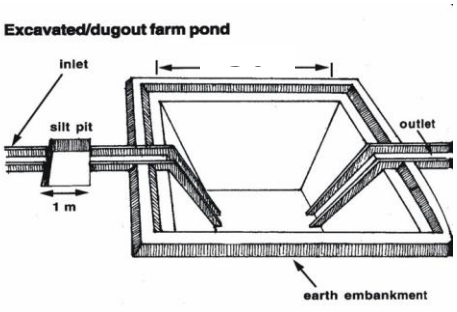
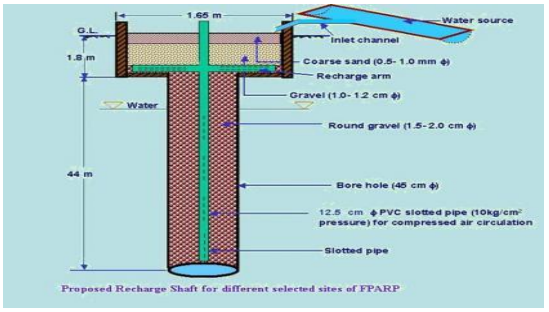
CENTRAL GROUND WATER BOARD

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





ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF BALI BLOCK, DISTRICT PALI, RAJASTHAN

Western Region, Jaipur
February 2017

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF BALI BLOCK, DISTRICT PALI

Plan at a Glance

1.	**Area of the Bali Block**	**1449.80 sq. km.**
2.	**Area identified for Artificial Recharge**	**943.75 sq km**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**42.20 MCM**
	Annual Ground Water Draft	**44.33 MCM**
	Stage of Ground Water Development	**105.06%**
4.	**Volume of water to be harnessed** **Volume of water available for recharge through RS** **Volume of water available for recharge through PT**	**0.822 MCM** **0.510 MCM** **-**
5.	**Volume of unsaturated aquifer zone available for recharge**	**469.153 MCM**
6.	**Total number of structures to be proposed**	
	Recharge structures Existing village pond with recharge shaft/ well Percolation Tanks Sprinkler Irrigation	**15 shafts in 14 Nos. of existing village ponds** **--** **300 ha**
	Expected Annual GW recharge	**0.41 MCM**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**0.24 MCM**
	Total recharge/ saving of ground water	**0.65 MCM**
7.	**Estimated Cost** Artificial Recharge Plan Sprinkler Irrigation Piezometer construction Operation and maintenance	**2.325 crore** 0.654 crore 1.50 crore 0.06 crore 0.111 crore

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Introduction

The **Bali Block, district Pali** 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 **105.06%.** 943.75 sq. km. area is potential zone area and thus feasible for artificial recharge.

Location of the block

The Bali Block of Pali District covering an area of 1449.80 Sq. Km. falls in eastern most tip of Pali District and is located between North latitudes 24°45' & 25°22' and East longitudes 72°60' & 73°25'.

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 0.822 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)
PALI	**BALI**	1449.80	943.75	SR	87.50	0.060	32.8	29.8	156.450
				HR	856.25	0.020	21.26	18.26	312.703

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_Jawai_014_RJ2601_HR	Jawai	HR	44.712	0.142	Y	4	0
Luni_Jawai_015_RJ2601_HR	Jawai	HR	131.450	0.308	Y	0	0
Luni_Jawai_016_RJ2601_HR	Jawai	HR	587.946	0.000	Y	0	0
Luni_Mithari_085_RJ2601_AL	Mithari	SR	2.569	0.003	N	0	0
Luni_Mithari_086_RJ2601_AL	Mithari	SR	491.185	0.370	Y	11	0
Luni_Sukri_091_RJ2601_AL	Sukri	SR	1.376	0.000	N	0	0
Luni_Sukri_092_RJ2601_AL	Sukri	SR	88.546	0.000	Y	0	0
Luni_Sukri_093_RJ2601_AL	Sukri	SR	16.079	0.000	Y	0	0
Sabarmati_Sei_006_RJ2601_HR	Sei	HR	1.400	0.000	Y	0	0
West Banas_West Banas_002_RJ2601_HR	West Banas	HR	2.856	0.000	N	0	0
				0.822		**15**	**0**

Recharge Shaft

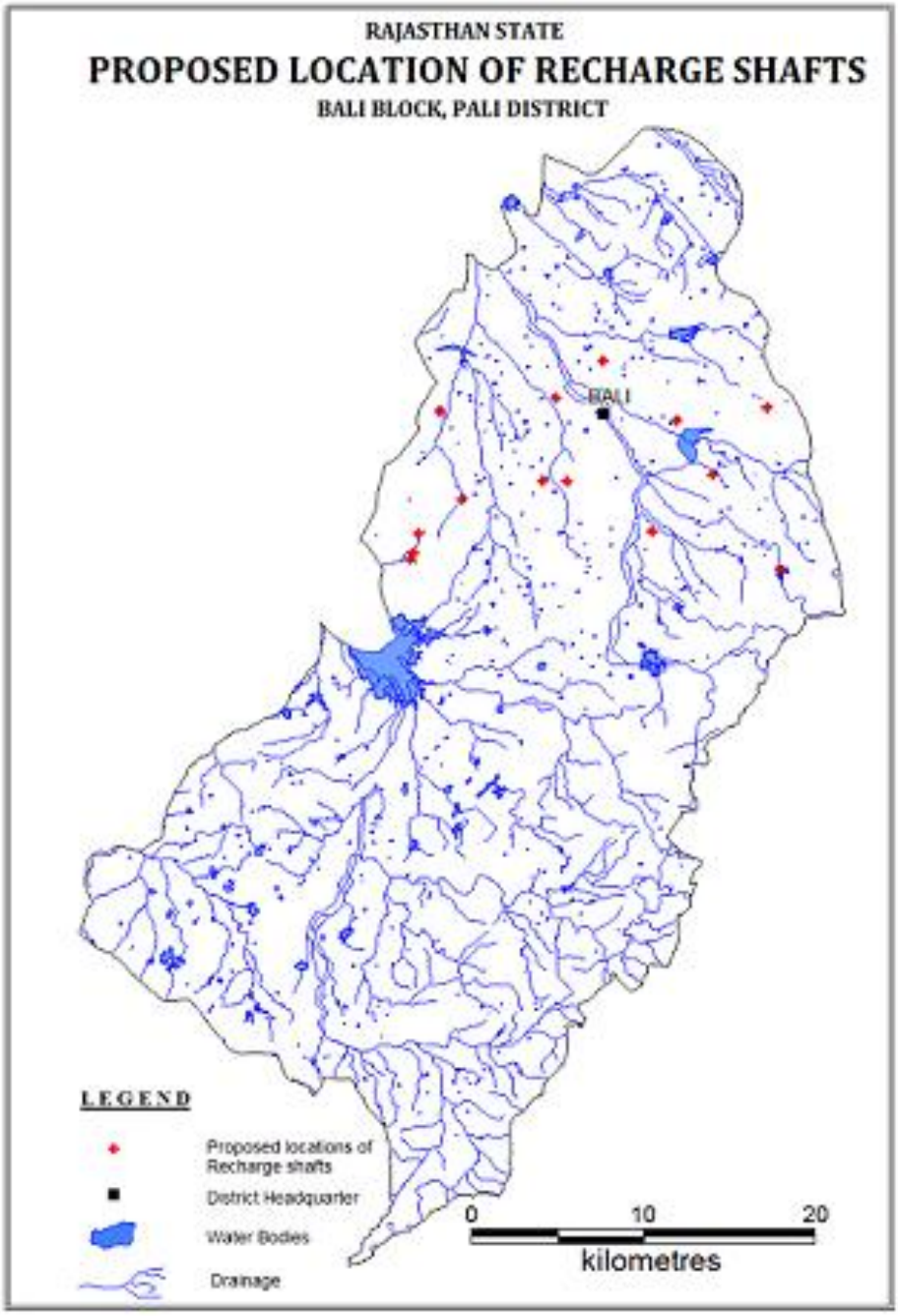
It is proposed to construct Recharge Shaft in existing ponds. The selected ponds should be atleast 3m deep and shallow ponds will be deepened accordingly. It is proposed that the inlet for the Recharge Shaft should be atleast 1m above bed of pond so that the pond retains adequate water for use by villagers.

. 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	Beesalpur	73.188	25.132	Luni_Jawai_014_RJ2601_HR	1	2.6	2.6
2	Beesalpur	73.185	25.122	Luni_Jawai_014_RJ2601_HR	1	2.6	2.6
3	Beesalpur	73.183	25.119	Luni_Jawai_014_RJ2601_HR	2	2.6	5.2
4	Beral	73.200	25.196	Luni_Mithari_086_RJ2601_AL	1	5.0	5.0
5	Perwa	73.213	25.150	Luni_Mithari_086_RJ2601_AL	1	5.0	5.0
6	Boya	73.260	25.160	Luni_Mithari_086_RJ2601_AL	1	5.0	5.0
7	Boya	73.274	25.160	Luni_Mithari_086_RJ2601_AL	1	5.0	5.0
8	Sela	73.267	25.203	Luni_Mithari_086_RJ2601_AL	1	5.0	5.0
9	Kotbaliyan	73.337	25.191	Luni_Mithari_086_RJ2601_AL	1	5.0	5.0
10	Lunawa	73.323	25.133	Luni_Mithari_086_RJ2601_AL	1	5.0	5.0
11	Chamunderi Mertiyan	73.294	25.223	Luni_Mithari_086_RJ2601_AL	1	5.0	5.0
12	Mundara	73.389	25.198	Luni_Mithari_086_RJ2601_AL	1	5.0	5.0
13	Lalrai	73.357	25.163	Luni_Mithari_086_RJ2601_AL	1	5.0	5.0
14	Latara	73.396	25.113	Luni_Mithari_086_RJ2601_AL	1	5.0	5.0
				Total	**15**		**65.4**

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 10 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. 2.325 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 – 0.55 Hard rock- 0.104	-	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	11	0.370	5	55	0.296
	Hard rock: Depth –60m, Dia 10-12"with filter pit	4	0.14	2.6	10.4	0.112
Percolation tanks (3 fillings)	200m*200m*1.5 m	-	-	-	-	-
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		Total			**215.40**	**0.65**
Impact assessment & Monitoring						
Piezometer	50 – 80 m	10		0.6	6	
Impact assessment will be carried out by implementing agency						
O & M - 5% of total cost of the scheme					11.07	
TOTAL					**232.47**	**0.65**

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