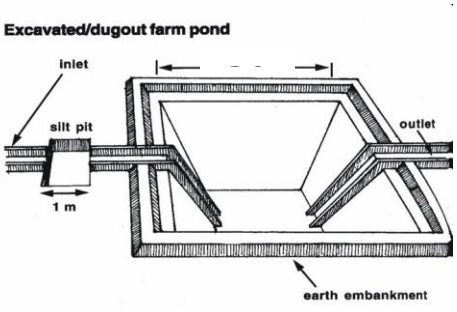
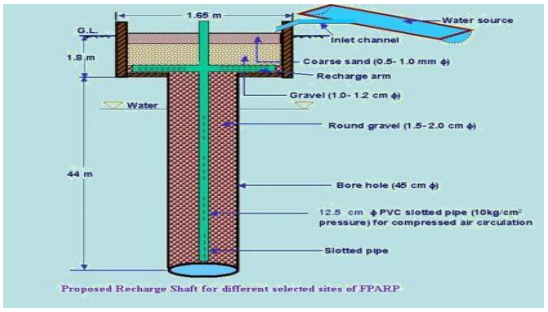
CENTRAL GROUND WATER BOARD

MINISTRY OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
GOVERNMENT OF INDIA





ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF BADI SADRI BLOCK, DISTRICT CHITTOR, RAJASTHAN

Western Region, Jaipur
November 2016

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF BADI SADRI BLOCK, DISTRICT CHITTOR

Plan at a Glance

1.	**Area of the BADI SADRI Bas Block**	**504.68 Sq. km.**
2.	**Area identified for Artificial Recharge**	**428.38 sq km**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**18.10 MCM**
	Annual Ground Water Draft	**28.79 MCM**
	Stage of Ground Water Development	**159.06 %**
4.	**Volume of water to be harnessed** **Volume of water available for recharge through RS** **Volume of water available for recharge through PT**	**28.275 MCM** **1.225 MCM** **3.60 MCM**
5.	**Volume of unsaturated aquifer zone available for recharge**	**16.514 MCM**
6.	**Total number of structures to be proposed**	
	Recharge structures Existing village pond with recharge shaft/ well Percolation Tanks Sprinkler Irrigation	**35 shafts in 26 Nos. of existing village ponds** **18 nos.** **300 ha**
	Expected Annual GW recharge	**3.86 MCM**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**0.24 MCM**
	Total recharge/ saving of ground water	**4.10 MCM**
7.	**Estimated Cost** Artificial Recharge Plan Sprinkler Irrigation Piezometer construction Operation and maintenance	**10.217 crore** 8.11 crore 1.50 crore 0.12 crore 0.487 crore

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF BADI SADRI BLOCK, DISTRICT CHITTOR

Introduction

The **Badi Sadri Block, district Chittor** 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 **159.06%.**

Location of the block

The Badi Sadri Block covers an area of 504.68 Sq. km. and falls in southern part of Chittor district. It is located between North latitudes 24°13' & 24°35' and East longitudes 74°21' & 74°34'.

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 28.275 MCM has been considered for recharge plan in the block. **But since volume of unsaturated aquifer zone available for recharge is only 16.514 MCM, so that much volume of surplus run off i.e. 16.514 MCM is taken for recharge plan of 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)
Chittor	BADI SADRI	504.680	428.380	HR	428.380	0.015	5.570	2.570	16.514

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
Banas_Berach_034_RJ1001_HR	Berach	HR	163.478	0.000	Y	0	0
Banas_Berach_035_RJ1001_HR	Berach	HR	185.077	0.000	Y	0	0
Mahi_Jakham_007_RJ1001_HR	Jakham	HR	22.121	0.000	Y	0	0
Mahi_Jakham_014_RJ1001_HR	Jakham	HR	106.260	24.279	Y	25	15
Mahi_Jakham_016_RJ1001_HR	Jakham	HR	15.535	3.996	Y	10	3
Mahi_Som_046_RJ1001_HR	Som	HR	11.707	0.000	Y	0	0
Mahi_Som_047_RJ1001_HR	Som	HR	2.914	0.000	Y	0	0
				28.275		**35**	**18**

Recharge Shaft

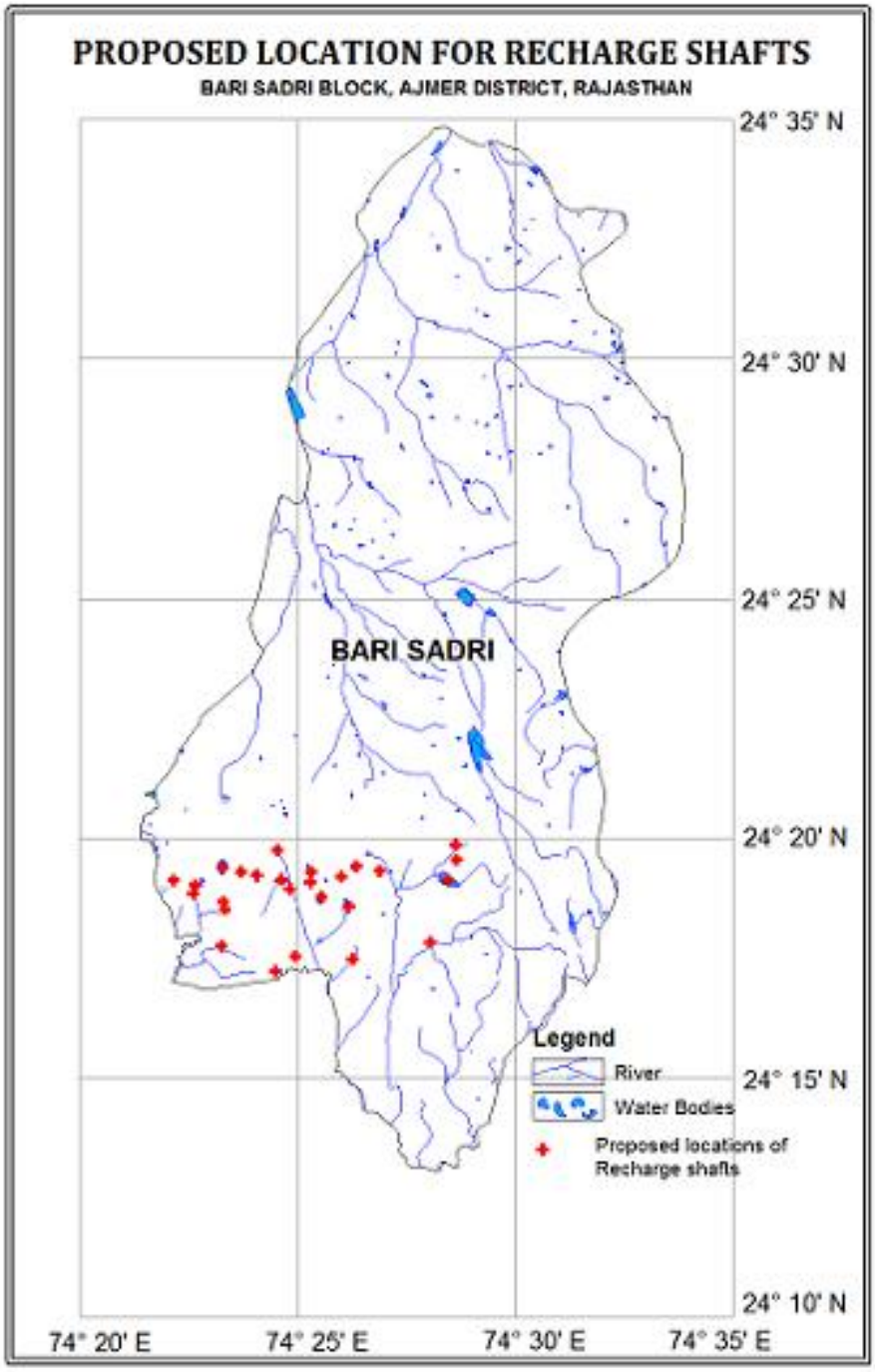
It is proposed to construct Recharge Shaft in existing ponds. The selected ponds should be atleast 3m deep and shallow ponds will be deepened accordingly. It is proposed that the inlet for the Recharge Shaft should be atleast 1m above bed of pond so that the pond retains adequate water for use by villagers.

. 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	Bansi	74.395	24.322	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
2	Tegariyo Ka Phala	74.409	24.329	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
3	Bansi	74.401	24.320	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
4	Tegariyo Ka Phala	74.411	24.319	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
5	Naya Khera	74.414	24.316	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
6	Bansi	74.416	24.292	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
7	Bansi	74.408	24.287	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
8	Naya Khera	74.422	24.322	Mahi_Jakham_014_RJ1001_HR	2	2.60	5.20
9	Naya Khera	74.421	24.318	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
10	Rani Maliya	74.426	24.313	Mahi_Jakham_014_RJ1001_HR	2	2.60	5.20
11	Kewalpura(B)	74.436	24.310	Mahi_Jakham_014_RJ1001_HR	2	2.60	5.20
12	Kewalpura	74.433	24.320	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
13	Rooppura	74.439	24.324	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
14	Maraodiya	74.448	24.322	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
15	Kewalpura (A)	74.438	24.291	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
16	Khankriya Kheri	74.467	24.297	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
17	Moonjwa	74.474	24.319	Mahi_Jakham_014_RJ1001_HR	4	2.60	10.80
18	Moonjwa	74.477	24.326	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
19	Moonjwa	74.477	24.331	Mahi_Jakham_014_RJ1001_HR	1	2.60	2.60
20	Payron Ka Khera	74.369	24.319	Mahi_Jakham_016_RJ1001_HR	1	2.60	2.60
21	Bansi	74.378	24.317	Mahi_Jakham_016_RJ1001_HR	2	2.60	5.20
22	Bansi	74.377	24.314	Mahi_Jakham_016_RJ1001_HR	1	2.60	2.60
23	Bansi	74.388	24.323	Mahi_Jakham_016_RJ1001_HR	3	2.60	7.80
24	Bansi	74.388	24.311	Mahi_Jakham_016_RJ1001_HR	1	2.60	2.60
25	Bansi	74.389	24.309	Mahi_Jakham_016_RJ1001_HR	1	2.60	2.60
26	Tajela	74.388	24.296	Mahi_Jakham_016_RJ1001_HR	1	2.60	2.60
				Total	**35**		**91.40**

Figure 1: Showing Tentative location of the Recharge Shaft



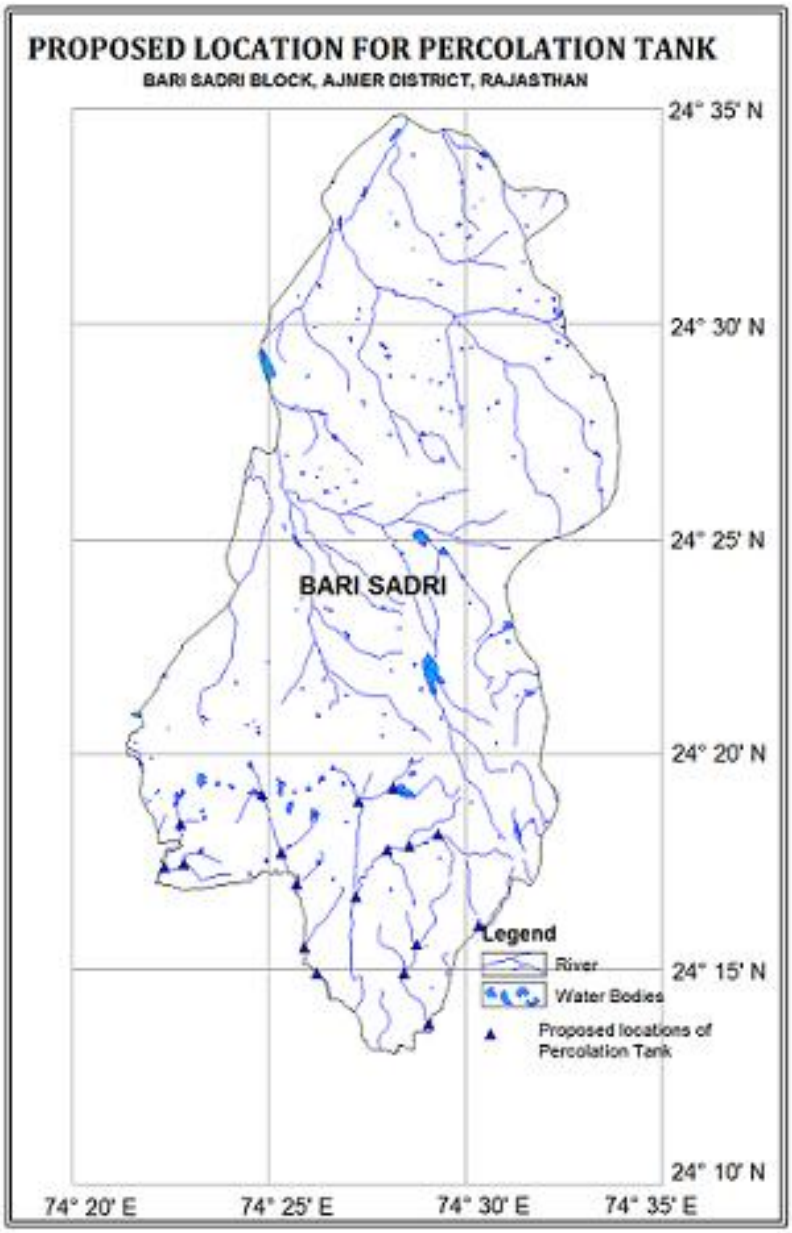
Percolation Tank

The tentative location of villages for construction of percolation tank and their cost estimates are shown in Fig 2 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	Naya Khera	74.414	24.318	Mahi_Jakham_014_RJ1001_HR	40
2	Rani Maliya	74.422	24.295	Mahi_Jakham_014_RJ1001_HR	40
3	Kewalpura (A)	74.429	24.283	Mahi_Jakham_014_RJ1001_HR	40
4	Forest Block	74.437	24.248	Mahi_Jakham_014_RJ1001_HR	40
5	Forest Block	74.484	24.229	Mahi_Jakham_014_RJ1001_HR	40
6	Forest Block	74.474	24.248	Mahi_Jakham_014_RJ1001_HR	40
7	Forest Block	74.479	24.260	Mahi_Jakham_014_RJ1001_HR	40
8	Forest Block	74.454	24.278	Mahi_Jakham_014_RJ1001_HR	40
9	Khankriya Kheri	74.467	24.296	Mahi_Jakham_014_RJ1001_HR	40
10	Khankriya Kheri	74.476	24.298	Mahi_Jakham_014_RJ1001_HR	40
11	Khankriya Kheri	74.488	24.302	Mahi_Jakham_014_RJ1001_HR	40
12	Kalakhet	74.505	24.267	Mahi_Jakham_014_RJ1001_HR	40
13	Lachhmipura	74.455	24.315	Mahi_Jakham_014_RJ1001_HR	40
14	Mata Magri	74.469	24.320	Mahi_Jakham_014_RJ1001_HR	40
15	Forest Block	74.432	24.259	Mahi_Jakham_014_RJ1001_HR	40
16	Bansi	74.373	24.290	Mahi_Jakham_016_RJ1001_HR	40
17	Bansi	74.381	24.291	Mahi_Jakham_016_RJ1001_HR	40
18	Bansi	74.379	24.306	Mahi_Jakham_016_RJ1001_HR	40
				Total	**720**

Figure 2: Showing Tentative location of the Percolation Tank



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 loses 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 20 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. 10.217 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)
Hard rock – 0.91	7.20	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
Recharge Structures/ Activities						
Recharge shaft within the pond /tanks	Alluvium – Depth 80m, Dia: 10-12" with filter pit	-	-	-	-	-
	Hard rock: Depth –60m, Dia 10-12"with filter pit	35	1.225	2.6	91	0.98
Percolation tanks (3 fillings)	200m*200m*1.5 m	18	3.60	40	720	2.88
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		Total			**961**	**4.10**
Impact assessment & Monitoring						
Piezometer	50 – 80 m	20		0.6	12	
Impact assessment will be carried out by implementing agency						
O & M - 5% of total cost of the scheme					48.65	
TOTAL					**1021.65**	**4.10**

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