



MADE EASY

Leading Institute for IES, GATE & PSUs

**IRRIGATION
ENGINEERING**

**CLASSROOM
NOTES**

~ Session : 2026-27 ~

Faculty : Sagar Dodeja (Ex. IES)

MADE EASY Education Private Limited

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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, evapotranspiration; 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 dissipators, 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

* WHAT IS IRRIGATION?

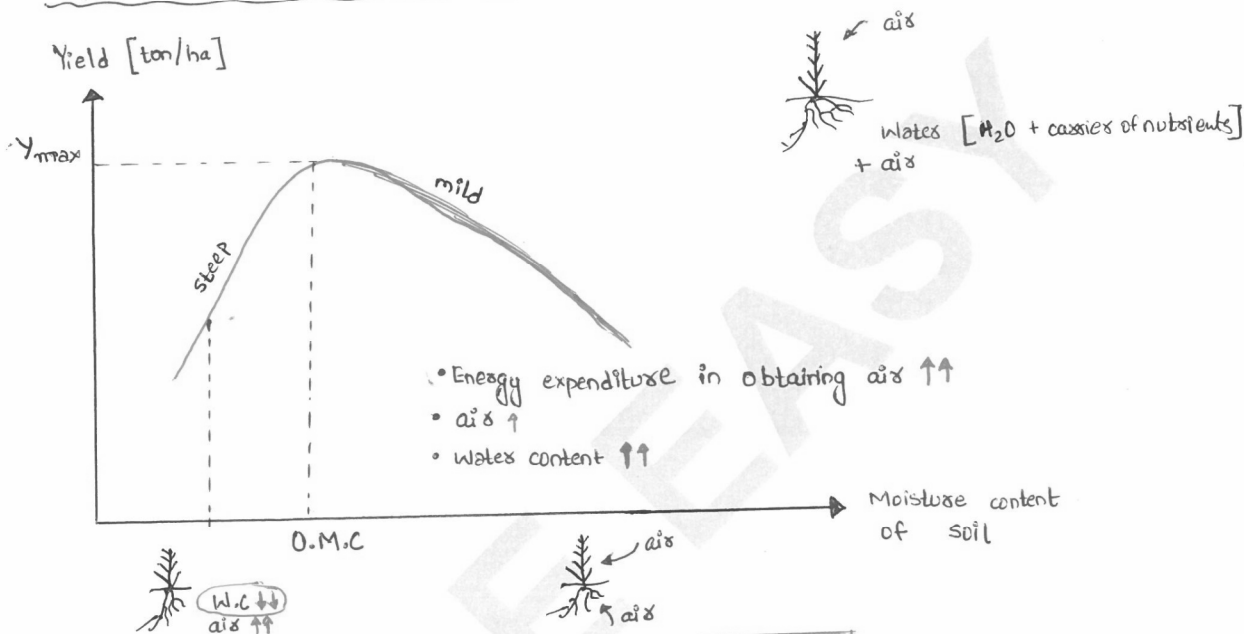
IS 4410

- IS 4410 defines Irrigation as - "The supply of water by artificial means for raising crops".
- It includes diversion, conveyance, regulation, distribution and application of water to the fields to ensure the moisture required for plant growth.
- Irrigation supplements rainfall and natural soil moisture.

* 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. [OMC]



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, at least he would get the yield of the other.
- However, this reduces the overall yield from the field.
 - With assured water from irrigation, farmers 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 is a small scale process in which the cultivators grow multiple types of crops in a certain field.
- The reason behind is to grow a variety of crops for local or small scale consumption.

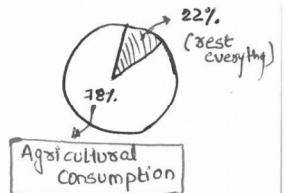


Diff. types of crops.

4. Domestic & Industrial Water Supply -

The canal system can be utilized for domestic and industrial water supply for nearby areas.

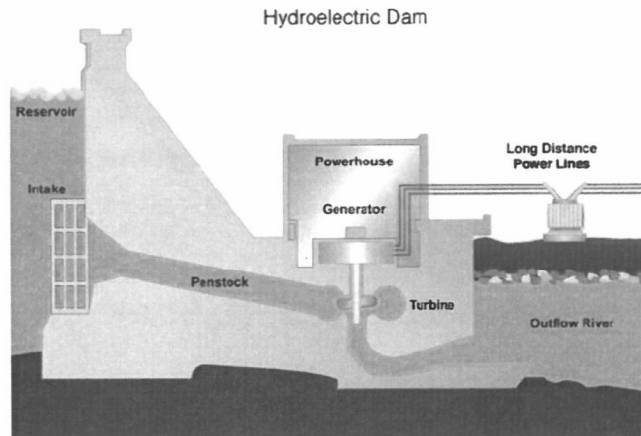
NEETI AAYOG, 2024



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 (Sutlej) 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 droughts.
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.

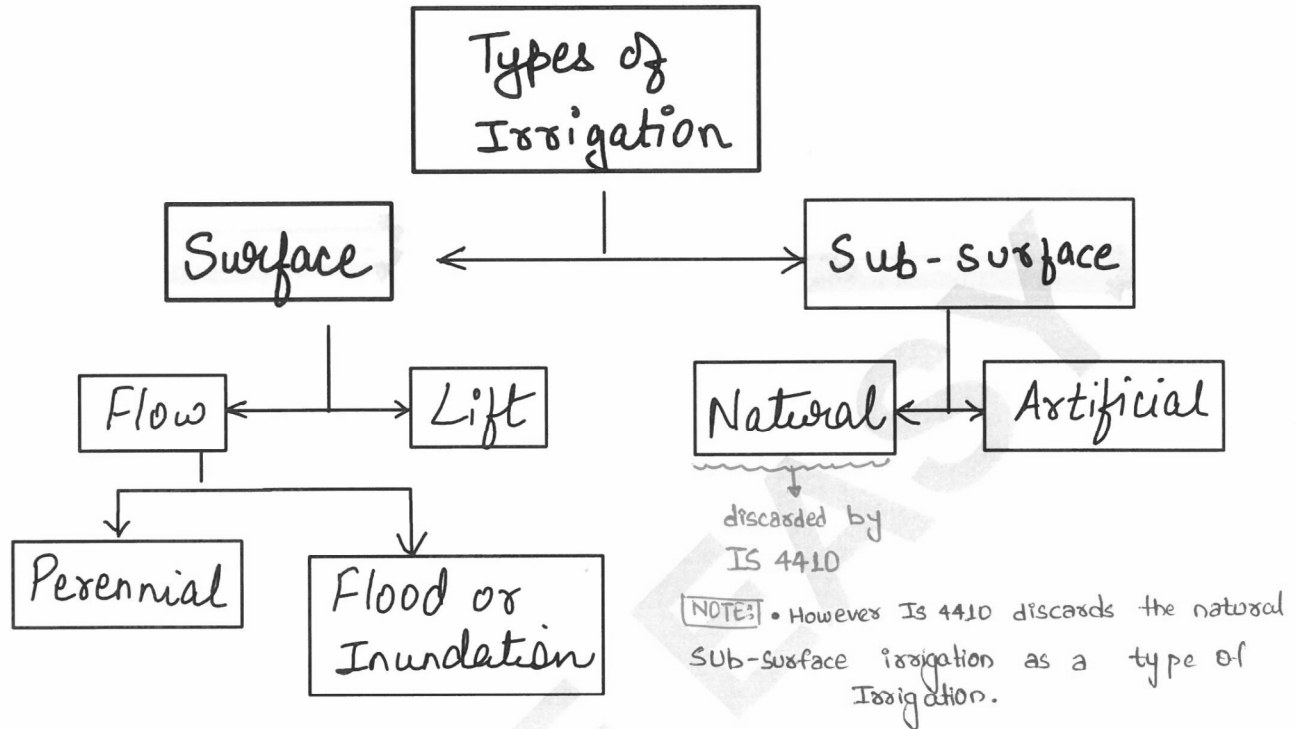
Canada
→ Largest timber wealth

* 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) ↓
salt concentration
5. Excessive pumping out of groundwater for irrigation decreases the ground water level which increases the risk of land subsidence. ← sinking
6. It leads to wastage of precious water resource.

Water Resource Engg. ≈ Irrigation Engg.

* TYPES OF IRRIGATION



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** — assured and continuous water is supplied throughout the crop period.

It is supplied from dams, barrages or weirs.

Examples:- Bhakra-Nangal Project (Punjab-Haryana-Himachal Pradesh)

Indira Gandhi Canal (Rajasthan)

• focus on crop irrigation only not on Flood

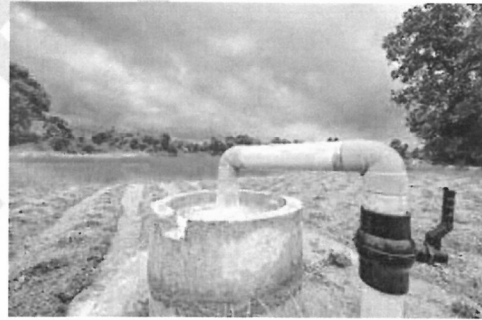
Note:- It is also called as Controlled Irrigation

b) Flood / Inundation Irrigation - Water is supplied during floods or high river stages without regulation. There is no control on timing or quantity.
Examples - Old flood channels of Kosi river in Bihar, Bagar Canals in UP.

2. Lift Irrigation - Usually, water is lifted by some mechanical or manual means and it is supplied to the fields.

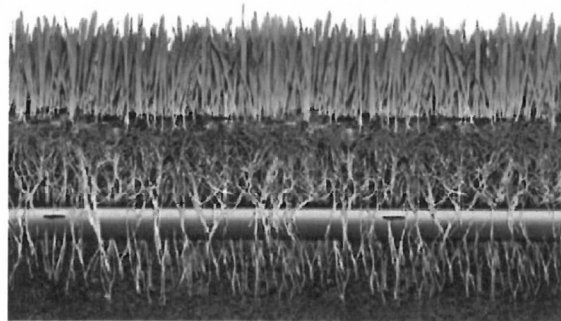
Example -

Kaleshwaram Scheme in Telangana, Lift irrigation from Tungabhadra river in Karnataka.



Sub Surface Irrigation

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

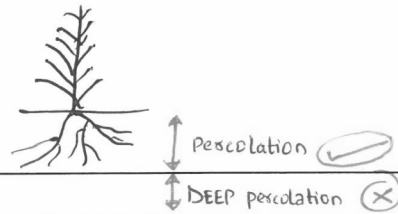


Note:- Sub-surface irrigation can be naturally achieved by moisture already present in soil or can be supplied artificially.

NOTE: Percolation below the root zone is referred as DEEP PERCOLATION.



Classroom Notes of Irrigation Engineering
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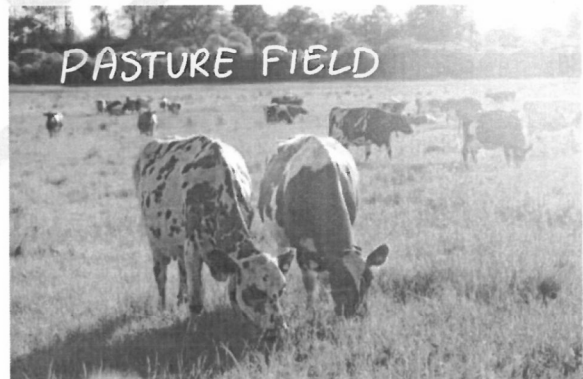
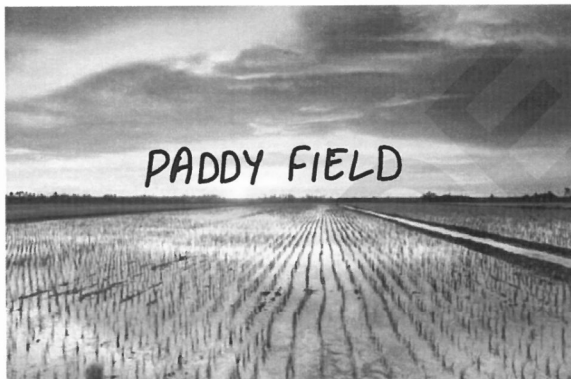


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* TECHNIQUES/METHODS OF IRRIGATION

1. Free or Ordinary Flooding

- Water flows uncontrolled over the field from ditches.
- Uneven distribution; high losses due to runoff and deep percolation.
- It is also called as Wild Flooding as the movement of water is not restricted.
- Suited for close growing crops such as rice, pastures etc.



- Not suited for water scarce areas, row crops etc.
- Example - Traditional Paddy fields in West Bengal and Assam.

2. Border Strip Irrigation

- A large piece of land is divided into a no. of