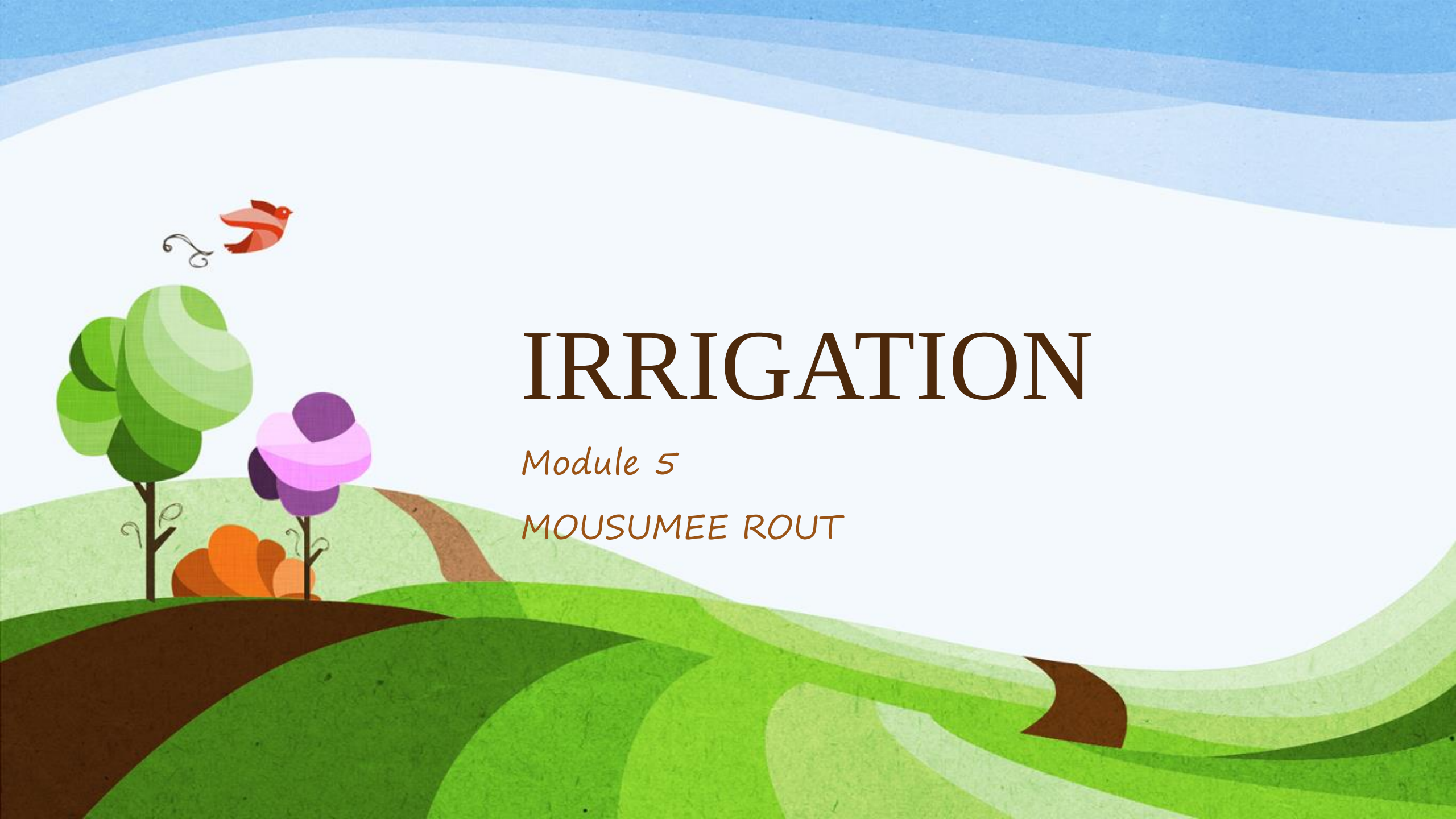


IRRIGATION

Module 5

MOUSUMEE ROUT


What is
IRRIGATION?

- **IRRIGATION**
- The process of **supplying water artificially** to the **crops** in an adequate amount for cultivation is known as Irrigation. Crops require water for their production at frequent intervals but in a **controlled manner**.

IMPORTANCE OF IRRIGATION

Irrigation serves as a vital component for both engineering and agriculture, delivering a multitude of essential advantages for food production and beyond:

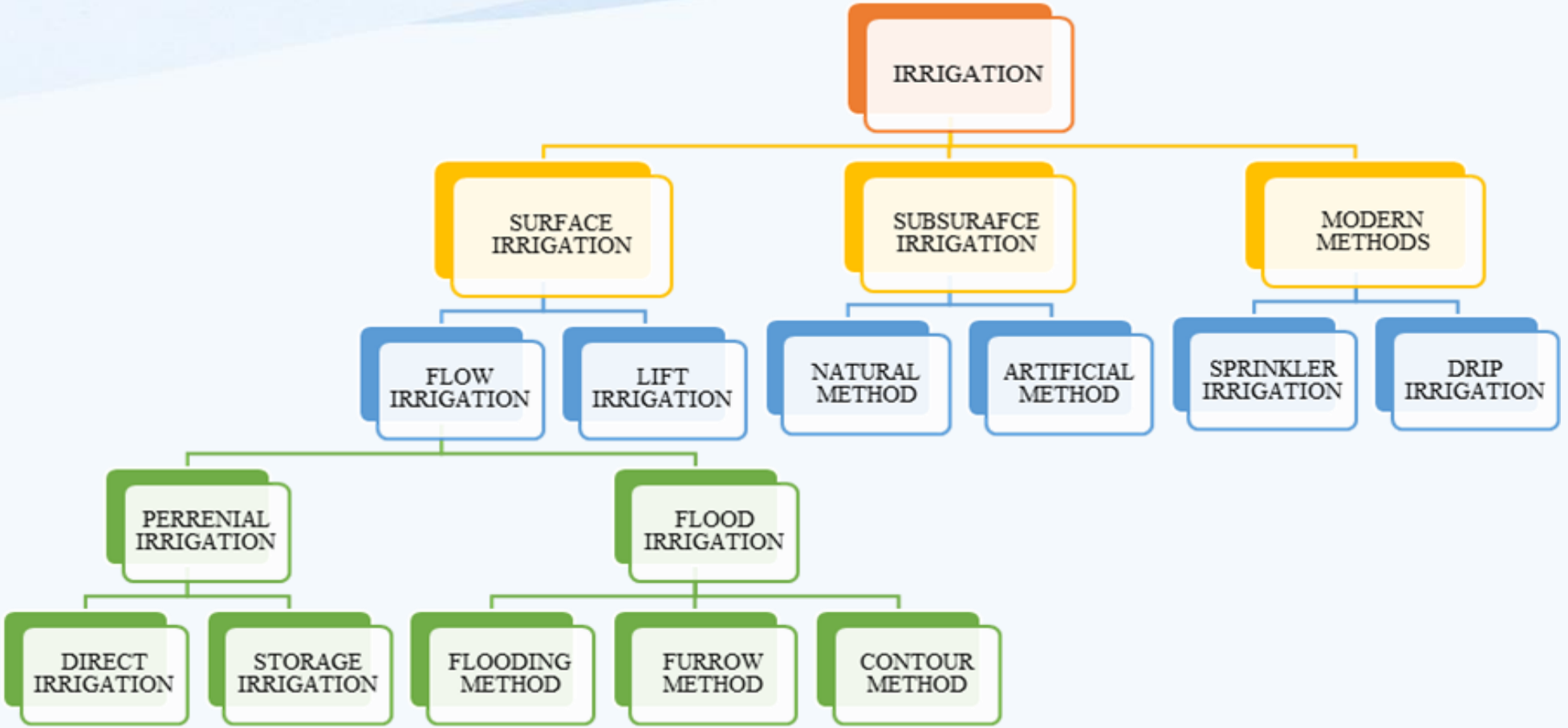
Engineering Aspects:

1. Efficient Resource Management: Irrigation systems are designed and engineered to efficiently allocate and distribute water resources, minimizing wastage.
2. Infrastructure Development: Engineers construct irrigation structures like dams, canals, and pipelines to control and deliver water, facilitating agricultural activities.
3. Technology Integration: Modern irrigation systems incorporate advanced technology, such as sensors and automation, to enhance water efficiency and reduce environmental impact.

- **Agricultural Aspects:**

1. Crop Yield Improvement: Irrigation ensures a consistent and adequate water supply, which is essential for optimal crop growth, leading to increased yields.
2. Risk Mitigation: Diversified water sources and irrigation systems help farmers mitigate the risks associated with unpredictable rainfall and droughts.
3. Crop Diversification: Irrigation enables farmers to grow a wider range of crops, promoting agricultural diversity and food security.

In summary, irrigation bridges the gap between engineering and agriculture, enhancing water management, increasing crop productivity, and contributing to overall food and economic sustainability.


IRRIGATION
SURFACE IRRIGATION
SUBSURAFCE IRRIGATION
MODERN METHODS
FLOW IRRIGATION
LIFT IRRIGATION
NATURAL METHOD
ARTIFICIAL METHOD
SPRINKLER IRRIGATION
DRIP IRRIGATION
PERRENIAL IRRIGATION
FLOOD IRRIGATION
DIRECT IRRIGATION
STORAGE IRRIGATION
FLOODING METHOD
FURROW METHOD
CONTOUR METHOD




Irrigation is of two types

1. LIFT IRRIGATION
2. FLOW IRRIGATION

Methods of field water distribution:

1.SURFACE IRRIGATION

2.DRIP IRRIGATION

Lift irrigation:-

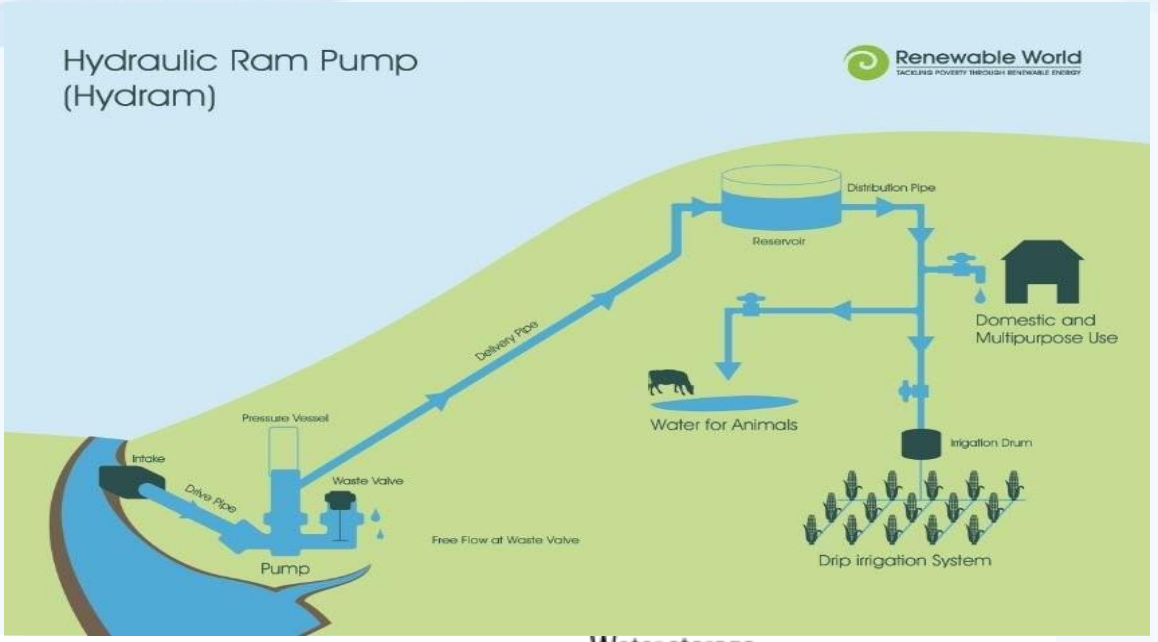
- In this method water being transported by natural flow as in the case of rivers canals is lifted from a water source using animal-driven, mechanical or electrical pumps and directly supplied to the cropland.

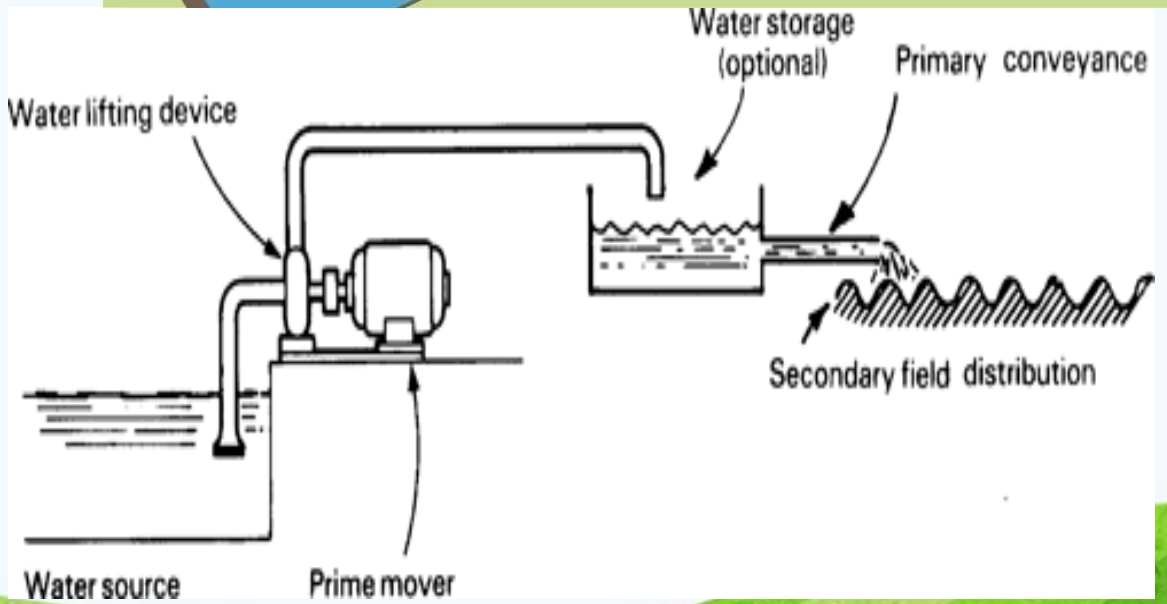
- For a viable lift irrigation scheme, the prime necessities are the availability of a stable water source for the entire crop season and feasibility of lifting water to the indented crop field.

Flow irrigation:-

Also known as gravity irrigation is a system of irrigation where the water flows from its source to the crop field due to gravity force.

In summary, irrigation bridges the gap between engineering and agriculture, enhancing water management, increasing crop productivity, and contributing to overall food and economic sustainability.


Hydraulic Ram Pump
(Hydram)
Renewable World
Distribution Pipe
Reservoir
Domestic and
Multipurpose Use
Delivery Pipe
Water for Animals
Pressure Vessel
Intake
Drive Pipe
Waste Valve
Irrigation Drum
Free Flow at Waste Valve
Pump
Drip irrigation System


Water storage
(optional)
Primary conveyance
Water lifting device
Secondary field distribution
Water source
Prime mover

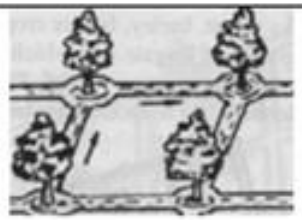
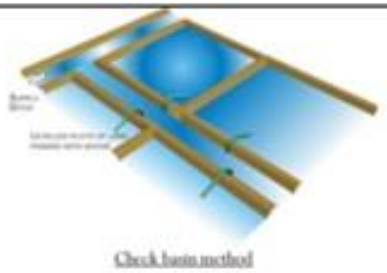
Surface irrigation

Borders: Water is gently spread across a defined strip of land, gradually moving throughout the field.

Basins: Water is concentrated within soil depressions, permitting gradual infiltration into the root zones of plants.

Furrows and Ridges: Water is directed into furrows between elevated ridges, allowing it to flow directly to the plant roots.

Contour Levee Irrigation: This method is adopted in hilly areas where the land has a steep slope.

Complete Flooding	Partial Flooding
 Wild Flood Irrigation	 Furrow Irrigation
 Border Irrigation	 Basin and Ring
 Check Basin	 Surge Irrigation

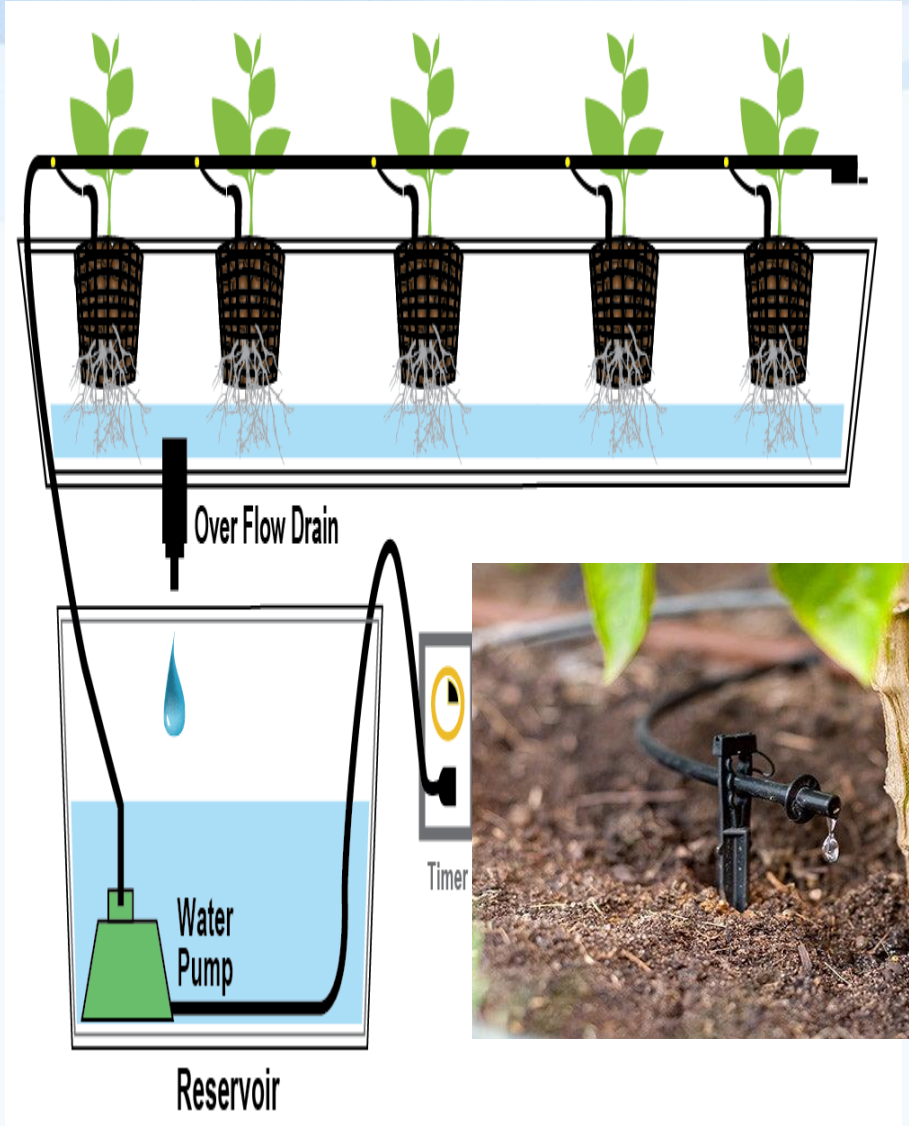
Drip Irrigation :

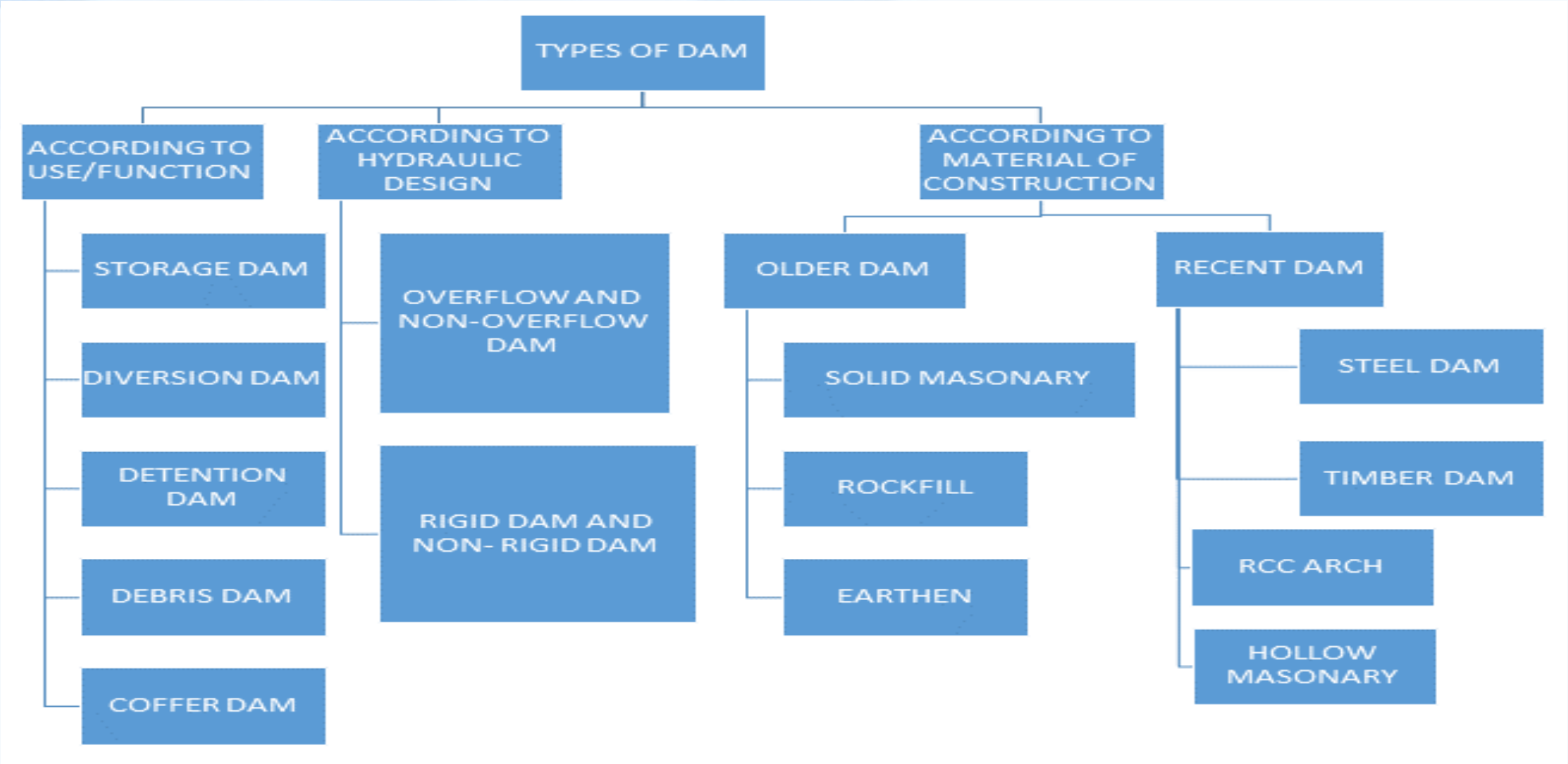
Water is meticulously delivered to the roots of plants via emitters distributed along drip lines.

Sprinkler irrigation :

This is a method of irrigation in which water is **sprayed**, or **sprinkled** through the air in rain like drops.

1. **Perforation on lateral pipes**
2. **fixed nozzles on lateral pipes**
3. **Rotating sprinklers**


Over Flow Drain
Timer
Water
Pump
Reservoir


TYPES OF DAM
ACCORDING TO USE/FUNCTION
ACCORDING TO HYDRAULIC DESIGN
ACCORDING TO MATERIAL OF CONSTRUCTION
STORAGE DAM
DIVERSION DAM
DETENTION DAM
DEBRIS DAM
COFFER DAM
OVERFLOW AND NON-OVERFLOW DAM
RIGID DAM AND NON- RIGID DAM
OLDER DAM
SOLID MASONARY
ROCKFILL
EARTHEN
RECENT DAM
STEEL DAM
TIMBER DAM
RCC ARCH
HOLLOW MASONARY

DAMS: PURPOSE AND TYPES

Dams are essential engineering structures designed to harness the power of water for various purposes. They serve as barriers across rivers and streams, and their primary objectives can be categorized into several key purposes.

- **Purposes:**

1. **Water Storage:** Dams store water, creating reservoirs that serve as vital water sources for drinking, agriculture, and industry. They help ensure a stable supply, even during dry seasons.
2. **Hydropower Generation:** Dams with turbines generate electricity through hydropower. This renewable energy source is environmentally friendly and provides a steady electricity supply.

3. **Water Supply**

- Water stored in reservoirs of the dam is used to provide adequate amounts of **quality freshwater to residential, industrial facilities and mining sites**.
- Dams can be used to **regulate the flow of water** in rivers. This is to say that water can be released from the reservoir to **support wildlife and ecosystems** downstream during a **drought** and water can be released for **agricultural** uses during the same drought.

1. **Flood Control:**

- Dams can mitigate the impact of floods by controlling the release of water during heavy rains or snowmelt. They protect downstream areas from devastating inundations.

- inundations.

1. **Irrigation:**

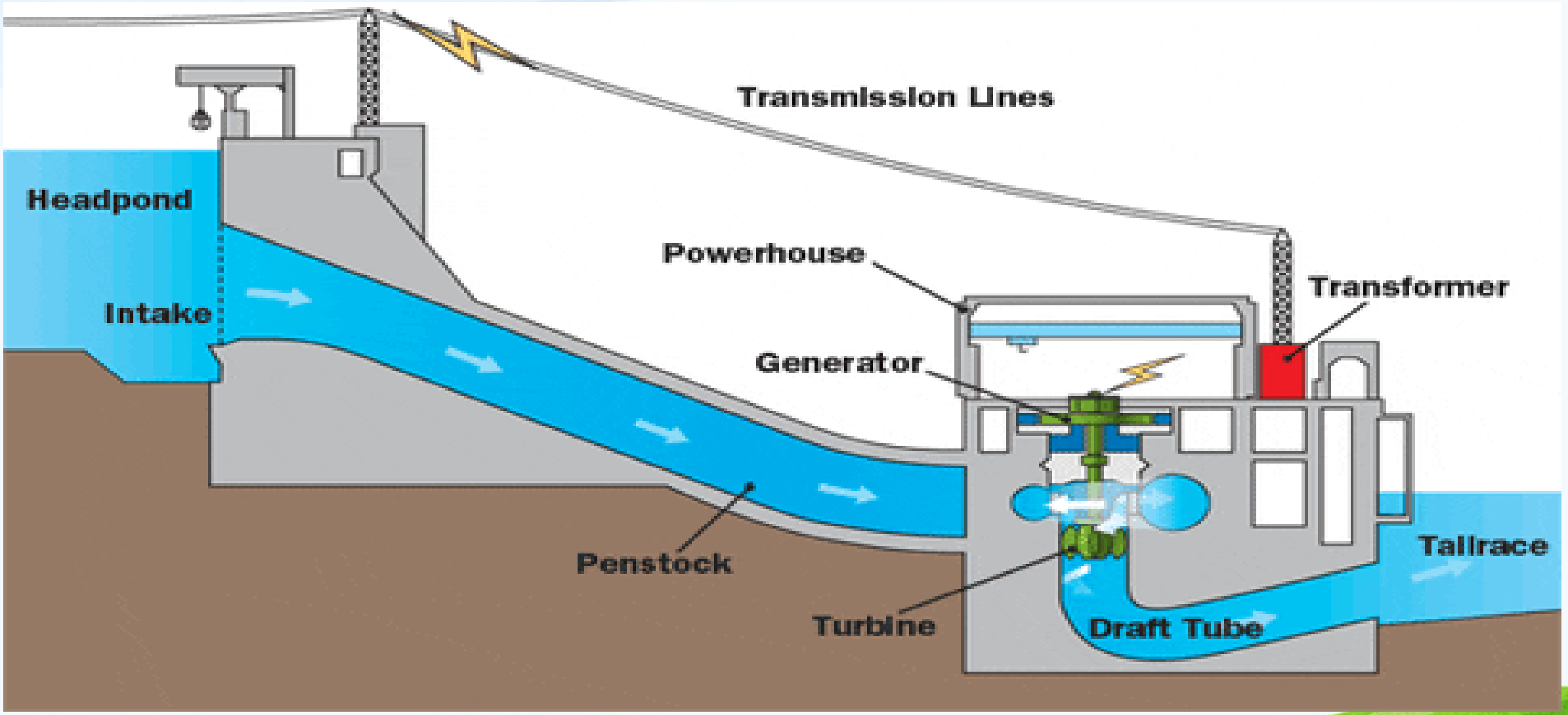
- Dams release water as needed for crop irrigation. They support agriculture by enabling controlled and reliable access to water, boosting crop yields.

1. **Mine Tailings:**

- It allows the mining and processing of coal and other vital minerals while protecting the environment.
- Mount Polley is a mine tailing dump of British Columbia, Canada.

1. **Debris Control**

- Dams provide enhanced environmental protection, such as the retention of hazardous materials and detrimental sedimentation.


Transmission Lines
Headpond
Intake
Powerhouse
Transformer
Generator
Penstock
Tailrace
Turbine
Draft Tube

Weir

1. **Navigation**

- Dams and locks provide for a stable system of inland river transportation throughout the heartland of the Nation.
- Bonneville Dam of Washington, USA is a river navigation dam.

1. **Recreation and Tourism:**

- Many reservoirs created by dams offer recreational opportunities such as boating, fishing, and wildlife habitat, attracting tourists and enhancing local economies.

TYPES OF DAM

- dams are classified according to their size, intended purpose or structural behavior
- based on size:
- Major dam:- height over 150m and above
- large dams:- height above 15m dam between 10-15m .
- small dam:- less than 15m height .

- **Based on intended purpose:-**
- **Storage dam :** They are constructed to **store water during the rainy season** when there is a large flow in the river. Many small dams impound the spring runoff for later use in dry summers. Storage dams may also provide a water supply, or improved habitat for fish and wildlife.
- **Detention dam ::** Detention dams are constructed for **flood control**. A detention dam **retards the flow in the river** on its downstream during floods by storing some flood water. Thus, the effect of sudden floods is reduced to some extent
- **Diversion dam :**A diversion dam is constructed for the purpose of **diverting water of the river into** an off-taking canal (or a conduit). They provide sufficient pressure for pushing water into ditches, canals, or other conveyance systems. Such shorter dams are used for irrigation, and for diversion from a stream to a distant storage reservoir

- **Levee: an earthen embankment extending generally parallel to the river channel and designed to protect the area behind it form overflow by floodwaters.**

- **Check dam: a dam is small, sometimes temporary, dam constructed across a shallow, drainage ditch or waterway to counteract erosion by reducing water flow velocity**

- **Coffer dam:** It is an **enclosure constructed around the construction** site to exclude water so that the construction can be done in dry. A cofferdam is thus a **temporary dam constructed for facilitating construction**.

Based on structural behavior

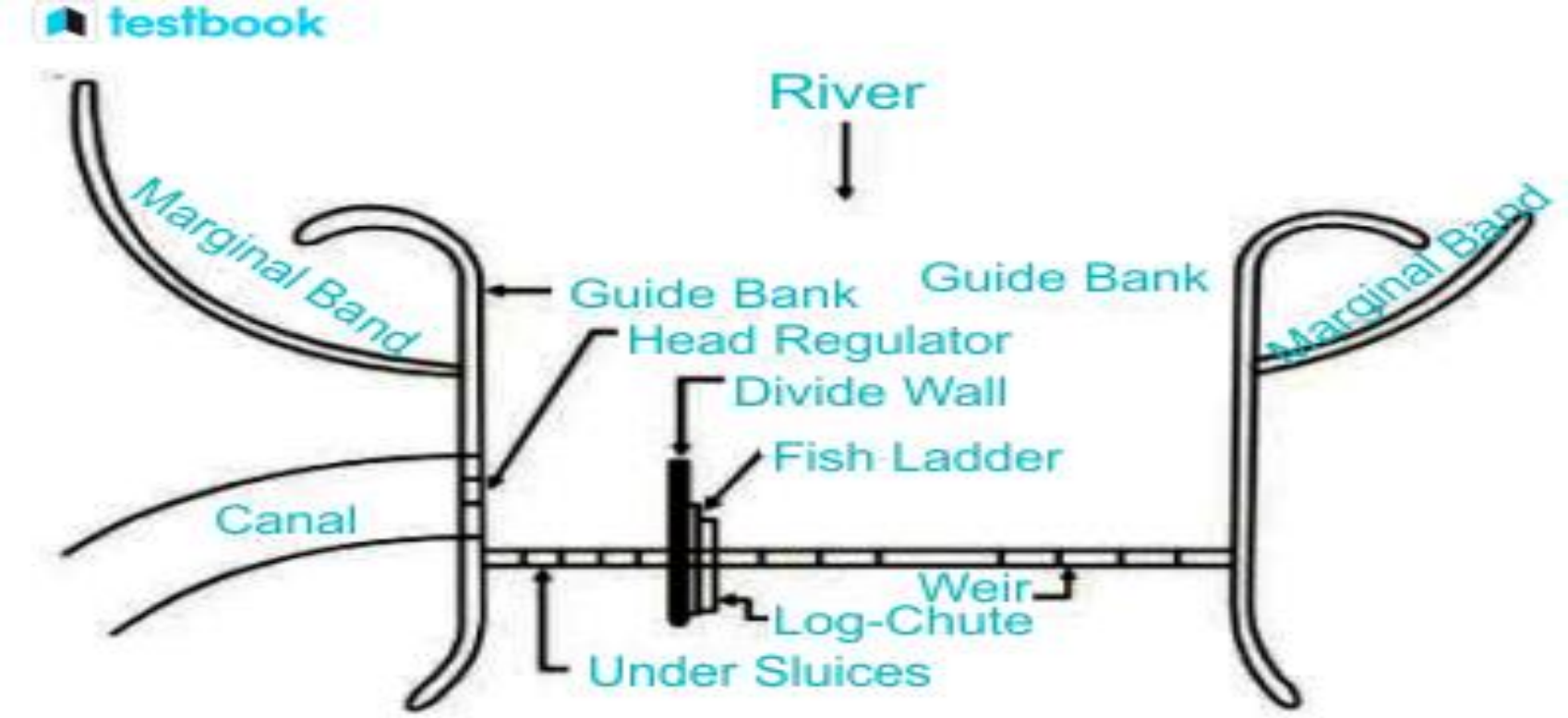
- Gravity Dam:- it is basically a solid concrete or masonry dam, that is designed and shaped in such a way its weight is sufficient to resist all forces acting on it.
- Arch dam: a curved solid masonry or concrete dam convex upstream, that depends principally on arch action to resist the forces acted on it
- Buttress dam: a dam consisting of water supporting upstream face or deck, usually reinforced concrete slab, supported by buttress generally in the form of equally spaced triangular reinforced concrete or masonry walls or counterforts.
- it transfer the water load and weight of the deck to the foundation

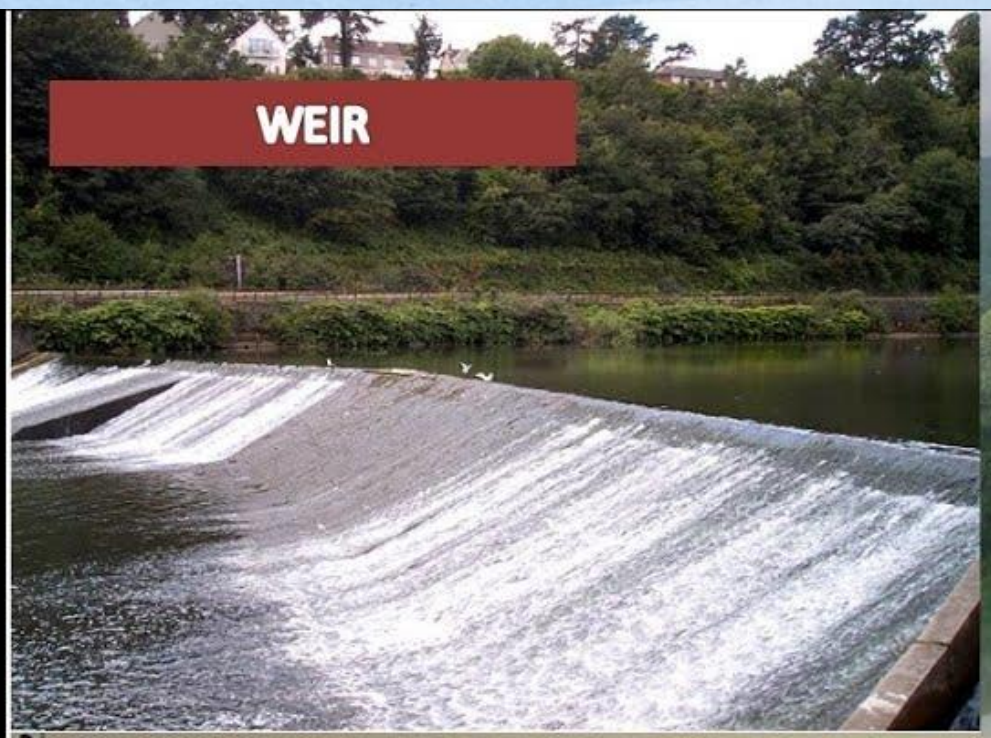
➢ CANAL IRRIGATION SYSTEMS OVERVIEW:

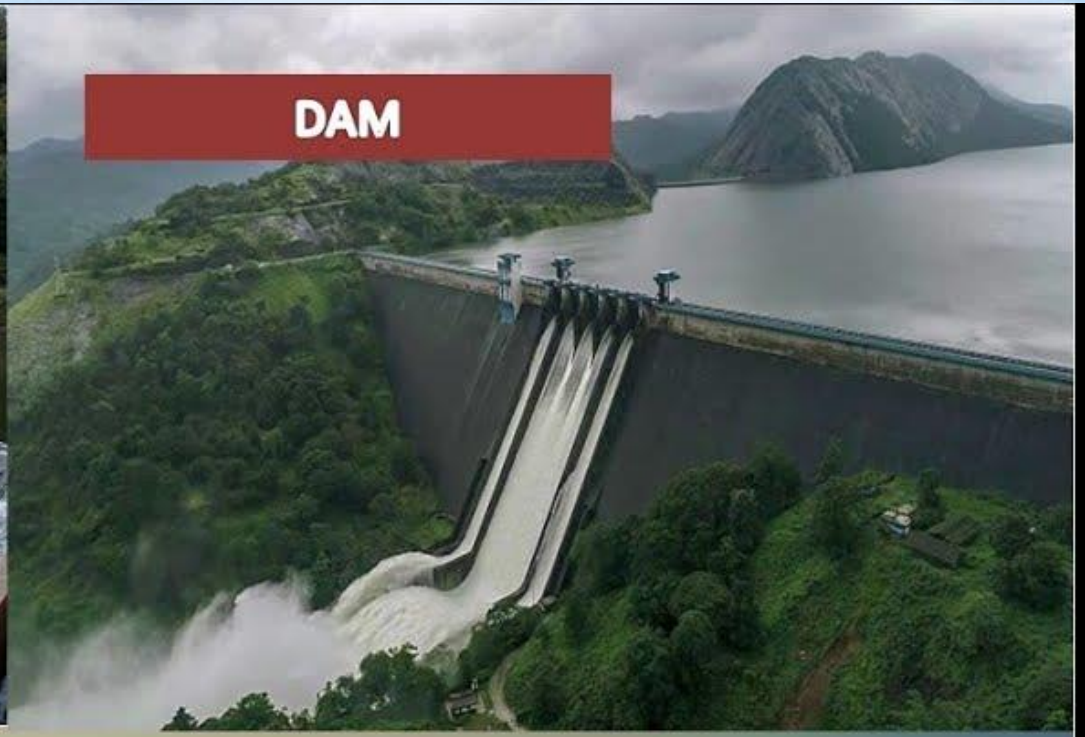
Canal irrigation systems are networks of canals, ditches, and structures that transport water from sources like rivers or reservoirs to agricultural fields. They play a crucial role in providing water for a variety of crops, including rice, wheat, and cotton.

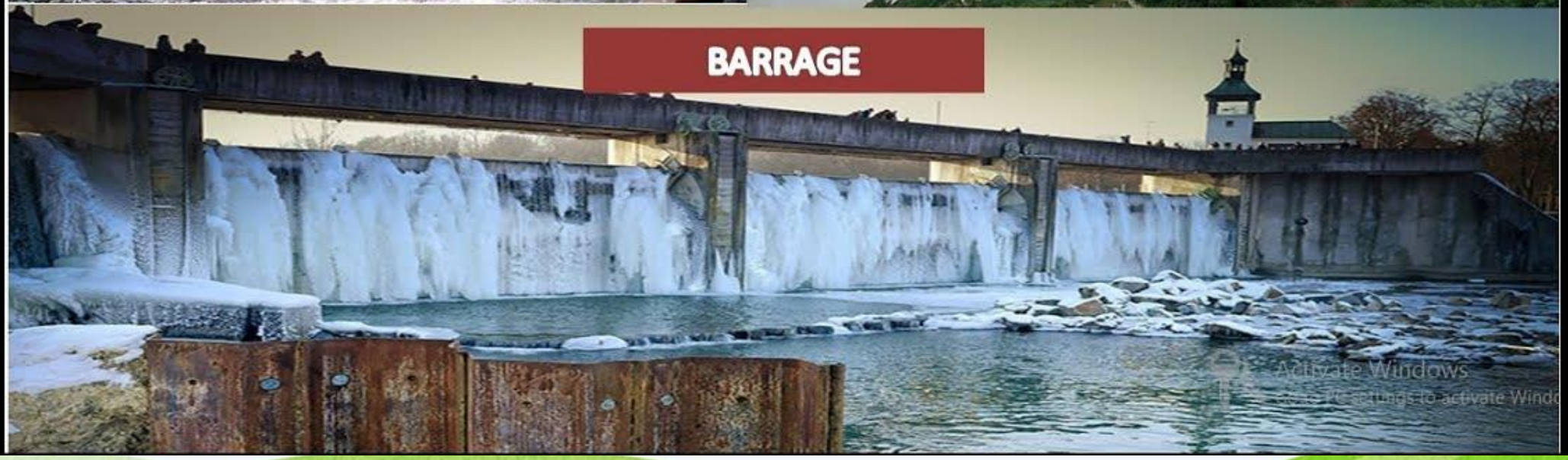
The canal irrigation involves :

- ❑ Construction of diversion head work
- ❑ the excavation of a network of canal system


testbook
River
Marginal Band
Guide Bank
Guide Bank
Marginal Band
Head Regulator
Divide Wall
Fish Ladder
Canal
Weir
Log-Chute
Under Sluices







Components of a Canal Irrigation System

1. **Headworks**: These structures, like dams and weirs, manage the water's flow from the source into the canal system.
2. **Main Canal:** The primary channel carries water from the headworks to the branch canals.
3. **Branch Canals**: These convey water from the main canal to the distributaries.
4. **Distributaries**: Distributaries distribute water to the minors.
5. **Minors:** Minors further transport water to the field channels.
6. **Field Channels**: Field channels deliver water directly to the cultivated fields.

THANK YOU