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Weather Forecast and its Application in Agriculture

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Weather forecast:

Foretelling the coming weather in advance is known as weather forecasting. It may be defined as advance information about the probable weather conditions for few days to follow. So the time for which weather forecast is made is also important which is known as lead time. The accuracy of a forecast decreases with increasing lead period and decreasing area under forecast.

Elements of weather forecast: Generally the weather forecast includes the following elements:

- Amount and type of coverage of sky by clouds
- Rainfall and Snow
- Maximum, Minimum and Dew point temperatures
- Relative humidity
- Wind Speed and Direction
- Extreme events like heat and cold waves fog, frost, hail, thunderstorms, wind squalls and gales, low pressure areas, different intensities of depressions, cyclones, tornados.

Types of weather forecast:

1. **Now casting:**
   This type of forecast is valid for 12 to 24 hours and issued for earthquake, hail storm, typhoons and tornados.
2. **Short range weather forecast:**
   Forecasting of weather for 2 to 3 days in advance is called short range weather forecasting.
3. **Medium range forecast:**
   Forecasting of weather for 4-10 days in advance is termed as medium range forecasting.
4. **Long range weather forecast:**

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Forecasting of coming weather for more than 10 days or a month or a season in advance is called as long range weather forecasting. It may also be categorized as monthly forecast or seasonal forecast depending on the lead time. Long range forecasting is issued by India Meteorological Department, New Delhi for south west monsoon rains, first in April and then the forecast is updated in July.

Name of the weather forecast	Issued by	Clients	Mode of communication	Forecasting weather elements	Methods used in India	Lead time	Accuracy (%)
Now casting	IMD	Public including farmer	Radio and Television and Dailies	Thunder storm, dust storm Cold and heat waves	Synoptic and weather map	One to two hours earlier	90-98
Short range	IMD	Public including farmer	Radio and Television and Dailies	Cloud spread, rainfall, temperature, cyclone warning	Synoptic and weather map, NWP	One day	80-90
Medium range	NCMRWF (IMD)	Farmers	SMS through mobile, Web site, Dailies, television	Rainfall, temperature, RH, wind speed, wind direction and cloud cover	GNWPM, RCM	3-10 days	70-75
Long range	IMD	Farmers	Television, dailies, radio	Seasonal rainfall	Statistical regression like ARIMA model	30 to 40 days	60

Tools of weather forecasting:

- Use of barometer
- Use of radar
- Use of weather satellites
- Radiosondes
- Automated surface-observing systems
- Supercomputers
- Advanced Weather Interactive Processing System (AWIPS)

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Methods of weather forecasting:

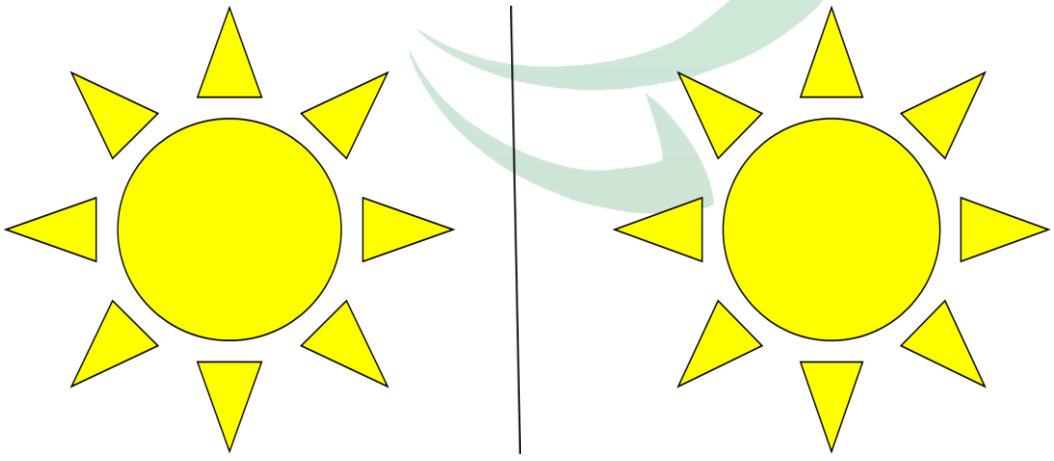
Synoptic method:

- A synoptic chart is the scientific term for a weather map.
- Synoptic charts provide information on the distribution, movement and patterns of air pressure, rainfall, wind and temperature.
- This information is conveyed using symbols, which are explained in a legend.
- Synoptic charts are used to report on the current weather and to predict future weather patterns.

Analogue method:

- This method is defined as any particular type of system if it is present in the past also, it is assumed that the present system is likely to behave in the same way as the previous one.
- There are a number of limitations on the success of this method. First, it is difficult to select right analogue, and second, even if we succeed in picking up the right ones, there is no guarantee that they will evolve in the same way.
- It has been suggested that analogue should be used in conjunction with other methods, either as an aid or a check on pressure pattern prognosis.
- The success of forecast depends upon the knowledge and the experience of the forecaster.

Persistence method: Tomorrow will be much the same as today.



Today`s Weather (Clear skies, 19^0C, Low winds) Tomorrow Weather (Clear skies, 19^0C, Low winds)

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Climatological Method:

- This method involves historical weather data over long periods of time (years) to predict conditions on a given date.
- The weather statistics accumulated over many years has been averaged to make the weather forecast.
- For example, if you were using the climatology method to forecast for temperature and precipitation for Hisar on September 4th, you would go through the temperature and precipitation data that has been recorded for every September 4th and take an average.
- If these averages were 35°C with 25 mm of rain, then the weather forecast would be 35°C temperature and 25 mm of rain for Hisar on September 4th.
- The climatology method only works well when the weather pattern is similar to that expected for the chosen time of year.

Statistical methods:

- This method is based on statistical approaches such as regression and auto regressive integrated moving average techniques.
- The regression equations are used to predict weather parameters.
- Knowledge of correlation coefficient will also help to access effect of one parameter over the other.
- This method is used for long range forecasting of Indian monsoon rainfall.

Application of weather forecast in agriculture:

Weather plays an important role in agricultural production. It has a profound influence on the growth, development and yields of a crop, incidence of pests and diseases, water needs and fertilizer requirements in terms of differences in nutrient mobilization due to water stresses and timeliness and effectiveness of prophylactic and cultural operations on crops. Weather aberrations may cause

(i) physical damage to crops
(ii) (ii) soil erosion.

The quality of crop produce during movement from field to storage and transport to market depends on weather. Bad weather may affect the quality of produce during transport and viability and vigor of

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seeds and planting material during storage. Weather forecasts provide the necessary meteorological information to aid farmers in making certain special "crop and/or cost saving" decisions on farm operations. Therefore it plays a vital role in minimizing the crop losses due to aberrant weather. Weather forecast enhances the crop production and productivity and farm income. It can be applied in various areas in agriculture to increase the yield of crop by minimizing the losses due to aberrant weather which includes:

- Field preparation
- Sowing/planting
- Application of agricultural chemicals
- Evaporation losses for irrigation
- Weeding
- Crop harvest and post harvest operations (including crop curing/drying of meat and fish)
- Control of plant diseases
- Control of noxious insects
- Transportation of agricultural products
- Operation of agricultural aviation
- Prevention of damage due to chilling, frost and freezing
- Forestry operations
- Fishery operation
- Safeguarding animal husbandry
- Protecting Horticulture and Arboculture (non forest trees) plants