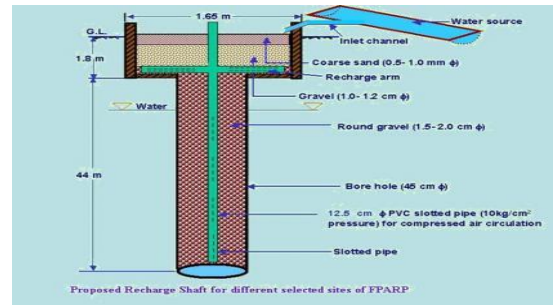




**CENTRAL GROUND WATER BOARD**  
MINISTRY OF WATER RESOURCES,  
RIVER DEVELOPMENT & GANGA REJUVENATION  
GOVERNMENT OF INDIA



Excavated/dugout farm pond



**ARTIFICIAL RECHARGE TO GROUND WATER AND  
WATER CONSERVATION PLAN OF BAYTOO  
BLOCK, DISTRICT BARMER, RAJASTHAN**

Western Region, Jaipur  
December 2016

# ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF BAYTOO BLOCK, DISTRICT BARMER

## Plan at a Glance

1.	<b>Area of the Baytoo Block</b>	<b>3228 sq.km.</b>
2.	<b>Area identified for Artificial Recharge</b>	<b>476.56 sq km</b>
3.	<b>Dynamic Ground Water Resources (as on 31.03.2011)</b>	
	Net Ground Water Availability	<b>6.18 MCM</b>
	Annual Ground Water Draft	<b>14.95 MCM</b>
	Stage of Ground Water Development	<b>242.02%</b>
4.	<b>Volume of water to be harnessed</b>	<b>0.813 MCM</b>
	<b>Volume of water available for recharge through RS</b>	<b>0.28 MCM</b>
	<b>Volume of water available for recharge through PT</b>	<b>0.20 MCM</b>
5.	<b>Volume of unsaturated aquifer zone available for recharge</b>	<b>1524.75 MCM</b>
6.	<b>Total number of structures to be proposed</b>	
	<b>Recharge structures</b>	<b>8 shafts in 7 Nos. of existing village ponds</b>
	Existing village pond with recharge shaft/ well	
	Percolation Tanks	<b>1 No.</b>
	Sprinkler Irrigation	<b>300 ha</b>
	<b>Expected Annual GW recharge</b>	<b>0.38 MCM</b>
	<b>Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation</b>	<b>0.24</b>
	<b>Total recharge/ saving of ground water</b>	<b>0.62 MCM</b>
7.	<b>Estimated Cost</b>	<b>2.434 crore</b>
	Artificial Recharge Plan	0.776 crore
	Sprinkler Irrigation	1.50 crore
	Piezometer construction	0.042 crore
	Operation and maintenance	0.116 crore

# ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF BAYTOO BLOCK, DISTRICT BARMER

## Introduction

The **Baytoo Block, district Barmer** is one of the over exploited blocks of Rajasthan and is under severe stress, as evident from the stage of ground water development, which has attained an alarming level of **242.02%**.

## Location of the block

The Baytoo Block of Barmer District covering an area of 3228 Sq. Km. falls in northern part of Barmer District and is located between North latitudes 25°42' & 26°22' and East longitudes 71°18' & 72°11'.

## Surface Water Availability

As per the studies carried out by Water Resources Department (WRD), Government of Rajasthan there is very little surplus water available for further development at 75% dependability. Based on the data made available from GWD, the surplus runoff available at 75% dependability level has been worked out for the zones as part of watershed within the block. The nature of aquifer (Alluvium/ Hard rock) is also considered while computing the number of Artificial Recharge structures feasible.

Accordingly about 0.813 MCM has been considered for recharge plan in the block. Optimum utilization of rainwater runoff depends on availability of land, feasible conditions, etc. Volume of Aquifer available for Artificial Recharge is given in **Table.1**

## Supply Side Management

### Feasible Artificial Recharge and Water Conservation Structures

About 0.035 mcm/year surplus has been considered for each recharge shaft and 0.2 mcm/year for percolation tank wherever feasible. The areas with shallow water level (<5m) have not been considered for construction of Artificial Recharge Structures

The number of Recharge Shaft is decided based on the number of suitable ponds available within the zone. If still some surplus remained unallocated, than few Percolation tanks are proposed at suitable locations. However, in some of the blocks entire available surplus cannot be utilized due to non availability of ponds for Recharge shaft or suitable location for Percolation tanks. Zone wise number of Recharge Structures proposed to be constructed is given in **Table 2**.

**Table 1: Volume of Aquifer available for artificial recharge**

District	Block	Area of Block (Sq.km.)	Potential area suitable for recharge (Sq.km.)	Type of Aquifer	Area feasible for artificial recharge (Sq km)	Sp Yield	Average DTW (mbgl) NOV 2013	Thickness of unsaturated zone 3 m below ground level (m)	Volume of sub surface storage space available for artificial recharge (MCM)
Barmer	Baytoo	3228	476.56	HR	476.56	0.06	56.33	53.33	1524.75

**Table 2: Number of recharge structure**

ZoneCode	Sub_Basin	Type of Aquifer	Zone-Area (sq. km.)	Total Surplus (mcm)	Water Level >5m	Feasible RS_Prop	Feasible PT_Prop
Luni_Luni_047_RJ0507_AL	Luni	SR	19.248	0.001	Y	0	0
Luni_Luni_053_RJ0507_AL	Luni	SR	163.218	0.060	Y	0	0
Luni_Luni_054_RJ0507_AL	Luni	SR	304.988	0.046	Y	0	0
Luni_Luni_054_RJ0507_SR	Luni	SR	61.227	0.009	Y	0	0
Luni_Luni_058_RJ0507_AL	Luni	SR	63.606	0.014	Y	0	0
Luni_Luni_061_RJ0507_AL	Luni	SR	154.256	0.033	Y	0	0
Luni_Luni_062_RJ0507_AL	Luni	SR	524.442	0.039	Y	1	0
Luni_Luni_063_RJ0507_AL	Luni	SR	565.307	0.235	Y	0	1
Luni_Luni_065_RJ0507_AL	Luni	SR	758.178	0.115	Y	2	0
Luni_Luni_065_RJ0507_HR	Luni	HR	142.554	0.022	Y	1	0
Luni_Luni_065_RJ0507_SR	Luni	SR	445.322	0.068	Y	0	0
Luni_Luni_069_RJ0507_AL	Luni	SR	19.851	0.002	Y	0	0
Luni_Luni_070_RJ0507_AL	Luni	SR	154.978	0.127	Y	4	0
Luni_Luni_071_RJ0507_AL	Luni	SR	73.312	0.043	Y	0	0
				<b>0.813</b>		<b>8</b>	<b>1</b>

## Recharge Shaft

It is proposed to construct Recharge Shaft in existing ponds. The selected ponds should be atleast 3m deep and shallow ponds will be deepened accordingly. It is proposed that the inlet for the Recharge Shaft should be atleast 1m above bed of pond so that the pond retains adequate water for use by villagers.

. The tentative location of villages for construction of recharge shaft/well in existing village pond and their cost estimates are shown in Fig 1 and Table 3.

**Table 3: Tentative locations of village for village pond with recharge shaft**

S.No.	Village	Long	Lat	Watershed	No of Shafts	Unit cost (Rs in lac)	Total cost (Rs in lac)
1	Bhadarwa	71.363	26.008	Luni_Luni_062_RJ0507_AL	1	5	5.00
2	Ladhoniyan Ki Dhani	71.663	25.857	Luni_Luni_065_RJ0507_AL	1	5	5.00
3	Kosariya	71.607	25.937	Luni_Luni_065_RJ0507_AL	1	5	5.00
4	Dheeraniyan Ki Dhani	71.658	26.168	Luni_Luni_065_RJ0507_HR	1	2.60	2.60
5	Moodhonki Dhani	71.436	25.857	Luni_Luni_070_RJ0507_AL	1	5	5.00
6	Chandoniyan Ki Dhani	71.451	25.847	Luni_Luni_070_RJ0507_AL	1	5	5.00
7	Alaniyan Ki Dhani	71.474	25.844	Luni_Luni_070_RJ0507_AL	1	5	5.00
8	Alaniyan Ki Dhani	71.480	25.828	Luni_Luni_070_RJ0507_AL	1	5	5.00
				<b>Total</b>	<b>8</b>		<b>37.60</b>

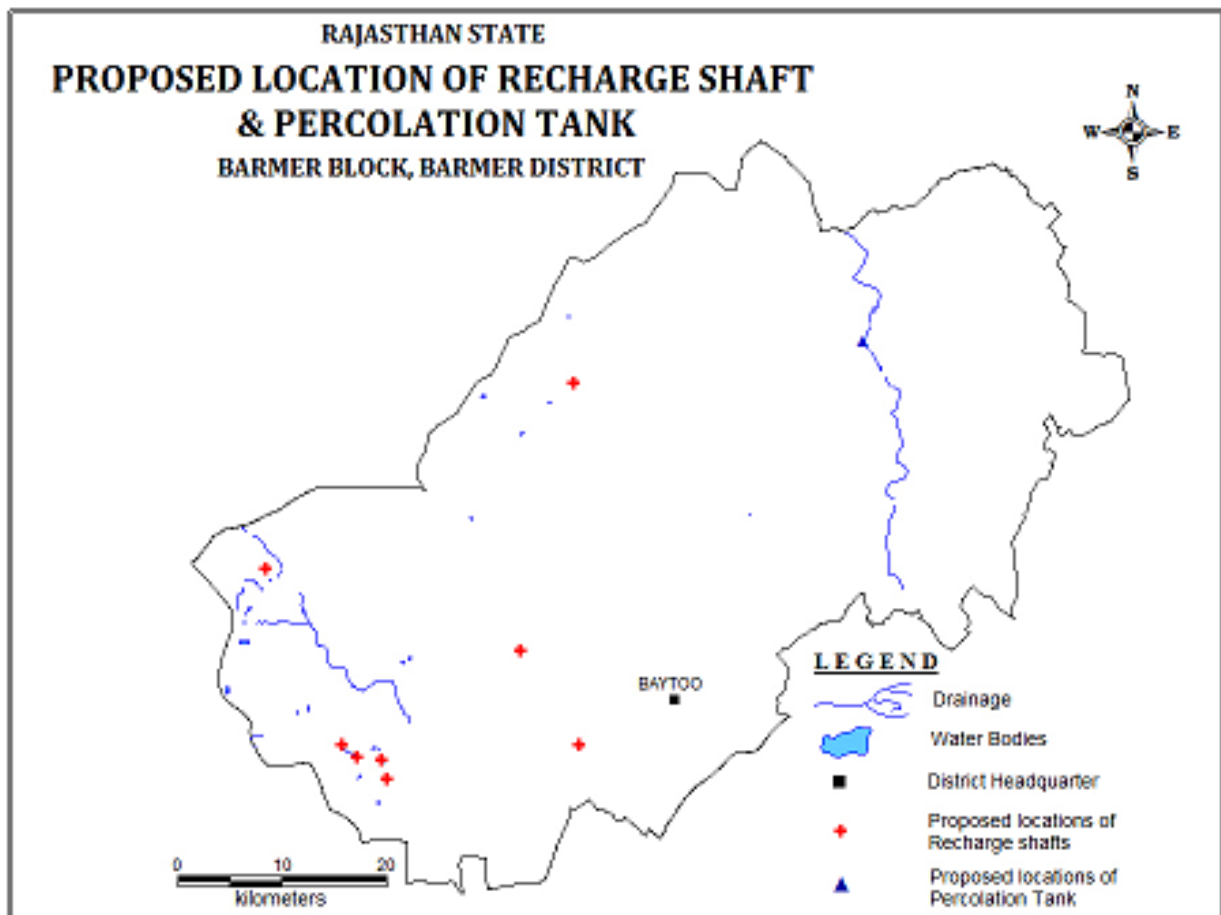
## Percolation Tank

The tentative location of villages for construction of percolation tank and their cost estimates are shown in Fig 1 and Table 4

**Table 4: Tentative locations of village for Percolation Tanks**

S. No.	Village	Longitude	Latitude	Micro Watershed	Unit Cost (Rs. In lacs)
1	Neemba Ki Dhani	71.936	26.200	Luni_Luni_063_RJ0507_AL	40
				<b>Total</b>	<b>40</b>

**Fig: 1: Tentative location of Recharge Shaft and Percolation Tanks**



## Demand Side Management

### Efficient Irrigation:

In Flood/ furrow irrigation method more than 50% of applied water is wasted through seepage to deeper levels, local inundation causes loss through evaporation and it leaches out the nutrients from the plants. While through drip and sprinkler irrigation method, wastage through irrigation losses could be minimized. Ground water usage can be minimized drastically by using HDPE pipes. Initially the scheme can be proposed to be started in 300 ha area, which is worst affected showing deepest water level and declining trends. The area is to be finalized based on land holdings, willingness of farmers and No Objection certificate from the land owner.

### Impact Assessment and Monitoring

Assessment of impact of the artificial recharge schemes implemented is essential to assess the efficacy of structures constructed. It helps in identification of cost-effective recharge mechanisms for optimal recharge into the ground water system. It also helps to make necessary modifications in site selection, design and construction of structures in future.

It is proposed to construct 7 piezometers, at suitable locations for monitoring of water levels, in the vicinity of proposed recharge structure.

### Revival, Repair of Water Bodies

The existing ponds and tanks with time loose their storage capacity as well as the natural ground water recharge through these water bodies has also become negligible due to siltation and encroachment by farmers for agriculture purposes. There are several such villages where ponds/ tanks are in dilapidated condition. These existing village tanks, which are normally silted and damaged, can be modified to serve as recharge structure in case these are suitably located to serve as percolation tanks. Through desilting, coupled with providing proper waste weir, the village tanks can be converted into recharge structure.

### Financial Outlay of the Plan

The total estimated cost of the Plan is Rs. 2.434 cr. The tentative cost estimates of the various activities of the Plan are shown in Table 5 & 6. The unit rates are as followed by the Govt. of Rajasthan (BSR).

**Table 5: Cost of the recharge structures**

Cost Recharge Shaft Rs in crs (Unit cost Rs 0.05 cr for alluvium and Rs 0.026 cr for hard rock)	Cost of Percolation Tank in Rs in crs (Unit cost Rs 0.4 cr)	Cost of Sprinkler irrigation in Rs (Unit cost 0.005 cr/ha)
Soft rock – 0.35 Hard rock- 0.026	0.40	1.50

**Table 6: Tentative cost of different activities**

Feasible Artificial Recharge & Water Conservation structures/ activities	Tentative Design	Quantity (in nos. or area in ha)	Rainwater harvested (mcm ) or No. of sprinklers (/ha)	Tentative unit cost (in Rs lakh)	Total tentative cost (in Rs lakh)	Expected Annual GW recharge/ conservation (mcm) @ 0.8 mcm/structure
<b>Recharge Structures/ Activities</b>						
Recharge shaft within the pond /tanks	Alluvium – Depth 80m, Dia: 10-12” with filter pit	7	0.245	5	35	0.196
	Hard rock: Depth –60m, Dia 10-12”with filter pit	1	0.035	2.60	2.60	0.028
Percolation tanks (3 fillings)	200m*200m*1.5 m	1	0.20	40	40	0.16
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		<b>Total</b>			<b>227.6</b>	<b>0.624</b>
<b>Impact assessment &amp; Monitoring</b>						
Piezometer	50 – 80 m	7		0.6	4.20	
<i>Impact assessment will be carried out by implementing agency</i>						
O & M - 5% of total cost of the scheme					11.59	
<b>TOTAL</b>					<b>243.39</b>	<b>0.624</b>

*Note: Type, number and cost of structure may vary according to site after ground verification*