Factors affecting on crop production
CROP GROWTH

INTERNAL FACTORS
(Genetic or heredity)

EXTERNAL FACTORS
(Environmental)
A. Climatic
B. Edaphic
C. Biotic
D. Physiographic
E. Socio-economic
Internal factors (Genetic factors)
The increase in crop yields and other desirable characters are related to Genetic make up of plants.

- High yielding ability
- Early maturity
- Resistance to lodging
- Drought flood and salinity tolerance
- Tolerance to insect pests and diseases
- Chemical composition of grains (oil content, protein content )
- Quality of grains (fineness, coarseness)
- Quality of straw (sweetness, juiciness)

The above characters are less influenced by environmental factors since they are governed by genetic make-up of crop.
External factors

• Climatic
• Edaphic
• Biotic
• Physiographic
• Socio-economic
CLIMATIC FACTORS

Nearly 50% of yield is attributed to the influence of climatic factors. The following are the atmospheric weather variables which influence the crop production.

1. Precipitation
2. Temperature
3. Atmospheric humidity
4. Solar radiation
5. Wind velocity
6. Atmospheric gases
Precipitation

- Precipitation includes all water which falls from atmosphere such as rainfall, snow, hail, fog and dew.
- Rainfall one of the most important factor influences the vegetation of a place.
- Total precipitation in amount and distribution greatly affects the choice of a cultivated species in a place.
- In heavy and evenly distributed rainfall areas, crops like rice in plains and tea, coffee and rubber in Western Ghats are grown.
- Low and uneven distribution of rainfall is common in dryland farming where drought resistance crops like pearl millet, sorghum and minor millets are grown.
• In desert areas grasses and shrubs are common where hot desert climate exists
• Though the rainfall has major influence on yield of crops, yields are not always directly proportional to the amount of precipitation as excess above optimum reduces the yields
• Distribution of rainfall is more important than total rainfall to have longer growing period especially in drylands.
Temperature

- Temperature is a measure of intensity of heat energy. The range of temperature for maximum growth of most of the agricultural plants is between 15 and 40ºC.
- The temperature of a place is largely determined by its distance from the equator (latitude) and altitude.
- It influences distribution of crop plants and vegetation.
- Germination, growth and development of crops are highly influenced by temperature.
- Affects leaf production, expansion and flowering.
• Physical and chemical processes within the plants are governed by air temperature.
• Diffusion rates of gases and liquids changes with temperature.
• Solubility of different substances in plant is dependent on temperature.
• The minimum, maximum (above which crop growth ceases) and optimum temperature of individual’s plant is called as cardinal temperature.

<table>
<thead>
<tr>
<th>Crops</th>
<th>Minimum temperature °C</th>
<th>Optimum temperature °C</th>
<th>Maximum temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>10</td>
<td>32</td>
<td>36-38</td>
</tr>
<tr>
<td>wheat</td>
<td>4.5</td>
<td>20</td>
<td>30-32</td>
</tr>
<tr>
<td>Maize</td>
<td>8-10</td>
<td>20</td>
<td>40-43</td>
</tr>
<tr>
<td>Sorghum</td>
<td>12-13</td>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td>Tobacco</td>
<td>12-14</td>
<td>29</td>
<td>35</td>
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</tbody>
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Atmospheric Humidity (Relative Humidity - RH)

• Water is present in the atmosphere in the form of invisible water vapour, normally known as humidity. Relative humidity is ratio between the amount of moisture present in the air to the saturation capacity of the air at a particular temperature.
• If relative humidity is 100% it means that the entire space is filled with water and there is no soil evaporation and plant transpiration.
• Relative humidity influences the water requirement of crops
• Relative humidity of 40-60% is suitable for most of the crop plants.
• Very few crops can perform well when relative humidity is 80% and above.
• When relative humidity is high there is chance of outbreak of pest/disease
Solar radiation

- From germination to harvest and even post harvest crops are affected by solar radiation.
- Biomass production by photosynthetic processes requires light.
- All physical process taking place in the soil, plant and environment are dependent on Light.
- Solar radiation controls distribution of temperature and there by distribution of crops in a region.
- Visible radiation is very important in photosynthetic mechanism of plants. Photosynthetically Active Radiation (PAR - 0.4 – 0.7µ) is essential for production of carbohydrates and ultimately biomass.
0.4 to 0.5 µ - Blue – violet – Active
0.5 to 0.6 µ - Orange – red - Active
0.5 to 0.6 µ - Green – yellow – low active
• Photoperiodism is a response of plants to day length
• Short day – Day length is <12 hours (Rice, Sunflower and cotton), long day – Day length is > 12 hours (Barley, oat, carrot and cabbage), day neutral – There is no or less influence on day length (Tomato and maize).
• Phototropism — Response of plants to light direction. Eg. Sunflower
• Photosensitive – Season bound varieties depends on quantity of light received
Wind velocity

- The basic function of wind is to carry moisture (precipitation) and heat.
- The moving wind not only supplies moisture and heat, also supplies fresh CO2 for the photosynthesis.
- Wind movement for 4 – 6 km/hour is suitable for more crops.
- When wind speed is enormous then there is mechanical damage of the crops (i.e.) it removes leaves and twigs and damages crops like banana, sugarcane.
• Wind dispersal of pollen and seeds is natural and necessary for certain crops.
• Causes soil erosion.
• Helps in cleaning produce to farmers.
• Increases evaporation.
• Spread of pest and diseases.
Atmospheric gases on plant growth

- CO2 – 0.03%, O2 - 20.95%, N2 - 78.09%, Argon - 0.93%, Others - 0.02%.
- CO2 is important for Photosynthesis, CO2 taken by the plants by diffusion process from leaves through stomata.
- CO2 is returned to atmosphere during decomposition of organic materials, all farm wastes and by respiration.
- O2 is important for respiration of both plants and animals while it is released by plants during Photosynthesis.
- Nitrogen is one of the important major plant nutrient, Atmospheric N is fixed in the soil by lightning, rainfall and N fixing microbes in pulses crops and available to plants.
- Certain gases like SO2, CO, CH4, HF released to atmosphere are toxic to plants.