# MADE EASY

## CIVIL ENGINEERING

### Irrigation

### BY-Sagar Dodeja SIR

- Theory
- Explanation
- Derivation
- Example
- Shortcuts
- Previous Years Question With Solution

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# Irrigation Engineering

## CLASSROOM
## INTERACTIVE NOTES

**~ Session : 2022-23 ~**

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# CHAPTER 1
# INTRODUCTION TO IRRIGATION & METHODS OF IRRIGATION

## CONTENTS

Students should write this after chapter completion. This provides with overall view & acts as a tool for active recalling.

## Course Structure

1. Introduction to Irrigation, Methods of Irrigation.
2. Water Logging, Quality of Irrigation Water (CWC, IARI) AS PER
3. Water Requirement for Crops. ***
4. Canal design.
5. Analysis of Gravity Dams.
6. Conveyance and Regulating Structures for Canals.
7. Theories of seepage.
8. River Training and Diversion Headworks.
9. Dams, Spillways and Energy Dissipators.

## Weightage

| YEAR | ESE (PRE) | GATE |
|---|---|---|
| 2014 | 14 Q | 1.5 M (AVG) |
| 2015 | 15 Q | 1.5 M (AVG) |
| 2016 | 11 Q | 1.5 (AVG) |
| 2017 | 10 Q | 2 (AVG) |
| 2018 | 11 Q | 1 (AVG) |
| 2019 | 11 Q | 1 (AVG) |
| 2020 | 12 Q | 3 (AVG) |
| 2021 | 14 Q | 3 (AVG) |

## Official GATE Syllabus

Irrigation: Types of irrigation systems and methods; Crop water requirements - Duty, delta, evapo-transpiration; Gravity Dams and Spillways; Lined and unlined canals, Design of weirs on permeable foundation; cross drainage structures.

## Official ESE Syllabus

**2. Hydrology and Water Resources Engineering:**

Hydrological cycle, Ground water hydrology, Well hydrology and related data analysis; Streams and their gauging; River morphology; Flood, drought and their management; Capacity of Reservoirs. Water Resources Engineering : Multipurpose uses of Water, River basins and their potential; Irrigation systems, water demand assessment; Resources - storages and their yields; Water logging, canal and drainage design, Gravity dams, falls, weirs, Energy dissipaters, barrage Distribution works, Cross drainage works and head-works and their design; Concepts in canal design, construction & maintenance; River training, measurement and analysis of rainfall.

27/12/2021

Usage of water:→
82% → Agriculture
6% → domestic & Municipal need
12% → industries.

# WHAT IS IRRIGATION?

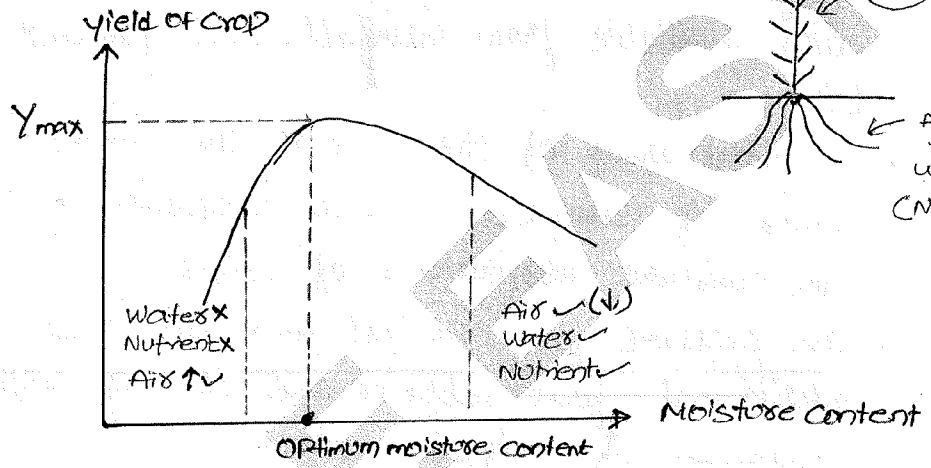
- Irrigation is the artificial application of water to soil throughout the crop period to assist in the production of crops.
- Irrigation water is supplied to supplement the water available from rainfall and ground or soil.
- In many areas of the world, the amount and timing of rainfall are not adequate to meet the moisture requirements of crops
- The pressure for survival and the need for additional food supplies are causing rapid expansion of irrigation throughout the world.

## Advantages of Irrigation

1. Increase in food production – Exact quantity required can be supplied as different crops have different water requirements and the same crop may have different water requirements at different places, depending upon the variation in climate, type of soil, method of cultivation, useful rainfall etc.

Crop yield → Soil, Nutrients, Water availability, Temp & Humidity

2. Ensuring Optimum Growth in Field – Maximum yield is obtained when just sufficient quantity is supplied and the corresponding moisture content is called as optimum moisture content.




3. Elimination of Mixed Cropping – Farmers have a tendency to cultivate more than one type of crop in the same field such that even if one dies without the required water, atleast he would get the yield of the other.
   - However, this reduces the overall yield from the field.
   - With assured water from irrigation, farmer would cultivate only one type of crop at any time, which would increase the yield.

Prepare interview for ex: State multiple Projects (Dams) like Nagarjuna Sagar dam: Srisilam dam.

Note - Mixed Farming & Mixed Cropping are being used interchangeably in irrigation engineering. (Refer class for clarity in both definitions).

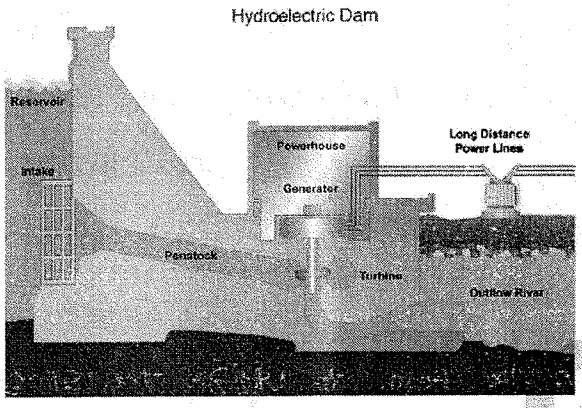
Mixed farming is a method in which multiple crops are grown in the field to utilize the space (or) land more effectively. In addition to that, it helps to prevent (or) control soil erosion.

4. Domestic & Industrial Water Supply - The canal system can be utilized for domestic and industrial water supply for nearby areas.

5. Flood Control - Provision of various techniques such as building of canals, flood cushioning, embankments and dykes, flood plain zoning, flood proofing etc.

6. Generation of Hydroelectric Power - Various multipurpose projects generate hydro-electric power. It is a clean, reliable and renewable energy source. Eg → Bhakra-Nangal project, Hirakud project, Nagarjuna Sagar project, Damodar Valley Project to name a few.

Potential head → K.E → Mechanical head → Electrical energy.




7. Draught Control – Good irrigation practices promote soil conservation, water harvesting and development of ground water which in turn reduces draughts.

## DEMERITS OF IMPROPER IRRIGATION

1. Over irrigation may cause water logging which reduces the crop yield. The roots of most crops require oxygen for respiration and hence, full saturation leads to restricted growth. However, exceptions such as rice, jute etc. which demand standing water for their growth. Rice → close growing crop.
2. Excessive irrigation may cause leaching of pesticides, insecticides, nitrates etc. to ground water.
3. Water logging due to over irrigation leads to creation of favourable conditions for the spread of diseases like dengue and malaria.
4. Over irrigation may increase the salinity of soil (CH-2)
5. Excessive pumping out of groundwater for irrigation decreases the ground water level which increases the risk of land subsidence.
6. Needless to say, it leads to wastage of our valuable water.