IOSR Journal of Applied Geology and Geophysics (IOSR-JAGG)
e-ISSN: 2321–0990, p-ISSN: 2321–0982.Volume 1, Issue 4 (Sep. – Oct. 2013), PP 01-09
www.iosrjournals.org

An Appraisal of Groundwater Resources and Sustainable Stratigies for Recharge of Aquifers in State Of Rajasthan

S.K.Maanju *, K. Saha**, G.R.Jakhar**
** Vikram University,Ujjain(M.P.)*
*** Govt. Dungar College, Bikaner (Rajasthan)*

Abstract: *The largest State of India, Rajasthan has since beginning witnessed scanty and erratic rainfall, which is lonely source of groundwater recharge. More than 90% of land area is irrigated by groundwater and main source of domestic water is also groundwater. Excessive withdrawal of groundwater has posed serious problems and resulted in depletion of this natural resource. The water level has been declining at an alarming rate of 1 to 2 mts. per year in critical aquifers which is a matter of great concern for every one specifically for future generations.*

The authors in this paper suggest viable methodologies for arrest of declining trend of water level by adopting various artificial recharge methods and an emphasis is given for deciding accurate recharge method.
Key words: *Aquifer, Groundwater, Recharge.*

I. Introduction

The state of Rajasthan which is largest state of India, lies between latitude $23^0$31'N to $30^0$12' N and longitude $69^0$3'E to 78^0 E covering an area of 342239 sq. kms. which is 10.74% of Indian union.The state suffers from vagaries of monsoon having lowest rainfall in western part namely, Jaisalmer district where it rains only 171mm and this rain is not sufficient even to recharge aquifers there and entire rains are consumed as soil moisture, evapotranspiration and allow little or no surface runoff as a result of which even defined channel of stream flows are lacking. However, the story is entirely different in the eastern part of the state and as we move from Jaisalmer-Jodhpur-Ajmer,Jaipure and Dholpur, there is a continuous rise in rainfall which is 386 mm at Jodhpur, 514 mm at Ajmer,603 mm at Jaipur and 819 mm Dholpur indicating a condition of pure desertic to semidesertic type.

The state which from suffers from such an extreme climatic condition in temperature and rainfall also suffers lack of fresh water in its aquifers and in many western distts, 3/4 of the area are only occupied by saline water tract. There was no scientific organization in the State to prospect and delineate the groundwater potential zones and people were digging their wells and tube wells on the advice of unscientific methods of quacks. The State Government realised the shortcoming and opened up a survey and research wing specially to prospect for groundwater and delineate the fresh potential zones of aquifers in the year 1966.

Background :- The survey and research wing earlier came into the existence as a very small unit in the groundwater department in the year 1963-64 with a post of Geo-
Hydrologist, a junior Geology with two research assistants. Looking to the vastness of problem of groundwater and its exploitation a further strengthening was made in the year 1966-67 and full fledge surrey and investigation wing was created in the department with main aim to carry out detailed investigation and demarcate ground water potential zones and its exploitation. Since, the departmental work increased and then it was again reorganized as survey and research wing in 1970, which is exiting date.

The survey and research wing carried out hydro geological survey in whole of Rajasthan and mapped out the potential zones of ground water. This resulted in huge exploitation in ground water for agriculture and domestic purpose with financing of NABARD. The resulted so much so that the total draft from the ground water potential zone exceeded many times more than the recharge taking place through rainfall & other sources between 1980 and 1990. The water level started declining at alarmingly fast rate and matter then came to the notice of government.

Stages Of Ground Water Development.

The number of safe blocks has significantly reduced from 203 to 49 in year 1984 to 2001 and status of ground water condition of different blocks of Rajasthan during period from 1984 to 2001 is quite dismal as shown in table no. 1. Groundwater resources as on 1.1.1998 and 1.1.2001 in state of Rajasthan is shown in table no. 2 and district wise groundwater resources as on 1.1.2001 is shown in table no. 3. As per ground water department data of 1.1.95, out of 30 districts, only 9 districts namely, Baran, Banswara, Bikaner, Dholpur, Tonk, Udaipur, Saimadhopur show some potential of exploitation but rest of the districts comes under grey and dark

categories and water level is going down by 1 to 2 meters every year and till date 3/4th of the potential aquifer have been dewatered at the present rate of the present rate of the ground water withdrawal and if this trend is not arrested timely, may bring havoc in the state even on the brink of rioting amongst the people for water. The same point can be emphasis by stating that at present 123 block are over exploited, 28 block have become dark and 50 block have gone gray as per 1.1.95 year of assessment of ground water department and during subsequent year assessment many more numbers of blocks may be added leaving no hope for exploitation by the tube well and dug wells in near future and even tube wells for drinking water will be drilled because if the following reason:-

A. Most of the potential zones are on the verge of drying up because of over exploitation.
B. Water level in dug wells and tube wells have declined to a depth, which have become uneconomic as the cost of lift become exorbitantly high.
C. Deterioration of ground water quality with excessive withdrawal of water from the aquifer.
D. The entire ground water resources available for irrigation as per data collected and resources determined as on 1.1.95 is 11028. 223 MCM. The net draft due to irrigation for agricultural area in the State is 6493.7144 MCM. The remaining ground water potential further utilization is 4534. 5085 MCM and this meager balance too will be completely utilized by 2041 years by taking 4% growth rate of utilization of ground water resources per year and taking 85% use of existing ground water storage.

The water level fluctuation and category of blocks as per cgwb reports are shown below as well as one hydrograph of Jhotwara block of Jaipur district is also shown as figure 1,2 &3 and diagram-1.

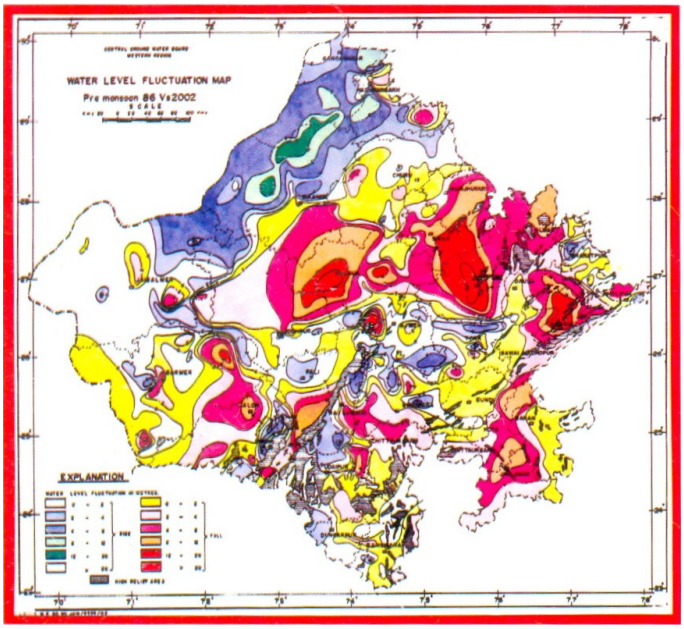

Figure-1 (Source-CGWB)

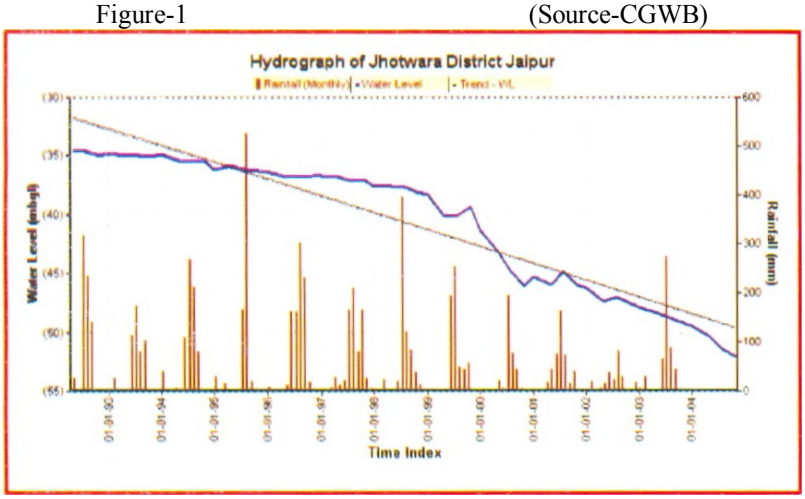

Figure-2 (Source-CGWB)

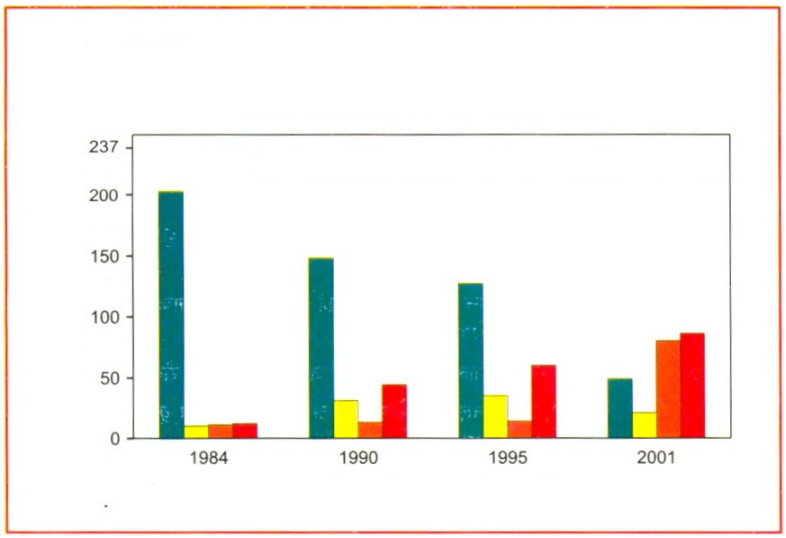

Diagram-1 (Source-CGWB)

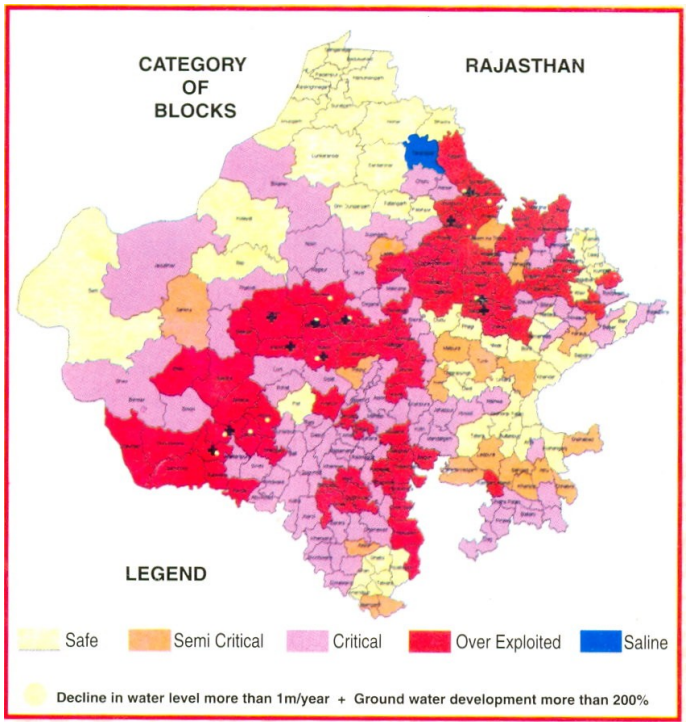

Figure-3 (Source-CGWB)

Table NO. 1:- Status of Groundwater in different blocks.

Year	Total number of block in State	Category (% area)				Remark
		White Safe	Grey Semi-critical	Dark Critical	Over Exploited	
1984	237	203 (86.02)	10 (4.24)	11 (4.66)	12 (5.08)	1 bock not assessed due to saline ground water (Tara Nager, Churu district
1988	237	122 (53.98)	42 (18.58)	18 (7.96)	44 (19.47)	11 block not assessed
1990	237	148 (62.71)	31 (13.14)	13 (5.51)	44 (18.64)	1 block not assessed due to saline ground water (Tara Nager,)

1992	237	149 (63.14)	19 (8.05)	15 (6.36)	53 (22.46)	1block not assessed due to saline ground water (Tara Nager)
1995	237	127 (53.81)	35 (14.13)	14 (5.93)	60 (25.42)	1 block not assessed due to saline ground water (Tara Nagar)
1998	237	135 (57.2)	34 (14.41)	26 (11.02)	41 (17.37)	1 block not assessed due to saline ground water (Tara Nagar)
2001	237	49 (20.76)	21 (8.9)	80 (33.9)	86 (36.44)	1 block not assessed due to saline ground water (Tara Nagar)

Table No. 2 :- Groundwater resources as on 1.1.1998 and 1.1.2001

	Groundwater resource as on 1.1.1998 and 1.1.2001		
S.No	Particular	1998	2001
1	Recharge		
	Gross Recharge	12602.15	-
	Net annual ground water availability	-	11158.97
2	Ground water draft		
	(a) Irrigation Draft	11035.7	10453.52
	(b) Domestic and Industrial Draft	983.42	1181.26
	(c) Gross draft	12019.12	11634.78
	(d) Net G.W draft(70% of irrigation Draft +domestic draft)	8708.41	-
3	**Ground Water balance**	3893.74	(-) 475.81
4	**Stage of G.W development(%)**	69.1	104.26
5	**Total no of blocks (assessed)**	236	236
	(a)safe	135	49
	(b)semi critical	34	21
	(c) critical	26	80
	(d)over exploited	41	86

UNIT : Million Cubic Mitre (MCM)

Table No. 3:- District-wise groundwater resources (as on 1.1.2001)

District	Area sq(km)	Potential Zone area (Sq.km.)	Netannual ground Water Availability (mcm)	Existing Gross ground Water draft for Arrigation (mcm)	Existing G.W draft for domestic and Industrial use (mcm)	Existing Gross Ground water Draft for all Uses (mcm)	Allocation for domestric and Industrial requiremen t as on year 2025 (mcm)	Net ground water availability for futire Irrigation Developm ent (mcm)	Prsent ground water balance (mcm)	Stage of G.W Developm -ent (%)
1	2	3	4	5	6	7	8	9	10	11
Ajmer	8481	7466.76	314.4243	305.2392	43.5855	348.8247	102.6046	-93.4195	-34.4004	110.94
Alwer	8720.46	6825.81	912.3019	1063.587	48.4847	1112.072	120.8226	-272.1083	-199.7704	121.9
Banswara	5037	4288.92	162.5044	28.6074	10.598	39.2054	24.7078	109.1892	123.299	24.13
Baran	6955.31	6892.21	495.3083	305.1357	16.858	321.9937	42.1455	148.0271	173.3146	65.01
Barmer	28387	21734.65	249.8049	204.5159	51.3937	255.9096	81.202	-35.913	-6.1047	102.44
Bharatpur	5044.1	3412.52	514.261	452.2776	27.3797	479.6573	78.38	-16.3966	34.6037	93.27
Bhilwara	10455	9354.85	426.7917	424.3371	26.0477	450.3848	75.9095	-73.4549	-23.5931	105.53
Bikaner	27244	10898.63	197.6075	110.703	33.8147	144.5177	78.0991	8.8054	53.0898	73.13
Bundi	5500	4240.18	355.7014	212.041	20.0769	232.1179	42.1148	101.5456	123.5835	65.26
Chattorgar h	10856	8277.81	460.1123	503.9096	15.5684	519.478	65.6317	-109.429	-59.3657	112.9
Churu	16830	7895.62	197.6883	77.9693	39.3821	117.3514	67.4409	52.2781	80.3369	59.36
Dausa	3420.17	3085.62	269.0076	277.249	18.0481	295.2971	46.68	-54.9214	-26.2895	109.77
Dholpur	3009.05	2049.9	237.211	229.7608	16.0349	254.7957	35.7771	-28.3269	-8.5847	103.62
Dungarpur	3770	2634.13	92.7842	63.6858	12.8433	76.5289	35.7529	-6.6543	16.2553	82.48
Ganganaga r	11603.65.	1545.6	198.8341	131.0265	2.5305	133.557	6.3263	61.4813	65.2771	67.17
Hanumang arh	9579.54	1278.5	194.6094	162.0825	4.588	166.6675	10.2813	22.2456	27.9419	85.64
Jaipur	11061.44	9994.67	684.4074	855.4227	160.5661	1015.988	389.2935	-560.3088	-331.5814	148.45
Jaisalmer	38401	9868.3	52.5923	26.4482	13.147	39.5952	22.35	3.7941	12.9971	75.29

Jalore	10640	8228.1	423.614	797.7421	29.7364	827.4785	74.341	-448.4691	-403.8645	195.34
Jhalawar	6219	6106.16	397.6954	362.754	18.4849	381.2389	46.2123	-11.2708	16.4565	95.86
Jhunjhunu	5928	5273.69	243.0369	358.0869	61.5882	419.6751	139.25	-254.3	-176.6382	172.68
Jodhpur	22250	18867.92	393.1304	555.8329	105.0362	660.8691	182.4611	-345.1636	-267.7387	168.1
Karauil	5038.6	3902.42	412.6633	298.6469	42.1661	340.813	77.4437	36.5727	71.8503	82.59
Kota	5203.94	5123.17	404.1037	191.62	29.1788	220.7988	67.5018	144.9819	183.3049	54.64
Nagaur	17718.25	16378.5	628.1586	707.7749	134.3686	842.1435	228.897	-308.5133	-213.9849	134.07
Pali	12357	7362.54	413.391	304.4199	25.9214	330.3413	54.4331	54.538	83.0497	79.91
Rajsamand	4635.46	3540.09	154.1856	131.7258	11.8988	143.6246	36.416	-13.9562	10.561	93.15
S. Madhopur	5020.65	4325.63	384.7027	262.4127	49.1224	311.5351	99.06	23.23	73.1676	80.98
Sikar	7880.85	7263.46	324.524	305.1129	39.5821	344.695	84.1352	-64.7241	-20.171	106.22
Sirohi	5136	4075.7	265.6484	240.9045	6.4672	247.3717	17.6779	7.066	18.2767	93.12
Tonk	7200	6525.72	414.531	230.6505	40.0198	270.6703	95.5775	88.303	143.8607	65.3
Udaipur	12643.54	8229.48	283.6293	271.8368	26.7417	298.5785	85.7885	-73.9957	-14.9489	105.27
TOTAL	34222.01	217947.3	11158.96	10453.51	1181.256	11634.77	2614.714	-1909.267	-475.8098	104.26

The water is being wasted an unintentionally also and quantity of such water is shown in table no. 4. Although the government is aware of situation and in every meeting, daily news papers, the problem of lowering of water level have been discussed but till date serious efforts the direction is lacking on the part of the government The comprehensive State Water policy recently approved by the Govt. contains a tall order on the responsible organizations in the water resources Sector, which inter-alia lays down that standardized training shall be a part of water resources management & should cover all its aspects & all personnel involved in it, including farmers. The State shall also encourage education of public at large. Scholarships, study tours, incentives etc. shell be provided to encourage & support training.

Table No. 4 :- UNINTENTIONAL WASTAGE OF WATER

Activity	Method adopted	Qty used Ltr.	Method to be adopted	Qty. required Ltr.	Qty saved Ltr
Brushing teeth	running tap for 5 min	20	tumbler or glass	0.5	19.5
Washing hand	running tap for 2 min	8	half filled wash basin	2	6
Shaving	running tap for 8 min	15	shaving mug	1	14
Shower	letting shower run while soaping. staying under shower too long	70	wet down, tap off, soap up rinse off	20	50
Flushing toilet	using old fashioned large capacity cistern	13.5or more	dual system short flush liquid waste	4.6	4.5 or more
Watering plant	running hose for 5 minutes	80	water cane	5	75
Washing floors	running hose for 5 minutes	80	mop& bucket	18	62
Washing car	running hose for 10 minutes	160	bucket	25	135

However the matter is becoming serious day by day and the government has to take a quick decision to meet the above situation and specially the ground water department being an apex organization has to take the responsibility of meeting the challenge of 21stcentury by solving this problem by taking up the following work immediately in hand and effectively managing the ground water utilization in the State.

1) Artificially recharging the over exploited potential zones by taking best possible artificially recharging method available in India.
2) There are 15 recognized basin in the state namely :-
   1) Shekhawati
   2) Ruparaill
   3) Banganga
   4) Gambhir
   5) Parbati
   6) Sabi
   7) Banas
   8) Chambal
   9) Mahi
   (10) Sabarmati
   (11) Luni
   (12) West-Banas
   (13) Sukly
   (14) Other Nallahs
   (15) Out Side Basin

The above basins are very well defined and have different Geological and hydrogeological conditions and requires special study for artificially recharging the aquifers falling in these basins.

3) Study for possibly of conjunctive use in chambal ,mahi, I.G.N.P. and gang canal area .This study is essential to solve the water logging problems by sinking shallow tube wells along the canals and then pouring the water in to the canal for increasing the flow to the tail and villages so that these are properly irrigated.
4) Small stream flow retarding structure intended to enhance ground water replenishment deserves special consideration in the state because of occurrence of flash floods, erratic and unevenly distributed monsoonal rainfall.
5) Inter-basin transfer of surface water as well as ground water.
6) Importing water from surplus basin to deficit basin for artificial recharge.
7) Utilization of Ghaghar nali flood in the out side basin for artificial recharge.
8) Pursuing with the Government for bringing out a comprehensive ground water utilization rule in the state binding the people not to dig or bore a hole eithout the permission of the officer of ground water department.
9) Emphasis with the Government to build anicuts only mand not medium or minor irrigation projects which makes the down stream area dry and thus reduce the chances of recharging the agriculturist well .
10) Building sub-terranean dams on rever emptying out side state boundaries to prevent base flow through thick alluvium bed up to 75% depth of the total thickness. this would stop base flow going waste out side state by 75% and only allows 25% of water to pass down stream so that salinity is not allowed to develop.
11) Because of developmental activities in the state big buildings & colonies have come up in an area which used to from the recharging zones during rains and presently allowing large surface runoff. The Government should make compulsory to conserve such rainwater by guiding it to a recharging pit.

Artificial Recharge methods

Artificial recharge is defined as "the practice of increasing by artificial means the amount of water that enters ground water".

The specific purpose for which artificial recharge is praticed are:-

I) To conserve and dispose of run off and flood water.
II) Supplement the quantity of ground water available.
III) Reduce or eliminate the decline in water level of ground water reservoirs.
IV) Store water to reduce cost of pumping and piping.
V) Store clear, cool water for use of drinking during summer season.

To achieve the above objective we have to find out what are the methods available to us in present's day times. There are the following methods, which can be used permeability and then depth to areas based on hydrogeological formations, permeability, and transmissibility and then depth to water level from natural surface to aquifer to be take place in between natural surface and depth to water level. Boardly, artificial recharge method can be classified in to two groups:- To achieve the above objective we have to To achieve the above objectives we have to find out what are the methods available to us in present's day times. There are the following methods, which can be used permeability and then depth to areas based on hydrogeological formations, permeability, and transmissibility and then depth to water level from natural surface to aquifer to be take place in between natural surface and depth to water level. Boardly, artificial recharge method can be classified in to two groups:-

(a) Direct methods and (b) Indirect methods. These are as follws:

A) DIRECT METHODS:

The direct methods techniques can be divided in to two methods viz:-

1) Surface spreading techniques.
2) Sub surface technique.

Surface spreading technique :- These technique can be further divided into following sub -groups:

I. Flooding
II. Ditch and Furrows
III. Recharge basin
IV. Run off conservation

The structures which have following sub group

a) Gully plugging.
b) Bench Terracing
c) Contour Bunding
d) Nala Bund
e) Percolation Tank

V. Stream Modification
VI. Surface Irrigation.

B) INDIRECT METHODS:

The indirect methods can be further sub-divided in to

I. Induced recharge
II. Aquifer Modification
III. Grounds water conservation structure.

I. **Induced Recharge-** These can be further divided in following heads:
   a) pumping wells
   b) collector well
   c) infiltration Gallery

II Aquifer modification-
   a) Bore Blasting
   b) Hydro-Fracturing
   c) Ground water conservation structure
   d) Ground water dams/under ground bandharas

Of the above method, we have select the,most economical and suitable methods that
Suits to the climatic condition as well as taking into account the rever basins.
If we look at the map of Rajasthan State, we find a clear-cut division of the state parallel to the Aravallis Hills and can be divided roughly in two parts
To the Aravllis Hills and can be devided roughly in two parts

1. These areas are eastern sides falling in definded basins.
2. Areas that falls out side basins mostly in desertic areas(courtesy un – published report of TAHAL), Methods of artificial recharge in both areas are of different types and hence dealt with separately.

The basin can be defined "as entire rains falling in area is drained by a single river having single out let and having prominent water divide boundaries. Accordingly, there are 15 basin which have been mentioned earlier.
Based on the economic condition and with least effort the most important methods of artificial recharge that would suit in these basin are by surface spreading methods.
Among surface spreading methods , following methods are best.

1) **FLOODING BY.**
   a) check dams
   b) anicuts

2) **Run off conservation structure**
   a) Percolation tank
   b) Water harvesting structure.

Each of the above methods are described as follows:

a) **Check Dam**

These are generally built to arrest the flood water and then these flood water is allowed on side to spread and remind in contract with permeable soil for longer period so as to enable the store water to infiltrate down ward to become ground water. Therefore, permeability of the area to be recharged and topography play the important role in location and contraction of check dams . Further, these structure are mostly suited if there is a deep incised channel with sufficient permeable strata up stream and on side of reservoir . These store water up stream and these water can be pumped out with construction of canal and can be taken to desired places also for recharging purpose. The slope of valley / gradient should not be more than 3 to 4%.

Anicuts: Anicut too are an important structure which are generally utilized for water conservation and artificial recharge in area where run off is going waste and because of slope factor flowing water does not have enough contact time to allow recharge to take place through infiltration provided there are no impermeable bed down below the river bed. Anicuts are smaller structure then check dam and when used for artificial it is designed in such a manner as to retain/ arrest the surface run off water by obstructing its downward flow at the same time allowing excess water to overflow it and move down ward recharging further down stream side.

3) Runoff conservation structure :-

a) **Percolation Tank** –its work is very well defined by its name. These are the structure conserve the surface run off which finds little time and because of slope factor water is not allowed to recharge. The area after investigation are selected and an obstruction is erected in the stream and nallah by building embankments so as to store water for some time and thus allows the water to increase contact time the permeable zone and thus recharging ground water in depleted zones.

b) **Water harvesting structures** –These are one of the best methods suites to spread the flood water going waste through rivers stream. The surface runoff is diverted water to more permeable zones mostly on the sides of the river banks and allows spreading. These allow increasing the contact of water with permeable zones thus leading more water to infiltrate to become ground water.

Suitable methods of artificial recharge out side the basin.

These are the areas falling in the arid zone which experience precipitation less then 400mm/ annum with number of rainy days between 29 to 30 days or even less ans rain fall variation coefficient lies from 30 to 70%. In such areas major component of out flow is evaporation due to high temperature and drainage is poorly developed. The infiltration rarely exceeds field capacity of soil and ground water recharge may be very small or negligible. Such region, though experience acute need, may be out of consideration for artificial recharge unless Trans basin water transfer is available.

However, in these areas too some times cloud burst occurs and instances are there that there was 200 or so millimeters rains have fallen with in 24 hours leading flooding especially in Jaiselmer, Barmer. Although, in such areas not much can be done but under the circumstances explained above, water harvesting structures can be tries and for such trial most suitable area is Lathi-Chandan basin which is a highly permeable area but so far study conducted by various ground water agencies indicate occurrence of fossil water which are being utilized by agriculturist for irrigating their land.

However, there is yet another method can be tried over there if cost permits by importing water from canal or by pumping through pipes from IGNP. This method can be attempted for artificial recharge either by spreading or injection methods for confined aquifers though shaft, bore wells and due wells etc.

II. Conclusion

Looking to the present condition existing in the state and results available of various studies points a very poor position of availability of water.Therefore,massive efforts are require to be made for utilizing every drop of rain water by diverting excess water for artificial recharging purposes so as to arrest the declining trend of water level or slowing down the downward trend. There is a need to bring ground water legislation to regularize the use if ground water in the state. There is also need to accurately assess the recharge to ground water as the present methodology followed by the state ground water department is on adhoc norms and it should be replaced by use of ISOTOPE Hydrology methods which takes 3 to 7 years to assess the actual recharge to ground water.

Refernces:

[1]. Bouwer, H. 1978 : Ground Water Hydrology, McGraw Hill, New York.
[2]. Davis D.N. and Dewiest, R.J.M. 1968 : Hydrogeology John Willey & Sons, New York.
[3]. Garg, S.P. 1984 : Ground Water and Tube Wells Oxford & IBH Publishing Co. 2nd Edn., New Delhi.
[4]. Ground Water Basin Management "ASCE Manual of Engineering Practice No.40", American Society of Civil Engineer, New York, 1967.
[5]. Heath R.C. and Frenk W. Trainer 1968 : Introduction of Ground Water Hydrology, John Willey & Sons, New York.
[6]. Hem, J.C. 1970 : Study and Interpretation of the Chemical Characteristics of Natural Water U.S.G.S. Water Supply Paper, 1473.
[7]. Indian Standard Institute (ISI) 1968 : Indian Standard Specification for Drinking Water.
[8]. Jacob, C.E. 1960 : Flow of Ground Water in Engineering Hydraulics, John Willey & Sons, New York.
[9]. Karanth, K.R. 1987 : Groundwater Assessment Development and Management, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
[10]. Maanju, S.K. 1992 : Hydrogeology and Hydrochemistry of Part of Moral Basin, Jaipur District, Rajasthan, India. Unpublished Ph.D Thesis, University of Rajasthan, Jaipur.
[11]. Rima, D.R. Chase, E.B. and Mayers, B.M., 1971 : "Sub-surface Disposal by Means of Wills – A Selected Annotated Bibliography", U.S. Geological Society Paper 2020.

[12]. Singor, D.C. Growetz, D.J. and Kam, W. 1971 : Annotated Bibliography on Artificial recharge of Ground Water 1955-67, U.S. Geological Survey Water Supply Paper 1990.
[13]. Todd, D.K., 1959 : Ground Water Hydrology, John Wiley & Sons, New York.
[14]. Un-published Report, brochures, handbills and pamphlet of Central Ground water Board
[15]. Un-published Report, brochures, handbills and pamphlet of Ground Water Deptt., Govt. of Rajasthan.