.044	0.388	-0.113
Income level	0.366	0.421	0.869

Note: * and **Significant at 0.05% level and 0.01% respectively; df = 7; Chi-squared = 51.75.

CONCLUSION

The micro-level AAS of Thrissur AICRPAM centre has helped in bringing out substantial awareness among farmers about adoption of weather based advisories through their timely availability and quality of the service. The perception about advisories issued by AICRPAM centres was very good and positive among AAS farmers. It helped the adopted farmers to take appropriate decision about their farm planning and better crop management thereby efficient utilization of existing farm resources. The economic impact study revealed that there were considerable benefits to farmers who adopted need based weather advisories regularly issued by AICRPAM centre as compared to non-adopted farmers. The study also revealed that micro-level AAS played imperative role in improving the productivity and farm incomes of those who adopted the AAS. However, majority of AAS farmers perceived that their willingness to pay for the services was low and they were ready to use advisories free of cost due to their farm resource constraints.

Paper received on : July 14, 2020
Accepted on : August 10, 2020

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