

Unit 1 - Agro-climatology

TOPIC 2: WEATHER FORECASTING

Introduction

Weather forecasting is the application of science and technology to predict the state of the atmosphere for a future time at a given location. In agriculture, accurate forecasting helps farmers plan sowing, irrigation, fertilizer application, pest control, and harvesting operations, thereby minimizing crop losses due to adverse weather.

Types of Weather Forecasts (Based on Time Range)

- 1. Now-casting (0-3 hours)** Very short-range forecasts used for predicting immediate weather events like thunderstorms or sudden rainfall, useful in timing of irrigation or spray operations.
- 2. Short-range Forecast (1-3 days)** Useful for day-to-day farm operations like spraying pesticides or harvesting, since rainfall within this window can wash away applied chemicals.
- 3. Medium-range Forecast (3-10 days)** Helps in planning major agricultural operations such as sowing or harvesting over the coming week.
- 4. Long-range/Seasonal Forecast (more than 10 days, up to a season)** Provides outlook on overall seasonal rainfall (e.g., India Meteorological Department's seasonal monsoon forecast), helping farmers and policymakers plan crop choice and acreage for the season.

Methods of Weather Forecasting

- 1. Synoptic Method** Based on analysis of current weather charts/maps showing pressure systems, fronts, and wind patterns across a region; forecasters extrapolate the movement of these systems.
- 2. Numerical Weather Prediction (NWP)** Uses mathematical models based on physical laws (fluid dynamics, thermodynamics) and powerful computers to simulate atmospheric behavior and predict future weather states. This is the most widely used modern method.
- 3. Statistical Methods** Based on historical weather data and statistical relationships between variables, used for long-range and seasonal forecasting where physical modeling is less reliable.
- 4. Satellite and Radar-based Forecasting** Satellites provide continuous images of cloud cover, moisture, and temperature, while Doppler radars detect precipitation intensity and movement, both critical for short-term and severe weather warnings.

5. Traditional/Indigenous Methods Farmers historically used indicators like animal behavior, plant flowering patterns, cloud formations, and wind direction to predict weather; though less scientific, these are still used in rural areas alongside modern forecasts.

Agromet Advisory Services (AAS)

The India Meteorological Department (IMD), in collaboration with state agricultural universities, issues District Agromet Advisory Bulletins twice a week. These provide: - Weather forecast for the next 5 days. - Crop-specific and stage-specific advisories (sowing, irrigation, fertilizer, plant protection). - Alerts for extreme weather events (heat waves, frost, heavy rainfall).

Importance of Weather Forecasting in Agriculture

1. Helps decide optimum sowing and harvesting time.
 2. Improves efficiency of irrigation scheduling.
 3. Reduces losses from pest/disease outbreaks linked to humidity and temperature.
 4. Minimizes risk from extreme events (frost, hailstorm, heavy rain).
 5. Supports crop insurance and disaster management planning.
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