WEATHER AND CLIMATE, MICRO-CLIMATE

Weather

i) 'A state or condition of the atmosphere at a given place and at a given instant of time'.

ii) 'The daily or short term variations of different conditions of lower air in terms of temperature, pressure, wind, rainfall, etc'.

iii) State of atmosphere at a particular time as defined by the various meteorological elements. (WMO)

The aspects involved in weather include small areas and duration, expressed in numerical values, etc. The different weather elements are solar radiation, temperature, pressure, wind, humidity, rainfall evaporation, etc. is highly variable. It changes constantly sometimes from hour to hour and at other times from day to day.

Climate

i) 'The generalized weather or summation of weather conditions over a given region during comparatively longer period'.

ii) 'The sum of all statistical information of weather in a particular area during a specified interval of time, usually, a season or a year or even a decade'.

iii) Synthesis of weather conditions in a given area, characterized by long-term statistics (mean values, variances, probabilities of extreme values, etc,) of the meteorological elements in that area. (WMO)

The aspects involved are larger areas like a zone, a state, a country and is described by normal. The climatic normals are generally worked out for a period of 30 years.

Differences between weather and climate:

Weather	**Climate**
1. A typical physical condition of the atmosphere.	1. Generalized condition of the atmosphere which represents and describes the

	characteristics of a region.
2. Changes from place to place even in a small locality	2. Different in different large region
3. Changes according to time (every moment)	3. Change requires longer (years) time.
4. Similar numerical values of weather of different places usually have same weather	4. Similar numerical values of climate of different places usually have different climates.
5. Crop growth, development and yield are decided by weather in a given season.	5. Selection of crops suitable for a place is decided based on climate of the region.
6. Under abnormal weather conditions planners can adopt a short-term contingent planning.	6. Helps in long-term agricultural planning.

Factors affecting climate

i) Latitude

The distance from the equator, either south or north, largely creates variations in the climate. Based on the latitude, the climate has been classified as

i) Tropical ii) Sub-tropical iii) Temperate & iv) Polar.

ii) Altitude (elevation)

The height from the MSL creates variation in climate. Even in the tropical regions, the high mountains have temperate climate. The temperature decreases by 6.5 ºC/Km from the sea level. Generally, there is also a decrease in pressure and increase in precipitation and wind velocity. The above factors alter the kind of vegetation, soil types and the crop production.

iii) Precipitation

The quantity and distribution of rainfall decides the nature of vegetation and the nature of the cultivated crops. The crop regions are classified on the basis of average rainfall which is as follow.

Rainfall(mm)	Name of the climatic region
Less than 500	Arid
500-750	Semi-arid
750-1000	Sub-arid
More than 1000	Humid

iv) Soil type

Soil is a product of climatic action on rocks as modified by landscape and vegetation over a long period of time. The colour of the soil surface affects the absorption, storage and re-radiation of heat. White colour reflects while black absorbs more radiation. Due to differential absorption of heat energy, variations in temperature are created at different places. In black soil areas, the climate is hot while in red soil areas, it is comparatively cooler due to lesser heat absorption.

v) Nearness to large water bodies

The presence of large water bodies like lakes and sea including its current affect the climate of the surrounding areas, eg: Islands and coastal areas. The movement of air from earth's surface and from water bodies to earth modifies the climate. The extreme variation in temperature during summer and winter is minimized in coastal areas and island.

vi) Topography

The surface of landscape (leveled or uneven surface areas) produces marked change in the climate. This involves the altitude of the place, steepness of the slope and exposure of the slope to light and wind.

vii) Vegetation

Kinds of vegetation characterize the nature of climate. Thick vegetation is found in tropical regions where temperature and precipitation are high. General types of vegetations present in a region indicate the nature of the climate of that region.

Scales of climate and their importance

i) Microclimate

Microclimate deals with the climatic features peculiar to small areas and with the physical processes that take place in the layer of air very near to the ground. Soil-ground conditions, character of vegetation cover, aspect of slopes, and state of the soil surface, relief forms – all these may create special local conditions of temperature, humidity, wind and radiation in the layer of air near the ground which differ sharply from general climatic conditions. One of the most important tasks of agricultural meteorology is to study the properties of air near the ground and surface layer of soil, which falls under the micro climate.

ii) Meso climate

The scale of meso climate falls between micro and macro climates. It is concerned with the study of climate over relatively smaller areas between 10 & 100 km across.

iii) Macro climate

Macro climate deals with the study of atmosphere over large areas of the earth and with the large scale atmospheric motions that cause weather. The scales of air motion in different climates are given in the Table below.

Type of climate	**Horizontal scale (km)**	**Vertical scale(km)**	**Time Scale(hrs)**
A. Macro climate			
1. Planetary scale	2000-5000 & more	10	200 to 400
2. Synoptic scale	500-2000	10	100
B. Meso climate	1 to 100	1-10	1-10

C. Micro climate	<100m	200 m	6-12 minutes

If any weather system develops under different types of climate, it persists longer periods under the macroclimate while smaller periods under micro climates.

CLIMATES OF INDIA AND TAMILNADU AND THEIR CHARACTERIZATION

Climate classification was tried by many scientists from beginning of 19th century using many parameters. Thornthwaite during 1931 and 1948 classified the climate using precipitation and evaporation /Potential evaporation and was subsequently modified by Mathur (1955) for the Moisture Index (Im) and is give below

Im = 100 [(P-PE)/PE]

Where P = Precipitation, PE = Potential evapo-transpiration

Using the moisture Index (**Im**) the following classification was made

Im Quantity	**Climate classification**
100 and above	Per humid
20 to 100	Humid
0 to 20	Moist sub humid
-33.3 to 0	Dry sub humid
-66.7 to -33.3	Semi arid
-100 to -66.7	Arid

Another classification by Troll (1965) based on number of humid months, said to be of more agricultural use was modified by ICRISAT for India. Humid month is one having mean rainfall exceeding the mean Potential evapo transpiration.

Climate	**Number of humid months**	**% geographical area of India**
Arid	<2.0	17.00
Semiarid-dry	2.0-4.5	57.17
Semiarid-wet	4.5-7.0	12.31
Humid	>7.0	1.10

The ICAR under All India Coordinated Research Project on Dryland Agriculture adopted classification based Moisture Deficit Index (MDI)

$$MDI = \frac{P - PET}{PET} \times 100$$

Where P is annual precipitation (cm) and PET is Potential Evapotranspiration. Based on MDI the climate is divided into three regions as below.

Type of climate	**MDI**
Subhumid	0.0 to 33.3
Semiarid	-33.3 to -66.6
Arid	> -66.6

Temperature based classification

The tropic of cancer, which passes through the middle of the country, divides it into two distinct climates. The tropical climate in the South where all the 12 months of the year have mean daily temperature exceeding 20°C; and in the North where a sub-tropical climate prevails. In sub-tropics during the winter months, it is cool to cold. Frosts occur sometime during the months of December and January. Some areas in the Northern India have a temperate climate. Here it snows during the winter months and freezing temperatures may extend to two months or more during the year. Three main climatic zones of India based on temperature are shown in the map below.