Rain Water Harvesting Through Tanka in Western Rajasthan

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Abstract- *In five elements of nature, water is the most important natural element supporting life on the earth. The earth is the 'Water Planet` because oceans cover 71 % of its surface. The total quantity of water on our planet is fixed and its distribution is highly uneven. Approximate 95 % of the total water present is chemically bound into rocks and does not cycle. Of the remainder, about 97.515 per cent constitutes the oceans, about 2.154 per cent exists as ice in the polar caps and permanent glaciers and the rest is fresh water present in the form of atmospheric water vapour, groundwater and inland surface water. Thus, less than one per cent of the total freshwater participates in the hydrological cycle. Rajasthan is India's largest state by area 3, 42,239 square kilometers and located on the north western side of the India and 65% area of Thar Desert. It has a total population of 68548437 and a literacy rate of 67.06% in which 80.51% male and 52.66% female according the Census of 2011. Rajasthan has the country's 10 per cent land mass but only 1.1 per cent surface water making it almost completely dependent on ground water which is fast depleting. What's worse only 10 per cent of wells have water that is safe for drinking and 88 percent of Rajasthan water is saline, 55 per cent has very high fluoride. The Thar Desert is the most densely populated desert in the world, with a population density of 85 people per km^2 versus 9 in other deserts. When the world population increases, the demand increases for quality drinking water. Surface and groundwater resources are being utilized faster than they can be recharged. Rainwater harvesting is an old practice that is being adopted by many nations as a viable decentralized water source.*

Rainwater harvesting and storage in an underground cistern locally known as Tanka is an age old common practice of western Rajasthan. Various types of tanka from rectangular to circular in shape and capacity ranging from as small as 1000 liters to 5,00,000 liters are prevalent in this region. The availability of water in this Tanka was usually round the year for drinking purposes for the whole family. The traditional construction of tanka varies from simple mud plaster to lime mortar or cement mortar, however wide variations have been observed.

This paper briefly presents the traditional and modern methods of water harvesting systems and details description of water Tanka which is widely used in Thar Desert of Rajasthan in India. The design of 50,000 litres masonry Tanka, their construction and repairs have also studied in this research paper.

Key Words: Rainwater Harvesting, Water Conservation, Tanka, Rajasthan, Literature Review.

1. INTRODUCTION

Rainwater harvesting is most suitable where Groundwater is scarce, Groundwater is contaminated, Terrain is rugged or mountainous, seismic and flooding events are common. The aquifer is at risk of saltwater intrusion, population density is low, electricity and water prices are rising, water is too hard or mineral laden, consumers must restrict salt and chlorine intake, where utility service is unreliable and conservation is an objective. Water conservation and harvesting have been practiced in India and other parts of world. Rajasthan is famous for its traditional water conservation and harvesting practices in Kunds, Pokhar, Talab, Johad, Khet Talab, Nadi, Khadins, Anicuts, Bavadi and Bandha. Madhya Pradesh the Pat Bandhna is an age old practice adopted by tribal families. Chandela tanks are good example of water conservation and harvesting, constructed by the Chandelas rulers. The dominant structure was the johad, a crescent shaped dam of earth and rocks, built to intercept rainfall runoff. A johad served two functions. On the surface, it held water for livestock. But like an iceberg, its most important parts were below the surface. By holding water in place, it allowed the liquid to percolate down through the soil. It recharged the aquifer below, as far as a kilometre away. Stored underground, the water could not be lost to evaporation.

Water is very essential for human life. Good quality potable water is a global issue, particularly in the developing world. With rapid growing population and improving living standards, the pressure on available water resources is increasing and per

capita availability of water resources is reducing day by day. The per capita availability of water in India has dropped from 5300 cum in 1955 to 2200 cum in year 2000 compared to7420 cum in world and 3250 cum Asian average.
The overall national availability of water may not pose a problem in the near future, but there would be a severe shortage of water in many regions of India particularly in the state like Rajasthan. Rajasthan is the driest state in term of availability of water resources. The annual per capita availability of water in the state a much below threshold value of 1700 m considered for water stress condition. The annual rainfall are varies significantly. There is a very rapid and marked decrease in rainfall in west of the Aravalli range, making Western Rajasthan, the most arid part of India. The average annual rainfall of he western arid region is 317 mm and that of rest of eastern Rajasthan is 680 mm with overall average rainfall of 554 mm for the state. The rainfall is highly variable at different places and it is most erratic in the western half with frequent spells of drought. The coefficient of variation of rainfall varies between 45 to 56%. Surface water resources in arid part of Rajasthan are very poor and majority of the population depends on ground water extraction to meet their essential water requirements. The source of drinking municipal wholesome water supply in most parts of the arid Rajasthan is mostly groundwater or bore hole based. With frequent droughts and chronic water shortages in many areas, most people pay an increasingly high price for water and for the lack of water. The poor, specially women and children, usually pay the highest price for small amounts of water. They also expend more in calories carrying water from distant sources, suffer more in impaired health from contaminated or insufficient water, and also lose more in diminished livelihoods. In the absence of adequate surface and groundwater resources, rainwater lays an important role in the survival and livelihood in arid regions. If rainwater is appropriately harvested, it can be a reliable source of portable water for domestic purposes. Rainwater harvesting is an ancient practice and has been practiced for more than 4000 years in many parts of the world. Rainwater harvesting is collection and storage of rain from runoff areas such as roofs and other surfaces is has necessary in areas lacking and kind of conventional, centralized government supply system, and also good quality fresh surface water or ground water is lacking. If collection and storage are designed carefully, it is possible for a family to live for a year for a year in area with rainfall as little as 100 mm per year.

Table-1: District/ Region wise Area of Thar Desert

Sl. No.	District / Region	Area in Km^2	Percent Area of Thar Desert
1.	Jaisalmer	38401	32
2.	Barmer	28387	24
3.	Bikaner	30248	25
4.	Jodhpur	22850	19
Thar Desert of Rajasthan		**119886**	**100**

2. LITERATURE REVIEW OF RAIN WATER HARVESTING

Harvested rainwater can be stored in any structures on the surface or below the surface. Traditionally, people in the region have been are known to harvest rainwater and store it in efficient ways for crop production and drinking purposes. Based on the local wisdom, communities have designed effective and efficient methods for storing the rainwater. Some of the novel systems prevalent in the region are baori and jhalara (step wells), nadi, tanka (cistern), khadin (runoff farming system) and roof water harvesting system. Baori and jhalara are largely to benefit the urban and semi- urban population whereas nadi, tanka and khadin are well suited for the rural population. The demand for community based water harvesting systems, which are the main sources of water for large population, became associated with progress in the rural areas. At present, the dependency of drinking water in villages in western Rajasthan is 42.4% on nadi, 34.7% on tanka, 15.0% on wells and tube wells and on 7.8% on other sources. This suggests that rainwater harvesting is the backbone of drinking water supply in rural areas. Storage of rainwater in underground cistern, locally known as Tanka is a common practice in Thar Desert. Various types of tanka from rectangular to circular, in capacity from as small as 1,000 liters to 5, 00,000 liters are prevalent in this region. The construction of this tanka also varies from simple mud plaster to lime mortar, cement concrete, ferro cement, fiber glass and PVC. A bigger tank in this region is lime mortar and cement concrete; however prefabricated PVC tanks are also used in some modern buildings in urban areas.

3. NEED FOR RAINWATER HARVESTING

1. As water is becoming scarce, it is the need of the day to attain self sufficiency to fulfill the water needs.
2. As urban water supply system is under tremendous pressure for supplying water to ever increasing population.
3. Groundwater is getting depleted and polluted.

4. Soil erosion resulting from the unchecked runoff and
5. Health hazards due to consumption of polluted water.

4. TRADITIONAL RAIN WATER HARVESTING SYSTEM

Many water harvesting structures and water conveyance systems, specific to the different cultures, were developed. The Indus Valley Civilization, that flourished along the banks of the river Indus and other parts of western and northern India about 4500 years ago, had one of the most sophisticated urban water supply and sewage systems in the world. The fact that the people were well acquainted with hygiene can be seen from the covered drains running beneath the streets of the ruins at both Mohenjo-Daro and Harappa. The well planned city of Dholaviras, on Khadir Bet, a low plateau in the Rann in Gujarat. One of the oldest water harvesting systems is found about 130 km from Pune along Nane Ghat in the Western Ghats. Each fort in the area had its own water harvesting and Storage system in the form of rock cut cisterns, ponds, tanks and wells that are still in use today. A large number of forts like Raigad had tanks that supplied water. They harvested the rain drop directly. From rooftops, they collected water and stored it in tanks built in their courtyards. From open community lands, they collected the rain and stored it in artificial wells. They harvested monsoon runoff by capturing water from swollen streams during the monsoon season and stored it in various forms of water bodies. They harvested water from flooded rivers. In Thar Desert traditional water harvesting methods are Kunds, Beris, Baoris , Jhalaras, Nadi, Talab, Tankas, Khadins, Anicuts , Bavadi, Virdas and Paar .

5. MODERN RAIN WATER HARVESTING SYSTEM

There are two main techniques of rain water harvesting:

1. Storage of rain water on surface for future use.
2. Recharge to ground water.

Modern Rain Water Harvesting system are-

1. **Pits:** Recharge pits are constructed for recharging the shallow aquifer.
2. **Trenches:** These are constructed when the permeable rock is available at shallow depth. Trench may be 0.6 to 1 m wide, 1 to 1.6 m deep and 10 to 20 m long depending upon the availability of water. These are back filled with filter materials.
3. **Hand pumps:** The existing hand pumps may be used for recharging the shallow and deep Aquifers, if the availability of water is limited. Water should pass through filter media to avoid chocking of recharge wells.
4. **Dug wells:** Existing dug wells may be utilized as recharge structure and water should pass through filter media before putting into dug well.
5. **Aquifer:** The aquifer is permeable, water saturated layers of sand, gravel or bed rock that can yield significant or usable amount of water. These are constructed 1 to 2m wide, 1 to 1.8 m deep which are back filled with boulders, gravels and coarse sand.
6. **Recharge wells:** Recharge wells of 100 to 300 mm diameter are generally constructed for recharging the deeper aquifers and water is passed through filter media to avoid choking of recharge wells.
7. **Recharge Shafts:** For recharging the shallow aquifer which is located below clayey surface, recharge shafts of 0.5 to 3 m diameter and 10 to 25 m deep are constructed and back filled with boulders, gravels and coarse sand.
8. **Lateral shafts with bore wells:** For recharging the upper as well as deeper aquifers lateral shafts of 1.5 to 2 m wide and 10 to 30 m long depending upon availability of water with one or two bore wells is constructed. The lateral shaft is back filled with boulders, gravels and coarse sand.
9. **Water Tanka-** A Tanka is a cylindrical underground rainwater storage cistern wherein rainwater from rooftops, a courtyard or natural or artificially prepared catchment flows into the paved underground pit, through filtered inlets made on the external wall of the structure, where it is stored and can be used by one family during the dry season. Once fully filled, the water is sufficient for a family of 4-5 members for a period of 5–6 months, and saves it from every day-water-fetching-drudgery.

6. DESIGN OF TANKA FOR WATER CAPACITY OF 50,000 LITRES

The most Common Rainwater technique prevalent in Thar Desert Rajasthan is Tanka. The studied of estimation of runoff of catchment area of water Tanka, rainfall, catchment area, runoff coefficient, technique for increase runoff from catchments, capacity of Tanka, design of Tanka, construction of Tanka, repairing and maintenance of Tanka, technical design and plan elevation and estimated cost of Tanka have Capacity of 50,000 litre described as below:

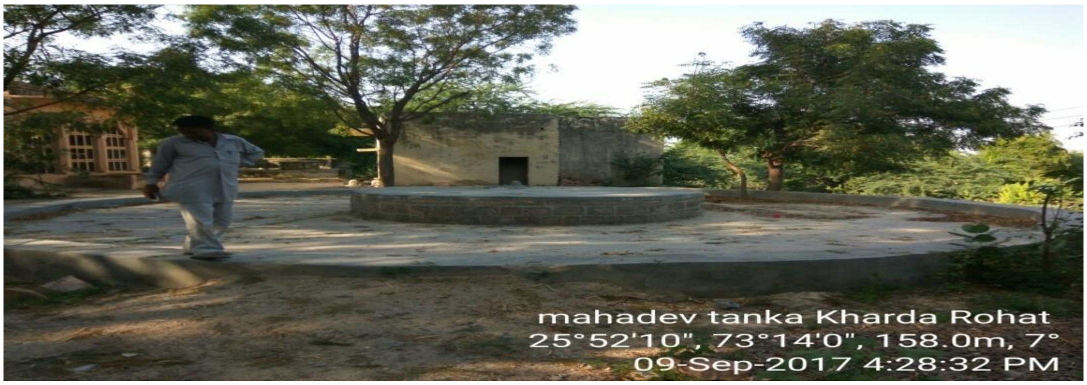

Fig.:1 Typical View of Tankas for Water Capacity of 50,000 Litres

6.1 Estimation of Runoff of Catchment Area of Water Tanka:

Rainfall is the principal source of water, which augments soil moisture, ground water and surface flows. Agriculture and several of the other economic activities in the arid areas depend on rain. Rainfall in the arid areas is of convective nature and usually occurs at a very high intensity for shorter duration, generating high runoff in response of even with small event little rainfall. Runoff could be very high particularly in urban areas where buildings and roads haves high runoff coefficient. The runoff depends upon rainfall intensity, duration of rainfall, type of soils and catchment characteristics particularly area, surface roughness, water absorbing capacity and slope, etc. Runoff can be estimated using equation 1.

$$R = P \times C \times A \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where R is runoff, P is rainfall, C is runoff coefficient which varies from minimum of 0 to maximum of 1 and A is the catchment area. By taking appropriate units of R, P and A selecting suitable runoff coefficient 'C', runoff can be estimated.

6.2 Rainfall:

The mean annual rainfall over the Indian hot arid region varies from more than 550 mm in the southern part to less than 100 mm in the northwestern and western part of the arid region. More than 85% of the total annual rainfall is received during the southwest monsoon season July, August and September. The withdrawal phase of monsoon has start middle of September in the extreme western part.

The rainy season varies from 55 days in the western part to 85 days in the eastern part of arid Rajasthan. A small quantum of rainfall of about 8-11 per cent of the annual is received during the winter season under the influence of western disturbances. Rainfall is low and erratic and the coefficient of variation of annual rainfall varies from 42 per cent to more than 64 per cent. Long term statistical analysis of the rainfall data of the region indicates an asymmetric average storm intensity profile for storms of short duration, with the highest intensities falling in the first part of the storm.
The statistical characteristics of high intensity and short duration are essentially independent of location within the region. A detailed statistical analysis of long term rainfall data of all districts of Thar desert of Rajasthan has been done to arrive at probable rainfall at three levels of probability i.e. 50, 60 and 70% . As the probability (or the level of surety) increases, the rainfall decreases. Therefore, a balance between the probability and certainty of rainfall is must for planning any rainwater harvesting system. Rainfall at 60% probability is generally considered safe for rainwater harvesting system.

6.3 Catchment Area:

Catchment area is very essential part of water tanka, because runoff has depends on catchment characteristics of soils, area, slope, surface roughness and other factors. Catchment area is a place where rain drops first strikes. After striking the catchment the subsequent process is entirely dependent on the inherent physical and chemical characteristics of the catchment. Physical characteristics like surface roughness and slope determine the flow of runoff while its textural constituent's proportion of sand, silt and clay determine the water absorbing holding and capacity of catchment. Certain chemical characteristics of catchment like presence of fertilizers, pesticides on natural surface determine the quality of runoff. The ratio of rainfall to runoff is denoted by the runoff coefficient (C) and is dependent on rainfall characteristics like intensity and duration and physical and chemical characteristics of the catchment, as mentioned earlier. Roof surfaces of buildings make the best catchment to generate runoff. Dune sand stabilizations by Cement, Lime, Gypsum, Bentonite and Stone crust, which reduce permeability of dune sand and runoff, can be increased up to 60-80%.

6.4 Runoff Coefficient:

The runoff coefficient (C) as mentioned above is ratio of runoff to rainfall for a given catchment and is dependent on rain fall and catchment characteristics. Various studies have been conducted by CAZRI Jodhpur and others to estimate the runoff percentage. These studies shows that the average runoff generation from arid Rajasthan is between 1 and 15 per cent of rainfall, as much of the terrain is dune sandy. However, due to the spatial variations in rainfall and terrain type, deviations from this average value are expected. In the less than 200 mm rainfall generate 10 to 15 percent of rainfall as runoff, if these are in undisturbed condition and have adequate vegetation cover. The rocky and gravelly surfaces, on the other hand, can generate between 20 and 25 per cent. In the 200 to 400 mm rainfall zone, the micro-catchments in the plains with sandy loam to loamy sand can generate as much as 30 to 40 per cent as runoff, although the larger catchments can generate between 15 and 20 per cent. The rocky and gravel1y surfaces in this zone can generate between 20 and 30 per cent of rainfall as runoff.

6.5 Technique for Increase Runoff from Catchments:

To a certain extent for higher runoff generation, Catchment characteristics can be modified. The extent of modification depends on the investment available and the expected use of runoff water. Where no source of water exists and in area with inaccessibility of other water sources, higher initial investment is justified on long terms.

1. Soils smoothing and compaction helps increasing runoff from the catchment areas. Success is generally greater on loam or clay loam soils.
2. Care must be taken to reduce the slope and or the length of the slope to lessen runoff velocity and thereby reducing runoff.
3. Less amounts of sodium salts particularly NaCl, $NaHCO_3$ applied to desert soils where vegetation has been removed causes dispersion of the surface soil, reducing infiltration and increases runoff. However, this type of treatment requires a minimum amount of expanding clays in the soil.
4. Removal of boulders, stones and unproductive vegetation from the catchment helps in uninterrupted flow, enhances runoff to collection site. Land shaping into roads and collection of water in channels.

5. Sandy soils have low water holding capacity. Spreading of clay blanket to the dune soil surface reduces the permeability and consequently accelerates runoff.
6. Chemical treatments like wax, asphalt, bitumen and bentonite prevent downward movement of water, which augments runoff.
7. Dune sand of catchment area to be stabilized by Cement, Lime, Gypsum and Stone crust, which reduce permeability of dune sand and runoff, can be increased.

6.6 Capacity of Tanka:

Capacity of tanka is dependent on the need use of harvested water and money available for investment. The designed capacity must match with the available runoff as estimated above using by the equation 1. For individual family water requirement can be worked out considering the family size, daily water requirement and period using equation 2

$$V = N \times Q \times T \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where
V is volume or Capacity of the tanka,
N is number of persons dependent on tanka,
Q is daily water requirement and
T is number of days for which water is required.

Daily minimum water requirement of a person varies from 8 liters to 15 liters depending upon the season and work stress. Additional requirement of water for other purposes like animals about 45 liters per day and raising small nursery, etc. can be worked out using equation 2 separately and total capacity can be worked out by adding all the individual water requirements. The total capacity should be multiplied by a factor 1.1 at the final capacity of tanka.

6.7 Design of Tanka:

As a Civil Engineering, once the capacity of tanka is decided, its shape and other dimensions can be worked out. Evaporation losses are greater in tanka with wider opening and shallow depth but are more stable and easy to construct. How- ever, cost to cover the opening of such tanka is more. On other hand, narrow opening tanka with deeper depth causes less evaporation but needs extra strengths in terms should be optimized for minimum evaporation loss and construction cost. In circular tanka, depth and diameter should be kept equal and can be calculated using equation 3.

$$D = (1.27 \times V)^{.33} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where D is diameter as well depth in meters and
V is capacity in cubic meters.

Table- 2: Diameter for Circular Tanka of Different Capacities

Capacity (m^3)	1	5	10	15	20	25	30	35	40	45	50	100	200	300
Diameter (m)	1.08	1.85	2.33	2.67	2.94	3.17	3.37	3.54	3.71	3.85	3.99	5.03	6.34	7.25

6.8 Construction of Tanka:

Tanka should be constructed at an appropriate site by supervision of Civil Engineer. The materials used in masonry tanka i.e. Stone, Coarse aggregates, Fine aggregates, Cement and Water have good quality. All masonry and Plastering works should be skilled Labour and minimum curing period should be 28 days and done by potable water. If rainwater is to be collected from rooftop, its location should be constructed near to the place of intended use. If rain water is to be collected from natural catchment then tanka should be constructed at one side of the depression area for maximum runoff and safe disposal of excess water. In arid area of western Rajasthan, a Murrum layer is reported in the sub surface strata at many places. Special care is needed when tanka is to be constructed at these sites. Murrum has a tendency of swelling after getting some moisture and causes cracks especially in sidewalls. To avoid these cracks surrounding of whole tanka should have an envelope of 5 cm sand around sidewalls.

In case of small little leakage from side-wall, sand envelope of 10 cm thickness of sand will absorb the pressure exerted by the swelling of Murrum around sidewalls and will prevent the cracks developing in sidewalls. Circular tanka is more economical in comparison to Rectangular tanka of same capacity in term of cost of materials. Further, the Rectangular tanka has the tendency for development of cracks in four corners due to uneven distribution of pressure whereas in the circular tanka pressure distribution is even, thus less chance of cracks developing in sidewalls. Masonry construction of tanka is good for small capacity and does not require trained workers for the construction as in case of the cement concrete tanka.

6.9 Repairing and Maintenance of Tanka:

Repairing of Masonry tanka is very essential for time to time for longer life. If the Masonry is finished and properly cured, then no leaks are likely to occur. Small leaks which create only a wet stain need not be attended to, since they will close after some time. Only leaks with water flowing out need have to be repaired. The major problem is not the repair work as such, but the fact that leaks usually cannot be seen and identified until the tanka is filled. As mentioned, curing after the structure is finished as well as while it is still under construction, is just as important as the quality of craftsmanship and material. This will not only preserve the structure, but also furnish immediate evidence of any leaks.
If there is no rainfall some days after the structure is finished, and the necessary amount of water is not available, a minimum filling of 150 mm is a must of masonry . This water serves as a long-term curing agent and will keep the plaster moist. In addition, especially in hot arid climates, the structure must be covered on all sides such a way that the moisture of the mortar cannot evaporate.

A properly constructed tanka serves for around 30-35 years if properly maintained. Its maintenance includes: keeping clean of catchments area and clear of moss, lichen, debris and leaves; cutting back trees and branches that overhang the roofs; cleaning of tanka inlets and screens every 3-4 months;, disinfecting the tanka if contamination is apparent, inspecting tanka annually and cleaning them out if necessary and ; testing the water periodically.

6.10 Technical Design and Plan Elevation of Tanka Capacity of 50,000 litre

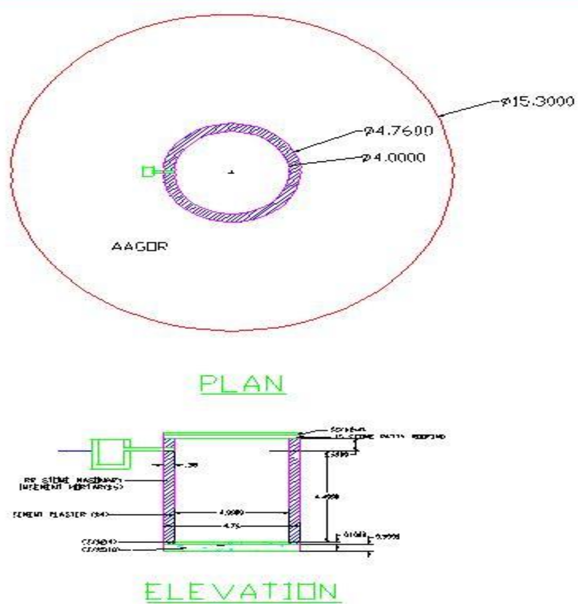

FIGURE-2 CONSTRUCTION DRAWING OF MASONARY TANKA FOR50,000 LITRE'S CAPACITY AT ROHAT DISTRICT PALI

6.11 Technical Design and Estimated cost Tanka Capacity of 50,000 litre

Table- 3: Technical Design and Estimated Cost of Masonry Tanka Capacity of 50,000 litre

Technical Design of Kund /Farm Pond / Tanka Capacity of 50,000 litre	
1	Volume of Kund / Tanka should be 50.00 Cum for 50,000 litre Capacity
2	Volume = л/4 × (Dia.)^2 × depth
3	Assuming Diameter of Kund = 4.0 m
4	Than Depth should be = 50 / Л/4(4.0)^2
5	Therefore Depth = 3.98 m ≈ 4.0m
6	Catchment area of Kund
7	Volume of Water = Catchment area × Average Rainfall
8	Average rainfall of the project area is 500 mm
9	Therefore Catchment area = 50/0.40= 125 Sq m
10	Catchment area = 125.0 Sq m
11	Taking Probability 75 percent
12	Catchment area = 166.66 Sq m
13	(Dia of Catchment area)^2 =166.66 / Л/4, (Dia of Catchment area)^2 = 169.85 Dia of Catchment area = 15.03 m ≈ 15.0 m

Name of Work -- Construction of Masonry Tanka

(A) Details of Estimate

Sl. No.	Item	No.	All dimension are in m			Unit	Qty.
			L	B	H		
1	Excavation in all kind of soil	0.785	4.76	4.76	1.5	Cum.	26.68
		3.14	15.30	0.30	0.3	Cum.	4.32
	(a) Extra lift 0m to 1.50m	Total				Cum.	31.00
	(b) Extra lift 1.50 m to 3m	0.785	4.76	4.76	1.50	Cum.	26.68
	(c) Extra lift 3.00 m to 4.50m	0.785	4.76	4.76	1.40	Cum.	24.90
2	Cement concrete in (1:5:10) agg.40 mm	0.785	4.76	4.76	0.30	Cum.	5.34
	Peripheri	0.785	15.00	15.00	0.075	Cum.	13.25
	Total					Cum.	18.58
	Deduction	0.785	4.76	4.76	0.075	Cum.	-1.33
					Net Total	Cum.	17.25
3	Cement Concrete in (1:2:4) agg.12mm	0.785	4.00	4.00	0.10	Cum.	1.26
	On Roof	0.785	4.76	4.76	0.075	Cum.	1.33
	Total					Cum.	2.59
	Deduction	1	0.45	0.45	0.075	Cum.	-0.02
					Net Total	Cum.	2.57
4	Random Rubble Stone Masonry in Cement Mortar (1:6)	3.14	4.38	0.38	4.60	Cum.	24.04
	Peripheri	3.14	15.30	0.30	0.75	Cum.	10.81
	Stair	1.500	0.90	0.60	0.15	Cum.	0.12
					Total	Cum.	34.97
5	Supply and Fixing of Stone Lintel	2.00	3.00	0.30	0.30	Cum.	0.54
Total						Cum.	0.54
6.							00.00
7	Roofing of Stone Patti with Joint Filling in cm (1;4)	1.00	4.38	4.38		sqm	19.18

	Deduction	1	0.45	0.45		sqm	0.20
					Total	sqm	19.39
8	Earth Work in Embankment	0.785	15.00	15.00	0.150	Cum.	26.49
	Deduction.	0.785	4.76	4.76	0.150	Cum.	-2.67
						Cum.	23.83
	Deduction					Cum.	-3.97
					Total	Cum.	19.85
9	Cement Plaster in (1:4) 25mm	0.79	4.00	4.00		sqm	12.56
	Inside Tank	3.14	4.00	4.60		sqm	57.78
						sqm	70.34
	Deduction	2	0.45	0.45		sqm	-0.41
					Total	sqm	69.93
10	Cement Plaster in (1:6) 20 mm	3.14	4.76	0.45		sqm	6.73
	Peripheri	0.79	15.00	15.00		sqm	176.63
	Peripheri	3.14	15.30	0.45		sqm	21.62
	Peripheri	3.14	15.60	0.45		sqm	22.04
	Peripheri	3.14	15.30	0.30		sqm	14.41
						sqm	241.43
	Deduction	1	0.30	0.45		sqm	-0.14
					Total	sqm	241.29
11	Plastic Paint	Total				1 litre	1.00
12	Jali & Door	5.00				5 nos	5.00
13	Over Flow Pipe	1.00				64.8 m	64.8
14	Photo	3.00				3 nos	3.00
(B) Abstract of Cost							
Sl. no.	Item	Qty.	Rate				Amount
1	Item1(A)	31.00	125.86				3902.05
2	Item1(B)	26.68	141.94				3786.86
3	Item1(C)	24.90	158.02				3934.81
4	Item no. 2	17.25	2318.90				39998.18
5	Item no. 3	2.57	3368.38				8672.83
6	Item no. 4	34.97	2580.04				90227.98
7	Item no. 5	0.54	1235.56				667.20
8	Item no. 6	0.00	61.42				0.00
9	Item no. 7	19.39	1251.04				24253.79
10	Item no. 8	19.85	119.19				2366.50
11	Item no. 9	69.93	226.32				15826.78
12	Item no. 10	241.29	129.77				31312.23
13	Item no. 11	1.00	540.00				540.00
14	Item no. 12	5.00	110.00				550.00
15	Item no. 13	64.80	42.30				2741.05
16	Item no. 14	3.00	500.00				1500.00
17						Total	230280.27
18		Contingencies				6908.41	6908.41
19						Grand Total	237188.67
Estimated Construction Cost of Masonry Water Tanka Capacity 50000 Litres						**Rs. 237188.67**	
Estimated Construction Cost of Masonry Water Tanka Per Liters Rate						**Rs 4.75**	

7. CONCLUSIONS

This research demonstrates the issues relating to tanka are most valuable rainwater harvesting systems in the Thar Desert and provide a domestic water supply for rural communities. The majority of tankas are worthwhile investments that provide substantial direct cost savings to beneficiaries, as well as numerous indirect benefits that have not been quantified. Rainwater harvesting, recycling and its management is key to survival in hot arid zone of Thar Desert of Rajasthan and elsewhere with similar climatic conditions. For the management of scarce water resources, multiple point strategies are needed. On one hand technologies of rainwater harvesting and conservation needs to be popularized and percolated at extreme down end and on the other hand, technological advancement is needed for the development of drought tolerant early maturing crops to use water efficiently. Traditional rainwater harvesting structures like Kunds, Beris, Baoris , Jhalaras, Nadi, Talab, Tankas, Khadins, Anicuts etc. needs renovation on a continuous basis. Efforts should be made by the Government of Rajasthan for timely desilting of the traditional rainwater harvesting structures. For this total 7726 Villages, 225783 Watershed works have covered and 59.31 crore Donations have received up to October- 2017 in Mukhya Mantry Jal Swavalamban Abhiyan in Rajasthan for Watershed Development Programmes. Since rainfall in this region is convective in nature and occurs duration. The nature of this rainfall not only causes flash flood situations, but also leads to loss of huge quantity of runoff water, particularly in the urban areas. So special efforts are needed to harvest flash floodwater for the lean period and this can be done by construction of large storage structures at appropriate sites.

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