



MADE EASY

India's Best Institute for IES, GATE & PSUs

Handout of

IRRIGATION ENGINEERING

CLASSROOM HANDOUT

~ Session : 2024-25 ~

Faculty : Sagar Dodeja (Ex. IES)

MADE EASY Education Private Limited

www.madeeasy.in

Course Structure

1. Introduction to Irrigation, Methods of Irrigation.
2. Water Logging, Quality of Irrigation Water.
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.

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.



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.

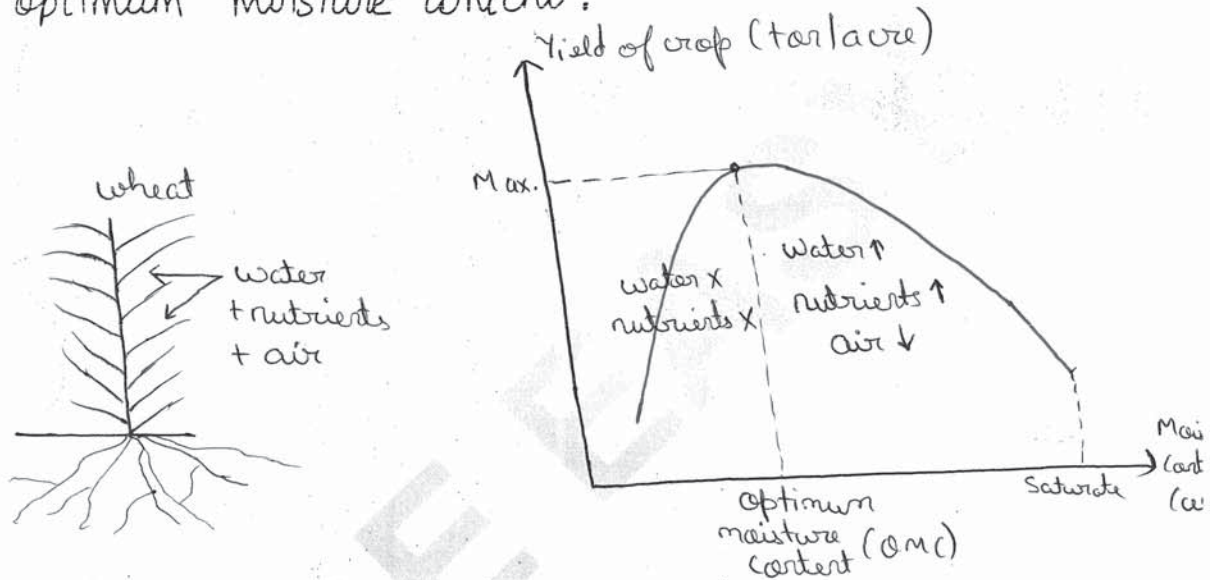
WHAT IS IRRIGATION?

- 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.

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. *Kitre ton pedh kaha ha*
- With assured water from irrigation, farmer would cultivate only one type of crop at any time, which would increase the yield.

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

Mixed farming:- It is done intentionally even if the irrigation facility is available

Mixed Cropping :-

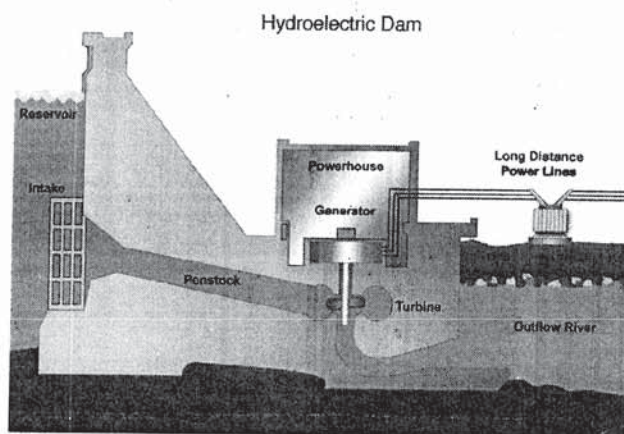
4. Domestic & Industrial Water Supply -

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 hydroelectric 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.

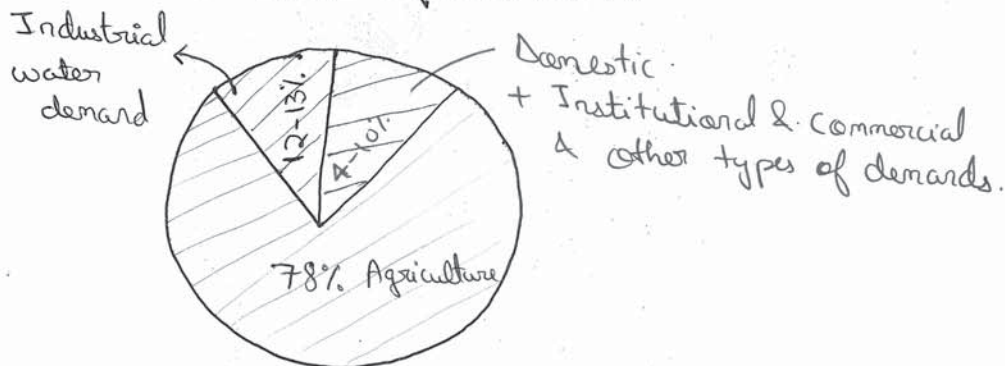


7. Drought Control - Good irrigation practices promote soil conservation, water harvesting and development of ground water which in turn reduces draughts.

8. Afforestation - Trees are generally grown along the banks of the channels, which increase the timber wealth of the country and also help in reducing soil erosion and air pollution.

(India is the wealthier country in terms of timber & India is 3rd)

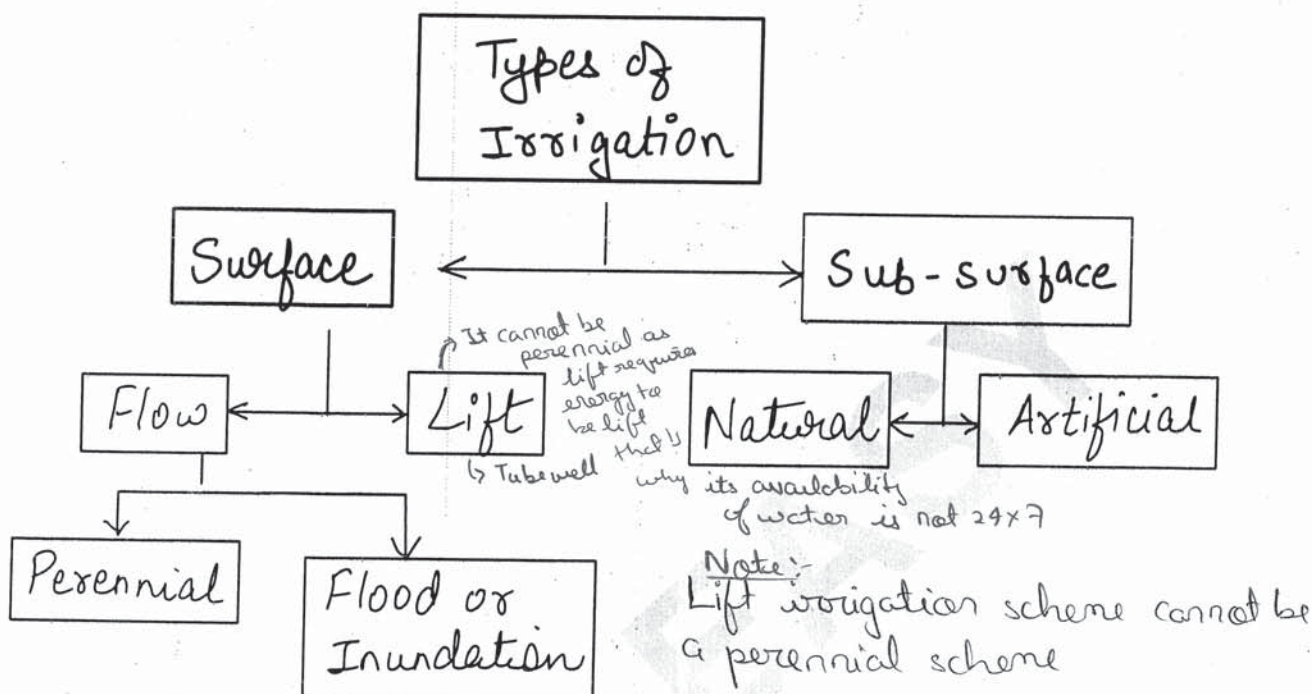
→ Total water requirement in INDIA (CWC, 2019)



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.
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. It leads to wastage of precious water resource.

TYPES OF IRRIGATION (Kitne tarike ke irrigation hote ha)



Surface Irrigation

It can be further classified as:-

1. Flow Irrigation — When water is available at a height such that it can be directly applied to the agricultural field by the action of gravity.

It can be further classified as:-

- a) Perennial Irrigation — constant and continuous water is supplied throughout the crop period.

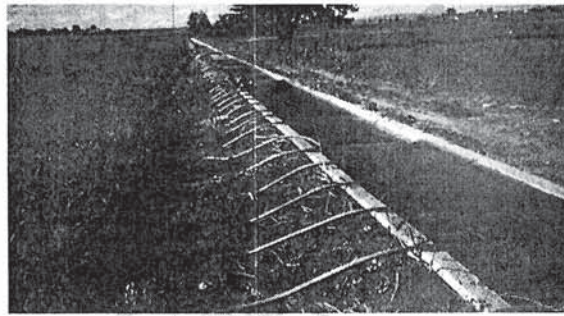
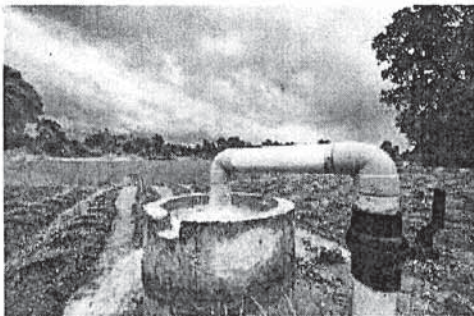
Example — Bhakra Scheme.

It is also called as Controlled Irrigation

- b) Flood / Inundation / Uncontrolled Irrigation —

When water is available, fields are flooded so

as to cause thorough saturation of the field.
 2. Lift Irrigation — Usually, water is lifted by some mechanical or manual means and it is supplied to the fields.



Sub Surface Irrigation

Water doesn't wet the surface and is applied to the root zone by the action of capillarity.



{ Note:- Sub-surface irrigation can be naturally achieved by moisture already present in soil or can be supplied artificially. (By drip irrigation) }

