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Irrigation Systems in India

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Why can’t rain alone keep Indian farming going? Rainfall alone cannot support Indian agriculture year-round. This lesson explains how India’s irrigation systems fill that gap, the types in use, and the water risks they create.



India’s full territory, showing every state and union territory along with the country’s major rivers. This lesson refers to several dam sites built on these rivers, including Bhakra. Source: Uwe Dedering, Wikimedia Commons, CC BY-SA 4.0.

Largest Source
Wells and tube-wells — about 65% of India's irrigation, but depletes groundwater.

Landmark Project
Bhakra Dam (1963) — multi-purpose: irrigation, power, flood control.

Modern Push
PMKSY, "Per Drop More Crop" — drip/sprinkler micro-irrigation for water efficiency.

Cropping Intensity
Rose from 139% (2011) to 151% (2019), credited mainly to irrigation expansion.

Irrigation
: Supplying water to crops through canals, wells, tanks, or pipes, instead of relying only on rain.

Rainfed area
: Land with no irrigation, fully dependent on the monsoon.

Cropping intensity
: Ratio of gross cropped area to net sown area; rises when land grows more crops per year.

Micro-irrigation
: Drip or sprinkler systems that deliver water directly to roots, using far less water than flooding fields.

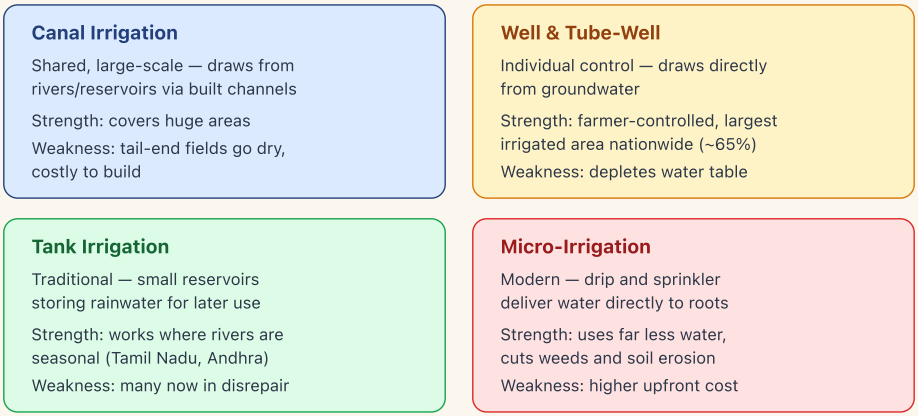
1. India's four irrigation systems

Must Know

1.1 Why farming needs irrigation at all

Irrigation is supplying water to crops through canals, wells, tanks, or pipes, instead of relying only on rain. The Indian monsoon is uneven, so crops fail without water in the dry months.

Irrigation lets farmers grow more than one crop a year, and protects against drought. It raises yields, and makes farming less dependent on the whims of the weather — it is the difference between subsistence farming and dependable production.



India's four main irrigation systems — how they work, and where each falls short.

1.2 Where canal irrigation works best, and where it fails

Canal irrigation draws water from rivers or reservoirs, through built channels to fields. It is concentrated in the northern plains, where rivers flow most of the year.

It can irrigate large areas, but needs big shared infrastructure and coordination. Canal water may not reach tail-end fields, and building canals is costly.

1.3 Why wells and tube-wells now cover the most land

Wells and tube-wells draw directly from underground water resources. They are growing fast, and now cover the largest irrigated area nationwide, giving farmers individual control unlike shared canals.

Groundwater pumping supplies about **65%** of India's irrigation, out of the roughly 53% of India's total cropped area that is irrigated at all (2020 baseline). Overuse depletes the water table, especially in dry regions.

Convenient but costly: wells give a farmer individual control that a shared canal never can, which is why they've grown so fast. But that same convenience is what's draining groundwater in places like Punjab and Haryana — the strength and the risk come from the same feature.

> **Quick check 1.** Q1. True or False: Canal irrigation currently covers a larger irrigated area than wells and tube-wells. *(True or False?)*
>
> See answer ↓

1.4 What tank irrigation was built to solve

Tanks are small reservoirs that store rainwater for later use. They have historically been vital in Tamil Nadu and Andhra Pradesh, capturing rain where rivers are seasonal. Many tanks have fallen into disrepair, reducing their role — a traditional southern system now needing revival.

2. Project scale and the Bhakra Dam

Good to Know

2.1 What separates a major project from a minor one

- **Major:** irrigates large areas, usually over 10,000 hectares.
- **Medium:** covers between 2,000 and 10,000 hectares.

- **Minor:** like tanks and small wells, covers under 2,000 hectares.

Size decides who funds and manages a project, and how much it can irrigate.

2.2 What made the Bhakra Dam a “temple of modern India”

Multi-purpose river valley projects combine irrigation with power, flood control, and drinking water. Work on the **Bhakra Dam** began in 1948, a year after independence. Nehru poured its first bucket of concrete himself, calling such dams the “temples of modern India.”

By the time it was completed in 1963, the dam stood 226 metres tall on the Sutlej river, holding back the Gobind Sagar reservoir and going on to irrigate large parts of Punjab, Haryana, and Rajasthan. Dams like this let one river serve several needs at once, but they are costly and can displace people and harm river ecology.

> **Quick check 2.** Q2. True or False: The Bhakra Dam serves only one purpose: irrigation. *(True or False?)* See answer ↓

3. Micro-irrigation and PMKSY

Good to Know

3.1 How drip irrigation differs from a sprinkler

Drip irrigation delivers water slowly to the plant roots, saving a lot of water. **Sprinkler irrigation** sprays water over crops like rain. Both use far less water than flooding fields, and drip also cuts weed growth and soil erosion.

3.2 What “Per Drop More Crop” actually means

The **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)** pushes irrigation and water efficiency. Its slogan is **“Per Drop More Crop”**, meaning more yield for every unit of water. It funds micro-irrigation and better water use, alongside new sources.

Not to be confused with PMFBY: PMKSY is about irrigation and water-use efficiency. It is NOT crop-failure insurance — that job belongs to a different scheme, PMFBY. Exams test this mix-up directly.

4. Groundwater depletion and water waste

Great to Know

4.1 Why groundwater in some states keeps running out

Over-reliance on tube-wells has depleted groundwater in some regions. Farmers keep drilling deeper as the water table falls, using more energy. More water is drawn than rain can recharge, so reserves shrink

— states like Punjab and Haryana face severe groundwater stress.

> **Quick check 3.** Q3. True or False: Groundwater in Punjab and Haryana is currently being recharged faster than it's drawn. *(True or False?)* See answer ↓

4.2 Where irrigation water actually gets wasted

Much irrigation water is wasted through flooding and leaky channels. Traditional flood irrigation loses water to runoff and evaporation. Micro-irrigation and lined canals use water far more efficiently, and better pricing plus drip systems can raise water productivity. Efficiency, not just building new dams, is the modern focus.

5. Rainfed farming and cropping intensity

Great to Know

5.1 What happens to farms that get no irrigation at all

Rainfed areas get no irrigation, and depend fully on the monsoon. The scale is bigger than most people expect: rainfed farming still covers about **51% of India's net sown area**, and produces roughly **40% of the country's total food output**, per the Ministry of Agriculture's own Rainfed Division. Irrigation gets most of the policy attention, but rainfed land is closer to half the country's farmland, not a small leftover category.

The **Rainfed Area Development (RAD)** scheme, running since 2014-15, is the government's main response. It does not try to irrigate this land. Instead, it takes a **watershed-plus approach**: conserving soil and water at the watershed level, and helping farmers diversify into an integrated mix of crops, horticulture, livestock, fisheries, and

agroforestry, so a single failed rainfed crop doesn't wipe out a farmer's whole income. For 2025-26, its central allocation was **₹343.86 crore**, under which over **96,000 farmers** received training.

Rainfed farming is the flip side of this whole lesson: everything else here explains how irrigation fills the gap left by uneven rain. Rainfed land is what's left when that gap isn't filled — riskiest, so it needs drought-resistant strategies rather than a canal or a well.

5.2 How irrigation actually reshapes what farmers grow

Reliable irrigation lets farmers grow water-hungry crops like paddy and sugarcane, because these high-value crops need water through the dry season. They can overuse water, and worsen groundwater stress — irrigation shapes which crops grow where across India.

Irrigation is a direct driver of cropping intensity: NITI Aayog data shows it rose from about **139%** in 2011 to **151%** in 2019, a rise it credits mainly to PMKSY-driven irrigation expansion.

> **Quick check 4.** Q4. True or False: India's cropping intensity has fallen since 2011, according to NITI Aayog data. *(True or False?)*
>
> See answer ↓

Exam Edge

The trap this topic keeps setting

Exams list several claimed advantages of drip irrigation, and expect you to spot the one that is NOT actually true — reducing soil salinity is a common false option, since drip cuts weeds and erosion but doesn't remove salts already in the soil. They also test what a scheme is NOT

meant to do: PMKSY is about irrigation and water efficiency, not crop-failure protection, which is PMFBY's job. **Read every option looking for the one plausible-sounding claim that doesn't actually hold.**

Three real questions worth studying

> **Quick check 5.** Q5. True or False: PMKSY's primary purpose is to protect farmers against crop failure and insure their harvest. *(True or False?)* See answer ↓

PMKSY's first decade, in numbers

Current Affairs

What PMKSY has actually delivered in 10 years

PMKSY, launched 1 July 2015, crossed 10 years in 2025, with central assistance exceeding **₹64,407 crore** since 2016-17. The scheme has benefited over **27 million farmers**, and created or restored irrigation potential across 24.61 million hectares. Union Budget 2026-27 allocated ₹6,587 crore to keep expanding it.

How much land is now under micro-irrigation

Under PMKSY's Per Drop More Crop component, **110.92 lakh hectares** have been brought under micro-irrigation since the scheme began. Groundwater stress makes saving every drop a national priority, and drip and sprinkler systems are how that target actually gets hit on the ground.

Source: PIB Backgrounder, 30 June 2026.

Quick Q&A

Which irrigation source covers the most land in India, and what's its biggest downside?

Wells and tube-wells, about 65% of irrigation. Their downside is depleting groundwater, since farmers keep drilling deeper as the water table falls.

Why does drip irrigation reduce weeds, but NOT soil salinity?

Drip delivers water precisely to plant roots, which starves weeds of water elsewhere in the field. But it doesn't remove salts already in the soil, which is a separate problem.

Why did India's cropping intensity rise between 2011 and 2019?

NITI Aayog credits it mainly to PMKSY-driven irrigation expansion, which let farmers grow more crops per year on the same land.

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Practice MCQs

1. What do multi-purpose river valley projects like Bhakra Nangal combine, beyond irrigation?

A. Only fishery licensing

B. Only military defence functions

C. Only tourism revenue

D. Hydroelectric power, flood control, and drinking water supply from the same system

See answer ↓

Answer Key

1. **D.** Multi-purpose river valley projects combine irrigation with other goals. These include hydroelectric power generation, flood control, and drinking water supply. All come from the same dam and reservoir system. ↑ Q1

Quick-check answers

1. **False.** ↑ 1
2. **False.** ↑ 2
3. **False.** ↑ 3
4. **False.** ↑ 4
5. **False.** ↑ 5

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