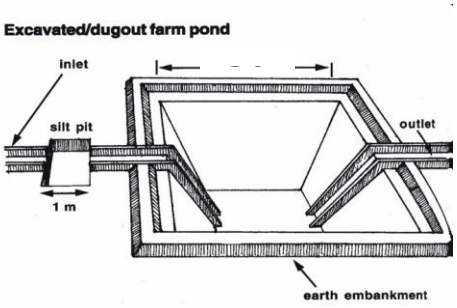
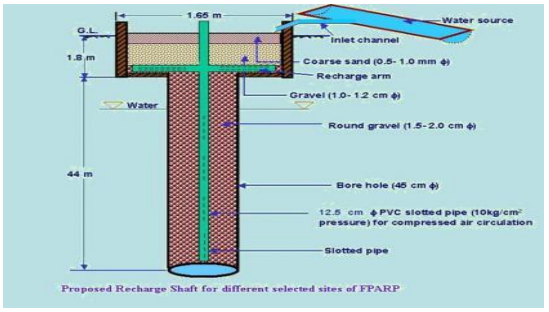
CENTRAL GROUND WATER BOARD

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





ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF NADBAI BLOCK, DISTRICT BHARATPUR, RAJASTHAN

Western Region, Jaipur
January 2017

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF NADBAI BLOCK, DISTRICT BHARATPUR

Plan at a Glance

1.	**Area of the Nadbai Block**	**446.70 sq. km.**
2.	**Area identified for Artificial Recharge**	**281.34 sq km**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**39.32 MCM**
	Annual Ground Water Draft	**70.45 MCM**
	Stage of Ground Water Development	**179.16%**
4.	**Volume of water to be harnessed** **Volume of water available for recharge through RS** **Volume of water available for recharge through PT**	**1.779 MCM** **1.05 MCM** **--**
5.	**Volume of unsaturated aquifer zone available for recharge**	**383.19 MCM**
6.	**Total number of structures to be proposed**	
	Recharge structures Existing village pond with recharge shaft/ well Percolation Tanks Sprinkler Irrigation	**30 shafts in 27 Nos. of existing village ponds** **--** **300 ha**
	Expected Annual GW recharge	**0.84 MCM**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**0.24 MCM**
	Total recharge/ saving of ground water	**1.02 MCM**
7.	**Estimated Cost** Artificial Recharge Plan Sprinkler Irrigation Piezometer construction Operation and maintenance	**3.276 crore** 1.50 crore 1.50 crore 0.12 crore 0.156 crore

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF NADBAI BLOCK, DISTRICT BHARATPUR

Introduction

The **Nadbai Block, district Bharatpur** 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 **179.16%.** 281.34 sq. km. area is potential zone area and thus feasible for artificial recharge.

Location of the block

The Nadbai Block of Bharatpur District covering an area of 446.70 Sq. Km. falls in central-western part of Bharatpur District and is located between North latitudes 27°03' & 27°20' and East longitudes 77°03' & 77°22'.

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 1.779 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)
Bharatpur	Nadbai	446.7	281.34	SR	281.34	0.1	16.62	13.62	383.19

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
Banganga_Banganga_003_RJ0605_AL	Banganga	SR	4.595	0.003	N	0	0
Banganga_Banganga_008_RJ0605_AL	Banganga	SR	128.610	0.560	Y	12	0
Banganga_Banganga_010_RJ0605_AL	Banganga	SR	2.195	0.004	N	0	0
Banganga_Banganga_012_RJ0605_AL	Banganga	SR	40.864	0.000	Y	0	0
Banganga_Banganga_014_RJ0605_AL	Banganga	SR	36.702	0.000	Y	0	0
Banganga_Banganga_017_RJ0605_AL	Banganga	SR	14.281	0.000	Y	0	0
Banganga_Banganga_025_RJ0605_AL	Banganga	SR	215.974	1.212	Y	18	0
				1.779		**30**	**0**

Recharge Shaft

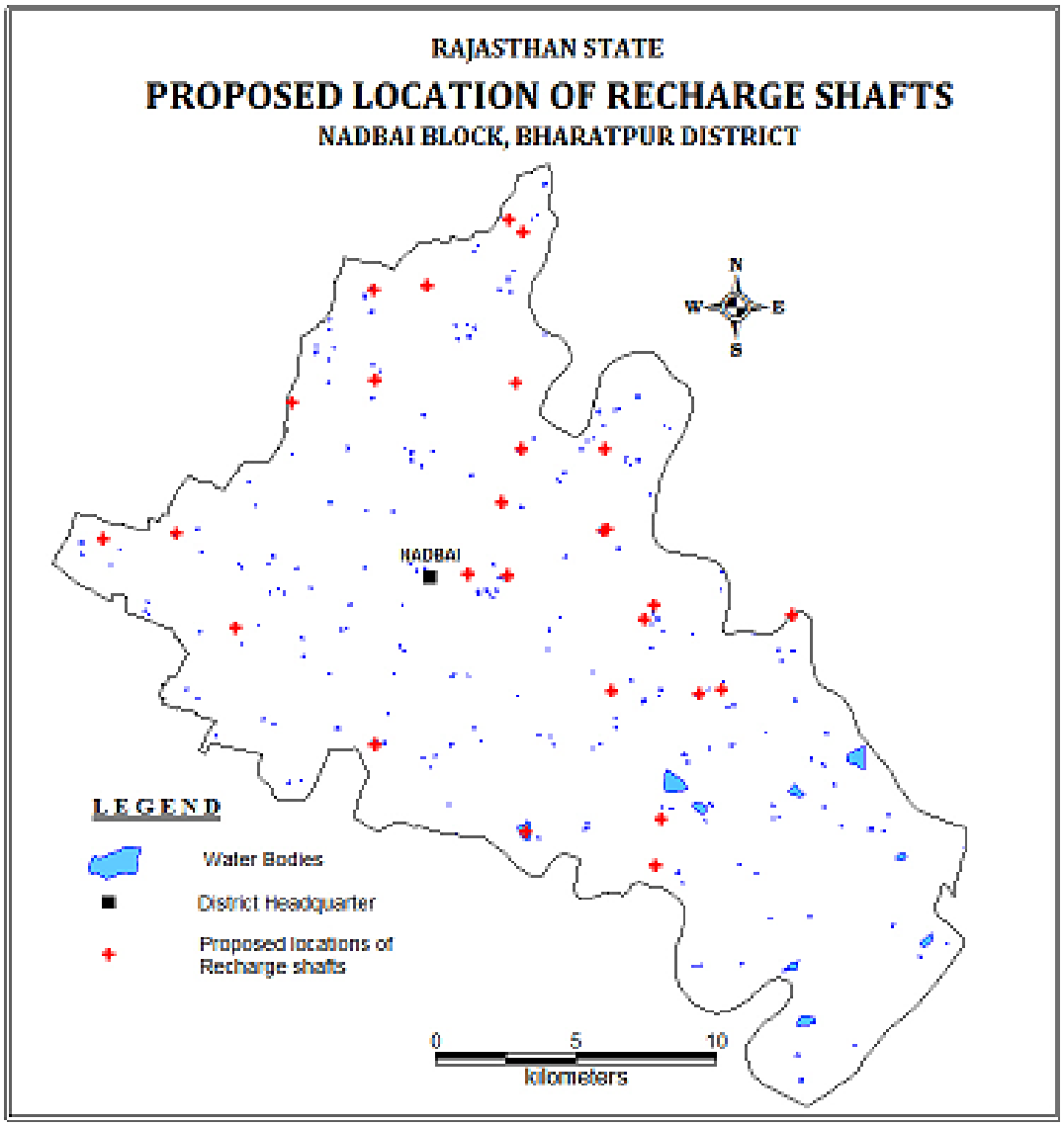
It is proposed to construct Recharge Shaft in existing ponds. The selected ponds should be atleast 3m deep and shallow ponds will be deepened accordingly. It is proposed that the inlet for the Recharge Shaft should be atleast 1m above bed of pond so that the pond retains adequate water for use by villagers.

. 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	Enchera	77.207	27.333	Banganga_Banganga_008_RJ0605_AL	1	5	5
2	Enchera	77.212	27.329	Banganga_Banganga_008_RJ0605_AL	1	5	5
3	Kailoori	77.178	27.312	Banganga_Banganga_008_RJ0605_AL	1	5	5
4	Roneeja	77.158	27.310	Banganga_Banganga_008_RJ0605_AL	1	5	5
5	Unch	77.159	27.281	Banganga_Banganga_008_RJ0605_AL	1	5	5
6	Lalpur	77.129	27.274	Banganga_Banganga_008_RJ0605_AL	1	5	5
7	Barauli Chhar	77.087	27.232	Banganga_Banganga_008_RJ0605_AL	1	5	5
8	Beekroo	77.061	27.230	Banganga_Banganga_008_RJ0605_AL	1	5	5
9	Bahramda	77.210	27.280	Banganga_Banganga_008_RJ0605_AL	1	5	5
10	Manjhi	77.211	27.259	Banganga_Banganga_008_RJ0605_AL	1	5	5
11	Luhasa	77.204	27.242	Banganga_Banganga_008_RJ0605_AL	1	5	5
12	Kheriya Jaga	77.242	27.259	Banganga_Banganga_008_RJ0605_AL	1	5	5
13	Talchhera	77.109	27.202	Banganga_Banganga_025_RJ0605_AL	1	5	5
14	Raisees	77.241	27.233	Banganga_Banganga_025_RJ0605_AL	1	5	5
15	Raisees	77.243	27.233	Banganga_Banganga_025_RJ0605_AL	1	5	5
16	Kawai	77.256	27.205	Banganga_Banganga_025_RJ0605_AL	1	5	5
17	Kawai	77.259	27.209	Banganga_Banganga_025_RJ0605_AL	1	5	5
18	Nadbai (M)	77.192	27.219	Banganga_Banganga_025_RJ0605_AL	1	5	5
19	Nadbai (M)	77.207	27.218	Banganga_Banganga_025_RJ0605_AL	1	5	5
20	Karhi	77.309	27.206	Banganga_Banganga_025_RJ0605_AL	1	5	5
21	Hasanpur	77.284	27.182	Banganga_Banganga_025_RJ0605_AL	1	5	5
22	Hasanpur	77.275	27.181	Banganga_Banganga_025_RJ0605_AL	1	5	5
23	Khatauti	77.244	27.182	Banganga_Banganga_025_RJ0605_AL	1	5	5
24	Nyotha	77.159	27.165	Banganga_Banganga_025_RJ0605_AL	1	5	5
25	Arauda	77.213	27.136	Banganga_Banganga_025_RJ0605_AL	4	5	20
26	Dahra	77.262	27.141	Banganga_Banganga_025_RJ0605_AL	1	5	5
27	Bharkau	77.260	27.126	Banganga_Banganga_025_RJ0605_AL	1	5	5
				Total	**30**		**150**

Fig: 1: Tentative location of Recharge Shaft



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. 3.276 cr. The tentative cost estimates of the various activities of the Plan are shown in Table 4 & 5. The unit rates are as followed by the Govt. of Rajasthan (BSR).

Table 4: 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 – 1.50	-	1.50

Table 5: 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	30	1.05	5	150	0.84
	Hard rock: Depth –60m, Dia 10-12"with filter pit	-	-	-	-	-
Percolation tanks (3 fillings)	200m*200m*1.5 m	-	-	-	-	-
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		Total			**300**	**1.08**
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					15.60	
TOTAL					**327.60**	**1.08**

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