Water Resources

Water Resources in India

India is a land of many rivers, lakes, lagoons and ponds. These resources account for 4% of the world's water resources. In India, water is mainly used for drinking, irrigation, household and industrial purposes. Currently, about 92% of water is used for agricultural purposes, 2% in industries and the remaining 6% is used for drinking and household purposes.
The process of watering agricultural plants through artificial means such as tanks, wells and canals is known as irrigation. Agriculture in India is largely dependent on rainfall to sustain crop production. To reduce the dependence of agriculture on rainfall, many tanks, wells and canals have been laid. Several multipurpose dams have also been constructed. Emphasis has been laid on building artificial means of irrigation because of the following reasons:

Uncertainty and Uneven Distribution of Rainfall: In India, rainfall is highly irregular and uncertain. At times, the monsoon arrives early, and sometimes, it comes too late. It also does not rain uniformly in all parts of the country. In such a situation, farmers cannot totally depend on the rainfall, and they therefore need other water sources to irrigate their fields.

Nature of Soil: Some soils require more water, while some require less. For example, clayey soil has high moisture-holding capacity and hence does not need intensive irrigation, while sandy loamy soil needs extensive watering.

Nature of River: Many rivers in India are not perennial. Most of the rivers in central and south India have water only for four months during the monsoon. Thus, an extensive irrigation system is required.

To Maximise Production: As the population of the country has increased manifold, the production of crops also needs to be enhanced to meet the demands of the people. Hence, advanced and reliable methods of irrigation are required.

Means of Irrigation

Major conventional means of irrigation in India are wells, tanks and canals.

Wells

A well is a small hole dug in the surface of the Earth to obtain water from subsoil for irrigational and other purposes. It is a traditional method of irrigation. Wells are usually found in regions having a high groundwater table.

- Well irrigation is generally found in the alluvial plains where they can be easily dug because of the soft nature of the soil.
- In India, well irrigation is generally practised in Uttar Pradesh, Goa, Punjab, Haryana, Bihar, Rajasthan, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.

The water from the well is lifted in the following ways:

Persian Wheel Method: It is a water-lifting device which has a partly submerged vertical wheel with buckets attached to the rim. Animals such as buffaloes and camels are used to rotate the wheel. As they rotate the wheel, the buckets are filled, and water is then emptied into a trough above which carries water to fields.

Lever Method: It is an economical and efficient method of lifting water from wells. It is widely practised in Bihar and Andhra Pradesh.

Inclined Plane Method: This method is also known as mhote. In this method, a pair of bullocks is used to lift water from wells.

Table Wells: In this method, power-driven pumps are used to lift water from tube wells from depths below 15 m.

Advantages of Using Wells

- They can be dug at very low costs and hence can be used even by poor farmers.
- Oxen which are used for ploughing the land can also be used for drawing water from wells.
- Pumps and tube wells can be used for lifting water from great depths.

Disadvantages of Well Irrigation

- It is difficult to dig wells in the hilly regions of the north and stony areas of the peninsula.
- Wells can dry up because of the lowering of the water table.
- Use of electricity and diesel to operate tube wells makes irrigating fields expensive.

Tanks

A tank is an artificial reservoir built across a stream to impound water. Water from the tank is then carried to the fields through narrow channels.

Tanks are used for irrigation in peninsular India including Maharashtra and Gujarat. Tanks are extensively used in Deccan because of the following reasons:

- The Deccan has many natural depressions where tanks can be easily built.
- The rivers of the region are not perennial and become dry during the summer.
- Wells cannot be dug in the stony regions of the Deccan. Tanks however can be easily built by making small dams of stones in the depressions where rainwater collects.

Tank irrigation is largely practised in Andhra Pradesh, Tamil Nadu, West Bengal, south Rajasthan and south Bihar.

Advantages of Tank Irrigation

- Tank irrigation is useful in Deccan regions where rainfall is seasonal and uncertain.
- In the rocky terrain of the Deccan Plateau, it is difficult to build wells and canals. In such regions, tanks are an important source of irrigation.
- Rainwater could be stored in the tanks which otherwise flow out and get wasted. This water is then used for irrigation.

Disadvantages of Tank Irrigation

- Tanks can easily get silted up. Thus, regular desilting of tanks is required.
- In case of failure of rains, tanks also remain dry and hence are not a dependable source of irrigation.
- Because of large area coverage and shallow depth, water from tanks either evaporates or sinks underground.
- Tanks can use a large infertile area which otherwise could be used for growing crops.
- The lifting of water from tanks and bringing it to the fields is a strenuous and costly task.

Canals

Canals are also an important means of irrigation in India. There are two main types of canals. These are

Inundation Canals: These are long canals directly taken off from large rivers. They receive water when the river is high enough and especially when in flood. Thus, these canals have limited use only.

Perennial Canals: These canals are taken out from the perennial rivers by constructing small dams and barrages to regulate the flow of rivers. Most canals in India are perennial.

Some important canals in India are Upper Bari Doab, Bist Doab, Sirhind, Bhakra and Western Yamuna Canals in Punjab and Haryana; the Indira Gandhi Canal and Bikaner Canal in Rajasthan; Eastern Yamuna Canal, Sharda Canal, Ramganga Canal and Betwa Canal in Uttar Pradesh; and Damodar Canal and Mayurakhi Canal in West Bengal.

In south India, canals are extensively used for irrigation. Nagarjunasagar and Tungabhadra projects are major canals in the south. One-third of the net irrigated area in Tamil Nadu is under canal irrigation. The state of Mizoram is solely dependent on canals for irrigation.

Advantages of Canal Irrigation

- Canals irrigate fields in regions which get scanty rainfall.
- In dry regions of Rajasthan, canals irrigate fields which are yielding good agricultural harvests.
- Canals have irrigated major parts of Punjab and Haryana. These two states have become the nucleus of the Green Revolution.
- Tamil Nadu gets rainfall during winters. Canals irrigate the fields during summer and make up for the lack of rainfall.

Disadvantages of Canal Irrigation

- In canal irrigation, where the water table is only few feet below the ground, the alkaline salts may come to the surface, mix with the soil and make it unproductive.
- Because of waterlogging of canals, the capacity of the soil to absorb water decreases which can damage the crops in the absence of a proper drainage system.

Major Drawbacks of Conventional Methods of Irrigation

- In the agricultural fields, about 10–15% of land is used for preparing water channels, decreasing the effective area of cultivation.
- In tanks and canals, owing to the evaporation of water, the soil may silt.
- The fields in the low-lying areas always get excess water resulting in waterlogging and subsequently the accumulation of salt which damages the quality of soil.
- In the conventional system of irrigation, a large quantity of water is not properly used and gets wasted.

Modern Methods of Irrigation


Furrow Irrigation

Furrow Irrigation: It is a type of surface irrigation in which furrows or trenches are dug between rows of crops in the field instead of distributing water throughout the fields. It is useful in areas where water is easily available.
Spray Irrigation: In spray irrigation, water is released in an agricultural field by spray guns. In spray irrigation, water is used efficiently in irrigating the fields.
One limitation of this method is that it is expensive as it requires complex and sophisticated machinery. Further, plants may suffer from many diseases because of overwatering of fields.
Drip Irrigation: In this system of irrigation, water is given directly to the crops through perforated pipes which are placed between rows of crops. This method reduces the rate of evaporation and helps in conserving water. This is the most advanced and efficient means of irrigation.

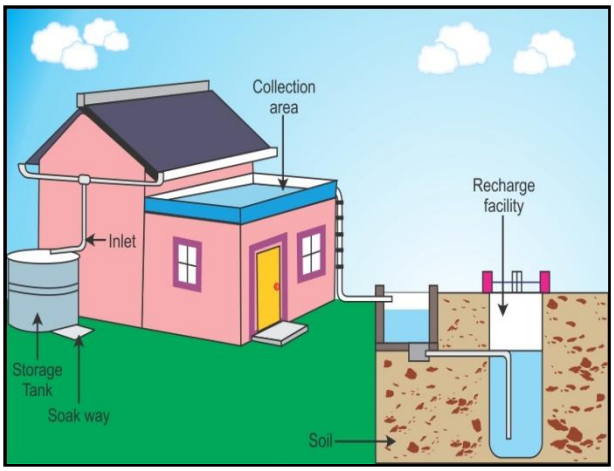
We need to conserve water as the population is growing at an extremely fast pace. Overexploitation of underground water has resulted in lowering the water table. Further, the demand of water for domestic and industrial use has also increased. Many water bodies such as rivers, lakes and tanks have been polluted and hence cannot be used for basic purposes.

Rainwater Harvesting

Rainwater harvesting is the method of collecting rainwater for use before it reaches the ground. Generally, rainwater is collected from the rooftop through pipes and stored in underground storage structures.

Mechanism of Rainwater Harvesting

- Rainwater on the rooftop is first collected using a PVC pipe. Water is then filtered by using sand and bricks.
- Water is taken down to either a sump (a hollow structure or a depression where liquids collect) for immediate use or is taken to a well or any other structure which is dug on the premises.
- Water from this well can be used later for domestic consumption. It also recharges the water table.



Rainwater Harvesting

Elements of Rainwater Harvesting:

Catchment: Catchment is an area or a surface which receives direct rainwater.

Conduits: The pipelines or drains through which rainwater is carried from the catchment to the water harvesting system are known as conduits.

Storage Facility: Rainwater can be stored in storage containers of RCC and masonry or in plastic water tanks.

Recharge Facility: Rainwater harvesting also recharges the groundwater aquifers.

Recharging Groundwater Aquifers

Some commonly used water recharging methods are digging of

- Bore wells
- Recharge pits
- Percolation pits
- Recharge trenches