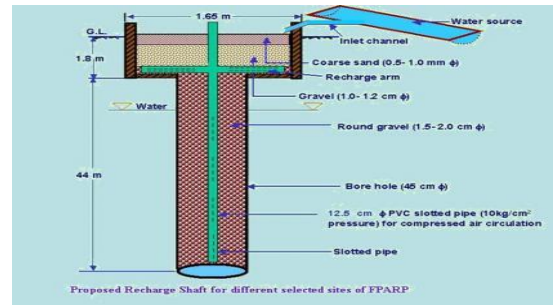




**CENTRAL GROUND WATER BOARD**  
MINISTRY OF WATER RESOURCES,  
RIVER DEVELOPMENT & GANGA REJUVENATION  
GOVERNMENT OF INDIA



Excavated/dugout farm pond



**ARTIFICIAL RECHARGE TO GROUND WATER AND  
WATER CONSERVATION PLAN OF KUCHAMAN  
BLOCK, DISTRICT NAGOUR, RAJASTHAN**

Western Region, Jaipur  
October 2016

# ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF KUCHAMAN BLOCK, DISTRICT NAGOUR

## Plan at a Glance

1.	<b>Area of the Kuchaman Block</b>	<b>1507.13 sq.km.</b>
2.	<b>Area identified for Artificial Recharge</b>	<b>1125.88 sq km</b>
3.	<b>Dynamic Ground Water Resources (as on 31.03.2011)</b>	
	Net Ground Water Availability	<b>66.8108 MCM</b>
	Annual Ground Water Draft	<b>182.9423 MCM</b>
	Stage of Ground Water Development	<b>273.82%</b>
4.	<b>Volume of water to be harnessed</b>	<b>1.45 MCM</b>
	<b>Volume of water available for recharge through RS</b>	<b>0.84 MCM</b>
	<b>Volume of water available for recharge through PT</b>	<b>0.40 MCM</b>
5.	<b>Volume of unsaturated aquifer zone available for recharge</b>	<b>1906.81 MCM</b>
6.	<b>Total number of structures to be proposed</b>	
	<b>Recharge structures</b>	<b>24 shafts in 24</b>
	Existing village pond with recharge shaft/ well	<b>Nos. of existing village ponds</b>
	Percolation Tanks	<b>2 No.</b>
	Sprinkler Irrigation	<b>300 ha</b>
	<b>Expected Annual GW recharge</b>	<b>0.992 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>1.232 MCM</b>
7.	<b>Estimated Cost</b>	<b>3.675 crore</b>
	Artificial Recharge Plan	1.88 crore
	Sprinkler Irrigation	1.50 crore
	Piezometer construction	0.12 crore
	Operation and maintenance	0.175 crore

# ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF KUCHAMAN CITY BLOCK, DISTRICT NAGAUR

## Introduction

The **Kuchaman City Block, district Nagaur** 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 **273.82%**.

## Location of the block

The Kuchaman City Block of Nagaur District covering an area of 1507.13 Sq. Km. falls in **northern - central part** of Nagaur District and is located between North latitudes 26°53' & 27°23' and East longitudes 74°45' & 75°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 1.45 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)
Nagaur	Kuchaman City	1507.13	1125.88	HR	68.75	0.015	24.08	21.08	21.74
				SR	1057.13	0.08	25.29	22.29	1885.07

**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_Jojri_017_RJ2504_AL	Jojri	SR	384.254	0.000	Y	0	0
Luni_Jojri_017_RJ2504_HR	Jojri	HR	0.000	0.000	Y	0	0
Outside Basin_Sub 5_036_RJ2504_AL	Sub 5	SR	25.367	0.000	Y	0	0
Outside Basin_Sub 5_040_RJ2504_AL	Sub 5	SR	0.000	0.000	Y	0	0
Outside Basin_Sub 5_040_RJ2504_AL	Sub 5	SR	65.159	0.000	Y	0	0
Shekhawati_Mendha_013_RJ2504_AL	Mendha	SR	79.440	0.037	Y	1	0
Shekhawati_Mendha_013_RJ2504_AL	Mendha	SR	0.000	0.000	Y	0	0
Shekhawati_Mendha_014_RJ2504_AL	Mendha	SR	0.000	0.000	Y	0	0
Shekhawati_Mendha_014_RJ2504_AL	Mendha	SR	185.218	0.423	Y	4	1
Shekhawati_Mendha_014_RJ2504_HR	Mendha	HR	0.000	0.000	Y	0	0
Shekhawati_Mendha_014_RJ2504_HR	Mendha	HR	79.930	0.182	Y	5	0
Shekhawati_Mendha_018_RJ2504_AL	Mendha	SR	351.122	0.192	Y	5	0
Shekhawati_Mendha_019_RJ2504_AL	Mendha	SR	150.225	0.180	Y	4	0
Shekhawati_Mendha_020_RJ2504_AL	Mendha	SR	29.816	0.004	Y	0	0
Shekhawati_Mendha_021_RJ2504_AL	Mendha	SR	0.030	0.000	Y	0	0
Shekhawati_Mendha_024_RJ2504_AL	Mendha	SR	121.895	0.039	Y	1	0
Shekhawati_Mendha_025_RJ2504_AL	Mendha	SR	170.518	0.396	Y	4	1
Shekhawati_Mendha_025_RJ2504_HR	Mendha	HR	0.000	0.000	Y	0	0
				<b>1.451</b>		<b>24</b>	<b>2</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	Riksa	75.144	27.310	Shekhawati_Mendha_013_RJ2504_AL	1	5.00	5.00
2	Sargoth	74.889	27.104	Shekhawati_Mendha_014_RJ2504_AL	1	5.00	5.00
3	Rampura	74.906	27.133	Shekhawati_Mendha_014_RJ2504_AL	1	5.00	5.00
4	Heerani	74.933	27.130	Shekhawati_Mendha_014_RJ2504_AL	1	5.00	5.00
5	Hanumanpura	74.911	27.090	Shekhawati_Mendha_014_RJ2504_AL	1	5.00	5.00
6	Palara	74.837	27.067	Shekhawati_Mendha_014_RJ2504_HR	1	2.60	2.60
7	Sidiyas	74.830	27.063	Shekhawati_Mendha_014_RJ2504_HR	1	2.60	2.60
8	Narayanpura	74.852	27.040	Shekhawati_Mendha_014_RJ2504_HR	1	2.60	2.60
9	Panwari	74.849	27.107	Shekhawati_Mendha_014_RJ2504_HR	1	2.60	2.60
10	Palara	74.856	27.095	Shekhawati_Mendha_014_RJ2504_HR	1	2.60	2.60
11	Shimbhoopura	75.181	27.115	Shekhawati_Mendha_018_RJ2504_AL	1	5.00	5.00
12	Matasukha	75.206	27.128	Shekhawati_Mendha_018_RJ2504_AL	1	5.00	5.00
13	Barjan	75.156	27.071	Shekhawati_Mendha_018_RJ2504_AL	1	5.00	5.00
14	Maroth	75.078	27.090	Shekhawati_Mendha_018_RJ2504_AL	1	5.00	5.00
15	Rajas	75.062	27.039	Shekhawati_Mendha_018_RJ2504_AL	1	5.00	5.00
16	Rewasa Dalelpura	75.035	27.153	Shekhawati_Mendha_019_RJ2504_AL	1	5.00	5.00
17	Rewasa Dalelpura	75.036	27.151	Shekhawati_Mendha_019_RJ2504_AL	1	5.00	5.00
18	Rughnathpura	75.091	27.189	Shekhawati_Mendha_019_RJ2504_AL	1	5.00	5.00
19	Panchota	75.018	27.062	Shekhawati_Mendha_019_RJ2504_AL	1	5.00	5.00
20	Bhatipura	75.199	26.992	Shekhawati_Mendha_024_RJ2504_AL	1	5.00	5.00
21	Ulana	74.903	27.023	Shekhawati_Mendha_025_RJ2504_AL	1	5.00	5.00
22	Mohanpura	74.946	27.016	Shekhawati_Mendha_025_RJ2504_AL	1	5.00	5.00
23	Nawa (M)	74.921	26.989	Shekhawati_Mendha_025_RJ2504_AL	1	5.00	5.00
24	Gurha Rajawata	74.892	26.985	Shekhawati_Mendha_025_RJ2504_AL	1	5.00	5.00
				<b>Total</b>	<b>24</b>		<b>108</b>

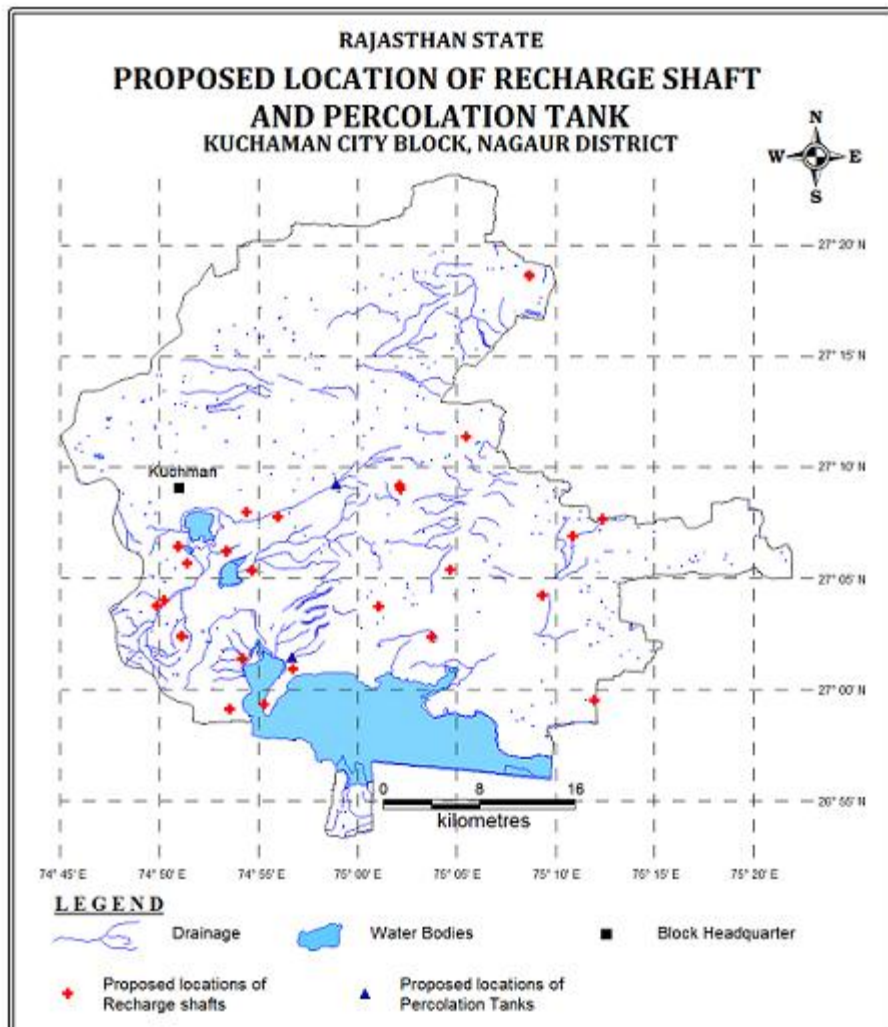
## Percolation Tank

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	Kankariya	74.982	27.154	Shekhawati_Mendha_014_RJ2504_AL	40
2	Mohanpura	74.945	27.024	Shekhawati_Mendha_025_RJ2504_AL	40
			<b>Total</b>		<b>80</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 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. 3.675 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 – 0.95 Hard rock- 0.13	0.80	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	19	0.665	5	95	0.532
	Hard rock: Depth –60m, Dia 10-12”with filter pit	5	0.175	2.60	13	0.14
Percolation tanks (3 fillings)	200m*200m*1.5 m	2	0.40	40	80	0.32
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		<b>Total</b>			<b>338</b>	<b>1.232</b>
<b>Impact assessment &amp; Monitoring</b>						
Piezometer	50 – 80 m	20		0.6	12	
<i>Impact assessment will be carried out by implementing agency</i>						
O & M - 5% of total cost of the scheme					17.50	
<b>TOTAL</b>					<b>367.50</b>	<b>1.232</b>

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