



User Manual

Dynamic Crop Weather Calendar (DCWC)

Agromet Advisory Services Division

India Meteorological Department (IMD)

Ministry of Earth Sciences (MoES), Government of India

<https://agromet.imd.gov.in/weather-crop-calendar>

The Dynamic Crop Weather Calendar (DCWC) is an operational decision-support framework developed by the India Meteorological Department (IMD), Agromet Advisory Services Division (AASD), Ministry of Earth Sciences (MoES), Government of India, to facilitate weather-informed agricultural management.

The conventional crop weather calendar provides information regarding the expected progression of a crop through different phenological stages under normal agro-climatic conditions. The DCWC extends this concept by dynamically incorporating real-time observations and weather forecasts to assess the actual and expected crop development and weather conditions. The DCWC provides a structured digital repository of crop weather calendars, crop phenology, weather information, crop-stage-specific weather thresholds, crop water requirements, pest and disease risk information, and location-specific weather forecasts. The system is designed to continuously assess the interaction between crop development and prevailing as well as anticipated weather conditions and to support the preparation of timely, scientifically sound and location-specific agro meteorological advisories.

The fundamental principle of the DCWC is that the impact of weather on a crop is not determined only by the absolute value of a meteorological parameter, but also by its departure from the normal weather conditions, the duration of the event, and the phenological stage and weather sensitivity of the crop. Therefore, the system provides a framework for assessing observed and forecast weather both in relation to crop-specific thresholds and to the normal climatological conditions of the selected district. The framework integrates:

- Crop phenology;
- Accumulated Growing Degree Days (AGDD/ACGDD);
- Real-time/observed weather conditions;
- Weather forecasts;
- District-wise normal weather;
- Deviation of observed and forecast weather from normal;
- Crop-stage-specific weather thresholds;
- Crop water requirement;
- Pest and disease thresholds; and
- Panchayat-level weather forecasts.

These components collectively enable assessment of the likely impact of weather conditions on crops at different stages of development.

OBJECTIVES

The major objectives of the DCWC are to:

- Monitor crop phenological stages throughout the crop growing season. Provide the deviation of phenological phase with respect to the normal weather data and observed forecast. The stage of the forecast using next 10 days forecast will also be provided.
- Assess the effects of observed and forecast weather conditions on crop growth and development.
- Provide observed rainfall and Actual Evapotranspiration based water status in the district for the particular crop. Also depict the phenological phase wise excess or deficit water status.
- Provide thumb rule based Pest and Disease occurrence based on the real time observation
- Provide the Weekly Weather Normal for the district in tabular format

COMPONENTS OF THE DCWC

Crop Phenology information

The system considers crop development from sowing to maturity through important phenological phases such as Sowing, Germination/Emergence, Seedling establishment, Vegetative growth, Tillering/branching, Flowering, Grain formation or fruit development, Physiological maturity and Harvest. The system uses the **Accumulated Growing Degree Days (ACGDD)** approach for phenological phase detection and forecasting. The accumulated GDD requirement for different stages is derived from observed phenological information and long-term field observations from the AMFU network under the GKMS programme. The expected phenological stage under normal weather conditions can be compared with the stage estimated from real-time weather information and the forthcoming forecast period. The system can therefore indicate whether crop development is:

- **Ahead of normal;**
- **Near normal;** or
- **Delayed compared with normal development.**

This is particularly important because abnormal temperature conditions can accelerate or retard crop development and consequently alter the timing of critical agricultural operations.

Thus, the DCWC provides information on both: **“What stage should the crop normally be in?”** and **“What stage is the crop likely to be in based on observed and forecast weather?”** This enables identification of possible advancement or delay in crop phenological development.

Weather Parameters

The DCWC utilizes observed and forecast meteorological variables that significantly influence crop growth. 7 days forecast of following crop growth important weather parameter i.e Maximum Temperature, Minimum Temperature, Rainfall, Relative Humidity Wind Speed, Wind Direction and Cloud cover forecast of IMD Multi Model Ensemble forecast at 12.5 Km resolution is integrated in the system.

Observed Weather dataset

Weather parameters	Unit	Data Source	Resolution
Rainfall	mm	Daily gridded rainfall data of India Meteorological Department (IMD)	$0.25^{\circ} \times 0.25^{\circ}$
Temperature Maximum (TMax)	$^{\circ}\text{C}$	Daily gridded maximum & minimum temperature data of India Meteorological Department (IMD).	$0.5^{\circ} \times 0.5^{\circ}$
Temperature Minimum (TMin)			

The grid datasets were spatially mapped to the administrative level of “District” to ensure consistency in analysis and interpretation. For each centroid of the district, nearest grid point was identified to the native spatial resolution of the dataset. The values from these nearest grid points were extracted to represent the respective district. This approach preserves the original data characteristics while enabling

uniform district -level assessments. It ensures spatial coherence across multi-source datasets used in the analysis.

For each district and relevant period, normal weather information provides a climatological reference against which current and forecast conditions can be evaluated. The system provides weekly normal weather information for parameters such as temperature, rainfall and relative humidity taken from IMD grid data as well as historical observations.

Crop Weather Thresholds

Weather thresholds represent the optimum and critical meteorological limits required for healthy crop growth during different phenological stages. These thresholds are used to identify favorable or adverse weather conditions affecting crop performance. The weather thresholds collected from the Crop Weather Calendars and literatures has been incorporated in the module.

Integration of Crop Water Status

The DCWC also incorporates crop water requirement assessment using Actual Evapotranspiration (AET) and observed rainfall. The stage-specific crop water requirement is estimated using crop coefficients and evapotranspiration. To estimate the actual evapotranspiration for specific stage of a crop of any region, estimated reference evapotranspiration is multiplied with the crop coefficient (Kc) of that stage of the crop. Crop coefficient (Kc) was calculated using stage-specific crop coefficient from FAO 56. $AET = Kc * PET$. Daily actual ET (AET) was computed as a sum of evaporation and transpiration. The daily AET estimated was accumulated for each phenological stage and was considered as the crop water requirement during the respective phenological stage. The water-status assessment is particularly useful for interpreting rainfall deviation. For example:

Below-normal rainfall + high AET → Possible water deficit

whereas: **Above-normal rainfall + low AET → Possible water surplus**

Pest and Disease Risk Assessment

The DCWC provides crop-stage-wise pest and disease information using weather-based threshold or thumb-rule approaches. Observed and forecast weather conditions are compared with the relevant thresholds to identify conditions potentially favourable for pest and disease occurrence. Deviation from normal weather may provide additional supporting information for such assessment. For example, prolonged periods of above-normal humidity or rainfall may create conditions favourable for certain diseases, while warmer-than-normal conditions may influence the development of particular insect pests.

Forecast Versus Normal Weather

The DCWC provides graphical comparison of forecast and normal weather for maximum temperature, minimum temperature and rainfall for the forthcoming period. The forecast-versus-normal representation allows the user to quickly identify periods where weather conditions may substantially depart from climatological conditions.

This feature is particularly useful for operational advisory preparation because it enables the AMFU/forecaster to identify potential periods of:

- Above-normal temperature;

- Below-normal temperature;
- Above-normal rainfall;
- Below-normal rainfall;
- Possible dry spells;
- Potential wet spells; and
- Other anomalous weather situations.

The information should subsequently be interpreted against the crop stage and relevant threshold before incorporating it into the agromet advisory.

Dynamic Crop Weather Calendar (DCWC)

1. SELECT DISTRICT

2. SELECT CROP & SEASON

Crop • Season • Sowing Week

3. DETERMINE CROP PHENOLOGICAL STAGE

AGDD / ACGDD • Current • Normal • Forecast

4. RETRIEVE WEATHER INFORMATION

OBSERVED WEATHER
Real-time

NORMAL WEATHER
Climatology

FORECAST WEATHER
Upcoming period

5. COMPARE OBSERVED / FORECAST WITH NORMAL WEATHER

6. ASSESS THE CROP PHENOLOGY DEVIATION FROM NORMAL

Above Normal • Near Normal • Below Normal

7. CROP-STAGE-SPECIFIC THUMB RULE BASED PEST AND DISEASE RISK

No

No Significant pest occurrence

Weather forecast crosses
pest weather threshold?

Yes

Potential pest occurrence

8. CROP-STAGE-SPECIFIC WEATHER PARAMETER THRESHOLD

9. CROP STAGE SPECIFIC WATER STATUS

Rainfall vs. AET / PET • Deficit / Adequate / Surplus

10. DEVIATION IN FORECAST AND NORMA FOR NEXT SEVEN DAYS

Occurrence of dry spell/Heat Wave/Cold Wave

11. IDENTIFY MANAGEMENT ACTION

Irrigation / Drainage / Plant Protection / Farm Operations / Sowing / Fertilizer / Harvesting

How to Use DCWC Module

DCWC Module

<https://agromet.imd.gov.in/weather-crop-calendar>



1. **Select Location:** Selection of the correct geographical location is the first step in generating the Dynamic Crop Weather Calendar. The system retrieves the crop-weather information and associated weather data corresponding to the selected location.

Select your **State** from the drop down menu

Select your **District** from the drop down menu

2. **Select Crop and Crop Duration**

After selecting the location, the user is required to select the **Crop** and the corresponding **Crop Duration** from the available options.

The crop duration should be selected according to the appropriate crop category available in the DCWC Module. Where **Short-Duration** varieties complete their growth cycle and reach maturity/harvest within a relatively shorter period eg. 90–120 days in case of rice. **Medium-Duration** crops have intermediate growth cycle, longer than short-duration but shorter than long-duration crops eg. 120–150 days in case of rice. The **Long-Duration** Crops requires a comparatively longer period to complete their growth cycle and reach maturity/harvest eg. >150 days in case of rice.

Select the desired **Crop** from the drop down menu

Select type of selected crop from the drop down menu

3. **Select Sowing Week and Crop Season**

After selecting the crop and crop duration, the user is required to select the **Sowing Week** corresponding to the actual or expected sowing period of the selected crop. Select the appropriate **Sowing Week/Standard Meteorological Week (SMW)**, based on the selected sowing week, the system estimates the progression of the crop through different phenological stages.

After selection of Sowing Week the season of the crop tab is enabled with option for Kharif, Rabi and Zaid. The selection of this information will guide the system for selection of ACGDD algorithm respective to selected crop.

- **Kharif Season:** Crops generally grown during the **monsoon season (June–October)**; e.g., **Kharif rice**.
- **Rabi Season:** Crops generally grown during the **winter season (October–March)**; e.g., **Rabi rice** in suitable regions.
- **Zaid Season:** Crops generally grown during the **summer season (March–June)** between Rabi and Kharif; e.g., **Zaid/summer rice** in suitable irrigated areas.

Select the
desired Crop
sowing week

Crop Details

Sowing Week ⓘ
Week 23, 2026

Season ⓘ
☒ Kharif ☐ Rabi ☐ Zaid

Select the
season of
selected
crop

Press the
submit
button

SUBMIT

Output Obtained:

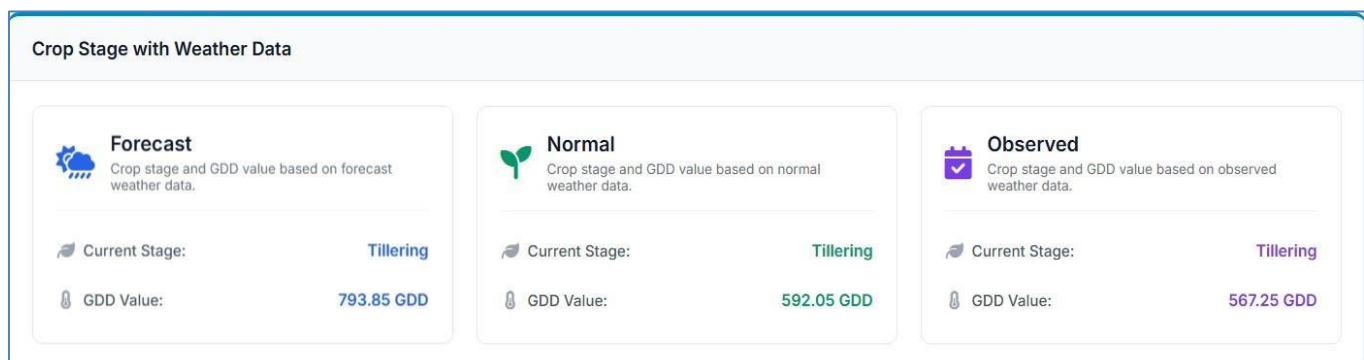
1. Crop Phenological Phase Stage (with Observed/Normal/Forecast data)

Integration of Observed, Normal and Forecast Information

To make the information useful for operational agricultural decision-making, the module provides three perspectives:

- **Observed Phenology:** Indicates the crop stage corresponding to the AGDD accumulated from the actual/recent weather observations.
- **Normal Phenology:** Represents the expected crop stage based on normal/long-term weather conditions of the concerned district or location.
- **Forecast Phenology:** Uses the accumulated GDD from observed weather along with forecast temperature to estimate the **probable date/period of attainment of the upcoming phenological stages**.

Thus, the module can indicate whether crop development is **ahead of, near to, or behind the normal phenological progression**, and can provide an indication of the expected timing of the next critical crop stage.



2. Pest and Disease information

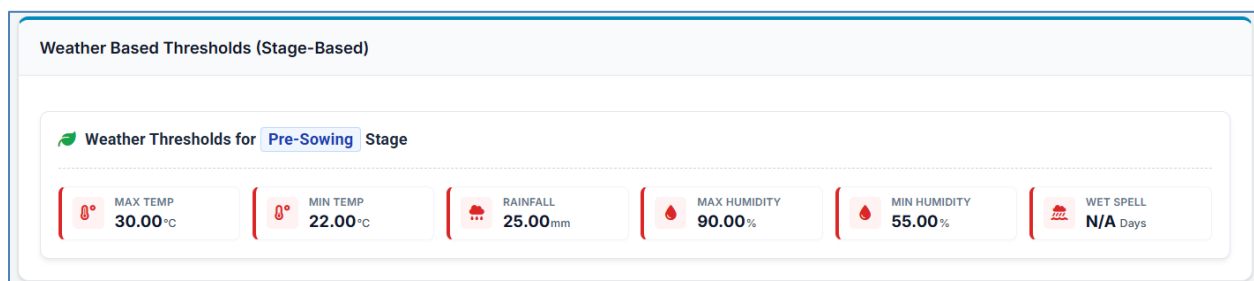
The Crop Stage-wise Pest and Disease module provides crop-specific information on the potential occurrence and risk of pests and diseases at different phenological stages by comparing the prevailing and forecast weather conditions with predefined weather-based threshold values.

The module follows a thumb-rule/threshold-based approach, in which the relationship between specific weather conditions and the occurrence or development of important pests and diseases is represented through scientifically established weather thresholds. The thresholds are compiled from District-wise Crop Weather Calendars (DCWCs), Crop Weather Calendars, field-level observations, agro meteorological literature, research publications and other validated technical references.

3. Crop stage wise weather threshold

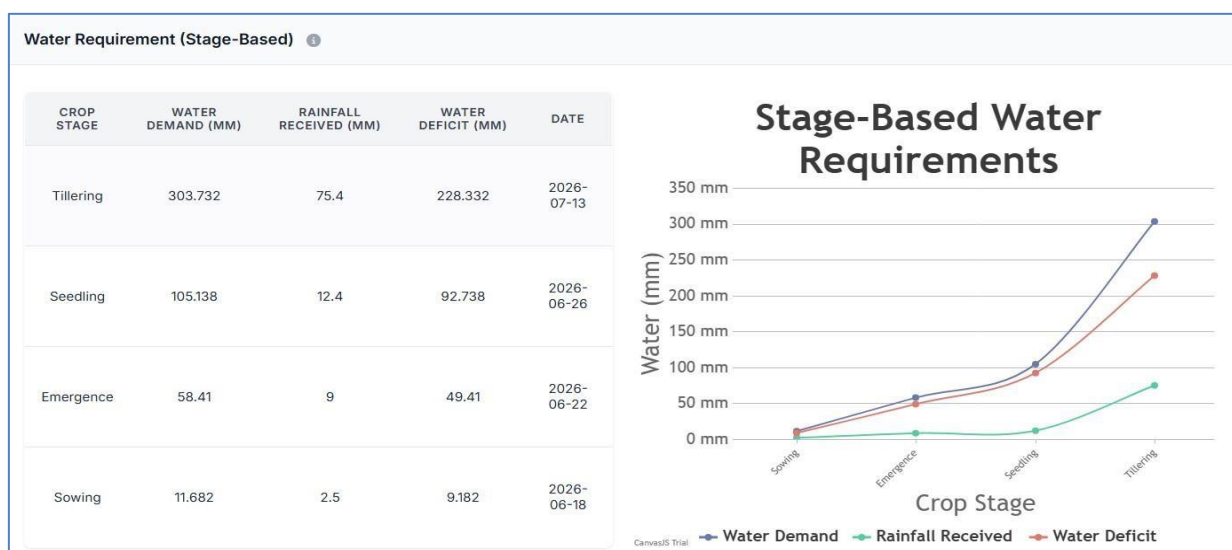
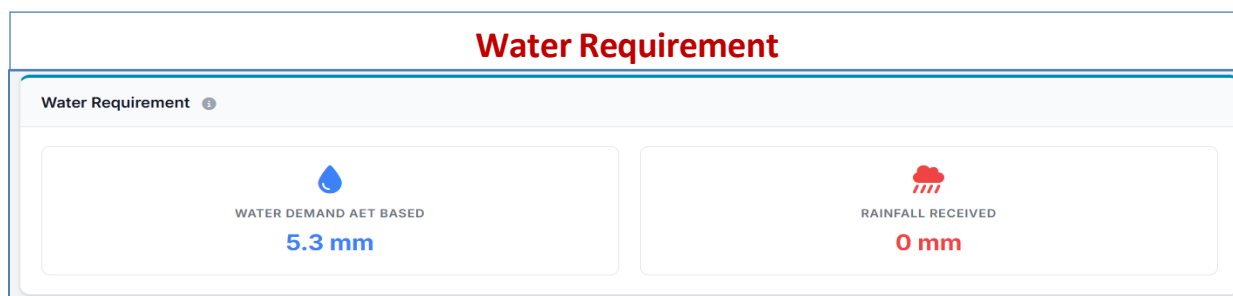
Based on the thumb rule the Crop stage wise weather threshold collected from the Crop Weather Calendar are placed in the system to compare with the observed weather and forecast.

Weather Threshold for the Crop Stages



4. Water Requirement phenological stage wise

Module provides the information on AET based water requirement vs Rainfall received. The information is provided for the current phenological stage as well as the stages which have been already achieved since sowing.



The graphical representation of the stage wise water requirement reflects the deficit and surplus status of crop water requirement.

5. Weekly Normal

The **Weekly Normal Weather** module provides the long-term normal weather conditions of the **selected district** on a Standard Meteorological Week (SMW) basis. It enables users to understand the typical weather conditions expected during a particular week and provides a baseline for comparison with observed and forecast weather.

The module displays the **weekly normal values** of key weather parameters, including:

- **Temperature (°C):** Normal weekly temperature, generally represented through relevant temperature parameters such as maximum and minimum temperature.
- **Rainfall (mm):** Normal accumulated rainfall expected during the selected meteorological week.
- **Relative Humidity (%):** Normal weekly humidity conditions of the selected district.

The weekly normals are useful for assessing **deviation from normal weather conditions** and understanding the climatological background during different crop growth periods. This information can also support the interpretation of crop phenology, pest and disease risk, irrigation requirements and other agrometeorological decisions.

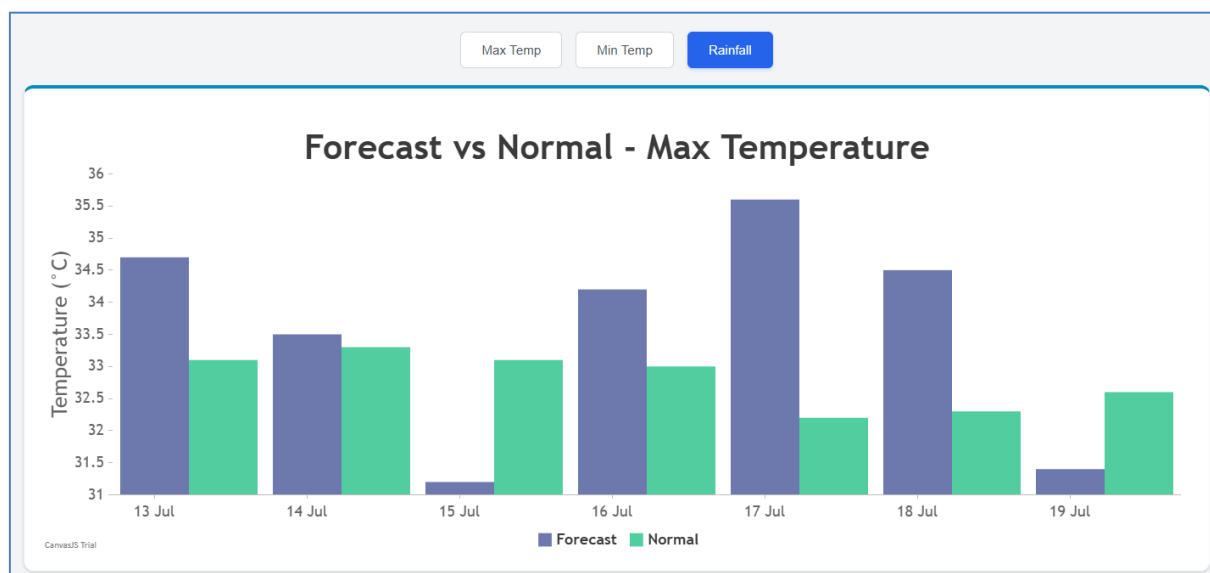
Weather Normal Weekly Data

Normal Weekly Data						
WEEK	PERIOD	MAX TEMP (°C)	MIN TEMP (°C)	AVG TEMP (°C)	RAINFALL (MM)	HUMIDITY %
1	1-7 to 7-7	33.56	26.01	29.79	10.79	81.71
2	8-7 to 15-7	33.29	26.04	29.66	12.20	82.86
3	16-7 to 22-7	32.67	25.87	29.27	10.47	83.86
4	23-7 to 29-7	32.91	26.00	29.46	10.27	83.00
5	30-7 to 31-7	32.55	26.00	29.28	10.75	84.00

« Prev 1 Next »

The module also provides the normal weakly weather of the selected district for the parameter Temperature in °C, Rainfall in mm and Humidity in %.

6. Forecast vs. Normal for Maximum, Minimum Temperature, Rainfall and Growing Degree Days Rainfall



The graphical representation of the Forecast vs Normal for next 07 days is also enabled in the system for reference purpose.

The District Crop Weather Calendar (DCWC) serves as an integrated decision-support system that combines crop phenology, weather observations, weather forecasts, crop weather thresholds, crop water status, and pest and disease risk information to support weather-informed agricultural decision-making. The system has been developed to assist Agrometeorological Advisory Services (AAS) in preparing scientifically sound, location-specific advisories for farmers.

The major applications of the DCWC:

- Preparation of Weather-Based Agrometeorological Advisories:** Supports Agrometeorological Field Units (AMFUs) in generating district-specific crop advisories by integrating crop growth stages with observed and forecast weather conditions.
- Crop Growth Monitoring:** Enables continuous monitoring of crop phenological development using the Accumulated Growing Degree Days (AGDD) approach and identifies deviations from normal crop growth due to prevailing weather conditions.
- Weather Impact Assessment:** Assesses the influence of current and forecast weather on crop growth and development by comparing meteorological parameters with crop-stage-specific weather thresholds.

- d. **Crop Water Management:** Evaluates crop water requirement using Actual Evapotranspiration (AET) and rainfall received, facilitating timely recommendations on irrigation scheduling, water conservation, and drainage measures.
- e. **Pest and Disease Forewarning:** Provides weather-based assessment of potential pest and disease occurrence using scientifically established threshold values, enabling preventive crop protection measures.
- f. **Support for Farm Management Decisions:** Assists in scheduling critical agricultural operations such as sowing, transplanting, irrigation, fertilizer application, intercultural operations, plant protection measures, and harvesting based on prevailing and forecast weather conditions.
- g. **Climate Risk Management:** Helps identify potential weather-induced risks such as heat stress, cold stress, heavy rainfall, dry spells, high humidity, and strong winds, allowing timely contingency planning to minimize crop losses.
- h. **Reference for Operational Advisory Preparation:** Provides district-wise weekly normal weather information and weather forecast comparisons to support operational advisory formulation under the Gramin Krishi Mausam Sewa (GKMS) programme.

Note: The Dynamic Crop Weather Calendar Module is ready to use for Rice, Soyabean, Kharif Maize, Cotton and Groundnut Crop additional crops will be added subsequently.