

Farm Ponds: A Lifeline for Rainfed FarmingA. S. Lodhi^{1*}, S. S. Chouhan² and Satish K Sharma³**Abstract: -**

Rainfed agriculture supports nearly half of India's cultivated land and provides livelihood to millions of farmers. However, crop productivity in these regions is highly dependent on the timely availability of rainfall. Erratic monsoons, prolonged dry spells, and climate change have increased the vulnerability of rainfed farming, often leading to crop failure and reduced farm income. Among various water conservation technologies, farm ponds have emerged as one of the most effective and economical solutions for harvesting rainwater and ensuring protective irrigation during critical crop growth stages. A farm pond stores excess rainwater and surface runoff, making it available when crops need it the most. Besides irrigation, farm ponds support livestock, fisheries, horticulture, groundwater recharge, and integrated farming systems. This article explains the concept, importance, design considerations, types, and components of farm ponds in a simple and practical manner, highlighting their role in improving water security and enhancing the resilience of rainfed agriculture.

Keywords: Farm pond, rainwater harvesting, rainfed farming, protective irrigation, climate resilience, water conservation, integrated farming.

Introduction:

Water is the most critical input for agriculture. While irrigation has transformed crop production in many regions, nearly **52–55% of India's net sown area** still depends primarily on rainfall. These rainfed regions

contribute significantly to the production of pulses, oilseeds, coarse cereals, cotton, and several horticultural crops. Despite their importance, farmers in these areas often face uncertainty due to uneven rainfall distribution, prolonged dry spells, and frequent droughts.

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India receives an average annual rainfall of about **1,170 mm**, but nearly 75–80% of it falls within a short period during the southwest monsoon. A large proportion of this rainwater flows away as surface runoff because of inadequate storage and poor water conservation practices. Consequently, water that could support crop production during dry periods is lost, while groundwater resources continue to decline due to overexploitation.

Climate change has further intensified these challenges by increasing rainfall variability. Farmers now experience delayed monsoons, short-duration high-intensity rainfall, and longer dry spells between rainfall events. Such uncertainties make rainfed agriculture increasingly risky and reduce crop productivity and farm income. To overcome these challenges, harvesting and storing rainwater at the farm level has become an essential strategy. Among the available water conservation structures, **farm ponds** are simple, effective, and affordable. They collect runoff generated during the rainy season and store it for later use, particularly for **protective irrigation** during critical crop growth stages.

Importance of Rainfed Agriculture in India

Rainfed agriculture occupies a central position in India's food and nutritional security. Although irrigated agriculture contributes significantly to total food grain production, rainfed regions remain

indispensable for cultivating several economically important crops. Major rainfed crops include: Pulses, Oilseeds, Millets, Sorghum, Maize, Cotton, Soybean, Groundnut, Horticultural crops. Millions of small and marginal farmers depend entirely on rainfall for crop production. Their livelihoods are closely linked to the performance of the monsoon.

What is a Farm Pond?

A **farm pond** is a small, engineered water storage structure constructed on or near agricultural land to collect and store rainwater, surface runoff, or excess irrigation water for future use. Farm ponds may be excavated below ground level, constructed by building embankments, or developed using a combination of excavation and embankment. Depending on soil type and water requirements, they may be lined with plastic geomembranes, compacted clay, concrete, or left unlined where seepage is beneficial for groundwater recharge. The primary objective of a farm pond is to store water during the rainy season and utilize it during dry periods for protective irrigation and other farm activities. Unlike large reservoirs, farm ponds are decentralized, relatively inexpensive, and can be constructed on individual farms. Their size varies according to rainfall, catchment area, land availability, soil type, and intended use.

Types of Farm Ponds

Farm ponds can be classified based on their method of construction, water source, and lining material.

- 1. Excavated Farm Pond:** This is the most common type of farm pond. Water is stored in an excavated pit below ground level. Excavated ponds are suitable for relatively flat land where sufficient soil depth is available.
- 2. Embankment Farm Pond:** In sloping areas, earthen embankments are constructed across natural drainage lines to impound runoff.
- 3. Excavated-Cum-Embankment Pond:** This type combines excavation with embankment construction to maximize storage while minimizing excavation costs.
- 4. Lined Farm Pond:** In permeable soils such as sandy or gravelly soils, ponds are lined with impermeable materials to reduce seepage losses. Common lining materials include: HDPE geomembrane, LDPE sheets, PVC liners, Bentonite clay, Cement concrete, Brick masonry.
-  Lined ponds are particularly useful in arid and semi-arid regions where water conservation is critical.
- 5. Unlined Farm Pond:** Where soils contain sufficient clay, ponds may be

left unlined. Controlled seepage from such ponds can contribute to groundwater recharge.

Role of Farm Ponds in Climate-Resilient Agriculture

Climate change has increased the frequency of droughts, erratic rainfall, and prolonged dry spells, making rainfed agriculture increasingly vulnerable. Farm ponds provide a practical adaptation strategy by capturing excess rainwater during the monsoon and making it available during periods of moisture stress. This stored water enables farmers to provide one or two lifesaving irrigations at critical crop growth stages such as flowering and grain filling, often preventing severe yield losses. Farm ponds also facilitate crop diversification, encourage horticulture and integrated farming, and reduce the risks associated with climate variability. By improving water availability at the farm level, they enhance resilience, stabilize crop production, and strengthen the livelihoods of farming communities.

Utilization of Stored Water

The stored rainwater can be used for multiple agricultural and domestic purposes.

- 1. Protective Irrigation:** Protective irrigation is the primary objective of most farm ponds. Even a single irrigation during flowering or grain

filling can significantly improve crop yield.

2. **Supplemental Irrigation:** Farm ponds provide additional irrigation whenever rainfall is insufficient. This stabilizes crop production and reduces the risk of crop failure.
3. **Horticulture:** Fruit orchards, vegetable crops, floriculture, and nurseries require regular watering. Farm ponds ensure a dependable water source for these high-value enterprises.
4. **Livestock:** Water stored in farm ponds can be used for cattle, buffaloes, goats, sheep, and poultry, improving livestock productivity and animal health.
5. **Fish Culture:** Many farmers integrate fish farming with farm ponds. Species such as rohu, catla, and mrigal can be cultured, generating additional income while utilizing stored water efficiently.
6. **Kitchen Gardens:** Farm families can use pond water to grow vegetables and fruits throughout the year, improving household nutrition and reducing food expenses.

Benefits of Farm Ponds: Farm ponds offer numerous advantages that extend beyond water storage.

1. **Improved Crop Productivity:** Availability of irrigation during critical crop growth stages reduces moisture

stress and increases crop yields. Farmers often report substantial improvements in the productivity of cereals, pulses, oilseeds, vegetables, and fruits.

2. **Increased Cropping Intensity:** Stored water enables farmers to cultivate an additional crop after the monsoon, increasing overall land productivity and annual farm income.
3. **Crop Diversification:** Reliable water availability encourages farmers to shift from low-value rainfed crops to high-value vegetables, fruits, spices, flowers, and seed production.
4. **Improved Water Use Efficiency:** Water stored in farm ponds can be applied through drip or sprinkler irrigation, minimizing conveyance and application losses while maximizing crop response.
5. **Groundwater Recharge:** In suitable soils, seepage from unlined ponds contributes to groundwater recharge, improving the availability of water in nearby wells.
6. **Soil Conservation:** Farm ponds intercept surface runoff, reducing soil erosion and preventing the loss of fertile topsoil and nutrients.
7. **Flood Mitigation:** By temporarily storing runoff, farm ponds reduce peak

runoff and help minimize localized flooding during heavy rainfall events.

- 8. Increased Farm Income:** Farm ponds support multiple enterprises such as fisheries, horticulture, livestock, and vegetable cultivation, providing diversified income sources and reducing financial risk.

Conclusion

Rainfed agriculture is increasingly vulnerable to climate change, erratic rainfall, and declining groundwater resources. Farm ponds offer a practical, affordable, and scientifically proven solution for improving on-farm water availability. By harvesting and storing rainwater, they provide protective irrigation during critical crop growth stages, stabilize crop production, and enhance farmers' resilience to drought. Beyond irrigation, farm ponds support horticulture, fisheries, livestock, agroforestry, and integrated farming systems, creating multiple income opportunities for rural households. They also contribute to groundwater recharge, soil conservation, biodiversity enhancement, and sustainable watershed management. The success of farm ponds depends not only on proper design and construction but also on regular maintenance, efficient water use, and integration with modern irrigation technologies. With continued support through government programmes, scientific guidance, and

community participation, farm ponds can play a transformative role in achieving water security and sustainable agricultural development. In the face of increasing climate uncertainty, every drop of rain harvested on the farm is an investment in the future. Farm ponds are not merely storage structures—they are strategic assets that strengthen livelihoods, improve productivity, and ensure the long-term sustainability of rainfed farming.

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