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# Qualitative Evaluation of Farm Pond of Mangalwedha Tehsil

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## Abstract

A qualitative evaluation of farm ponds was conducted in the Mangalwedha watershed, Solapur district, during the year 2020–21. The study involved the assessment of 24 farm ponds to understand the changes in their physical dimensions and the impact of silt deposition. Measurements of the ponds were recorded both pre- and post-monsoon, and the amount of silt accumulated in each pond was estimated. The investigation revealed that while the top and bottom widths and lengths of the ponds remained largely unchanged, a significant reduction in depth occurred due to silt deposition. The outlet structures showed altered dimensions—particularly width and depth—caused by heavy outflows, while the inlet sections were affected by high-velocity inflows and unstable soil conditions. Overall, silt accumulation led to a decrease in both depth and water-holding capacity of the farm ponds, highlighting the need for regular maintenance and desilting practices.

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Farm Pond, Silt Deposition, Water Storage Capacity, Mangalwedha Watershed.

## Introduction

### Farm Pond

Farm ponds are small tank or reservoir like constructions, are constructed for the purpose of storing the surface runoff, generated from the catchment area. The farm ponds are water harvesting structures, solve several purposes of farm needs such as supply of the water for irrigation, cattle feed, fish production etc.

Farm ponds also play a key role in flood control by constructing them in large numbers in the area. In addition, the farm ponds are also used for storing the monsoon water, which is used for irrigation of crops, and several other purposes, according to the need. A farm pond also has significant role in rain fed farming cultivation.

## Types of Farm Pond

### Embankment type farm ponds

These are generally constructed across the stream or water course. Such ponds consist of an earthen dam, which dimensions are evaluated on the basis of volume of water to be stored etc. These farm ponds are usually built in that area where land slope ranges from gentle to moderately steep and also where stream valleys are sufficiently depressed to permit a maximum storage volume with least earthwork.

### Dug out type farm ponds

These are constructed by excavating the soil from the ground, relatively in level areas. The depth of pond is decided on the basis of its desired capacity which is

obtained almost by excavation. The use of this type of pond is suitable, particularly where a small supply of water is required.

### Surface water ponds

These 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 ponds

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 ponds

These 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.

Agriculture is the mainstay of the Indian economy. Agriculture and allied sector contribute nearly 22 per cent of gross domestic product (GDP) while about 65.70 per cent of the population is dependent on agriculture output. India has 16 per cent of world population, 2.41 per cent of the world land and 4 per cent of the world water resource. Recent World Bank study indicated that per capita availability of water, which was in the order of $5000m^3$ per year at the time of independence, has drastically come down to $2000m^3$ per year. With continuous increase in population, the demand of land and water resources has been increasing for enhancing agricultural production. Contribution of ground water is so significant that more than 70 per cent population uses ground water for its domestic needs and more than half of irrigation needs are met form it (Hadda and Yadav, 2009). The average annual rainfall of India is about 119.4 cm considered over the geographical area of 328 M ha, amounts to 392 M ha-m surface water. But there is spatial and temporal variation in the rainfall 150 M ha-m flows as surface and subsurface runoff, and is not useful for the type of production.

Our natural resources soil, water, air and sunlight need attention from everyone. Soil and water resources on which we have some controls are being exploited because of increased population and careless attitude of human being (Kanetkar and Kulkarni, 1999). Farming population depending on agriculture land for livelihood and so there is a need to conserve the soil and water. Farm pond is a large hole dug out in the earth, usually square or rectangular in shape, which harvests rain water and stores it for future use. it has an inlet to regulate inflow and an outlet to discharge excess water (Gupta, 1974).

The semi-arid black soil region in the dry land tract receives low rainfall of about 500-700 mm, spread over a relatively longer period of seven months from May to November with an uneven, unpredictable and erratic distribution both in terms of amount and intensity. In spite of low rainfall, a few intense showers are common, which account for 20-30% of annual rainfall. Rain fed agriculture constitutes about 55% of net sown area in the country.

Water harvesting becomes all the more relevant now in the view of the recent increase in extreme events, wherein heavy rainfall is occurring in few days followed by long dry spells. Farm pond technology is well known in the country, its adaptation has been quite low due to number of constraints like high initial cost, short life of the lining materials, lack of suitable lifting system and above all low awareness among farmers about its utility and cost benefit analysis (Gajri, 1982).

There is also lack of authentic literature on design and performance of farm ponds in different agro ecologic zones and soil types. Farm pond technology has very good potential for implementation in different schemes of state and central government, several programs of the government of India like RADP (Rain Fed Area Development Program), NHM, MGNREGA and IWMP have farm pond as one of the important components. The field staffs involved in the implementation of such schemes often faces difficulties in designing structure at a given site considering the rainfall, slope and soil characteristics.

Farm pond technology would help the farmer to enhance the productivity of rain fed areas in the region (Deshmukh, 2017). Farm ponds are undertaken in various states of India along with Maharashtra. The main aim of construction farm pond is to make the availability of protective irrigation at critical growth stages of crop. The farm pond has a great impact on changing the crop productivity as well as cropping intensity. Farm ponds are expected to have an impact on cropping pattern,

productivity, employment and income of the farmers; it also helps in changing the economic situation of farmers. The irrigated area also increases due to the construction of farm pond. Farm pond as water harvesting structure is used for several purposes of farm need. Farm pond is used for storing the monsoon rainwater, which is used for irrigation.

Construction of water harvesting structures led to availability of water for irrigation, for livestock, drinking purposes and household purposes, which contribute to an increase in crop production and ensured food security (Kunnal *et al.*, 2007; Wan Chou, 2014). Farm pond even though limited in terms of size and capacity performs very significant roles in various aspects according to placement in the watershed context.

The farm pond impact indicates not only increasing crop yields in both the rainy and the dry seasons, but also reduction of downstream load. Farm pond provides additional employment among farmers. Harvesting every drop of rain water in-situ is very essential for promoting sustainable agriculture in semi-arid regions. Water harvesting is the activity of direct collection of rainwater.

Ponds can provide the following benefits in addition to the provision of irrigation water. Ponds are commonly used on ranches for stock watering. Cattle and horses require 45-57 liter of water per day. Rather than allow the stock to drink directly from the pond, a more environmentally friendly innovation is to fence the pond and use solar pumps to move water into troughs for the cattle.

The Ponds constructed primarily for fish production, typically at leasa half-acre in size and a minimum design depth of 2.44 m can yield up to 45-136 kg of fish per year. Ponds can assist in flood control by capturing and slowing the flow of water through a watershed. Particularly as climate change leads to greater storm flows, a distributed network of ponds could play an important role in attenuating peak flows and reducing flooding. Ponds help recharge groundwater.

Whether filled with water diverted from a stream or with tail water from irrigation, clay-lined ponds seep water into the ground at highly variable rates. Ponds at least one acre-foot in size can serve as water sources for fire protection if they are sited in proximity to structures. Ponds can be used to settle and filter farm runoff, capturing soil that can be returned to fields and filtering pollutants and particulates that would otherwise negatively impact the broader ecosystem.

Water harvesting like many techniques in use today is not new. Maharashtra government has launched the project "Jalyukt Shivar Abhiyan" in a bid to make Maharashtra a drought-free state by 2020.

The project involves deepening and widening of streams, construction of cement and earthen stop dams, work on nalas and digging of farm ponds. Solapur district was targeted construction of 3000 farm ponds but it was possible only to construct 1486 farm ponds.

## Materials and Methods

Evaluation study of farm pond was conducted in Mangalwedha tehsil. 42 farm ponds are constructed in Mangalwedha tehsil by state department of Agriculture Solapur. This farm ponds were evaluated their qualitative performance.

## Description of Watershed

Mangalwedha watershed is a micro watershed as shown in fig.1 and 2. The watershed is located at 17.510986N latitude and 75. 451950E.longitude. This comes under Mangalwedha tehsil of Solapur district in Maharashtra state. The watershed falls in semiarid tropics. The south west monsoon is the measure source of a rainfall during June to September. The total geographical area of Mangalwedha watershed is 777ha.

## Location of farm pond

## Soil

The upper reaches Mangalwedha watershed is having sloping land. The soils are shallow in depth and sandy soil. In the upper reaches soils are unstable in nature. The top soil is undrained by soft murum. The soil of cultivated area is medium deep with medium clay content. In general, the soil of Mangalwedha watershed various from sandy soil to medium black soils. The soil at the location of the farm pond is black loamy soil.

The farmers of Mangalwedha watershed have constructed the fourty two farm ponds in their fields during the year 2020 before June. One of the farm pond constructed in the field of Mahesh Babasaheb Ingole.

## Observation

Following observation of a farm pond were recorded qualitative performance of a farm pond.

1) Designed dimensions of farm pond

The dimensions of the farm pond such as length, width and depth of a farm pond were recorded before monsoon season. Considering the soil types, side slopes was assumed 1:1 for sandy/soft murum soil, The designed dimension at the bottom of the farm pond were determined.

2) The inlet and outlet dimensions such as width, depth and length were measured before monsoon season.

3) Existing dimension of a farm pond, inlet and outlet dimensions also measured after post monsoon. The observation and location of farm pond also recorded. Inlet and outlet dimensions also measured after post monsoon. The designed and existing capacity of a farm pond also determined by using following prismodial formula.

$$V = \frac{(A + 4B + C)}{6} \times D$$

Where,

A = Area of excavation at the ground surface ($m^2$)

B = Area of excavation at mid depth point ($m^2$)

C = Area of excavation at bottom of pond ($m^2$)

D = Average depth of the pond (m)

V = Volume of the excavation

We have,

A=25 x 20=500 $m^2$

B=23 x 17=391 $m^2$

C=19 x 14=266 $m^2$

D=3 m

$$V = \frac{(400+4x391+266)}{6} \times 3$$

V= 1165 $m^3$

## Quantity of silt deposited

The area of silt deposited and depth of silt deposited in farm pond was measured and volume of silt deposited in farm pond was estimated.

## Location of the farm pond

The location of farm pond was studied and it was compared with the criteria suggested for site selection of farm pond.

## Results and Discussion

The present investigation was carried out to study the qualitative evaluation of the farm ponds constructed in Mangalwedha tehsil. The dimension of farm ponds such as top width and top length, bottom width and bottom length, depth of farm pond measured.

Similarly, the dimension of the farm pond embankment such as top width, bottom width and height of embankment was measured. The size of inlet and outlet of the farm pond were also measured.

The existing dimensions of farm pond were compared with designed dimensions. The silt deposited in each farm pond was determined. The result of present investigation is discussed and presented under following subheads.

## Qualitative Evaluation of Farm Pond

It is observed that designed dimension was not as per the standard dimensions specified.

## Existing dimensions of farm pond (Pre monsoon-2020)

The dimensions of the farm ponds were measured before the onset of a monsoon and presented in table no.2

From table no.2, It is revealed that the dimensions of a farm are not same. Except depth of farm pond, other dimensions such as top width and length and bottom width and length were different depending upon the soil strata and side slope. The farm pond with dimensions 25x20 m and side slope 1:1 was having capacity 1165 $m^3$.

## Existing dimensions of the farm pond (Post monsoon – 2020)

The dimension of the inlet of farm pond were measured after monsoon season and presented in table 3.

### Dimensions of inlet and outlet (pre monsoon and post monsoon-2020)

### Inlet size of farm pond (pre monsoon)

The inlet size of farm pond, the width, depth and length of inlet was measured and presented table no.4.

The depth inlet of farm pond was same i.e. 0.50 for the pond. It is also observed that the inlet was provided at proper locations.

### Inlet size of a farm pond (Post monsoon)

The dimension of the inlet farm pond were measured after monsoon season and presented in table no.5.

The dimensions of inlet of farm pond recorded after monsoon found to be changed. The width and depth of inlet were changed. The scouring of the soil at the inlet might have occurred due to high velocity of incoming runoff flow into the farm pond, though the stone pitching was provided, Inlet sizes changed due to high velocity of inflow runoff and unstable soil.

### Outlet size of farm pond (Pre monsoon)

The dimensions of the outlet of farm pond before monsoon were measured and presented in table no.6.

It seen from table no.6 that the dimensions of an outlet such as width and length were not same for all farm ponds. However, the depth outlet was same for all farm ponds. The outlet selection of the farm pond was provided stone pitching to prevent the scouring. It is also observed that outlet was provided at a proper location.

### Outlet size of farm pond (Post monsoon)

The dimension of the outlet after monsoon are presented in table 7.

### Measurement of silt deposition of farm pond

It seen from the table 8. The dimensions of outlet such as width and depth changed after monsoon. The width and depth of outlet increased due to heavy outflow from pond and insufficient hydraulic capacity, improper pitching and unstable soil. The width of outlet increased in the range of 1.5 to 4m and depth increased in the range of 0.50 to 2.2m.

### Criteria for site selection

Some important features for site selection of a farm pond are given below:

1. Farm and economical point of view, a pond should be located at that site were the largest storage volume can be obtained with least amount of earth work.
2. If ponds are constructed for the purpose of livestock storage, then they should be formed at as such as distance, so that the transportation distance of the water will not be more than one-quarter mile in a rough area.
3. The site should be such that, water can be conveyed for various uses, such as for irrigation or a fire protection very easily.
4. Pond to be used for fishing other farms of a recreation, should be readily accessible by transportation facility.
5. Thus, pond site should be such that, The drainage farmsteads, feeding lots, corrals, sewage lines, minus dumbs and other similar things should not there.
6. The site should also not be selected, for pond construction, were sudden release of water due to failure of dam is suspected, because this type of happening can result to loss of human life, injury to the person or livestock, damaging of residence or industrial building, rail roads or highways interruption s in use of a service of a public utilities.
7. The site, where low hanging power lines are present in the area, should be avoided for pond construction because they create the problem for use of farm pond.
8. For selecting the pond site, A check should also be made to ensure that there is no buried pipeline or cables at the construction site.
9. Where use of such a site is essential the land owners must be connected before starting the construction work.

The location of farm pond was studied. It is observed that the location of farm pond fulfills to the criteria suggested for the site selection which is at the lowest point of farm.

**Table.1** The standard dimension of the farm pond applicable for subsidy in as under

| Sr. No | Farm pond size (m) |
|---|---|
| **1** | 25X20X3 |

**Table.2** Existing dimensions of farm pond (Pre monsoon)

| Farm pond No. | Top dimensions C/S area ($m^2$) (length x width) | Bottom dimensions C/S area ($m^2$) (length x width) | Depth (m) | Side Slope | Capacity ($m^3$) |
|---|---|---|---|---|---|
| **1** | 25x20 | 19x14 | 3 | 1:1 | 1165 |

**Table.3** Existing dimensions of farm pond (Post Monsoon)

| Farm pond No. | Top dimensions C/S area ($m^2$) (length x width) | Bottom dimensions C/S area ($m^2$) (length x width) | Depth (m) | Side Slope | Capacity ($m^3$) |
|---|---|---|---|---|---|
| **1** | 25 x 20 | 19 x 14 | 2.9 | 1:1 | 1126.16 |

**Table.4** Farm Pond dimensions

| Farm pond no. | Width of inlet(m) | Depth of inlet (m) | Length of inlet (m) | Remark |
|---|---|---|---|---|
| **1** | 2 | 0.50 | 11 | Non pitching |

**Table.5** Inlet size of farm pond (Post monsoon)

| Farm pond no. | Width of inlet (m) | Depth of inlet (m) | Length of inlet (m) |
|---|---|---|---|
| **1** | 2.3 | 1 | 11 |

**Table.6** Outlet sizes of farm pond (Pre monsoon)

| Farm pond no. | Width of outlet (m) | Depth of outlet (m) | Length of outlet (m) |
|---|---|---|---|
| **1** | 2.50 | 0.50 | 10 |

**Table.7** Outlet size of farm pond

| Farm pond no. | Width of outlet (m) | Depth of Outlet(m) | Length of outlet (m) | Remark |
|---|---|---|---|---|
| **1** | 3 | 1 | 10 | Non pitching |

**Table.8** Measurement of silt deposition

| Farm pond no. | Bottom dimension C/S area(LxW)($m^2$) | Depth of silt deposited(m) | Volume of silt deposited($m^2$) | Weight of silt (tone) |
|---|---|---|---|---|
| **1** | 19 x 14 | 0.1 | 26.6 | 35.91 |

**Figure.1** Location details of selected farm pond in Mangalwedha Tehsil

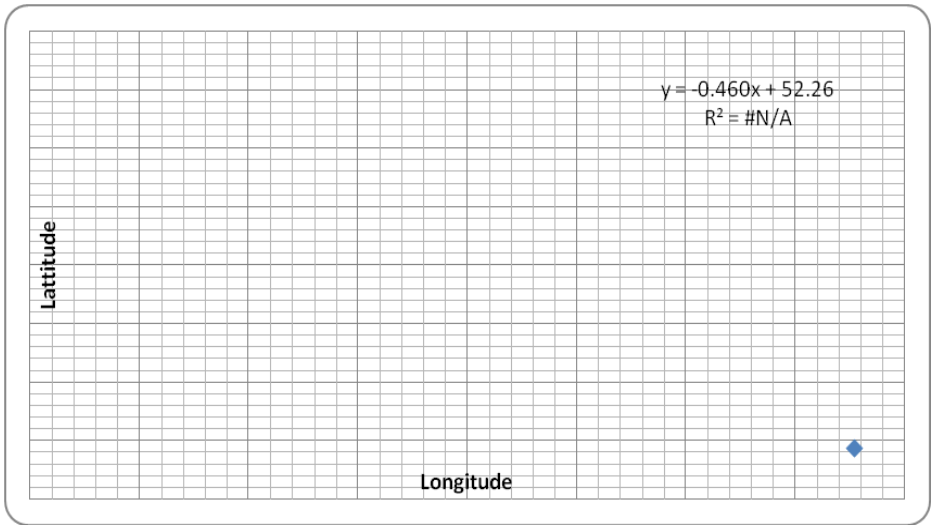


**Figure.2** Location of the farm pond

## Summary and Conclusion

The study of qualitative evaluation of farm pond was carried out in Mangalwedha (Solapur Dist.) watershed during 2020-21. Twenty-four farm ponds were evaluated. The existing dimensions of the farm pond (pre monsoon and post monsoon) were recorded and completed. The silt deposited in the farm pond was measured and quantity of silt deposited in each farm pond was evaluated.

Following conclusions were drawn from the present investigation.

1. The dimension of the farm pond such as top width and top length, bottom width and bottom length remain unchanged. However, the depth of farm pond reduced due to silt deposition.
2. The dimension of outlet width and depth changed due to heavy outflow from farm pond.
3. Width and depth of inlet changed after monsoon season due to high velocity of inflow and unstable soil.
4. Silt deposition decreased the depth and capacity of farm pond.

## References

Deshmukh JM. (2017). LDPE film lined conveyance channel flow irrigation system. Indian Journal of Soil Conservation 17 (2) 18-28.

Gajri PR, HN Verma and SS Prihar (1982). Rain water harvesting and recycling of maximization of crop production.

Gupta K and VV Dhruva (1974). Design consideration for dual purpose ponds. Soil Conservation Digest 2 (1): 1-7.

Hadda and Yadav (2009). Construction and measurement of farm pond. Journal of Agricultural Engineering 26: 63-64.

Kanetkar TP. and Kulkarni SV (1999). Surveying and leveling Pune Vidyarahi Grih Prakashan Pune: 471-472.

Kunnal (2007). Computing and capacity of dugout ponds. Journal Agricultural Engineering 32: 32-33.

Wen Wen Chou (2014). An evaluation of supplemental irrigation through farm ponds on dryland. Indian Journal of Soil Conservation 15 (1): 1-6.

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