**ARIDITY AND DROUGHT**

Low rainfall or failure of monsoon rain is a recurring feature in India. This has been responsible for droughts and famines. The word drought generally denotes scarcity of water in a region. Though, aridity and drought are due to insufficient water, aridity is a permanent climatic feature and is the culmination of a number of long-term processes. However, drought is a temporary condition that occurs for a short period due to deficient precipitation for vegetation, river flow, water supply and human consumption. Drought is due to anomaly in atmospheric circulation. The difference between aridity and drought

 **Aridity Drought**

**Duration**. Permanent feature, Temporary condition of scarcity of varying duration

**Factors.** Culmination of many long term processes, Caused by deficient rainfall

 **Aspect described**, Description of climate, Description of water availability

**Aridity Aridity**

Refers to a condition of deficiency of water due to either insufficient precipitation or excess water loss over supply. The term “arid” is derived from a Latin word, “arere” which means ‘dry’.

 **Definition of drought**.

 prolonged period without rainfall. According to Ramdas (1960), drought is a situation when the actual seasonal rainfall is deficient by more than twice the mean deviation.

**II. Classification**

**1. Based on duration**

**(a) Permanent drought**

This is characteristic of the desert climate where sparse vegetation growing is adapted to drought and agriculture is possible only by irrigation during entire crop season**.**

**(b) Seasonal drought**

This is found in climates with well-defined rainy and dry seasons. Most of the arid and semiarid zones fall in this category. Duration of the crop varieties and planting dates should be such that the growing season should fall within rainy season**.**

**(c) Contingent drought**

This involves an abnormal failure of rainfall. It may occur almost anywhere especially in most parts of humid or sub humid climates. It is usually brief, irregular and generally affects only a small area**.**

**(d) Invisible drought**

When rainfall is inadequate to meet the evapotranspiration losses, the result is borderline water deficiency in soil resulting in less than the optimum yield. This occurs usually in humid regions**.**

 **2. Based on nature of the users**

 **(a) Meteorological drought**

It is defined as a condition, where the annual precipitation is less than the normal over an area for prolonged period (month, season or year).

**(b) Atmospheric drought**

It is due to low air humidity, frequently accompanied by hot dry winds. It may occur even under conditions of adequate available soil moisture. It refers to a condition when plants show wilting symptoms during the hot part of the day, when transpiration exceeds absorption temporarily for a short period. When decreases, absorption keeps pace with transpiration and plants revive.

**(c) Hydrological drought**

Meteorological drought, when prolonged results in hydrological drought with depletion of surface water and consequent drying of reservoirs, tanks etc. It results in deficiency of water for all sectors using water. This is based on water balance and how it affects irrigation as a whole for bringing crops to maturity**.**

**(d) Agricultural drought**

It is the result of soil moisture stress due to imbalance between available soil moisture and evapotranspiration of a crop. It is usually gradual and progressive. Plants can therefore, adjust at least partly, to the increased soil moisture stress. This situation arises as a consequence of scanty precipitation or its uneven distribution both in space and time. It is also usually referred as soil drought. Relevant definition of agricultural drought appears to be a period of dryness during the crop season, sufficiently prolonged to adversely affect the yield. The extent of yield loss depends on the crop growth stage and the degree of stress

**Important causes for agricultural drought are:**

**• Inadequate precipitation,**

 **• Erratic distribution,**

**• Long dry spells in the monsoon,**

**• Late onset of monsoon,**

 **• Early withdrawal of monsoon,**

**• Lack of proper soil and crop management**

**3. Based on time of occurrence**

**(a) Early season drought** - It occurs due to delay in onset of monsoon or due to long dry spells after early sowing.

 **(b) Mid-season drought**

It occurs due to long gaps between two successive rains and stored moisture becoming insufficient during this long dry spell.

 **(c) Late season drought**

It occurs due to early cessation of rainfall and crop water stress at maturity stage.

**4. Other terms to describe drought**

**(a) Apparent drought** - What is drought for one crop may not be drought for another crop; what is drought in red soil may not be drought in black soil.

 **(b) Physiological drought** - It refers to a condition where crops are unable to absorb water from soil even when water is available, due to the high osmotic pressure of soil solution due to increased soil concentration, as in saline and alkaline soils. It is not due to deficit of water supply.

**IV. Drought periods**:

**Beginning of drought**:

Droughts do not occur in Assam, South Kerala and eastern part of West Bengal. Severe drought begins on 1st October in the northwest arid zone and even much earlier in the western parts of the country. In the southern arid zone and adjoining interior portion of Maharashtra, the severe drought begins by the end of November. In most of the central portion of the country to the east of the line joining Delhi, Udaipur and Baroda, the commencement is only in the month of February or later. This is due to high water holding capacity of the black soil region. In the western coastal region of Maharashtra and Karnataka, the rainfall is very high. In spite of this, severe drought begins by December-January, probably because of the lower water holding capacity of the soil. Severe drought commences only after April in Gwalior, Guna, Jabalpur, Pendra, and Satna regions of Madhya Pradesh.

 (**ii) Closure of drought:**

 In general, severe drought ends outside the regions of east Bihar, Tamil Nadu, Karnataka, and southern Andhra Pradesh only by 1st May. In most of these regions, it ends after 15th May. In the arid zone of northwest India, severe drought ends normally during

**V. Drought on crop production**:

**• Water relations:**

Drought alters the water status by its influence on absorption, translocation and transpiration. The lag in absorption behind transpiration results in loss of turgor as a result of increase in the atmospheric dryness.

 **• Photosynthesis**:

 Photosynthesis is reduced by moisture stress due to reduction in photosynthetic rate, chlorophyll content, leaf area and increase in assimilates saturation in leaves (due to lack of translocation).

**• Respiration**:

Respiration increases with mild drought but more severe drought lowers water content and respiration.

 **• Anatomical changes**:

Decrease in size of the cells and intercellular spaces, thicker cell wall and greater development of mechanical tissue are the anatomical changes. Stomata per unit leaf tend to increase.

 **• Metabolic reaction**:

Almost, all metabolic reactions are affected by water deficits.

 **• Hormonal relationships altered**:

 The activity of growth promoting hormones like cytokinin, gibberlic acid and indole acetic acid decreases and growth regulating hormone like abscisic acid, ethylene etc. increases.

**• Nutrition:**

The fixation, uptake and assimilation of N is affected. Since dry matter production is considerably reduced, the uptake of NPK is reduced.

**• Growth and Development**:

 Drought results in decrease in growth of leaves, stems and fruits. Maturity is delayed if drought occurs before flowering, while it advances if drought occurs after flowering.

 **• Reproduction and grain growth**:

 Drought at flowering and grain development determines the number of fruits and individual grain weight, respectively. Panicle initiation in cereals is critical while drought at anthesis may lead to drying of pollen. Drought at grain development reduces yield while vegetative and grain-filling stages are less sensitive to moisture stress.

 **• Yield:**

The effect on yield depends on what proportion of the total dry matter is considered as useful material to be harvested. If it is aerial and underground parts, effect of drought is as sensitive as total growth. When the yield consists of seeds as in cereals, moisture stress at flowering is detrimental. When the yield is fibre or chemicals where economic product is a small fraction of total dry matter, moderate stress on growth does not have adverse effect on yields.