Session 7: Environmental Factors Affecting Production

Factors affecting crop production:

Several factors affected the crop production. These factors are to be taken into consideration by a crop producer (farmer) during crop planning & crop production. Some of these factors are under control of a producer, whereas, others can be modified for obtaining good results. On the contrary, some factors are beyond the control of crop producer.

- Factor within total control
- Factors that can be manipulated
- Factors outside the producer's control

Elements affecting crop production:

Some specialists have identified 52 elements/ factors affecting growth and production. It is believed that, a farmer can control 45 of them. A crop producer may not manage these 7 Factors; these are temperature, solar radiation, strong winds, inundation or flood, rainfall, carbon dioxide and altitude.

Classification of elements affecting crop production

1. **Genetic or Internal Factors**

2. **Environmental or External Factors:**

a) Temperature
b) Moisture
c) Solar energy
d) Composition of atmosphere
e) Soil structure & composition of soil air
f) Soil reaction
g) Biotic factors
h) Nutrient elements
i) Growth restricting substance
j) Toxic atmosphere substance

Genetic/ Internal factors

1. Genetics can be easily known with the development and introduction of new varieties & hybrid of cultivated crops and consequently upon there has been a big jump in the production & productivity of crops.

2. **Variety & Plant nutrient needs:** it is obvious that, the high crop yields produced with modern hybrid varieties, will require more plant nutrient than was necessary for lower yields of past. Under low-fertility conditions a new high – yielding variety cannot develop to its full yield potential.

Environmental/External factors

Environment is defined as the aggregate of all the external condition and influences affecting the life and development of an organism.

1. **Temperature:** Temperature is measure of intensity of heat. Physicists consider that, the temperature of our universe ranges from a low – 273 ^{0}C to a high of several million degrees near the center of sun. The range of growth for most agricultural plants however, is usually much narrower; perhaps between 15 to 40 ^{0}C.

a) **Photosynthesis:** The effect of temperature on photosynthesis is complex and different for plants of various species as well as the carbon dioxide content of the atmosphere, the intensity of light and the duration of light of given intensity.

b) **Respiration:** it is also affected by change in temperature. At very high temperature the rate of respiration is initially great but is not maintained.

c) **Transpiration:** The loss of water in vapour form stomata of leaves is influenced by temperature.

d) **Water absorption:** Low soil temperature may adversely affect the growth of plants by its effect on the absorption of water. If the soil temperature is low, Yet excessive transpiration take place and the plant may be injured because of tissue dehydration.

e) **Mineral element absorption:** this may be caused by lower respiratory activity or reduced cell membrane permeability, both of which could affect uptake itself as well as the rate and extent of root permeability in the soil.

f) **Soil microbial activity:** The activity of nitro bacteria and most of the heterotrophic organisms increase with a rise in temperature. Soil P^H may be related with temperature, which may in turn affect the plant growth. It has

g) **Composition of soil air:** Temperature may also alter the soil air.

2. Moisture: the growth of many plant is proportional to the amount of water present. The plant growth is restricted both at very low and very high levels of soil moisture.

3. Solar energy: Solar energy is a significant factor in plant growth and development. The quality, intensity and duration of light are all important.

a. Photoperiodism: Even though light quality & intensity may be limited significance from the standpoint of field grown crops, duration of light period is important. The behavior of the plant in relation to day length is termed as photoperiodism.

4. Composition of atmosphere: Carbon is required for plant growth and apart from water, is the most abundant material with in plants and other living things. The major source of carbon for plant is carbon dioxide gas is the atmosphere.

5. Soil structure and composition of soil air: The structure of soil, particularly those containing appreciable quantities of silt and clay, has a good influence on both root and shoot growth of plants

6. Soil reaction: it may affect plant development by its influence on the availability of certain nutrients required for growth.

7. Biotic Factors: Many biotic factors can limit plant growth and cause hazard to farming operation and pose a potential threat of reduce crop yields.

8. Nutrient elements: About 5 to 10 % dry weight of plants is composed of the nutrient elements viz. nitrogen, phosphorus, calcium, magnesium, sulphur, boron, chlorine, copper , iron, magnese, molybdenum, zinc etc.

9. Growth restricting substances: Normal development of plants can be restricted or stopped completely by toxic substances.

10. Toxic atmospheric substance: The quality of the atmosphere surrounding above gases parts of plants may under certain conditions influence growth.