# **Certificate Course on Participatory Irrigation Management (PIM)**

Module 14- Use of Information Technology by Water User Associations (WUAs)

## **Topic 14.4 – Importance of weather forecasting for WUA members**



# Topics of Module 14: 14.1 Use of information technology in daily uses for WUAs 14.2 Use of information technology in Irrigation Management 14.3 Use of remote sensing in Agriculture 14.4 Importance of weather forecasting for WUA members

### 1. Introduction

There is a close relationship between weather and agriculture. Weather is the main factor in impacting the agriculture. Agriculture activities are most sensitive with the weather. Increase in variations in weather activities is happening due to climate change, which leads to several activities causing adverse impact on agriculture and worsen the economics of farmers. On one side there is an increase in the population

of the country and on the other side due to climate change, changes in variety of weather activities are happening. In this situation weather forecasting information is very useful for the farmers. If the farmer has access to forecast of weather, proper arrangements for the agriculture inputs can be done timely, crop damage can be reduced be preventing crops from diseases and pests and more profit can be earned by reducing the cost of production.

The day-to-day conditions of the atmosphere at a place with respect to elements like temperature, humidity, atmospheric pressure, sunshine period, wind speed, rainfall, etc. is called the weather of that place. Weather can be cloudy, sunny, rainy, stormy or clear. It is a part of the natural phenomenon which maintains the equilibrium in the The difference between weather and climate is atmosphere. а measure of time. Weather is what conditions of the atmosphere are over a short period of time, and climate is how the atmosphere "behaves" over relatively long periods of time. When we talk about climate change, we talk about changes in long-term averages of daily weather. Climatic conditions of any place decide the vegetation of that area. The agriculture, crops, cropping system, breeds of livestocks, etc are decided by the climate of that area. Like this, weather at any place decides the selection of variety of crops, their sowing season, proper time for using various inputs for the agricultute, proper time for harvesting of crops etc.

Positive and adverse impact of weather on agriculture is well known to us. Heavy or less rainfall, frost, fog, cyclons, etc. adversely affects the agriculture. Therefore, its clearly understood that if we know in advance, the probable changes which will happen in weather or forecasting of weather is available we can plan our activities accordingly. For example, frost of one night n completely or partially damage our crops but if we know in advance the information about frost, we can take proper measures to reduce the damage by frost. Similarily, if we know inadvance the flooding in rivers, we can take proper steps to prevent damage by floods.

Therefore, there is no doubt that damage by disasters can be reduced by weather forecasting of short range or long range. It's essential that weather forecasting is available to us through various communication medium and it's also essential that these weather forecasting should be reliable. Looking to the direct or indirect impact of weather forecasting on our all activities, demand for short range forecasting as well as medium range and long range is increasing. This is the reason why all developed and developing countries are trying to establish their own national weather forecasting system (**Figure 1**)

### Figure 1: A Weather Station.



# 2. Brief Description of Weather-Related Services

Farmer is the last user for every technique and every such discovery's success depends on prior information on weather is provided to him alongwith best management techniques so that his production is enhanced and cost of cultivation is reduced. In this way weather forecasting is also helpful in efficient utilization of farm labour and inputs for the agriculture. Therefore, following information may be provided to the farmers:

- Regional Agriculture Weather and its diversity
- Regional weather and special changes happening in climate.
- Weather forecasting and pre information about Climate change.
- Pre information about pests/disease.
- Weather based farm management for crops as well as domestic animals.

# 3. Types of Weather Forecasting

Weather forecasting is mainly four types:

• Nowcasting – Upto 24 hrs

- Short Duration 1 to 3 days
- Medium Duration 4 to 10 days
- Extended Range more than 10 days.

Medium duration weather forecasting is very important for which validity is 4 to 10 days and 70% trueness is believed. Agriculture related weather forecasting includes 5 days advance forecasting for 7 weather parameters including rain, wind speed and direction, maximum and minimum tempuretaure, humidity, and cloud coverage.

# 4. Process of Weather Forecasting

Indian Metereological departmetal in cooperation with Indian Agriculture Research Institute, Central and State level Agriculture Universities and other associations has initiated the Intigrated Agriculture Weather Advisory Services for farmers to do timely agriculture according to weather and for overall development of farmers.

# 5. Essential Parameters for Weather Forecasting

Maxium and minimum temperature, relarive humidity, wind speed and direction, evaporation rate, solar radiation period, status of clouds, quantity of water vapour, rain etc. are the parameters which are essential for estimating weather parameters. Various instruments are kept in weather observatory to measure these parameters.

# 6. Temperature

Temperature is the main parameter which affects the selection of crop, seed sowing and germination (**Table 1**). Temperature in winter indicates the possibility of frost. In case of possibility of frost, farmer can irrigate his field alongwith making smoke around crops or can spary sulphur (0.1%) to prevent crop damage. Similarly, livestock and poultry farmer are advised to keep them at safe place.

Сгор	Minimum Temperature	Favourable Temperature	Maximum
			Temperature
Wheat	3 – 4.5	25	30 - 32
Barley	3 – 4.5	20	38 - 40
Jai	4 – 4.5	25	30.0
Maize	8 – 10.0	32 - 35	40 - 44
Jowar	8 – 10.0	32 - 35	40.0
Paddy	10 – 12.0	30 - 32	36 - 38

#### Table 1: Favourable temperature for seed germination for major crops (°C)

# 7. Wind Speed and Direction

Wind speed and wind direction (**Figure 2**) have significant influence on crop growth. Impact of wind speed is more on plants in coastal and hilley area. In general, wind increases transpiration and plants need more water. When wind is hot, it accelerates the desiccation of the crop by replacing the humid air by dry air. Hot dry winds cause reduction in plant height due to reduction in cell expansion as the cells cannot attain full turgidity. Lodging is another major injury or damage caused by high wind thereby reducing the production. The other adverse effect of winds is drying of leaf tips, tearing of leaves, fruit drop, breaking branches, uprooting of plants, etc. Fruit drop due to heavy gales is a major problem in mango crop. Heavy winds accompanied by rainfall cause uprooting of crops. Incase of high wind speed, farmers may be advised not to irrigate their fields as well as not to spray pesticides in the fields.



## Figure 2: Instruments for Measurement of Wind Speed and Direction.

Incase prediction of wind direction is east to west then lodging of crops will be less as the wind will pass through the rows, whereas incase of opposite wind chances of damge to crops will be more reducing the production.

# 8. Sunshine Hours and Clouds

Prediction of sunshine period and absence of clouds helps farmer to do weeding operations easily. Similarly, use of weedicides and pesticides during good sunshine period increases the effectiveness speed, thereby increasing the production.

# 9. Rainfall

Suitable and efficient cropping systems can be developed by understanding the rainfall pattern. Rainfall analysis helps in taking decision on time of sowing, scheduling of irrigation, time of harvesting, etc. Amount, distribution and intensity of rainfall are the important aspects of rainfall that have considerable influence on crop production.

Generally, yield levels are determined by the amount of precipitation above the basic minimum required to enable the crop to achieve maturity. Though rainfall has major influence on yield of crops, yields are not always directly proportional to the amount of rainfall. When the rainfall is concentrated in 4-5 months of the year, there may be period when the rate of precipitation exceeds the intake rate of soil. As a result, considerable runoff occurs, plant nutrients are leached out of the root zone and crops are adversely affected by anaerobic conditions, especially if the excess precipitation occurs during the cool season.

Intensity of rainfall mainly influences erosion of soil. Study of rainfall intensity helps in probable period of floods, filling of irrigation tanks, etc. If the intensity of rainfall exceeds rate of infiltration of soil, runoff starts. High intensity rainfall causes soil erosion. The runoff from hills and mountain slopes is collected in tanks. The amount of rainfall received (**Figure 3**) at periodic intervals like weeks, months, season, etc. indicates distribution. In addition, distribution of rainfall can be known by the length of dry spells, wet spells and rainy days. Distribution of rainfall is more important than total rainfall.



Figure 3: A Rain Gauge.

Forecast of rains is very useful for the farmers. Farmer can initiate sowing of crops in advance if the prediction is available and thereby can reduce the time. Use of pesticides and weedicides can also be done in case of no rain prediction. Rain water helps in disolving of fertilizer and enhance the availability to plants.

## 10. Relative Humidity

Relative humidity (RH) directly influences the water relations of plant and indirectly affects leaf growth, photosynthesis, pollination, occurrence diseases and finally economic yield. Relative humidity has considerable influence on evapotranspiration and hence on the water requirement of crops. When RH is low, transpiration increases causing water deficits in the plant. Moderately low air humidity is favorable for seed set in many crops, provided soil moisture supply is adequate. The incidence of insect, pest and disease is high under high humidity conditions. High RH favors easy germination of fungal spores on plant leaves. The blight diseases of potato and tea spread more rapidly under humid condition. Several insects such as aphids and jassids thrive better under moist conditions. Very high or very low RH is not conductive for high grain yield. Under high humidity, RH is negatively correlated with grain yield

of maize. Similarly, wheat grain yield is reduced in high RH. It can be attributed to adverse effect of RH on pollination and high incidence of pests.

Incase of high RH and Temperature farmers are advised to use proper insecticide/pesticides to reduce crop damage. Mostly, 40% relative humidity is considered favourable for crops. Chances of rains are more incase of relative humidity is more than 80%.

# 11. Weather Related Advisory Services

The sources of weather and climate-related risks in agriculture are numerous and diverse: limited water resources, drought, desertification, land degradation, erosion, hail, flooding, early frosts and many more. Effective weather and climate information and advisory services can inform the decision-making of farmers and improve their management of related agricultural risks. Such services can help develop sustainable and economically viable agricultural systems, improve production and quality, reduce losses and risks, decrease costs, increase efficiency in the use of water, labour and energy, conserve natural resources, and decrease pollution by agricultural chemicals or other agents that contribute to the degradation of the environment. Thus, the importance of the Agromet Advisory Services that have now been established at district levels in India.

These Services meet the real-time needs of farmers and contribute to weather-based crop/livestock management strategies and operations dedicated to enhancing crop production and food security. They can make a tremendous difference in agricultural production by assisting farmers in taking the advantage of benevolent weather and in minimizing the adverse impact of malevolent weather.

Indian Meteorological Department (IMD) is implementing operational agrometeorological schemes across the country under a five-tier structure:

- Top-level policy planning body in Delhi
- Execution by the National Agromet Service headquarters in Pune
- Coordination and monitoring by State Agromet Centres
- Definition of the agro-meteorological zone
- District or local level extension and training for input management advisory service

This structure includes State Agricultural Universities, Institutes of Indian Council of Agricultural Research and Indian Institutes of Technology. Without it, the district Agromet Advisory Services would not be sustainable.

The primary need of a farmer is a location-specific and quantified weather forecast. IMD started by issuing from June 2008 quantitative district level weather forecasts – for rainfall, maximum and minimum temperatures, wind speed and direction, relative humidity and cloudiness – with up to 5 days advance warning and a weekly cumulative rainfall forecast. These products were sent twice a week along with other value-added information to 130 AgroMet Field Units (AMFUs) for preparation of district level advisories.

The application of weather forecasts to generate crop advisories requires the definition of a spatial domain of validity and a temporal range as well as accuracy. At the district level, such are prepared containing past weather, forecast for 5 days ahead and a weather-based agrometeorological advisory that includes pest and disease information. The phenological stages of plant development are included in crop specific advisories to offer farmers guidance on cultural practices. All of the information is geared to help farmers maximize output and avert crop damage or loss. The Agromet Advisory Services also has an end-user group feedback mechanism to help the district level forecasters to tailor their services further.

The analysis and decision support information, for example, include information on how to manage pests when the forecast is for relative humidity, rising or falling temperatures or high or low winds; on how to manage irrigation through rainfall and various temperature forecasts; on how to protect crop from thermal stress when the forecast is for extreme temperature conditions, etc. It also helps farmers anticipate and plan for chemical applications, irrigation scheduling, disease and pest outbreaks and many more weather-related agriculture-specific operations from cultivar selection to dates of sowing, planting, transplanting, intercultural operations, harvesting and post-harvest operations. In a recent survey conducted by the National Council of Applied Economic Research (NCAER), 93% of farmers responding agreed that numerical weather prediction was reliable, and asserting that they used the information in making decisions during different farming stages, from sowing to harvesting.

Such actionable weather information is consistently being delivered to farmers and productivity reports have shown significant increases in yields and with-it food availability and incomes. A study has demonstrated that the Agromet Advisory Services has decreased cultivation costs overall by up to 25% for the studied crops. Initial results in some cases had shown increased costs of up to 10%, but this was more than offset by consequent rise in net returns of up to 83%. The crops that benefited most are paddy, wheat, pearl millet, and fruits and vegetables.

Agromet Advisory Services use three dissemination channels – mass media, group awareness campaigns and individual contacts – in order to reach more farmers. Large number of farmers are currently subscribed to the SMS advisories, but there is still a need for greater dissemination and to convince farmers of the sustainability of the positive impacts observed in the long term.

The group awareness campaigns are strengthening use of the services in farming communities and helping farmers to be more self-reliant in dealing with weather and climate issues that affect agricultural production. They are also permitting farmers to adapt better by improving their planning skills and management decision-making. A participatory, cross-disciplinary approach is taken to deliver climate and weather information and enhance awareness in these user groups. IMD, state agricultural universities, Institutes of the Indian Council of Agricultural Research (ICAR) and the Indian Institute of Technology, working with local non-governmental organizations (NGOs) and other stakeholders, have jointly organized these group awareness campaigns in different parts of the country.

Government of India has <u>www.farmerportal.gov.in</u> and <u>www.mkisan.gov.in</u> web portals for Agro advisory. Latest information is provided to farmers through SMS on their registered mobile numbers. A farmer can register himself. Procedure for registration on "*mkisan portal*" for receiving advisory through SMS is available at **Figure 4** below. Advisory (**Figure 5, Figure 6** and **Figure 7**) are also provided on the websites of Central, State Government and Agriculture Universities websites.

## References

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- <u>https://mausam</u>.imd.gov.in/imd\_latest/contents/agromet/advisory/benglishmain.php
- https://agromet.imd.gov.in
- www.farmerportal.gov.in
- www.mkisan.gov.in

### 1. Kisan Call Centre Registration

Farmers can call up Kisan Call Center (KCC) through a toll-free number 1800-180-1551. Registration of the farmers is done by Kisan Call Centre Agent at the Kisan Call Centre who records personal details of the farmer in the Kisan Knowledge Management System (KKMS).

Farmer is then asked to opt for his mode of receiving information/advice i.e., Text message (SMS) or Voice message.

Preferred language options are then entered. Hindi and English option are given all over India while Regional Language in Roman Script is State specific. Regional Language written in Roman Script is given for handsets not supporting Regional Language fonts (e.g. Kisan Ko salah di jati hai).

Up to 8 options of Crop/Activity can be given by the farmer so that he/she does not receive unnecessary messages for crops/practices he is not interested in. Immediately on registration, farmer will receive a welcome SMS message.

## 2. Web Registration

A farmer having internet access can register through the portal or go to the nearest Common Service Center (CSC) to register with the help of a Village Level Entrepreneur (VLE). A onetime fee of Rs. 3 per registration will be charged by the VLE. Link for web registration is <u>http://mkisan.gov.in/wbreg.aspx</u>

Name, Mobile Number, State, District and Block fields are mandatory in personal details.

The farmer is also expected to enter preference for mode of communication and also preference for Language, crop/activities. After pressing 'Register' button, a verification code will be sent to farmer's mobile which needs to be entered on the web-page to complete the registration process.

## 3. Registration through SMS

Farmers can also register by sending an SMS on 51969 or 7738299899. Procedure and format for registration are as under:-

- 1. Format for typing in the message text box is "KISAAN REG < NAME > , <STATE NAME >, <DISTRICT NAME>, and <BLOCK NAME>" (only first 3 letters of State, District & Block Names are needed)
- 2. After typing the message send it to 51969 or 7738299899.

Farmer will be charged for this SMS. There will however be no charge for subsequent SMSs received from experts & officers. Please note that commas (,) are necessary.

Figure 4: Procedure for registration on "mkisan portal".



Figure 5: Weather Advisory for the State of Rajasthan.



Figure 6: Sub Division wise weather Advisory for the State of Rajasthan



Figure 7: District wise Agro-Metereological Advisory.