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Research Paper

Traditions of Water Conservation in Some Ethnic Villages of Banswara District (Rajasthan).

[1]Seema Bhardwaj* and [2]Lalit Choudhary
HDJ Govt. Girls P.G. College, Banswara 327001, Rajasthan, India.
Leo College, Banswara 327001, Rajasthan, India.

ABSTRACT: *The hydrological cycle is the basic and primary cycle for the survival of life, but it is greatly affected by global warming and climate change. It is an alarming signal for us. Water resources in our country remain unutilized. They require proper management. The utilization and harvesting of rainwater is the current issue of the present era. Rainwater harvesting is a good alternative for freshwater management. The government has already introduced so many integrated management schemes and projects. The Indian subcontinent has its traditional systems of water conservation and harvesting. In this area, so many hilly pockets enjoy the benefits of modern harvesting systems, and some also depend on their traditional system practices of rainwater harvesting. In arid and semi-arid areas, rivers are seasonal, where water is not available throughout the year. Storage structures are prevalent practices in these areas. These structures collect running water from the catchment area. Banswara is quadrangular with hills, tanks, rivers, undulating plains, and ponds. The north-east and south part's hills belong to the Aravali belt; its formation is quartzite – schists. The central and western parts of varying undulating altitude from 140-200 m. above m.s.l. Five rivers are present in the Banswara district (Mahi, Haran, Anas, Chap, and Eru). A good number of larger tanks (Survania, Patella, Mimkhor, Delwara, Metwada, Bhagora, and Makampura), temporary ponds, ditches, low lying area, mashers, and lagoons are also found in this district. Banswara has a good catchment and command area of freshwater. This paper aims to study some water conservation strategies and some ground realities in this ethnic belt of Aravali hills. Watershed is an integrated management strategy for natural resources. Traditional water management approaches (Bavdi, Wells, Canals, Tanks, Charas, Rahant, Earthen channels, etc.) are also appreciable in this area.*
KEYWORDS: *Water conservation, Traditional, Watershed, Ethnic, Aravali hill.*

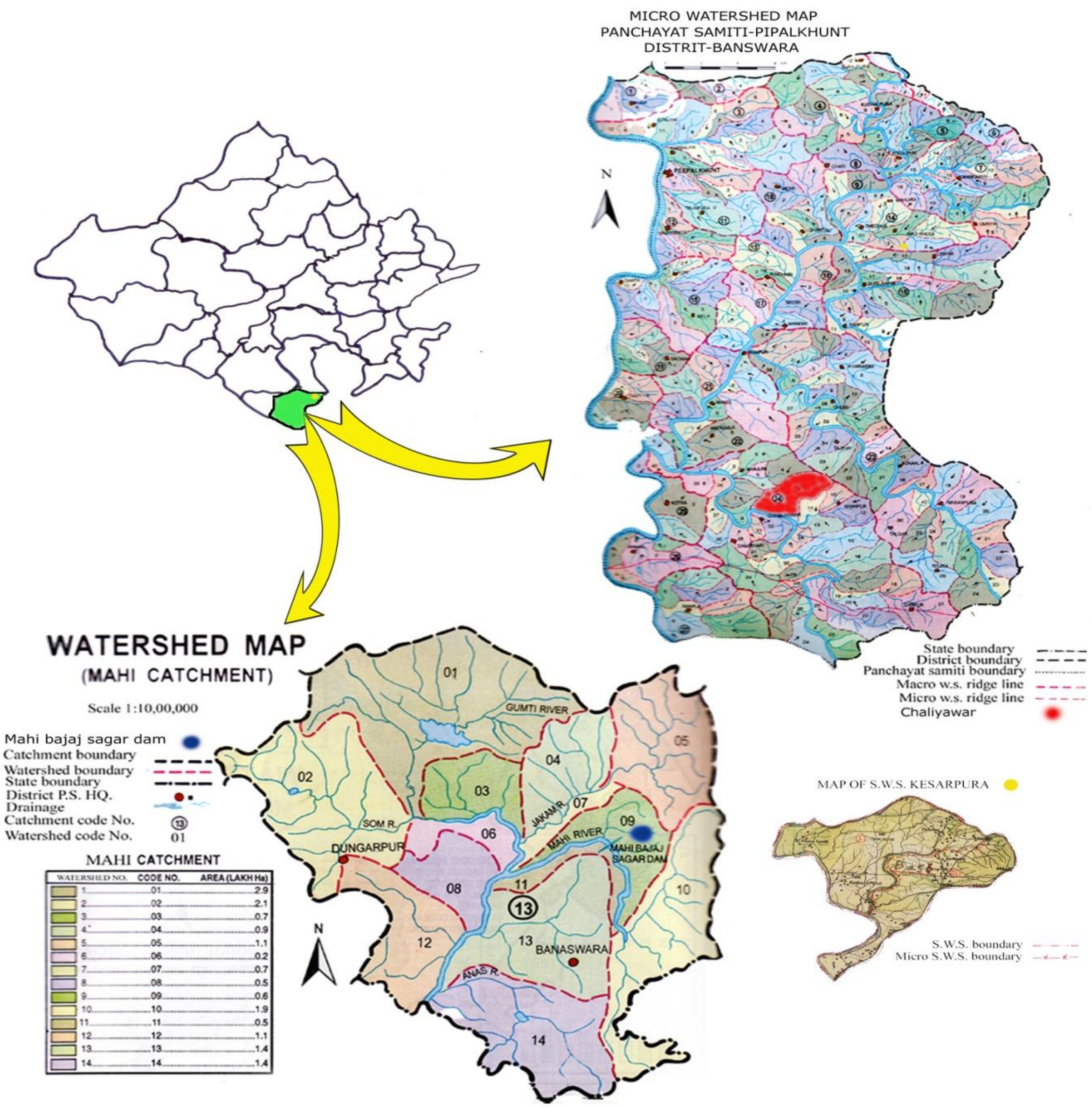
I. INTRODUCTION

Water has vital importance in the survival of biodiversity. Groundwater is the main part of the earth's circulatory system. Groundwater development dates from ancient's times. The old testament contains numerous references to groundwater springs and wells [1]. Groundwater is an important source of water supply all over the world. Shortage of groundwater in excessive draft areas emphasizes the importance of correct estimates and proper development, regulation, and protection of supplies to ensure this key natural resource [2]. Groundwater occurs in aquifers; it may be confined and unconfined. In the Indian subcontinent, many traditional strategies of water harvesting are common. These strategies are related to the use of groundwater or surface water. In hilly areas, the communities have devised their means of water supply for domestic and irrigation purposes for generations to provide water. Some parts of this area enjoy the benefits of the modern system. Some depend on their traditional water harvesting conservation strategies and utilization, such as Rhant, Charas, Tanks, Bavdis, Ponds, Manual irrigation, Canal system, Earthen check dams, etc. The hydrological cycle of the earth is affected by climate change. Mountain range, Earth climate, and hydrological cycle are crucial. High altitude forests play a huge part in the maintenance of this hydrological cycle. Deforestations in the hilly region were severely affecting all watersheds and river sources [3]. The global hydrological cycle is one of the primary systems that are most detrimentally affected by the changes brought about by global warming. Many indicators of this disruption are already evident in the increasing incidences of droughts, floods, storms, and devastation that these events cause [4]. Framework for "Water future" research has formed. Each aspect of this framework needs a diverse set of expertise and competencies because, on their own, they might not provide an overview of India's water challenge in 2050. A good prognosis, rather than suggesting definitive answers to how much water India will need in 2050, will generate alternative policy scenarios and sensitivity analyses. Which of the scenarios will be closest to the reality in 2050 will depend on the robustness of the assumptions, and India's path over the coming decades? One of the windfalls of the entire debate on NRLP [5] has been a heightened interest among the scientific community in projections about 'India's water future.' Perhaps, prompted by the estimates made by NCIWRD [6], there have been some attempts at the arguably difficult exercise of predicting the future. Irrespective of whether the river-linking plan finally gets implemented or not, we believe that it provides an excellent opportunity for India to review its preparedness for meeting the challenge ahead. Admittedly, our analysis raises more questions than we attempted to answer, but we hope this will trigger a studied debate on this significant theme. Agriculture continues to be the biggest absorber of people in India. Even if food security concerns were to be met; otherwise, people will continue to depend on agriculture for their livelihoods and will continue to demand water for irrigation. Therefore, it becomes important to make studied projections of what proportion of the country's population will continue to depend on agriculture through to 2050. As of now, some 64 percent of the country's population derives its livelihood substantially from agricultural operations—either as cultivators or as agricultural wage laborers [7]. Rainwater harvesting can be implemented as a viable alternative to conventional water-supply schemes in the region, considering that any land anywhere can harvest rainwater [8]. Rainwater harvesting, besides helping meet the ever-increasing demand for water, reduces runoff, choking storm drains, reducing flood hazards, augmenting groundwater storage, controlling the decline in the water level, and improving the quality of groundwater, and reduce soil erosion. This is considered an ideal solution for the water problem, where there is inadequate groundwater supply or where surface resources are either not available or insufficient. Rainwater is bacteriologically pure, free from organic matter, and soft. The suggested structures for harvesting rainwater are simple, economical, and eco-friendly. Previous studies have shown that subsistence agriculture in the hilly northeastern region could be successfully transformed into a profit-earning enterprise by tapping and utilizing rainwater in limited quantities [9] and [10]. We need conservatory fresh water strategies because some warring articles alert us about future problems related to the quality, quantity, and availability of freshwater worldwide. It is better to refer here some lines of an article of J. Qui "In the past half-century 82% of the plateau's glaciers have retreated. In the past decade, 10% of its permafrost has degraded. As the changes continue or even accelerate, their effects will resonate for beyond the isolated plateau, changing the water supply for billions of people and altering the atmospheric circulation over half the planet" [11]. Rural and urban areas in the world are facing challenges to the supply and conservation of water. Water management and conservation are a crucial method of resolving water scarcity. Anthropogenic support and improvements in behaviour depend on the effectiveness of conservational initiatives [12].

In Rajasthan generally, villages & cities were built around areas of water sources. Tank, Wells, Bavdis, and Ponds are common water sources for drinking, irrigation, and other villagers' domesticated works. "The City of Hundred Islands" is the Banswara district of the southernmost part of Rajasthan. It is lies between 23.1°N to 23.56°N latitudes and 73.58°E to 74.49°E longitudes. Its eastern part occupied by hills of Deccan trap. Banswara district lies in the Mahi river basin. Mahi enters from the southeast and flowing north towards the northern end of Banswara. It turns southwest, where it forms the boundary between Dungarpur & Banswara; finally, Mahi reaches to Gulf of Cambay. This district is supported by five rivers, namely Mahi, Anas, Erav, Chanp, and Haram. Mahi Bajaj Sagar Dam has been constructed on the river Mahi. Most of the Banswara district parts are dependent on water and irrigation Right & Left canals of river Mahi. People use so many traditional water conservation strategies; besides, some other modern strategies are also common in this area, such as watersheds, modern canal systems, check bundles, etc. Heavy shower causes rapid runoff on slopes resulting in heavy soil loss and siltation of river beds and dam beds. To reduce siltation and simultaneous storage of water Kadana Mahi River Valley project was started in this area. Groundwater is recharged and used by local wells, tube wells, bavdis, and talab.

II. METHODOLOGY

The present study carried out in Chaliyawar watershed (No. 4-10) of Pipalkhunt range of Banswara (now in Pratapgarh) of Rajasthan and in Kataron ki bhe, Thikariya, Kesarpura, Ratnagarh, Kundel, and Rana ki Harvar villages of sub-watershed of Kesarpura of Kadana Mahi River Valley Project. This study is mainly based on field study, site observation, and villager's views. The information and data were collected through discussions with Forest Department members, Kadana Mahi River Valley Project \and Watershed project of Pipalkhunt and some villagers. Some data were also collected through secondary sources. These include literature review, reports, and records of F.D. and Watershed Project, etc. Sub watershed Kesarpura area is located between the longitude of s/w $74^{\circ}1'$E to 74° E, the latitude of S/W 23° 48'N to$23^{\circ}51'$ N on the Banswara Partapgarh road via Lambadabra 70 Km. N/E. This area comes under the Ghatol range Panchyat Samiti Pipalkhunt. Red, brown, and black cotton soil is found in the study area. The total land area is 1689 hac. Out of which 900 hac agriculture treatable and 92 hac. untreatable area. 90 hac. treatable area of wasteland and 17.00 hac. untreatable area of wasteland while 590 hac. untreatable area of forest land. The Government of Rajasthan is paying full attention to this crucial issue.



Source- Watershed Atlas of Rajasthan (Govt.of Raj. 1999)

Map-Location of study area

III. OBSERVATION AND RESULTS

The present study aimed to find common traditional and modern water conservation strategies and rural development in this hilly ethnic area of southern Rajasthan. We observed strategies under 3 categories:

A - Traditional strategies of water conservation irrigation and domestic uses.

B - Activities related to strategies of Chaliyawar watershed of Pipalkhunt related to strategy.

C- Activities of S.W.S. Kesarpura Kadana Mahi River Valley Project.

A- We observed some common traditional strategies in the field areas in the form of wells, canals, rhant, charas, Bavdis, tanks, wetlands, earthen check dams, etc. We also observed that the government has already introduced so many integrated management schemes and projects for water conservation & harvesting in this area.

B- We observed the following observation of Chaliyawar watershed activities during the year 2002-03 to 2007-08.

- The number of wells and tube wells is increased (Table -1)
- Water table increased (Table -1).
- Soil erosion checked.

- The cropping pattern changed in some parts, which result in increased yield.
- Migration of local people of the study area also checked which common and significant problem in the study area.

S.N.	W.shed Chal. .No.	Mac.	Mic.	Total area (Hac.)	Annual rainfall (mm.)	Season	Temp. (°C)		No. of Well		No. Of T.Wells		Water level (m.)	
							Min.	Max.	A	B	A	B	A	B
1	4	24	15(B)	535	1050	S. W. R	35 8 27	42 26 34	09	16	-	-	11.0	9.0
2	5	24	14,15 (A)	580	1050	S. W. R	35 8 27	42 26 34	09	15	-	-	10.5	8.5
3	6	24	16	605	1050	S. W. R	35 8 27	42 26 34	6	10	-	-	11.5	9.5
4	7	24	17	450	1050	S. W. R	35 8 27	42 26 34	10	18	-	-	11.0	9.5
5	8	24	18,19	515	1050	S. W. R	35 8 27	42 26 34	11	18	-	1	10.5	8.5
6	9	24	21(A)	500	1050	S. W. R	35 8 27	42 26 34	12	20	1	3	10.0	8.0
7	10	24	21(B)	500	1050	S. W. R	35 8 27	42 26 34	12	18	-	1	10.5	8.5

Table: - 1 Shows activities of the Chaliyawar watershed of Pipalkhunt.
A = Before, B = After, S=Summer, W= Winter, R= Rainy

C - In S.W.S. Kesarpura, we observed the following activities during 2004-05 to 06: -

- Contour Graded Bunds are formed in eroded areas.
- Loose boulders completed drainage. Line Treatments and loose boulders with vegetative supports were constructed in upper and middle reaches.
- Earthen bunds, water harvesting structures, field outlets, silt detention structures and Gabions structures were constructed in lower reaches.
- The plantation was done for the increment of the free cover area. These plants are useful for fodder, fuel, and small timber needs. Fruit plants (Amla, Lemon, and Mango) were also planted in the watershed area.
- Earthen, loose boulders, and loose boulders with vegetative support were also built-in villages' waste land areas.
- Forest land of 590 hac. was already treated by the forest department; therefore, this area was left by activities of S.W.S. Kesarpura.
- Except for these activities, workshops, field visits, and farmers' training of treated areas were also arranged for conservative water measures and the scientific understanding of the modern methodology.
- Products of the plantation will help improve the socioeconomic status of an ethnic population of the study area.
- Cropping intensity and irrigation potential were also increased due to these strategies. This increase also supports the improvement of the socioeconomic status of the study area.
- Ratanjot plantation was done, and the yield of ratanjot seed has also started from the year 2007, which will gradually increase in successive years. It is again going to give additional income to the villagers in the coming future.

A.  B. 

Fig. A & B Show-Structures formed for rainwater harvesting.

In the sub-watershed Kesarpura region, Kataron ki bhe, Thikariya & Kesarpura Ratnagarh, and Kundel were the main villages for studying water level in wells (Table -2). Sedimentation yield and runoff were also reduced due to project strategies. Data of rainfall, sedimentation yield, and runoff were collected during the rainy season, which shows a remarkable decrease in runoff and sedimentation yield. (Table- 3 and Graph-1, 2, 3).

S.N.	Date of measurement	1(A)	2(A)	4(A)	5(A)	6(A)	7(A)	8(A)	9(A)	10(A)	11(A)	14(A)	15(A)
1	13.06.04	0.30 (B)	0.60 (B)	1.50 (B)	3.00(B)	1.50(B)	1.50 (B)	1.50(B)	2.00(B)	0.30(B)	2.30(B)	0.60(B)	2.00(B)
2	13.07.04	0.35 (B)	0.70 (B)	1.65 (B)	3.30(B)	1.60(B)	1.65 (B)	1.70(B)	2.00(B)	0.45(B)	2.50(B)	0.70(B)	2.20(B)
3	13.08.04	9.20 (B)	6.60 (B)	9.20 (B)	13.45(B)	13.45(B)	13.45(B)	1.95(B)	2.20(B)	0.80(B)	2.90(B)	10.0(B)	2.50(B)
4	13.09.04	9.50 (B)	6.90 (B)	8.60 (B)	13.30(B)	13.35(B)	13.25(B)	2.50(B)	2.70(B)	1.90(B)	3.80(B)	9.90(B)	2.80(B)
5	13.10.04	9.40 (B)	6.45 (B)	7.70 (B)	11.85(B)	12.65(B)	12.85(B)	2.90(B)	2.90(B)	1.90(B)	4.00(B)	8.15(B)	2.70(B)
6	13.11.04	9.20 (B)	6.30 (B)	7.20 (B)	10.15(B)	10.15(B)	7.30 (B)	2.90(B)	2.80(B)	1.80(B)	3.80(B)	7.65(B)	2.65(B)
7	13.12.04	8.90 (B)	6.20 (B)	6.5 (B)	8.65(B)	7.90(B)	6.20 (B)	2.80(B)	2.65(B)	1.75(B)	3.75(B)	5.35(B)	2.60(B)
8	13.01.05	8.80 (B)	6.10 (B)	4.10 (B)	6.35(B)	4.35(B)	4.80 (B)	2.65(B)	2.60(B)	1.70(B)	3.70(B)	3.95(B)	2.50(B)
9	13.02.05	8.70 (B)	6.01 (B)	2.20 (B)	5.45(B)	1.25(B)	2.20 (B)	2.60(B)	2.50(B)	1.70(B)	3.60(B)	2.25(B)	2.45(B)
10	13.02.05	6.50 (B)	4.65 (B)	1.80 (B)	3.20(B)	0.60(B)	1.50 (B)	2.50(B)	2.40(B)	1.60(B)	3.40(B)	0.50(B)	2.30(B)
11	13.03.05	5.20 (B)	Dry	1.00 (B)	2.45(B)	Dry	1.00 (B)	2.30(B)	2.30(B)	1.80(B)	3.20(B)	Dry	2.25(B)
12	13.04.05	0.80 (B)	Dry	Dry	Dry	Dry	Dry	2.00(B)	2.10(B)	0.60(B)	3.00(B)	Dry	2.00(B)
13	13.05.06	0.45 (B)	Dry	Dry	Dry	Dry	Dry	1.70(B)	1.80 (B)	0.00(B)	2.00(B)	Dry	2.10(B)

Table - 2 shows water levels in different wells of the study area.

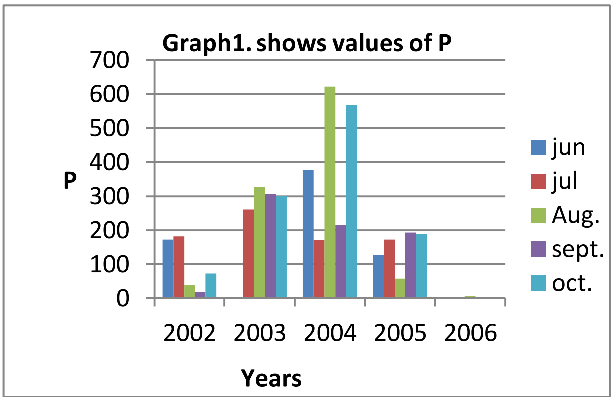
A=Well No. of the study area, B=Water level in Meter (M)

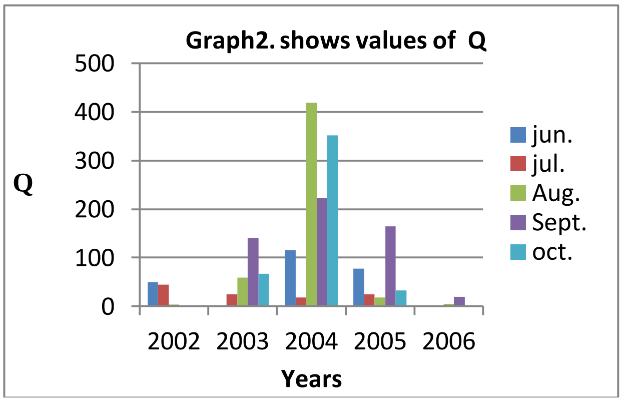
Month/Year		June	July	August	September	October	Total
2002	P	172.4	0.0	378.0	127.0	0.0	677.4
	Q	49.724	1.372	115.951	77.229	0.0	244.76
	S	3.67241	0.0	2.12457	1.12367	0.0	6.92065
2003	P	182.2	261.4	170.2	171.6	0.0	785.4
	Q	44.932	25.447	18.059	24.906	0.0	113.344
	S	1.31812	0.191920	0.01314	0.01641	0.0	1.53959
2004	P	39.2	326.6	622.2	58.2	5.8	1052.00
	Q	3.390	58.772	418.743	18.158	4.978	504.041
	S	.002678	0.578163	3.854816	.007796	0.0	4.443753

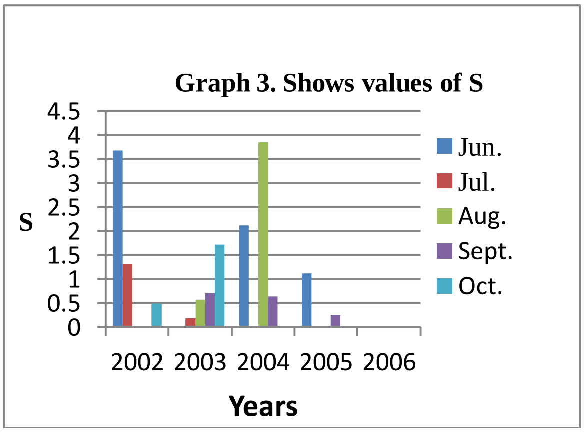
2005	P	18.8	305.0	215.0	192.8	0.0	731.5
	Q	0.0	140.51	223.04	164.42	20.14	548.11
	S	0.0	0.702	0.640	0.250	0.0	1.592
2006	P	72.0	300	566.80	190.0	0.0	1128.8
	Q	0.686	67.508	352.262	33.447	-	453.902
	S	.486980	1.720922	-	-	-	2.207902

Table – 3 Shows data on rainfall, runoff, and sedimentation yield in the study area.

P = Rainfall (mm.), Q = Runoff (mm), S=Sediment yield (Hac.mt. /100sq. Km.)







IV. DISCUSSION

Results of the present study show similarities with the results of earlier workers [2], [3], [8], [9], [10], [13], [14] and [15]. The groundwater levels show a seasonal pattern of fluctuation. This is due to water conservatory strategies of recharge from rainfall and irrigation and discharges from pumping, which follows a well-defined seasonal cycle. Results of present study show a remarkable increase in the ground water table. Water was seen flowing in all nallahs of these areas during March and April. According to Dr. Dinesh Chandra

Bhatt water will be available in the month of May-June too. While no single strategy fulfills the entire mode of conservation of water. Yet all methods are beneficial to yield multiple benefits. Some ways are useful for increasing crop harvesting; some are beneficial for drinking water quality and quantities and fisheries.

Suggestions

- Such type of conservative water policies should develop, which are helpful in sustainable development.
- Indigenous people should be involved and benefit from activities related to conservatory strategies.
- A traditional system like Bavdi, Pond, Tank, Rant should be considered for conservation, irrigation, and domestic uses.
- The new scientific technique of irrigation, harvesting should be adopted in the local area.
- Links and linkages between policy, project, and planning to be healthier.
- Programs to be managed which are helpful in the enhancement of popularity of water conservative and harvesting strategies.
- Safety measures of water-storing structures (dam, rivers, Tanks, Ponds, etc.) should be organized appropriately.
- Human resources activities should be an integral part of projects and planning of water conservation in rural development.
- Frontiers of knowledge can play prominent water conservation roles from different science, technology, research, and other educational centers.
- Flood forecasting should be modernized, and flood control management should be keeping in mind.
- System, structure, and scheme of maintenance and modernization for water conservation should be managed.

V. CONCLUSION

Due to these strategies, the groundwater table, crop cultivation, and yield are increased. The positive reflection of these strategies' results can also be seen in the people's socioeconomic status and the rural development of the study area. These strategies are appreciable, but there is still a need for some other scientific and technical process towards water conservation and management for rural development.

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