

Farm Pond Reservoir Lining For Agricultural Development In India A – Study

P. Thangaraj¹, Dr. P. Loganathan²

¹Ph.D, Research Scholar (F/T),
PG & Research Department of Economics,
Kandaswami Kandar's College Velur- Namakkal (Dt) Pin – 638182.

²Associate Professor & Head,
PG & Research Department of Economics,
Kandaswami Kandar's College, Velur – Namakkal (Dt) Pin – 638182.

ABSTRACT

To fulfill the demand of irrigation latent in agriculture as additional irrigation water administration play an important role, because rainfall in drought prone areas is highly erratic, storage must be an essential part of any rainwater harvesting system. It is therefore essential to harvest water from any water source e.g. rainfall, perennial source, roof water etc. in ponds and reservoirs for diverse domestic, agriculture and industrial purposes over a period of time-to stretch its usage to maximum. Farm ponds are manmade tanks constructed for holding water which could be used during scarce season to ensure life saving irrigation for the uninterrupted physiological activities of the crop. Water harvesting technologies in the form of farm ponds is addressed in this study. The main segment stored water in earthen tanks has been lost due to seepage. To avoid this reduce of stored water, ponds sealing/mechanically treating the ponds are necessary by installing lining of impervious material as plastic film lining along or in combination with conventional lining has proved to be an effective seepage proof in ponds and reservoirs but the majority effective and cost economic.

KEY WORDS: Farm Pond in India, Challenge faced by India, Benefit of lining farm pond India, Type of Farm Pond,

1. INTRODUCTION

Rain water harvesting is the collection and storage of rainfall runoff from any catchment or watershed, for subsequent use for irrigation or any other beneficial use. rainwater harvesting largely depends on quality and distribution of rainfall and will, therefore, be more successful in areas where rainfall is sufficient. besides, rainwater harvesting depends on several other factors including topography, soil type and slope, depth and vegetative cover in the catchment areas. rain water harvesting structures (rwhs), besides providing irrigation, can meet multiple needs of the society such as drinking and domestic water requirements, livestock, fish production etc. it is imperative that the rwhs should have sufficient catchment area and the capacity to achieve the purposes for which they are constructed.

The major works of RWHS adopted in the watershed are check dams, farm ponds, nala bunds, contour bunds, vegetative covers etc., which play major role in managing and conserving the soil and water resources. The farm ponds are water harvesting structures used for several purposes of farm need. Farm pond is used for storing the monsoon rainwater, which is used for irrigation. A farm pond has found significant in the rain fed cultivation. Since Rain Water Harvesting structures namely farm-ponds are expected to have an impact on cropping pattern, productivity, employment and income of the farmers.

2. OBJECTIVE OF THE STUDY

- The topography and inherent soil characteristics determine the need of restricted irrigation in the major parts of SSP command. Therefore, farmers are guided to adopt those crops which require less water.
- Empowering the farmers to adopt irrigated agricultural practices in place of traditional rain fed agriculture.
- Transferring the location specific technology/ research recommendations of SAUs to the grass root level farmers.

SITUATION OF FARM POND IN INDIA

1. In Jharkhand and West Bengal, Tamil Nadu farm ponds helped in superior water control through the harvesting not just of rainfall but also of surface run-off and subsurface flows. Some of them contribute to ground water replenishment.
2. They also helped in providing supplemental irrigation in the kharif season and enhanced irrigation coverage in rabi crop.
3. The yield of paddy, which is the most important crop in kharif, was stabilized contributing to greater food security.
4. The area used to cultivate vegetables and other commercial crops also increased.
5. The ponds were also a financially viable proposition, with a fairly high Internal Rate of Return, of about 19%, over 15 years.
6. Farm ponds, retaining water for 8-10 months of the year, enhanced cropping intensity and crop diversification within and across seasons.

CHALLENGES FACED BY FARM PONDS IN INDIA

1. In parts of peninsular India, only some farmers are benefiting from farm pond at an individual level, but not contributing to water conservation and recharge.
2. They are being used as intermediate storage points, accelerating groundwater depletion and increasing evaporation losses as the groundwater is brought to the surface and stored in relatively shallow structures.
3. Most of farm ponds under a flagship programme of Maharashtra that aims to dig over one lakh structures by offering a subsidy are being constructed without inlet and outlet provisions and their walls are raised above the ground level by only a few feet.
4. They cannot arrest the excess run-off as there is no inlet, and therefore cannot be used effectively for rainwater harvesting, further, farmers line them at the bottom with plastic, restricting seepage and converting the ponds into intermediate storage points.
5. The usual practice is to lift water from a dug well and/or a borewell, store it in the pond and then draw it once again to irrigate the fields, often using micro-irrigation, such farm ponds have an adverse impact on the water tables and accelerate water loss.
6. This practice intensifies competition for extraction of groundwater from the aquifer, which is a common pool resource.
7. In the irrigation area, farmers fill up their farm ponds first when the canal is in rotation.
8. This can impede circulation of water, as during canal rotation, the aquifer will get recharged because of the return flow of water coming from the irrigated fields. But if canals fill up the farm ponds first, it restricts their benefits only to the pond owners and in the long term, reduces the overall return flow at the system level.

BENEFITS OF FARM LINING POND

Historically ponds have been implemented for practical reasons such as irrigation, drinking water, livestock watering, erosion control and fire preparedness. More recently ponds are being installed for recreational activities like swimming and fishing as well as alternative agricultural practices like fish farming. There are also several ways that ponds contribute to conservation efforts which can be a primary reason for adding one to your property or simply a secondary benefit. The top five benefits to installing ponds on rural properties are as follows:

EROSION PREVENTION

When placed in the right location, ponds can trap or slow water flow on your property reducing the displacement of sediment (erosion). Ponds are especially useful in hilly areas to prevent gully formation. Erosion is further limited by adding vegetation along the banks which acts as an added barrier for catching sediment.

NUTRIENT RECYCLING

Along with sediment, ponds trap nutrients like phosphorous and nitrogen which are commonly found in agricultural areas as either soil additives or as a byproduct of livestock waste. These nutrients pose a risk to waterways since agricultural runoff is known to cause eutrophication, a condition where excess nutrients leads to aquatic plant overgrowth and eventual lack of oxygen in the water. Ponds trap these excess nutrients and prevent them from contaminating nearby waterways. The vegetation surrounding the pond acts as a natural filter by capturing and recycling the nutrients which improves the quality of the water remaining in the pond.

WILDLIFE

Shallow ponds without fish are prime habitat for amphibians such as frogs and salamanders, especially for breeding. If the pond is linked with a wooded area or has dense surrounding vegetation, it may also serve as preferable habitat for reptiles like turtles and snakes. Various species of waterfowl regularly use ponds for breeding, feeding, brood-rearing, and resting during migration which can be further encouraged by adding islands to your pond. The benefits of wildlife go beyond aesthetics and include the control of pest animals like mosquitoes and rodents.

FIRE PREPAREDNESS

When properly planned, ponds are capable of providing the quantity of water needed to suppress large fires involving rural buildings. The pond must be in a strategic location in proximity to the buildings, contain at least 8,000 gallons of water for a 2,000 square foot house, and an adjacent fire hydrant accessible to fire trucks.

PROFIT

Ponds present a number of financial opportunities in rural areas either independently or in support of other profitable practices. Fish-farming and other aquaculture practices such as rearing shrimp, crawfish, and plants are some examples of alternative agriculture ventures.

There's also the potential for non-agriculture related opportunities like recreation and leisure activities.

PLANNING OF FARM POND

Farm Pond is a dug out structure with definite shape and size having proper inlet and outlet structures for collecting the surface runoff flowing from the farm area. It is one of the most important rain water harvesting structures constructed at the lowest portion of the farm area. The stored water must be used for irrigation only. Inadvertently, some people use the farm ponds as ground water recharge structures which is not correct as per the definition. For recharging the ground water, the structures require high capacity and are generally located in the soils having high infiltration rates and are called percolation tanks. Percolation tank is meant for only recharge purpose and not for irrigation. Such structures conceptually differ in their hydrology and physical location. A farm pond must be located within a farm drawing the maximum runoff possible in a given rainfall event. A percolation pond can be dug out in any area where the land is not utilized for agriculture.

Farm ponds have a significant role in rainfed regions where annual rainfall is more than or equal to 500 mm. If average annual rainfall (AAR) varies between 500 to 750 mm, the farm ponds with capacity of 250 to 500 m³ can be constructed. If AAR is more than 750 mm, the farm ponds with capacity more than 500 m³ can be planned particularly in black soil regions without lining. It was observed from the field experience and if present rainfall pattern changes; atleast two to three rainfall events producing considerable runoff are possible in a season making farm ponds an attractive proposition.

In high rainfall semi arid regions, these structures can be made as multiple use enterprises like protective/supplemental irrigation, fish culture or duck farming integrated with poultry. These structures provide localised water and food security by enhancing the crop productivity and climate resilience. Moreover, farm ponds conserve the natural resources like soil and nutrients apart from water and acts as flood control structure by reducing peak flows in the watersheds or given area of catchment.

TYPES OF FARM POND

Depending on the source of water and their location with respect to the land surface, farm ponds are grouped into four types. These are

- Dugout ponds
- Surface ponds
- Spring or Creek fed ponds and
- Off-stream storage ponds.

DUGOUT POND

Dugout Ponds are excavated at the site and the soil obtained by excavation is formed as embankment around the pond. The pond could either be fed by surface runoff or groundwater wherever aquifers are available. In case of dugout ponds, if the stored water is to be used for irrigation, the water has to be pumped out.

SURFACE POND

Surface water ponds are the most common type of farm ponds. These are partly excavated and an embankment is constructed to retain the water. Generally a site which has a depression already is chosen for this pond construction.

SPRING OR CREEK FED POND

Spring or Creek fed ponds are those where a spring or a creek is the source of water supply to the pond. Construction of these ponds, therefore, depends upon the availability of natural springs or creeks.

OFF-STREAM STORAGE POND

Off-stream storage ponds are constructed by the side of streams which flow only seasonally. The idea is to store the water obtained from the seasonal flow in the streams. Suitable arrangements need to be made for conveying the water from the stream to the storage ponds.

MAINTENANCE OF FARM PONDS

- Desiltation
- Maintenance of inlet and outlet
- Maintenance of shoulder bunds
- Clearing silt trap
- Fencing of the farm pond
- Control of water pollution

SITE SELECTION CRITERIA

- Selected site should have impermeable underground strata up to a depth of around 3m.
- Site having black cotton soil with more amount of clay is suitable for construction of farm pond.
- Avoid pours, sandy and saline land for construction of farm pond.
- Farm Pond should be constructed at such places where minimum average rainfall is 700 mm/yr or more.
- Generally slope of land should be 3%.
- To conserve minimum 1000 m³ of water area of catchment, topography, geography, rainfall should be taken into consideration.
- While selecting site such place is selected where land should not become saline.
- Minimum Size of farm pond should be 20m x 20m x 3m.

POND LINING

Pond sealing or lining is the process of installing a fixed lining of impervious material, or mechanically treating the soil in a pond to impede or prevent water loss. Ponds can serve as storm water management detention facilities, add visual aesthetics, create an environment for wildlife, and serve as golf course hazards.

These reservoirs and ponds are located in a variety of soil types which –exhibit a wide range of seepage characteristics. Because of seepage, the water level of the reservoirs and tanks depletes rapidly seepage losses not only mean loss of useful water but also lead to other problems such as breach in the embankment.

THE LINING FILM

Lining film is a revolutionary concept in water management which dramatically reduces seepage loss at a reasonable cost. Lining film is tough, multilayer, wide width, black, low density polyethylene (LDPE) film by the latest Co-extrusion blown film technique it is available in various widths (4 to 10 metres) and thicknesses (100 to 250 microns).

3. CONCLUSION

Farm pond is an option for rainwater harvesting and to provide life-saving irrigation to standing crops when they are exposed to mid-term/terminal drought and also for pre-sowing irrigation in post-rainy crops in rain fed areas. Ponds may be lined in light textured soils, while unlined farm ponds in soils having higher seepage can be utilized to recharge. In a watershed, a series of ponds may be constructed in farm fields and across the water courses/ first- and second-order drainage channels to intercept run-off, reduce peak flow, control erosion and store water for supplemental irrigation and to recharge groundwater. Selection of crops and cropping systems based on profitability and irrigation requirement is needed to efficiently utilize the harvested water. Modern methods of irrigation like drip and sprinklers may be adopted for increasing water-use efficiency. Insufficient awareness among farmers, small farm holdings, relatively high initial investments, evaporation and seepage loss, and moderate benefits during ‘normal’ years are some of the constraints that impede adoption of farm ponds on a large scale in rain fed ecosystems of India.

4. REFERENCE

- [1] K. S. Reddy, M. Kumar, K.V. Rao, V. Maruthi, B.M.K. Reddy, B. Umesh, B. R. Ganesh, K. S. Reddy, and B. Venkateswarlu, Farm Ponds: A Climate Resilient Technology for Rainfed Agriculture; Planning, Design and Construction. Central Research Institute for Dryland Agriculture, Santoshnagar, Saidabad, Hyderabad-500059, Andhra Pradesh, India. 60p, 2012.
- [2] Guideli47U=e Booklet of Agricultural Department, Government of Maharashtra (2003).
- [3] www.indiawaterportal.org
- [4] R.N. Adhikari, P.K. Mishra, and W. Muralidhar, Dugout farm pond- A potential source of water harvesting in deep black soils in Deccan plateau region. Rainwater harvesting and reuse through farm ponds”, Proceedings of national workshop cum brain storming. CRIDA. Hyd, 2009.