



ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS INSTITUTION

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24AG201

CROP PRODUCTION
TECHNOLOGY

UNIT 3

CROP

MANAGEMENT

CROP WATER MANAGEMENT

Importance of water to plants

1. Plants contain 90% water which gives turgidity and keeps them erect
2. Water is an essential part of protoplasm
3. It regulates the temperature of the plant system
4. It is essential to meet the transpiration requirements
5. It serves as a medium for dissolving the nutrients present in the soil
6. It is an important ingredient in photosynthesis

Crop water requirement

Crop water requirement is the water required by the plants for its survival, growth, development and to produce economic parts. This requirement is applied either naturally by precipitation or artificially by irrigation. Hence the crop water requirement includes all losses also.

Hence the water requirement is symbolically represented as:

$$CWR = T + E + WP + WL + WSP$$

1. Transpiration loss through leaves (T)
2. Evaporation loss through soil surface in cropped area (E)
3. Amount of water used by plants (WP) for its metabolic activities which is estimated as less than 1% of the total water absorption.
4. Other application losses are conveyance loss, percolation loss, runoff loss, etc., (WL).
5. The water required for special purposes (WSP) like puddling operation, ploughing operation, land preparation, leaching, requirement, for the purpose of weeding, for dissolving fertilizer and chemical, etc.

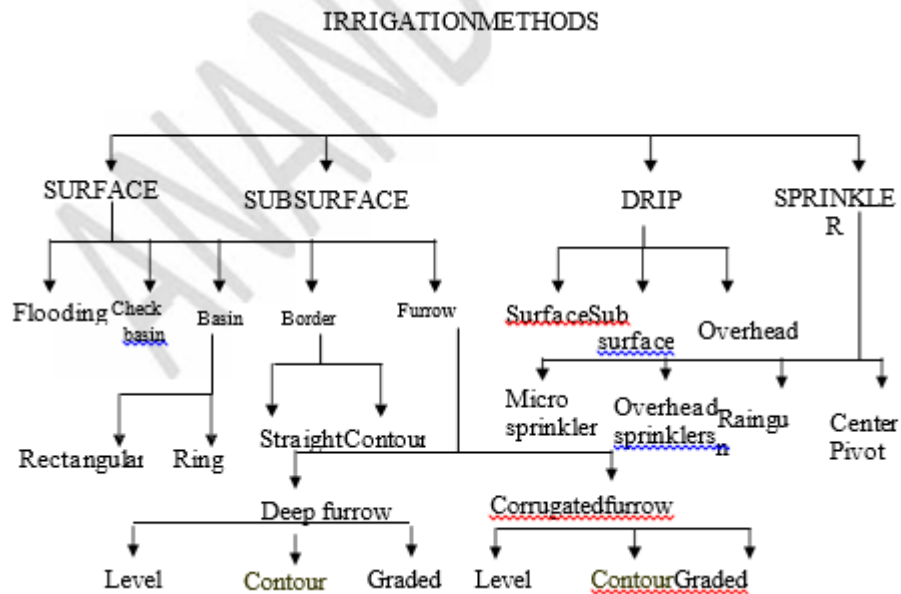
IRRIGATION

Irrigation is defined as the artificial application of water to the soil for the purpose of crop production in supplement to rainfall and ground water contribution

The crop water requirement varies from place to place, from crop to crop and depends on agro-ecological variation and crop characters. The following features which mainly influence the crop water requirement are:

Critical stages for irrigation:

The stage at which the water stress causes severe yield reduction is also known as **critical stage of water requirement**. It is also known as **moisture sensitive period**. Moisture stress due to restricted supply of water during the moisture sensitive period or critical stage will irrevocably reduce the yield.



SURFACE IRRIGATION METHODS

Surface irrigation is where water is applied and distributed over the soil surface by gravity. It is by far the most common form of [irrigation](#) throughout the world and has been practiced in many areas virtually unchanged for thousands of years.

Surface irrigation is often referred to as flood irrigation, implying that the water distribution is uncontrolled and therefore, inherently inefficient. In reality, some of the irrigation practices grouped under this name involve a significant degree of management (for example surge irrigation). Surface irrigation comes in three major types; level basin, furrow and border strip.



SUB-SURFACE IRRIGATION

In subsurface irrigation, water is applied beneath the ground by creating and maintaining an artificial water table at some depth, usually 30-75 cm below the ground surface. Moisture moves upwards towards the land surface through capillary action. Water is applied through underground field trenches laid 15-30 m apart. Open ditches are preferred because they are relatively cheaper and suitable to all types of soil. The irrigation water should be of good quality to prevent soil salinity.



Advantages

- Minimum water requirement for raising crops
- Minimum evaporation and deeper collation losses
- Cultivation operations can be carried out without concern for the irrigation period.

Disadvantages

- Requires a special combination of natural conditions.
- There is danger of waterlogging
- High cost.

PRESSURIZED

A. Drip Irrigation System

It is one of the latest methods of irrigation. It is suitable for water scarcity and salt affected soils. Water is applied in the root zone of the crop. Standard water quality test needed for design and operation of drip irrigation system.

Advantages of Drip Irrigation

- High water use efficiency (~95%, compared to less than 50% in surface),
- Economy in weed control,
- Day and night irrigation,
- Energy saving,
- Irrigation at variable topographic conditions

Limitation of drip Irrigation

- High investment,

- High level of knowledge for optimal and economical operation,
- Large number of emitters,
- Long application time,
- Maintenance.



B. Sprinkler irrigation system

Sprinkler irrigation is application simulating rainfall overhead so overhead sprinklers. The sprinkler (overhead or pressure) irrigation system conveys water to the field through pipes (aluminium or PVC) under pressure with a system of nozzles. This system is designed to distribute the required depth of water uniformly, which is not possible in surface irrigation. Water is applied at a rate less than the infiltration rate of the soil hence the runoff from irrigation is avoided.

Advantages of sprinkler

- Suitable for undulating topography(sloppy lands)
- Water saving to an extent of 35-40% compared to surface irrigation methods.
- Saving in fertilizers-even distribution and avoids wastage.
- Reduces erosion

Limitations

- High initial cost
- Efficiency is affected by wind
- Higher evaporation losses in spraying water
- Not suitable for tall crops like sugarcane



Water requirement of some selected crops

Sl. No	Crops	Duration (days)	Water requirement (mm)	No. of Irrigations
1.	Rice	135	1250	18
2.	Groundnut	105	550	10
3.	Sorghum	100	350	6
4.	Maize	110	500	8
5.	Sugarcane	365	2000	24
6.	Ragi	100	350	6
7.	Cotton	165	550	11
8.	Pulses	65	350	4

CROP NUTRITION MANAGEMENT

1. Need for supplementation to soil supplied nutrients,
2. Sources, generalized recommendations,
3. Methods and timing of application of supplemental nutrients including fertigation scheduling

NEED FOR SUPPLEMENTATION TO SOIL SUPPLIED NUTRIENTS

Essentiality of nutrient elements

- A mineral element is considered essential to plant growth and development if the element is involved in plant metabolic functions and the plant cannot complete its life cycle without the element.
- Usually the plant exhibits a visual symptom indicating a deficiency in a specific nutrient, which can be normally prevented or corrected by supplying that nutrient. The essentiality is given by Arnon (1956).