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Impact of Agrometerology Advisory Services (AAS) for Assessment of Cotton Cropping System in NTR District of Andhra Pradesh, India

M. Raja Narasimha [a++], P. Venkata Subbiah [a#], I. Venkata Reddy [a†], P. N. Siva Prasad [a‡*] and N. Raja Shekar [a^]

[a] Dr. K. L. Rao Krishi Vigyan Kendra, Garikapadu, NTR District, Andhra Pradesh-522614, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The survey was conducted from June 2022 to January 2023 to study the impact of Agro meteorology Advisory Services and to know the increases of production of cotton crops concerning the effect of weather parameters in selected villages under the DAMU project in NTR district, Andhra Pradesh. District Agromet Units (DAMU) which was established in Krishi Vigyan Kendra's by Andhra Pradesh cooperative program of India Meteorology Department and Indian Council of

[++] *Subject Matter Specialist, (Agromet);*
[#] *Programme Coordinator;*
[†] *Subject Matter Specialist, (Agricultural Extension);*
[‡] *Subject Matter Specialist, (Crop Production);*
[^] *Subject Matter Specialist, (Plant Protection);*
**Corresponding author: E-mail: sivassac007@gmail.com;*

Agricultural Research. The Main theme of DAMU is to provide timely location specific Agro-met advisories to the farmers at the sub divisional and district level. The agro meteorology advisory services were provided weekly twice among the sub divisions (Tuesday and Friday) and disseminated to farmers by including cotton growers using Whats App, emails and other print media. The impact assessment was based on feedback to come at significant illation in terms of using of Agro meteorology Advisory Service (AAS) by farmers. The assessment study revealed that the farmers who adopted agro advisory services on real-time basis obtained 18 % higher net return in cotton compared to Non-AAS farmers which were benefited by forecasting of rainfall for timely agricultural operations, the recommended dose of fertilizers, and efficient use of pesticides majors in a required support manner during different crop growth stages were advised in bi-weekly bulletins. AAS farmers benefited by timely application of insecticides and fertilizers, timely accurate weather forecasting and timely agricultural operations to gain more yield in cotton crop as compared to Non-AAS farmers. AAS might be used to be helpful to the farmers in managing and changing weather, finally decreased input cost in agriculture and acquiring cost-effective agricultural production by adopting of weather-based Agromet Advisory.

Keywords: Agromet advisory; DAMU; ICAR; IMD; cotton and adopting.

1. INTRODUCTION

"In present Agriculture the weather is the most important factor for agricultural production. The growth and yield of crop at each stage were affected by the weather. Rainfall and temperature are more important weather parameters. Changes of rainfall pattern at the time of growth in plants, such as the late onset of monsoon, prolonged rainfall and excessive rainfall crop growth ultimately affect the quality and quantity of the crop yield. In addition to natural calamities such as floods, droughts cyclone changes in spatial and temporary rainfall and important are most important weather parameters such as relative humidity, air temperatures, wind speed and cloud cover. It may be affect the crop growth and yield and at the same time control farmers' decision making such as crop selection, proper and regular use of inputs and crop supervision. Weather forecasting through agro-met advisory services help in increasing the economic benefits of farmers by selecting the appropriate crop management practices according to upcoming weather" [1].

"To reduce yield losses, farmers can gain agricultural production by selecting the agricultural weather advice and managing the crop in the proper direction. Generally, they are three types of weather forecasts are issued including short-range, medium-range and long-range forecasts. Among the above mentioned three types of forecasts medium-range forecast is very beneficial for agricultural production and productivity. The long-range weather forecast provides provide guidelines for selection of suitable location specific crop varieties. Because in the coming season, the amount of rainfall are known and the selection of crop accordingly. Short and medium-range weather forecasts will helps to farmers for making the decision on day to day operations of agricultural like seed sowing, weeding, inter cultivation, spraying of pesticides, proper and correct doses of fertilizers, etc" [2-7]. Therefore in today's time, "the negative effects of more changed weather can increase production by reducing the yield losses by agro met advisory on real time basis. The agro advisory services to provide timely, skillful weather forecasts offers the potential to reduces the vagaries to vulnerability of weather conditions" [8-10]. Agriculturally relevant forecast is not only useful for efficient management of farm inputs but also leads to accurate impact assessment of the given weather conditions" [11] and [12]. "The impact assessment [13] has showed that weather-based agro-meteorological service is able to reduce the cost of cultivation by 2-5% in the crop management practices". "Agro-met bulletin includes particular advice on field crops, horticultural crops and livestock, *etc*. on which farmers need to act upon by weekly twice *i.e*., Tuesday and Friday. So that farmers can use natural resources in an effective manner both in quantity and quality" [14]. "Due to AAS, the farmers are capitalizing the situation of weather condition in order to optimum utilization of the resource and to reduce the loss of adverse weather condition" [15]. "The mathematical and statistical methods are used to increase the value of the weather prediction" [16]. "The district level agro-met advisory bulletins are prepared and spread information for the help of the farmers of respective sub divisions and district level" [1].

2. MATERIALS AND METHODS

The current survey was carried out for the period of June 2022 to January 2023 in NTR District under the jurisdiction of DAMU project which is established in the year 2020 at Dr. K.L. Rao Krishi Vigyan Kendras under Acharya N. G. Ranaga Agricultural University, Lam, Guntur. The current study was carried out in two villages from Nandigama and jaggyyapeta in NTR district and two villages of Non-AAS from Maylavaram and Thiruvur. The NTR district comes under south coastal zone of Andhra Pradesh, the soil type of South coastal zone is Black and Red sandy loam. The soils under study were slightly acidic to alkaline in nature (pH 6.60 to 7.20), mostly non-saline and low to high in organic carbon status (0.18 to 1.52 %). The nutrient Index of majority soil samples of N, P, K, S and micronutrients are moderately sufficient to deficient [17].

The annual rainfall in this zone in more than 808 mm. Rainfall occurs from mid June to mid September the highest rainfall received in the month of August and September. In Rabi (Winter) season lower temperatures ranges from 16-30^{0C}. The selection of farmers based on agriculture land holding, 25 medium land holing farmers were selected from each sub divisional level selected agro advisory services receiving farmers from DAMU. All these farmers were selected on the basis of Simple random sampling. Similarly, Non-AAS farmers were selected who did not receive agricultural weather based advices.

A total of 4 sub divisions were selected in this survey, (for AAS) farmers from Nandigama and Jaggyyapeta, which received Agromet advisory other side (for non AAS) Maylavaram and Thiruvuru are the sub divisions which did not receive Agromet advisory. The weather forecast from India Meteorological Department, Amaravathi and agro advisories from KVK received on every Tuesday and Friday of the week. This weather forecast is valid for the next 5 days. In this the weather forecast parameters are issued rainfall, maximum and minimum temperatures, air humidity, wind speed, wind direction and cloud cover conditions are obtained. The study was completed based on a feedback collected with help of interview schedule from the farmers in which the usefulness and impact of Agromet Advisory Services (AAS) was assessed. This agricultural weather based advisory was delivered message to the farmers through Whats App groups of individual villages of mandals under the jurisdiction of DAMU and mailed block wise Agricultural officers, Agricultural extension officers and village agricultural assistants. Based on agro advisories to farmers can easily to do crop management practices such as proper use of irrigation, required based doses of fertilizers, proper spraying of pesticides for control of pests and diseases.

3. RESULTS AND DISCUSSION

The cotton crop was affected due to the recording of abnormal weather conditions because this year in *Kharif*, 2022 season actual rainfall is recorded more as normal rainfall (Table 1) than previous year. Rainfall and temperature played a key role in cotton crop. Because cotton crop requires annual rainfall is 450-500 mm and it requires hot and humid climate. When the crop is in reproductive sage on square formation to flowering. In view of this, the farmer was advised do not to accumulate water in the field and make proper drainage channels for removal of excess water. Farmers receiving of prediction of rainfall forecast in other crop stages, spraying of pesticides were reduced and net returns increased. The cost of various inputs in Cotton crop for Non-AAS farmers gave more input in seeds, fertilizers, labour and other input expenses. “Whereas, AAS farmers providing timely inputs (pesticides, irrigations and farm machinery. The farmers who benefitted from the weather based Agro Advisory services ultimate and other inputs were easily utilized by the Agro Meteorological Advisory. AAS farmers benefited to gain 20 per cent of more net returns than Non-AAS farmers. This can be possible through the Tuesday and Friday agromet advice bulletins. In which the farmers were informed about the agricultural work, timely use of inputs, according to advisory and right measures to prevent diseases and pests etc. during the growing period of the crop. The correct use of agricultural weather advisory services by AAS farmers received higher yields than Non-AAS farmers. Leading to a substantial increase in net returns. This survey also revealed that most of farmers gave more importance to rainfall forecasts than other weather parameters. Because the farmers were able to manage their agricultural works on time according to the forecast of rain. Majority of the farmer’s survey reported that the Agromet Advisory services were obtained on time to time to them. All the farmers expressed their happiness on getting

block level agricultural weather advice. Similar results of timely availability of clear information through agro advisory services" were reported by Ram Singh et al. [18].

Table 1. Input cost comparison in cotton crop between the AAS and non AAS farmer

S. No	Inputs	Cost of Inputs by AAS farmer	Cost of Input by Non AAS farmer
1	Seed	1200	1500
2	Fertilizers	4000	6000
3	Pesticides	8000	12000
4	Labour	4000	6000
5	Farm Machinery	3000	5000
6	Pickings	4500	6500
Total		**24,700**	**37,000**

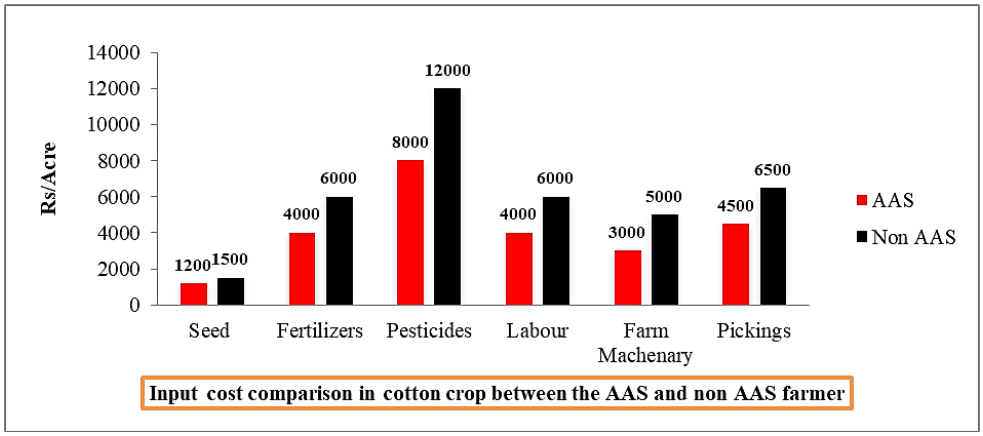

Fig. 1. Input cost comparison in cotton crop between the AAS and non AAS farmer

Table 2. Effect of weather parameters on cotton crop in NTR district

Growth stage	DAS	Weather parameter	Effect of weather parameter
Emergence	4 -10	Rainfall and Humidity	Wilt Rootrot disease.
Vegetative	20-45	Sunny weather,Hightemperature	Whitefly jassids attack
Square formation	50-70	Rainfall,and highhumidity.	Square dropping
Flowering	75-90	Humidity,Temperatureabove20°C	Bacterial leaf spot
Boll formation	90-110	Rainfall,Highhumidity,	Fruit rot disease
Boll maturity	110-125	Rainfall,andHighhumidity	Root rot,fruit rot.

Table 3. Profitability of weather based Agro Advisory services during the crop growing situation in NTR District

Advisory date and weather event	Given and used advisory	Profitability
Prediction of rainfall forecasting on June 09, 2022.	Farmers are advised for timely sowing.	Advantage of timely sown cotton.
Prediction of rainfall forecasting on June 29,2022.	Farmers are advised to do weeding operation.	Advantage of in time weeding operation.
Forecasting of Rainfall june 15,and 18, 2022	Farmers are advised to stop fertilizers application.	Saving of cost of fertilizers.
Prediction of forecasting of Rainfall Aug.25, 2022	Farmers are advised to stop pesticides spraying.	Saved money from pesticides and its spraying spraying.
Prediction of forecasting of Rainfall sep 07, 2022.	Farmers are advised to complete harvesting	Saved labor cost and cotton quality by completely picking.

Source: *District Agro met advisory unit, Dr. K.L.Rao KVK, Garikapadu*

The results of the studies of Olivares [19]; Olivares [20,21] and Cortez et al. [22] showed that AAS had a significant positive impact on crop productivity. The authors found that the average crop yield of farmers who received AAS was significantly higher than those who did not receive AAS. The studies also found that AAS had a positive impact on risk management [23], as farmers who received AAS were better able to manage risks associated with weather and climate variability [24,25]. Additionally, the study found that AAS had a positive impact on farmers' knowledge and decision-making. Farmers who received AAS had a better understanding of weather and climate patterns and were better able to make informed decisions about their cropping systems.

The studies Vashisth and Singh [26] find that farmers of who followed the agromet advisories are able to reduce the input cost upto 9.6 per cent in carrot, 6 per cent in wheat, 7 per cent in rice and increases the net profit by 0.9, 3 and 4 and per cent in wheat, rice and carrot correspondingly as compared to the non AAS farmers, who did not follow the weather based information. AAS farmers were able to reduce the input cost up to Rs. 836/acre in wheat, Rs. 2,618/acre in carrot and 1071/acre in rice. Increases in the net profit were Rs. 1041/acre in wheat, Rs. 4533/acre in carrot and Rs 2213/ acre in rice compared to the non AAS farmers. More net returns of AAS farmers than non-AAS farmers can be due to low input cost, following weather based different crop management practices and timely management of pests and diseases.

The study findings were in line with previous research on the impact of agro meteorological services [27,28,29]. The authors' findings suggest that AAS can play a critical role in improving the productivity and resilience of smallholder farmers in tropical cropping systems [30,31]. The study also highlights the importance of incorporating local knowledge and practices into AAS to ensure its effectiveness and sustainability.

The results of the study entitled that “Economic Assessment Of Weather Based Agromet Advisories Issued By KVK, East Champaran District Of Bihar” the farmers those who followed the weather based agromet advisiory services are able to reduce the input cost up to 5.4%, 5.7% (in maize) in 2019 & 2020 respectively and 5.08%, 6.11(rice) in 2019 & 2020 respectively. Increases the net profit by, 20.25 %, 21.17% in 2019 & 2020 respectively (maize) and 23.59%, 26.15% (rice) in 2019 & 2020 respectively as compared to the non AAS farmers, who did not follow the weather based agro advisory information.

One limitation of the study it is comparatively small sample size, which may limit the generalizability of the findings [32,33]. Additionally, the study did not assess the economic impact of AAS on farmers' livelihoods. Future research could explore these areas to provide a more comprehensive understanding of the impact and assessment of AAS on smallholder farmers in tropical cropping systems.

In conclusion, the study provides important insights into the impact of Agro metrology Advisory Services (AAS) on tropical cropping systems in agriculture [34,35], rural [36,37], and indigenous areas [38,39]. The study's findings suggest that AAS can play a critical role in improving crop productivity [40], risk management, farmers' knowledge [41], and decision-making [42,43]. The study highlights the importance of incorporating local knowledge and practices into AAS to ensure its effectiveness and sustainability [44,45-52]. Overall, the study has significant implications for policymakers and practitioners working in the field of agriculture and agrometeorology, particularly in tropical cropping systems.

4. CONCLUSION

It was revealed in this survey Utilizing of Agro-weather advisory services farmers can get more benefits for the planning of farm operations and got higher yields and net returns as compared to Non-AAS farmers.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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