I WATER RESOURCES

Water resources are natural resources of water that are potentially useful for humans, for example as a source of drinking water supply or irrigation water.

1.1 TYPES OF WATER RESOURCES

1. Rain
2. Groundwater
3. Ice
4. Rivers
5. Lakes
6. Streams and
7. Natural reservoirs

1.2 RIVER BASINS

- River basin is considered as the basic hydrological unit for planning and development of water resources
- A river basin is an area drained by a river and all of its tributaries.
- A river basin is made up of many different watersheds.
- A watershed is a small version of a river basin.
- Every stream and tributary has its own watershed, which drains to a larger stream or wetland
- There are 20 river basins/draining areas, large and small, in India.
- The Ganga basin is the largest.
- Narmada river is the fifth largest river and is also the largest west flowing river.
- In Tamil Nadu there are 34 rivers including one west flowing river.
- All these 34 rivers are grouped into 17 River basins for the purpose of hydrological studies for water resources planning and managing activities.
- Paravanar is one of the 17 river basins of TamilNadu.

1.2.1 Types of river basins

- Exorheic or open basins: their water drains into the sea or the ocean.
- Endorheic or closed basins: they are basins that drain into lakes, ponds or salt flats, with no outlet to the sea.
- Arheic basins: basins where water evaporates or infiltrates into the soil before forming a drainage system.

1.2.2 Components of a river system

- Source
- Tributaries
- Flood plains and
- Wetlands

II DEVELOPMENT AND UTILIZATION IN INDIA AND TAMIL NADU

2.1 HISTORICAL DEVELOPMENT OF IRRIGATION

•Historically, civilizations have been dependent on development of irrigated agriculture.

•Archaeological investigation has identified evidence of irrigation in Mesopotamia, Ancient Egypt & Ancient Persia (at present Iran) as far back as the 6th millennium BCE.

•In the "Zana"valley of the Andes Mountain in Peru, archaeologists found remains of three irrigation canals radiocarbon dated from the 4th millennium BCE, the 3rd Millennium BCE & the 9th century CE, These canals are the earliest record of irrigation in the new world.

•The Indus valley civilization in Pakistan & North India (from 2600 BCE) also had an early canal irrigation system. Large scale agriculture was used for the purpose of irrigation.

•There is evidence of ancient Egyptian Pharaoh Amenemhet-III in the 12th dynasty (about 1800 BCE) using the natural lake of the Faiyum Oasis as a reservoir to store surpluses of water for use during the dry seasons, the lake swelled annually from flooding of the Nile.

•The irrigation works of ancient Sri Lanka, the earliest dating from about 300 BCe, in the reign of King Pandukabhaya & under conditions development for the next thousand years, were one of the most complex irrigation systems of the ancient world.

•In the Szechwan region ancient China the Dujiangyan Irrigation System was built in 250 BCE to irrigate a large area & it still supplies water today.

•In the Americas, extensive irrigation systems were created by numerous groups in prehistoric times. One example is seen in the recent archaeological excavations near the Santa Cruz River in Tucson, Arizona. They have located a village site dating from 4000 years ago.

2.2 OBJECTIVES OF WATERSHED ACTIVITIES IN TAMILNADU

- The main objective of the present study is to understand the functions and implementation of watershed development programmes in TamilNadu.
- Watershed activities include soil and moisture conservation measures in agricultural lands (contour/field bunding and summer ploughing), drainage line treatment measures (loose boulder check dam, minor check dam, major check dam, and retaining walls), water resources development management (percolation pond, farm pond, and drip and sprinkler irrigation), crop demonstration, horticulture plantation and afforestation.
- The aim has been to ensure the availability of drinking water, fuel wood and fodder and raise income of, and employment opportunities for, farmers and landless laborers through improvement in agricultural production and productivity.
- Today, watershed development has become the main intervention for natural resource management. Watershed development programs not only protect and conserve the environment but also contribute to livelihood security
- Watershed Development Programs In order to increase the ariculture production and improve the living conditions of the farmers depending on the rain-fed lands, the watershed development programs are being widely implemented in the state. There are 19,331 micro-watersheds identified in the state of which, approximately 4,000 have already been treated.
- The important programs are

1. Restructured National Watershed Development Project for Rain-fed Areas (NWDPRA)
2. Watershed Development Fund assisted by NABARD.
3. Integrated Wasteland development Programme (IWDP)
4. Drought Prone Areas Programme (DPAP)

2.3 AREA OF IMPLEMENTATION

- During the X Five Year Plan project, the scheme was implemented in Tamil Nadu with community approach in 755 watersheds in 155 blocks in 23 districts.
- During the XI Five Year Plan project, the scheme will be implemented in 22 districts excluding Coimbatore district which has been saturated and as there is no new watershed available for treatment.
- The scheme is implemented under the Chairmanship of the Collectors through District Watershed Development Agency at District level and through Watershed committees /Associations at Village level.

2.4 Objective of the Scheme

1. To spread the message of participatory Watershed Development.
2. Involvement of Government, NGOs/Voluntary organization in implementation.
3. Constitution of Watershed Association & watershed committee to develop the watershed based on the local needs.

2.5 Present status of Irrigation:

•In the middle of 20th century, the advent of diesel & electric motors led for the first time to system that could pump groundwater out of major aquifers faster than it was recharged.

•This can lead to permanent loss of aquifer capacity, decreased water quality, ground subsidence& other problems.

•The largest contiguous areas of high irrigation density are found in North India & Pakistan along the rivers Ganges & Indus, in the Hai He, Huang He & Yangtze basins in China, along the Nile River in Egypt & Sudan, in the Mississippi-Missouri river basin & in parts of California.

III IRRIGATION

Irrigation is an artificial application of water to the soil. It is usually used to assist the growing of crops in dry areas and during periods of inadequate rainfall.

3.1 NEED OF THE IRRIGATION

•India is basically an agricultural country, and all its resources depend on the agricultural.

•Water is evidently the most vital element in the plant life.

•Insufficient and uncertain rainfall adversely affects agriculture.

•However, the total rainfall in a particular area may be either insufficient, or ill-timed.

•Droughts and famines are caused due to low rainfall.

- Irrigation helps to increase productivity even in low rainfall

3.1.1. Less rainfall

•Artificial supply is necessary

•Irrigation work may be constructed at a place where more water is available & than convey the water where there is less rainfall.

3.1.2. Non uniform rainfall

•Rainfall may not be uniform over the crop period in the particular area.

•Rains may be available during the starting period of crop but no water may be available at end, with the result yield may be less or crop may be die.

•Collection of water during the excess rainfall & supplied to the crop during the period when there may be no rainfall.

3.1.3 Commercial crops with additional water

•Rainfall may be sufficient to raise the usual crop but more water may be necessary for raising commercial & cash crop . (Sugarcane, Tea, Tobacco, cotton, cardamom, & indigo)

3.1.4 Controlled water supply

•Yield of the crop may be increased by the construction of proper distribution system

3.2 BENEFITS OF IRRIGATION

•Increase in food production

•Protection from famine

•Cultivation of cash crop (Sugarcane, Tobacco, & cotton)

•Addition to the wealth of the country

•Increase the prosperity of people

•Generation of hydro-electric power

•Domestic & industrial water supply

•Inland navigation

•Improvement of communication

•Canal plantations

•Improvement in the ground water storage

•General development of the country

3.3. DEVELOPMENTAL ASPECTS OF IRRIGATION

Irrigation is practiced to maintain the different developmental parameters.

Those are:

1. To make up for the soil moisture deficit.
2. To ensure a proper & sustained growth of crops.
3. To make harvest safe.
4. To colonize the cultivable wasteland for horizontal expansion of cultivation.
5. To shift from seasonal cultivation.
6. To promote more intensive cultivation by multiple cropping.
7. To improve the level of agricultural productivity by acting as an agent for adoption of modern technology.
8. To lessen the regional & size-class inequalities in agricultural productivity that will reduce in turn socio-economic imbalances.

3.4. ADVANTAGES OF IRRIGATION

Advantages of irrigation can be direct as well as indirect.

I. Direct Benefits

•The grower has many choices of crops and varieties and can go for multiple cropping for cultivation

•Crop plants respond to fertilizer and other inputs and there by productivity is high.

•Quality of the crop is improved.

•Higher economic return and employment opportunities. It makes economy drought proof.

•Development of pisciculture and afforestation. Plantation is raised along the banks of canals and field boundaries.

•Domestic water supply, hydel power generation at dam site and means of transport where navigation is possible.

•Prevention of damage through flood.

II. Indirect Benefits

•Increase in gross domestic product of the country, revenue, employment, land value, higher wages to farm labour, agro-based industries and groundwater storage.

•General development of other sectors and development of the country

•Increase of food production.

•Modify soil or climate environment – leaching.

•Lessen risk of catastrophic damage caused by drought.

•Increase income & national cash flow.

•Increase labor employment.

•Increase standard of living.

•Increase value of land.

•National security thus self sufficiency.

•Improve communication and navigation facilities.

•Domestic and industrial water supply.

•Improve ground water storage.

•Generation of hydro-electric power.

3.5 DISADVANTAGES OF IRRIGATION

The following are the disadvantages of irrigation.

•Water logging.

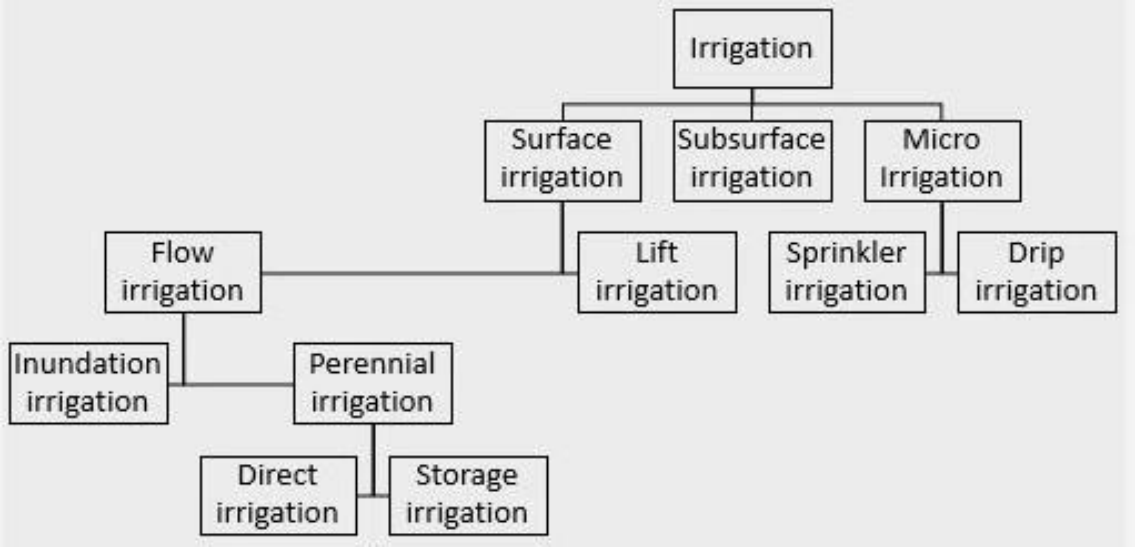
•Salinity and alkalinity of land.

•Ill aeration of soil.

•Pollution of underground water.

•Results in colder and damper climate causing outbreak of diseases like malaria.

IV TYPES OF IRRIGATION OR CLASSIFICATION OF IRRIGATION



4.1 Natural Irrigation

•No engineering structure is constructed.

1)Rainfall Irrigation

•Rainfall is only used for raising crops.

2) Inundation canal system

•Flood water is utilized for Irrigation purpose by properly direction flow of water.

4.2 Artificial Irrigation

•Properly designed engineering structure is constructed.

1) Flow irrigation

•Water flows to the irrigated land by gravity.

•Water sources is to be higher level than the irrigated land.

a) Perennial irrigation

Water is supplied according to the requirements throughout the crop period through storage canal head works & Canal distribution system.

b) Inundation irrigation

- Lands are submerged &throughly flooded when floods occur in the river.
- Lands are allowed to drain off & the crop are sown.
- Now the soil retains sufficient moisture for the crops to grow.

c) Direct irrigation

- Water is directly diverted to the canal from the river is called Direct irrigation.
- Discharge in the river shall be higher than the water requirement during the crop period.
- A low diversion weir or a barrage is constructed across the river to rise the water level and divert the same to the canal.
- Direct irrigation can be adopted only where there is enough flow in the river to provide sufficient quantity of water required for irrigation throughout the crop period.

d) Storage Irrigation

- River flow is not perennial or insufficient during crop period, Storage Irrigation is adopted.
- A dam is construction across the river to store water in the reservoir.
- In some area rain water that run off from a catchment area is stored in tanks and is used for irrigation during the crop period.

2) Lift or well Irrigation

- Water is lifted up by mechanical such as pump etc or manual to supply for irrigation .
- Lift irrigation is adopted when the water source is lower than the level of lands to be irrigated.