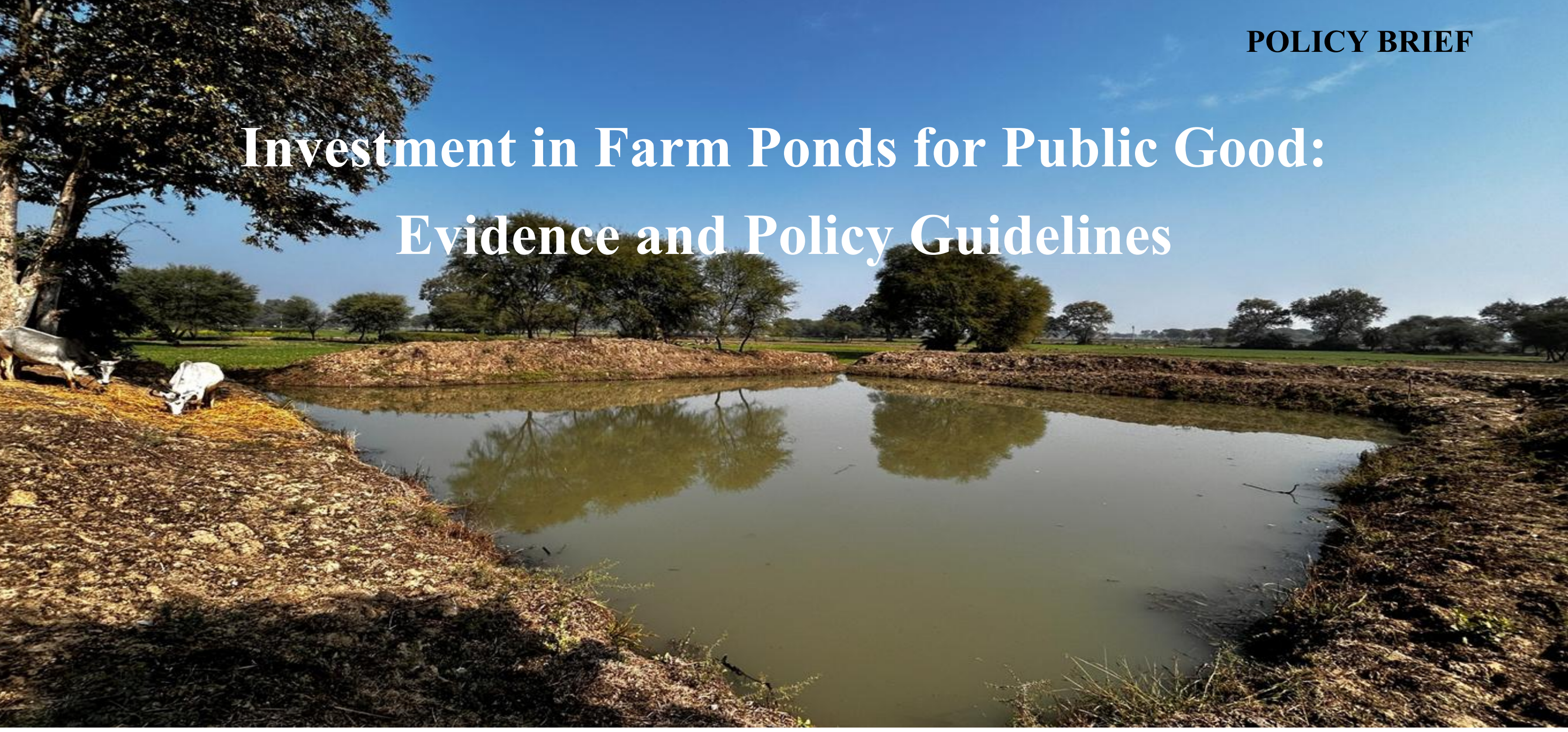
POLICY BRIEF

Investment in Farm Ponds for Public Good: Evidence and Policy Guidelines



Why this Policy Brief?

Farm ponds are a lifeline for India's rainfed areas. They are supported under many government and non-government programs which primarily define "farm ponds" as a physical structure with specific dimensions. In practice, however, farm ponds vary widely based on purpose, location, source of water and other factors. In the current era of increasing climate variability, continued public investments in farm ponds are important to strengthen adaptive capacity. However, a critical question is: are investments in a uni-conception of farm ponds productive, sustainable, and equitable?

Drawing upon an extensive study of farm ponds promoted by multiple agencies across 15 states, this policy brief brings out the need to structure public investments in accordance with different typologies of farm ponds. More importantly, the study flags the perverse incentives of elevated storage farm ponds that are driving competitive extraction from low yielding borewells resulting in aquifer depletion, high energy costs, and unsustainable and inequitable water use. The brief argues that farm ponds need to be seen and invested in as a part of the 'landscape ecosystem' rather than as isolated structures and provides guiding principles for public investments in farm ponds.

The study is anchored by the School of Public Policy at IIT-Delhi and developed in collaboration with WASSAN, BRLF, and 15 partner organisations across the country.

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FARM PONDS – LIFELINE FOR AGRICULTURE

Harvesting runoff water in small dug-out ponds located in farmers' fields is a traditional practice across India, especially in the rainfed regions. As a result, farm ponds are a key intervention in soil and water conservation, watershed development, and rural employment programs such as MGNREGS (Figure 1). Farm ponds are also supported under many central and state schemes related to irrigation, agriculture, horticulture, rural development, fisheries and water conservation, as well as through CSR and philanthropic initiatives.

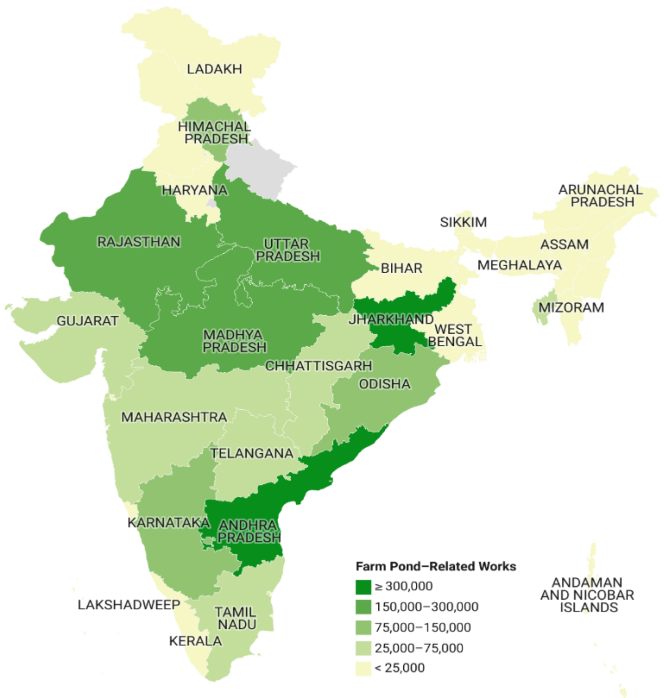

Figure 1: Farm ponds under MGNREGA up to 2022. (Source: MGNREGA - MIS)

Traditionally, farm ponds serve multiple functions. They regulate flood flow by storing runoff, improve soil moisture, support groundwater recharge, provide drinking water for livestock, and very importantly, support critical irrigation for agriculture. In the drylands and in regions with high rainfall alike, farm ponds have thus been a lifeline.

In recent times, farm ponds have evolved from the traditional idea of a rainwater harvesting structure and now vary widely in their source of water. While some farm ponds harvest farm or catchment runoff and/or groundwater discharge, many others are filled by pumping water from external sources, such as groundwater through shallow wells and deep borewells, and canal water. This diversity requires acknowledgement of different typologies of farm ponds with varying impact on sustainability, equity, cost of energy and productivity. Public funding of farm ponds should thus be in accordance with these typologies.

Collaborative Farm Ponds Study

Anchored by the School of Public Policy at IIT Delhi, this study was conducted in collaboration with 17 organisations across 15 states, representing civil society, practitioners, government bodies and academia, during 2024-26. It inventoried farm ponds across 7 agro-ecologies and studied 50 farm ponds in detail.

Based on this collaborative effort, this policy brief presents a "typology of farm ponds" and sets out guiding principles for investment in farm ponds through government, CSR and philanthropic programs. The guiding principles are intended to guide programs to minimise the unintended negative impacts of farm pond investment.

EVIDENCE FROM THE FIELD - BENEFITS AND RISKS

The Multi-faceted Benefits of Farm Ponds

When farm ponds are aligned with the local biophysical factors and socio-economic conditions, they provide multiple ecosystem and livelihood benefits:

Resilience and Water Security

- *Resilience and crop security:* In rainfed and groundwater-saline regions, farm ponds capture local monsoon runoff, providing critical 'protective irrigation' to kharif crops during dry spells.
- *Livestock drinking water:* Farm ponds are an important source of drinking water for livestock on the farms and in the grazing areas.

Livelihood Diversification and Intensification

- *Enables intensive cultivation:* In higher rainfall tribal and rainfed regions, farm ponds extend water availability beyond the monsoon, enabling farmers to take up small-scale vegetable cultivation in small areas around the farm pond.

- *Small-scale fisheries:* Where water is available for over 6 months period, farmers take up fish production in farm ponds for consumption and local sales.
- *Multi-purpose farm ponds:* Integrating cultivation of fruit trees/vegetables on the bunds, fisheries in the pond, critical irrigation for an intensive adjoining plot, and in some cases birds (ducks/poultry) gives high and diversified returns and secures food, especially in the high rainfall/ tribal areas.

Landscape and Ecosystem Services

- *Landscape and ecosystem services:* Integrated with broader watershed treatment and soil and water conservation measures in suitable hydrogeology, farm ponds act as recharge structures, improve soil moisture, reduce erosion, support the local water table, and extend water availability in the region.
- *Moderating high-intensity rainfall events:* Climate change is likely to increase high-intensity rainfall events. An appropriate number of farm ponds in the landscape helps to moderate the flood flows, supports soil moisture and groundwater recharge.

CASE STUDY 1: *Rainwater harvesting farm pond in the Tribal region of Nashik*

Amlon village, in the tribal Peth block of Nashik district, lies in a hilly, high-rainfall region marked by high runoff and low-storage basalt aquifers, where wells typically dry by February–March.

The farmer is a smallholder with 2.5 acres of land. Until 2016, he did not cultivate the land because it was undulating, rocky terrain with no access to irrigation. Following the initial watershed treatment (levelling, trenches, contour bunds, and loose boulder structures), he began cultivating rainfed finger millet on 1 acre. Later in 2020, with support from the local NGO and MGNREGA, he built a dugout, unlined farm pond with a depth of 1.5 m, which he later deepened to 3 m.
The pond naturally fills through rainfall runoff, lasts only through the monsoon, and is emptied within a month as the monsoon recedes. In this treated watershed setting, the pond also benefits from improved shallow subsurface recharge and extended soil-moisture conditions created by the watershed works. Initially, it held water only through the monsoon and provided 1–2 life-saving irrigations during dry spells. The farmer started cultivating kharif paddy on half an acre of his additional land. The pond deepening and watershed maturation on his farm improved soil moisture, increased runoff capture, and reduced silt inflow, thereby increasing pond storage and retention. This enabled 2–3 irrigations, and the cultivated area expanded to 2-3 acres during kharif. The enhanced soil moisture from the watershed interventions enabled a diversified orchard (mango, cashew, papaya, and drumsticks) and supported rabi-season kitchen gardens.

Farm Pond Typology: *Dugout rainwater-harvesting pond with watershed interventions – gravity-filled – protective irrigation*
Recommendation for Public Funding: Prioritize unlined rainwater harvesting ponds, especially in the tribal and hilly regions, alongside watershed treatment and related support practices. Where needed, bundle these investments with water lifting and on-farm application systems to improve livelihood outcomes, climate resilience, and returns on public investment.

Trade-offs and Risks

Farm ponds are observed to have multi-faceted benefits. However, when programs treat them as isolated structures rather than as part of a landscape system, they can also create systemic risks. Without a landscape-level plan, farm pond expansion can produce sustainability and equity problems.

- *Location purpose mismatch:* When the location and design of the farm pond do not align with the intended purpose, the pond may fail to deliver the expected hydrological function.
- *Groundwater appropriation and maladaptation:* In the groundwater-stressed, horticulture-intensive regions, farm ponds are being filled by groundwater pumping rather than by harvesting monsoon runoff. This turns a harvesting structure into an extracting one, where public subsidies result in competition for groundwater access, aquifer depletion, and high groundwater losses due to evaporation.
- *Resource congestion and downstream impacts:* Saturating a watershed with farm ponds without a water-budget exercise can reduce flows, resulting in reduced flows and unfilled ponds in downstream regions
- *Equity risks in access and allocation:* Farm ponds programs can create equity risks when eligibility is tied to larger pre-defined pond sizes. Without targeted, differentiated investments, such programs favour capital-rich farmers, who can spare the land and partly self-finance, while excluding smallholders from access and allocation.

CASE STUDY 2: *Hybrid farm pond harvesting runoff and storing canal water in Chandrapur*

Nandra village, in Warora block of Chandrapur district, is marked by erratic monsoon rainfall, shallow aquifers, and highly unreliable groundwater availability. The district is drought-prone, with an average annual rainfall of 1224 mm and a long-term declining rainfall trend. The region is largely rainfed, while some farmers access irrigation through an old Zilla Parishad-managed canal system.

The farmer has 20 acres of land and tried to secure irrigation by drilling borewellssix times over the last decade but failed each time. Before the pond, the farmer cultivated rainfed cotton-soyabean rotation in kharif (14 acres) and gram in rabi; irrigation for gram was provided through canal rotation. Although the farmer is situated in the middle region of the canal command area, access to canal water remains uncertain, since the rotations are not fixed and are often delayed or skipped. In 2023–24, the farmer constructed an unlined dug-out pond (35 × 30 × 3 m) with an inlet and outlet, with CSR support. The pond is fully filled by monsoon runoff and used as a buffer for protective irrigation in kharif and irrigation for gram in rabi. During the canal rotation in January, canal water is used to fill the pond via gravity diversion through field channels, mitigating rotation uncertainty and irrigating gram through February and March. The pond helped augment farm-level water availability and improved the farmer's ability to manage irrigation more reliably. It has helped stabilize rabi crop yields and increase cotton productivity by shifting to a hybrid variety (12 to 15 quintals per acre), with a plan to cultivate wheat crop next year. The demand for farm ponds is increasing in the area, both for canal and non-canal users, to manage irrigation uncertainty. Such ponds may also capture local canal seepage and runoff, but their wider promotion within canal commands may further worsen water availability for tail-end farmers.

Farm Pond Typology: *Dugout - filled with runoff harvesting and canal water – gravity filled – risk buffering*

Recommendation for public funding: Context-specific funding for unlined dugout buffer ponds in canal commands only when planned in coordination with the Water Users' Association, with a water budgeting approach to mitigate risk for farmers towards the tail end of the canal.

Farm Ponds: From Harvesting to Storage

There is a wide diversity of farm ponds in practice, with varying impacts. The evidence points to a spectrum along which farm ponds operate, shaped by how they are filled, used, and integrated into the local landscapes. Based on this, a broad typology of farm ponds is presented in Table 1. Depending on the typology, a farm pond can be either a tool for resilience or a driver of resource depletion.

Table 1: Typology of farm ponds as observed in practice

Typology	**Rainwater Harvesting Farm Pond**	**Hybrid Farm Ponds**	**Water Storage Farm Ponds**
Water Source	Farm runoff or catchment runoff	Runoff supplemented with shallow groundwater, and/or canal water	Groundwater and/or canal water
Location context	Rainfed regions with poor irrigation access (may be high or low rainfall), regions with saline groundwater	Rainfed regions with runoff availability and partial access to shallow groundwater and/or canal water	Independent of rainfall and agroecology; common in regions with unsafe groundwater status; driven by proximity to market
Purpose of the pond	Protective irrigation	Rabi irrigation, livelihood diversification, e.g. fisheries	Year-round irrigation, horticulture and high value crops
Pond structure	Excavated, unlined, may have inlet-outlet channels	Excavated or elevated, lined or unlined	Excavated with elevated walls, always lined
Inflow Energy Profile	Gravity-fed, may be cascading ponds: low energy use	Hybrid (gravity and pump-assisted): Moderate energy use	Pump dependent: high energy use
Water Availability	Seasonal: Up to 6 months	Up to 9 months	Year-round
Hydrological Impact	Minimal evaporation loss, may contribute to groundwater recharge	Downstream flow reduction in the catchment, groundwater loss to evaporation (if filled by wells)	High evaporation loss and groundwater depletion
Overall Impact	**Public Good**	**Equity Risk**	**Sustainability and Equity Risk**
Funding	**High Priority**	**Context Specific**	**Not Recommended**
Reference	Case Study 1	Case Study 2	Case Study 3

GUIDING PRINCIPLES FOR PUBLIC INVESTMENT IN FARM PONDS PROGRAMS

Drawing on lessons from a multi-state study of farm ponds across 15 states, illustrated through case studies, this brief argues for continued public investment in farm ponds. It emphasizes that such investments should differentiate by typology, context, function, and design. The brief synthesises the following guiding principles for public investment in farm ponds:

1. ***Prioritize Rainwater Harvesting Farm Ponds over Extractive Storage Ponds***
   a. Prioritize dugout, unlined farm ponds that naturally harvest farm runoff by gravity.
   b. Ponds with inlets/outlets that capture runoff from a larger catchment area through proximity to local streams may be designed as part of a system of cascading ponds.
   c. Avoid farm ponds with elevated/raised walls that require pumping to fill, as such designs can create perverse incentives for groundwater extraction, energy waste, and inequitable water access.
   d. Invest with caution in regions notified as unsafe by the Central Ground Water Board, targeting farmers without access to wells or borewells, and explicitly prohibiting farm pond filling with groundwater.
   e. Avoid farm ponds within canal command areas or near canals unless planned in coordination with the Water Users Association or the command authority using a water budget approach.
2. ***Targeting for Equitable Access***
   a. Prioritize ponds for protective irrigation by targeting farmers without access to irrigation to support rainfed crops.
   b. Prioritize subsidies for marginal and smallholder farmers, women farmers, and SC/ST farmers, especially in tribal and rainfed regions.
   c. Promote smaller-sized farm ponds aligned with landholding size and proportional to the catchment's potential and protective intent, rather than for storage.
   d. Promote farm ponds in regions with saline groundwater, where freshwater storage supports irrigation and drinking water.
3. ***Take a Systems View for Investment***
   a. Prioritize farm ponds as part of integrated watershed interventions rather than isolated structures.
      i. In the upstream/ridge regions, farm ponds are complemented by in-situ treatments (contour bunding, trenches, conservation tillage, etc.) to slow runoff, protect downstream areas, and act as recharge zones.
      ii. In midland regions, farm ponds for protective irrigation are prioritized, with inlets and outlets, and silt traps to manage flows and extend water availability.
      iii. In downstream regions, ponds are designed to prevent waterlogging and crop damage in the drainage line by equipping them with robust overflow management systems.
   b. In watersheds where many farm ponds and check dams already exist, additional farm pond construction should be contingent on the availability of surplus runoff even in poor rainfall years, which may be estimated by applying a water budget approach.
   c. Invest in farm ponds with due consideration to the hydrological setting, including recharge and discharge characteristics, so that pond siting, design, and use are aligned with the intended function.
   d. Farm pond investments should account for the full structural requirements of the system, including inlets, overflow arrangements, silt traps, side slopes, livestock access, and proper preparation of the water spread area.
   e. Promote resilience by integrating small-scale fisheries, horticulture, and livestock support, along with irrigation, into farm pond programs.

CASE STUDY 3: *Lined groundwater filled storage farm pond in Alwar*

Kherli Saiyyad village lies in the semi-arid plain of Alwar district, characterized by erratic monsoons (637 mm) and limited surface water, where agriculture is highly dependent on deep groundwater (water table >150 m) and is classified as 'over-exploited' by CGWB.

The farmer has around 11 acres of land, and after repeated borewell failures, the farmer opted for a farm pond under the Rajasthan state government scheme, with partial state and corporate subsidies. The pond is a dug-out, plastic-lined (22 x 25 x 3.2 m) pond that fills with surface runoff during the monsoon season and is topped up with groundwater from the borewell thereafter, providing water through much of the year. This requires dual pumping: from deep groundwater to the pond, and from the pond to the field. The integration of the pond into the farm system has led to favourable results at the individual level, such as increased yields across all crops and seasons, integration of horticulture, and reduced irrigation time per acre compared to direct irrigation from a low-yielding borewell. However, the evaporation loss from the pond is an average of 10 mm/day during the summer, amounting to a loss of about 5 lakh litres of pumped groundwater in four months alone. This practice of storing year-round pumped groundwater for water-intensive horticulture is increasing in the region. This shifts the structure from a protective runoff-harvesting pond to an extraction-oriented storage reservoir in an over-exploited aquifer setting, raising sustainability and equity concerns at scale.

Farm Pond Typology: *Lined dugout pond - filled with monsoon runoff – Groundwater top-up – dual pumping – intensification*
Recommendation for public funding: Prohibit public funding for groundwater-fed, dual-pumped, extraction-oriented storage ponds.

WAY FORWARD

Farm ponds are an integral part of India's rural landscape, playing a key role in adapting to and mitigating the impacts of climate change. The policy brief underscores the need for an investment approach that accounts for priorities, exclusions, and safeguards to maximize public good. A systems approach helps to ensure public investments strengthen water security, equity, and sustainability rather than becoming perverse incentives for water appropriation, unsustainable extraction, and inequity.


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