

Original Research Article

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Importance of Gramin Krishi Mousam Sewa in Hill Region of West Bengal

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ABSTRACT

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Agriculture is the backbone of Indian economy. Agriculture and its activities are mostly depends upon weather parameters. In this scenario weather based agricultural bulletin may create an effort to help the farming community to improve their decision making ability. The RMSE value of rainfall was recorded 30.28 and observed r value of maximum temperature and minimum temperature was recorded 0.63 and 0.86 after analyzing the forecasted and observed data from 01.04.2016 to 31.03.2017. From the economic point of view the weather related agromet advisory can minimise the cost of cultivation and also improve the crop production technology and animal husbandry.

Introduction

Agriculture is the cornerstone of Indian economy. In India over fifty percent of households depend on agriculture as their principal means of livelihood. The share of the Agriculture and Allied sector contributed approximately 17.0% of India's Gross Value Added (GVA) at current prices during 2015-16 (DOA, 2016-17). Agriculture is operations and its productivity is mostly depends up the weather parameters. Every individual crop has its own climatic requirement for its growth and development. Climate is also an important factor of infestation of insects and disease pathogen. Horticultural crops like vegetables are also depends up on the climatic condition

if they have optimum climate then production should be reaches it uttermost point. Variability of different vegetable, fruits and flowers also depends up the climatic factors. A number of factors determine crop yields primarily temperature and precipitation. The primary cause of oscillation in crop yield is due to weather discrepancy.

The extreme weather events like flood, drought, heat and cold waves, cyclone are also has direct collision over agricultural production. The all India percentage of net irrigated are to total cropped area was 34.5 per cent in 2014- 15 which means a large portion of agriculture depends upon rainfall (Economic Survey, 2017-18). Specifically,

south-west monsoon is the main source of rainfall in Indian continent. Some deviation in the nature of monsoon may create enormous reverberation in Indian economy.

In this context, Indian farmers are mostly dependent upon climate. Weather forecasting can help the farmers for minimising the risk and it also helps them to plan their agriculture calendar. Weather forecasting may also help the day to day activities of farms like optimum sowing date, nursery management. It also provides information related with rainfall that may help farming community to manage their irrigation schedule and optimum time of fertilizer application. Insect pest and disease occurrence also depends upon the climatic condition for these reasons farmers can apply prophylactic measures for crop protection aspect. Weather forecasting may guide farmers for actual harvesting time because harvesting is an important operation in crop production. Every farmer finds a clear sunny day with no rainfall incident for harvesting in this context weather forecasting can play a great role. In animal husbandry, weather forecasting has its enormous role.

India Meteorological Department (IMD) started the weather service in long back in the year 1945 in the form of broadcasting Farmers' Weather Bulletin. More recently, District-level (612 districts) Agrometeorological Advisory Service (DAAS) was launched in June 2008 and now it is called Gramin Krishi Mousam Sewa. The Gramin Krishi Mousam Sewa aims to generate agro-meteorological information (weather forecast and agromet-advisories) and develop suitable dissemination system, to the farming community in order to improve crop/livestock productivity. Presently, the weather based agro-advisories are disseminated to the farming community at district level through mass media (Radio, Print and TV). The DAAS is multidisciplinary and multi-institutional

project. It involves all stakeholders such as State Agricultural Universities (SAUs), Indian Council for Agriculture Research (ICAR), Krishi Vigyan Kendras (KVK), Department of Agriculture and Cooperation, State Departments of Agriculture/ Horticulture/ Animal Husbandry/ Forestry (up to District level offices), NGOs, Media Agencies, etc. It can facilitate farmers to take help of favourable weather parameters and minimise the undesirable impact of weather irregularities on crops.

The Agro-Met field unit (AMFU) Kalimpong, Gramin Krishi Mousam Sewa, located in the Regional Research Station (Hill Zone), Kalimpong, comes under Hill Zone, West Bengal has been serving the farming community in Darjeeling and Kalimpong districts. Weather forecast on rainfall, maximum and minimum temperature, wind speed, wind direction, cloud cover, maximum and minimum humidity are being received on every Tuesday and Friday from Regional Met Centre (RMC) (IMD), Kolkata (Table 2).

Once the forecast is received, the advisory members will discuss crop condition as well as animal husbandry relating with the weather parameters. After advisory received from the advisory members, the agro advisories are being prepared in local language which is Nepali in this zone as well as in English. These advisories are sent to RMC, Kolkata, IMD. The advisory also been sent to IMD Pune for preparation of national bulletins and are uploaded on the IMD website in both local language (Nepali) and English. Bulletins are regularly communicated to the farmers on real time basis through E-mail and SMS. Agro-met advisory bulletins are also sent by E-mail to local newspapers. The bulletins are also sent to Darjeeling Krishi Vigyan Kendra, State Agriculture Departments, District Agriculture offices, Different local Newspapers and All India Radio (Kurseong) etc. through e-mail

messages. The weather forecast based agromet bulletin contains a summary of previous weeks' weather, weather forecast information for the next five days, crop management, which is based on weather forecast to the farmers well in advance, regarding rainfall amount and day wise variation and other weather variables. In this bulletin the relationship between weather crop relation and insects and disease incidence are also present. Normalized Difference Vegetation Index (NDVI) map and Standardized Precipitation Index (SPI) map are also considered.

Considering above facts the specific objective of the study was to verify the weather forecasted data and observe data of rainfall, maximum temperature and minimum temperature and the weather based agromet advisory bulletins may help the farming community for their decision making in agricultural operations.

Materials and Methods

The weather forecasts obtained for Darjeeling district during the period under study (study period: 2016-17) was compared with the observed weather data of Kalimpong Automatic Weather Station (AWS). Qualitative as well as quantitative verifications were done from 01.04.2016 to 31.03.2017.

Verification study was done for the following meteorological parameters:

Rainfall (mm)
Maximum temperature (°C)
Minimum temperature (°C)

A survey was conducted with pre tested schedule by the help of simple random sampling without replacement technique to find out beneficial part of weather based agricultural advisory.

Results and Discussion

The r Value (0.06) and the RMSE value (30.28) is analysed from the data set from 1st April, 2016 to 31st March, 2017 as quantitative verification. The ration score/hit score (%) was seen 46.85 per cent as a qualitative verification and critical success index, HK score were 0.10 and 0.36 respectively.

The error structure shows that the success rate (i.e. the percentage of correct + usable forecast) was considerably good (88.3 %) for the said time period.

Daily Maximum temperature data was analyzed with the forecasted value and the results are presented in the table 2. After analysed the data set from 1st April, 2016-31st March, 2017 was considered it was observed that the r-value was 0.63 and the RMSE value is 5.30 and the error structure shows that the success rate was 20.00 per cent for the said time period.

Daily Minimum temperature data was analyzed with the forecasted value and the results are presented in the table 3. The evaluated the data set from 1st April, 2016-31st March, 2017 was measured that the observed r-value was considerably high (0.86) and the RMSE value is 6.41 and the error structure shows that the success rate was 3.01 per cent for the time period.

The survey was conducted among the farmers. Out of aware farmers, 35% received through ADA of different blocks, 25% received from KVK; 20% from RRS; 15% by personal contact and 5% through notice board.

Almost 98 percentages of farmers thinks that the service provide them the useful information and it was helpful for them then to minimise the cost of cultivation (Table 4).. Among the farmers

Fig.1 District level agro-met advisory service system (Source: Rathore, 2013)

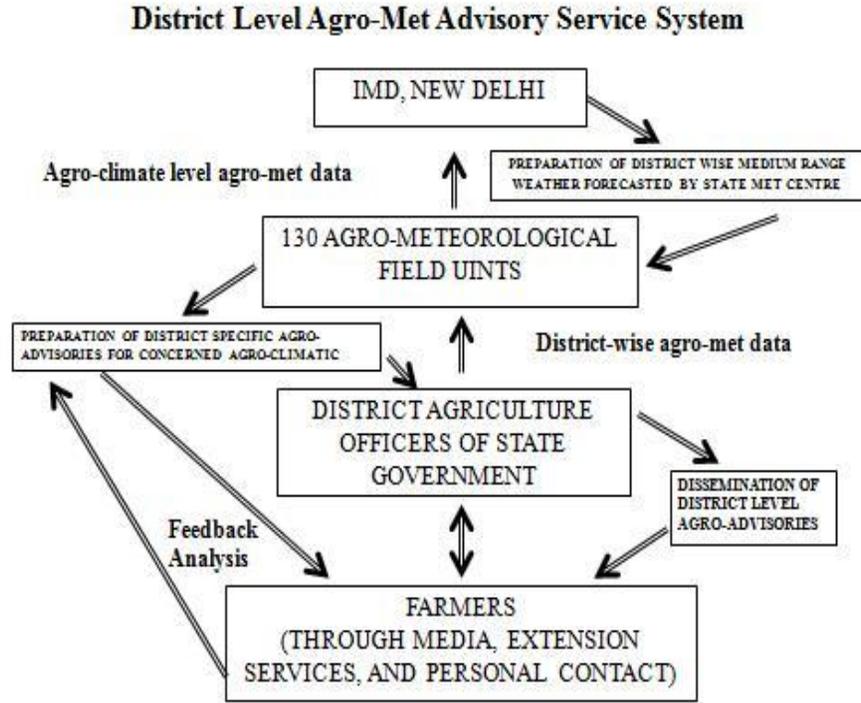


Table.1 Daily rainfall analysis for the year 2016-2017

Parameters	From 1 st April, 2016-31 st March, 2017
RMSE value	30.28
'r' value	0.06
Ratio score/Hit score (%)	46.85
Critical Success Index/ Threat score	0.10
HK score	0.36
Error structure (%)	
Correct	86.55
Usable	1.75
Unusable	11.7

Table.2 Maximum temperature analysis for the year 2016-2017

Parameters	From 1 st April, 2016-31 st March, 2017
RMSE value	5.30
'r' value	0.63
Error structure (%)	
Correct	8.77
Usable	11.23
Unusable	80.00

Table.3 Minimum temperature analysis for the year 2016-2017

Parameters	From 1 st April, 2016-31 st March, 2017
RMSE value	6.41
'r' value	0.86
Error structure (%)	
Correct	0.82
Usable	2.19
Unusable	96.99

Table.4 Feedback rating of weather forecast by 50 progressive farmers

Sl No.	Particulars	No. of farmers	Percentage
1.	Excellent	32	64
2.	Very good	11	22
3.	Good	6	12
4.	Satisfactory	1	2
5.	Irrelevant	-	-
6.	Did not answer	-	-

Table.5 Crops grown by the farmers in hill region of West Bengal

Type of crop	Name of the crop
Cereals	Rice, Wheat, Maize
Vegetables	Cabbage, Cauliflower, Broccoli, Chilli, Round Chilli (Dalle Khursani), Brinjal, Potato, Okra, Tomato, Beans, etc.
Oil seeds	Mustard, Soybean, etc.
Fruits	Orange and Peach etc.
Flowers	Cymbidium Orchid, Alstromeria, Gerbera, Chrysanthemum, etc.
Plantation crops	Tea
Spice crop	Ginger, Turmeric and Large Cardamom
Animal husbandry	Cattle, Poultry, Pig and Goat etc.

Table.6 Specific instances of benefit/ loss due to AAS with cultural Practices modified as per advisories

Crop	Forecasted events	Crop/Cultural operations recommended in advisory	Benefit (Rs/bigha)
Round Chilli	22nd July, 2016 Rainfall: 410 mm. MaxT: 18-21°C. Min T: 14-15°C. RH I: 95 to 97%. RH II: 90 to 96%.	Flowering and Fruiting Stage: Care should be taken to avoid water stagnation to manage collar rot. Collection and destruction of fallen fruits regularly from the field to minimize the population of fruit fly	450.00 Approximately
Rice	28th October, 2016 Rainfall: 2.0mm. MaxT: 21-22°C. MinT: 10-10°C. RH I: 61 to 89%. RH II: 36 to 62%.	Flowering stage: Standing water (2.5-3cm) should be maintained during this stage. Spray azadirachtin 0.03% (300PPM) neem oil based WSP @ 2000gm/ ha in 1000 lit. of water, if 10% dead heart or 2 egg mass / m ² of yellow stem borer is found in rice. Monitoring the rice field should continued for panicle blast incidence, If so, spray tricyclazole 75% WP @ 0.5 gm/lit of water.	400.00 Approximately
Animal Husbandry	15th November, 2016: Rainfall: 0.0 mm MaxT: 19-20°C. Min T: 8-10°C. RH I: 67 to 72%. RHII: 40 to 47%.	Goat and Sheep: Goat and sheep may get infected with FMD and pneumonia during winter months. They should be protected from chilling cold. Do not allow goat and sheep to graze during early morning.	500.00 Approximately
Large cardamom	6th January, 2017: Rainfall: 0.0 mm MaxT: 15-16°C. Min T: 3-4°C. RH I: 39 to 57%. RHII: 21 to 38%.	Vegetative and Early/ Initial flowering Stage: Weeding should be done followed by light irrigation. Use leaf mold at base of clump for moisture conservation as no rainfall has been forecasted for next five days.	450.00 Approximately

Table 5 reflects that in this zone the major cereals are rice, maize and wheat. Several of vegetables are cultivated like Cole crops (Cabbage, cauliflower, Broccoli), Chilli and round chilli etc. In oil seed cultivation, mustard and soybean are cultivated, in pomology orange and peach. In this hill zone, floriculture is one of the most important crop

for economical point of view. Cymbidium orchid, alstromeria, gerbera and chrysanthemum is the most popular flower among the farmers for cultivation. Large cardamom, Ginger and turmeric etc. are commercial grown in this place. In the world Darjeeling district is known for its tea aroma. So, in plantation crops tea is the most vital.

Animal husbandry is done by the most of the farmers basically cattle's; poultry, pig and goat are most preferred for animal husbandry.

Specific instances of benefit/ loss due to AAS with cultural practices modified as per advisories

National Council of Applied Economics Research (NCAER) estimated that farmers those were used weather information they were economically benefited (NCAER, 2010). Maini and Rathore (2011) also found that farmers who use the weather based bulletin were able to reduce the cost of cultivation by 2-5%. The overall advisories regarding irrigation scheduling, different farming operations, forecast related to incidences of pest and diseases along with control measures, crop planning for rainfed and irrigated situations etc. were very much helpful and popular among the farming community. As for example some of the advisories are given in table 6.

In this study, we have documented the quantitative and qualitative verification of the weather forecasted data and observation data. Farmers also take these services as a tool which may help them to take decision regarding the farming activity. These weather based agromet advisory may also help the farming community to increase the yield as well as for the reducing the cost of cultivation of crops.

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