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Surya Prakash Singh
Krishi Vigyan Kendra, Sohna,
Siddharthnagar, A.N.D.U.A.T.
Ayodhya, Uttar Pradesh, India

SR Mishra
Department of Agriculture
Meteorology, A.N.D. University
of Agriculture &Technology,
Kumarganj, Ayodhya, Uttar
Pradesh, India

Vineet Kumar
Krishi Vigyan Kendra,
Sonbhadra, A.N.D.U.A.T.
Ayodhya, India

Bhagwat Saran
Research Scholar, Department of
Soil and Water Conservation
Engineering, Govind Ballabh
Pant University of Agriculture
and Technology, Pantnagar,
Uttarakhand, Uttar Pradesh,
India

Pankaj Jaiswal
Krishi Vigyan Kendra, Buxa,
Jaunpur, A.N.D.U.A.T.
Ayodhya, Uttar Pradesh,India

Economic impact and usefulness of agromet advisory services for wheat crop of Siddhartha Nagar district of Uttar Pradesh

Surya Prakash Singh, SR Mishra, Vineet Kumar, Bhagwat Saran and Pankaj Jaiswal

Abstract
Survey was conducted during April 2020 to assess the impact and usefulness of Agromet Advisory Services to know the increasing production of wheat crops regarding to effect of weather in selected villages under DAMU Siddharthnagar, Uttar Pradesh. District Agromet Units (DAMU) established in Krishi Vigyan Kendras by joint program of IMD and ICAR. The main aim of DAMU to provide value added Agromet advisories to the farmers at the block level. The agromet advisory services were provided twice in a week (Tuesday and Friday) and communicated to farmers by using WhatsApp and cellphone. The impact assessment was based on feedback to come at significant illation in terms of using of Agromet Advisory Service by farmers. The assessment study indicated that the farmers who adopted agro advisory services on real time basis obtained 22 % higher net return in wheat crop compared to Non-AAS farmers which were benefited by timely agricultural operations, timely rainfall forecasting, recommended dose of fertilizers and efficient irrigation management and standard plant protection majors in a required base manner during crop growing period were advised in biweekly bulletins. AAS farmers benefited by timely application of fertilizers, timely and accurate weather forecasting and timely agricultural operations to obtained better yield in wheat crop as compared to Non-AAS farmers. Agromet Advisory Services (AAS) might be used to be helpful to the farmers in managing changing weather finally for decreased input cost in agriculture and acquiring profitable agricultural production by adopting of weather based Agromet Advisory.

Keywords: Agromet advisory, impact, usefulness, standard and adopting

Introduction
At this time, the weather is the most important factor of all factors affecting agricultural production. The growth and yield of each stage of the plant are affected by the weather. Rainfall and temperature affect plants the most among all parameters of weather. Changes in rainfall at the time of growth in plants, such as the delayed onset of monsoon, excessive rainfall and prolonged rainfall affect crop growth and ultimately yield quality and quantity. In addition damaging events such as floods, droughts, cyclone changes in spatial and temporary rainfall and important weather parameters such as air humidity, high temperature and low temperature, cloud cover, wind speed etc. affect crop yield and at the same time influence farmers' decision making such as selecting crops, correct use of inputs and crop management. Weather forecasting and agromet advisory help in increasing the economic benefits of farmers by adopting appropriate crop management according to oncoming weather.

To reduce crop losses, farmers can increase agricultural production by adopting agricultural weather advice and managing the crop in the right direction. In general, three types of weather forecasts are issued including short-range, medium-range and long-range forecasts. The medium-range forecast has so far proved very useful for agricultural production. The long-range weather prediction provides guidelines in the selection of crops and varieties. Because in the coming season, the rainfall conditions and the amount of rainfall are known and crops are selected accordingly. Short and medium-range weather forecast helps farmers to make decision on day to day agricultural activities like sowing, weeding, spraying of pesticide spray, irrigation scheduling, use of fertilizers, etc. correctly in crop management based on that season. Therefore in today's time, the negative effects of more changed weather can increase production by reducing the losses by agromet advisory on real time basis. The emerging capacity to provide timely, skillful weather forecasts offers the potential to reduce vulnerability to vagaries of weather (Hansen, 2002) [4].

Corresponding Author:
Surya Prakash Singh
Krishi Vigyan Kendra, Sohna,
Siddharthnagar, A.N.D.U.A.T.
Ayodhya, Uttar Pradesh, India

Agriculturally relevant forecast is not only useful for efficient management of farm inputs but also leads to precise impact assessment (Gadgil, 1989 and Anon., 2002) [3, 1].

The impact analysis (Rathore and Parvinder, 2008) [13] has showed that the weather-based agro-meteorological service is able to reduce the cost of cultivation by two to five per cent. Agro-met bulletin includes particular advice on field crops, horticultural crops, and livestock, *etc.* on which farmers need to act upon. Twice a week *i.e.*, Tuesday and Friday. So that farmers can use natural resources in an effectual manner both in quantity and quality (Ray *et al.,* 2017) [14]. Due to AAS, the farmers are capitalizing the situation of weather condition in order to utilize the resource and minimize the loss due to bad/abnormal weather condition (Venkataraman, 2004) [16]. The statistical methods and mathematical methods are used to increase the trustworthiness of the weather prediction (Damrath *et al.,* 2000) [2]. The district level agro-met advisory bulletins are prepared and spread information for the help of the farmers of respective district.

Materials and Methods
The effective survey was conducted during April 2020 in Siddharthnagar district under District Agromet Units (DAMU) project established in Krishi Vigyan Kendras of A.N.D. University of Agriculture & Technology Kumarganj, Ayodhya of Uttar Pradesh. In this survey two villages were selected from Siddharthnagar district under Agromet Advisory Service and two villages of Non-AAS. The Siddharthnagar district falls under Northeastern Plain zone-7, the soil type of this zone in sandy and sandy loam to loam, calcareous clay and deep alluvial. The annual rainfall in this zone in more than 1000 mm. In this zone temperature reaches in the month of May and June upto 45^0C and hot wind blow during this period. Rainfalls occur from mid June to mid September but major rainfall takes place in the month of July and August. The winter is very cold and temperature goes down up to 4-5^0C in the month the January.

On the basis of agriculture area, 25 farmers of medium agriculture area were selected from each block level who received agricultural weather advice. All these farmers were selected on the basis of random sampling. Similarly, Non-AAS farmers were selected who did not receive agricultural weather advice.

A total of 4 blocks were selected in this survey, including Itwa and Bhanwapur, which received Agromet advisory other side Domariaganj and Mithwal are the blocks which did not receive Agromet advisory. The weather forecast is received every Tuesday and Friday from the India Meteorological Department. This weather forecast is valid for the next 5 days. The maximum temperature, minimum temperature, rainfall, wind speed, wind direction, maximum humidity and minimum humidity and cloud conditions are obtained in this weather forecast. The survey was completed based on a feedback questionnaire from farmers in which the usefulness and impact of Agromet Advisory Services was assessed. This agricultural weather advisory was delivered by sending message to the farmers' WhatsApp number and personal number. It includes weather based agricultural advice to farmers, including weather related information for the next 5 days and agricultural work such as crop management, proper use of irrigation, quantity of fertilizer and time of planting and method of planting, measures to avoid diseases and pests were informed.
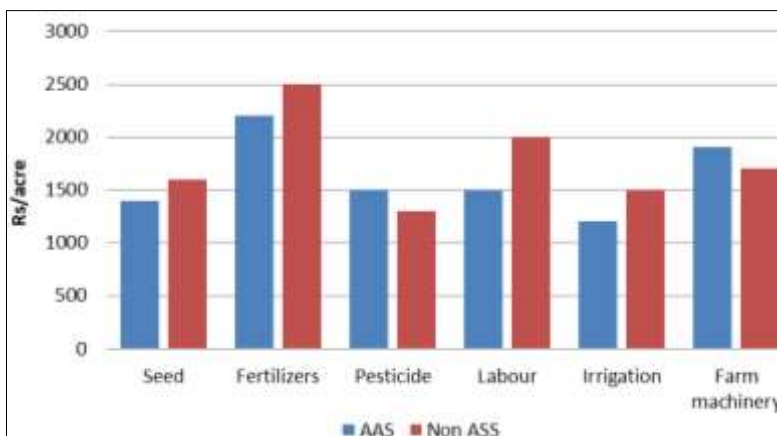

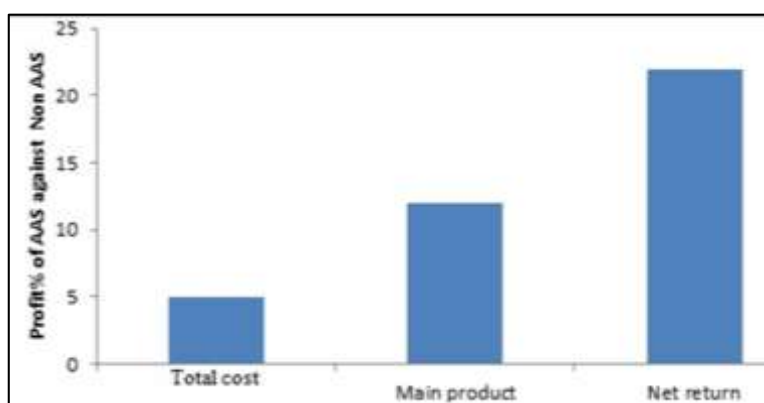**Fig 1:** Difference of various input cost between AAS and Non-AAS farmers of wheat crop

Fig 2: Difference of total cost, main product and net return between AAS and Non-AAS farmers of wheat crop

Table 1: Effect of weather parameter on wheat crop

Growth stage	DAS	Weather parameter	Effect of weather parameter
Crown Root Initiation	25	Rainfall and Humidity	Yellowing of wheat
Late Tillering	42	Sunny weather, High temperature	Yellow and purple discoloration of wheat leaves
Late Jointing	60	Rainfall, Low temperature is 10-20°C and high humidity.	Brown rust, stripe rust (yellow rust)
Flowering	80	Humidity, Temperature above 20° C	Black rust, loose smut
Milk Stage	95	High humidity, Cool to moderate temperature	Powdery mildew
Dough Stage	115	Low temperature and High humidity	Loose smut

Table 2: Economic Gain of Agromet advisory during growing season

Advisory date and weather event	Given and used advisory	Economic Gain
Forecasting of rainfall on December 14, 2019.	Farmers are advised to stop irrigation.	Gain: Advantage of irrigation in timely sown wheat.
Forecasting of rainfall on December 31, 2019.	Farmers are advised do not provide fertilizers and irrigation.	Gain: Save from reduction losses of fertilizers.
Forecasting of rainfall 17 and 18 January 2020.	Avoid irrigation and also manage drainage in the field crops.	Gain: Saved crop from water logging condition.
Forecasting of rainfall and cloudy weather condition on 25 February 2020.	Avoid irrigation, fertilizers and inspect insects & pest in crops.	Gain: Advantage of irrigation and safe from insect and pest.
Forecasting of rainfall 14 and 15 March 2020.	Avoid irrigation and do not apply pesticide.	Gain: Saved money of irrigation and pesticide.

Source: IMD Agromet DSS of DAMU Siddarthnagar, (2019-2020)

Results and Discussion

The wheat crop was affected due to the changing weather because this year the Rabi season received more rainfall (Table 2) than back year. Rainfall and temperature played a very important role in wheat crop. Because when the crop of wheat was on 20 to 25 days and crown root initiation was happening at that time the rains happened and at that time benefited the farmers a lot (Table 1). But when this rain exceeds the requirement, the wheat plant turns yellow. In view of this, the farmer was advised do not to accumulate water in the field and arrange for drainage. Tillers of wheat are affected due to frequent rains and tillers are also reduced. Due to farmers receiving forecasts of rainfall in other stages of crop also, irrigation cost was reduced and net returns increased.

The cost of various inputs in wheat crop (Fig.1) revealed that Non-AAS farmers gave more input in seed, fertilizer, labor, irrigation. Whereas AAS farmers gave more input in pesticides and farm machinery. The farmers who benefitted by the Agro Advisory Ultimate and other inputs were easily utilized by the Agro Meteorological Advisory. AAS farmers benefited 22% more net returns (Fig. 2) than Non-AAS farmers. This can be attributed to the Tuesday and Friday agromet advice. In which the farmers were informed about the agricultural work, timely use of inputs, managing irrigation 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 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. Most of the farmers surveyed reported that the Agromet Advisory Bulletin was obtained on time by them. All the farmers expressed their happiness on getting block level agricultural weather advice. Similar results of timely availability of clear information through agroadvisory services were reported by Ram Singh *et al.* (2015) [12].

Conclusion

It was revealed in this survey that AAS farmers get higher yield and net returns and then Non-AAS farmers because using the agro-weather advisory, the crop of AAS farmers used to less cost and the use of agricultural techniques increased the yield therefore resulted in higher net returns.

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