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Sustainable Development Through Watershed : A Case Study of Southern Part of Bharatpur District

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Abstract

Water is primary natural resources, a basic human need and a precious national asset. A human can survive for a long time without food but cannot survive for a few days without water. The study area is the eastern most district of Rajasthan state lying between $26^0$22' north latitude to $27^0$50' north latitude and $76^0$53' east longitude to $78^0$17' east longitudes. The southern tehsils have hilly topography and undulating. Watershed programmes are implemented to enhance ecological and Socio-economic status of this region. The sustainable development was observed after the watershed interventions in the region. High correlation between the number of watersheds and forest cover was observed in the study area. There was a change in the traditional mindset of the society towards women. Farmers were benefited with a bumper production of rabi crops. Dairy development and livestock rearing activities are flourishing after the watershed interventions. So watershed programmes have helped immensely in sustainable development of the study area.

Keywords: Assets, Personal Hygiene, Congregation, Bharat, Sinsinwar, Banganga, Watershed Interventions, Sustainable, Correlation, Mindset, Flourishing, Landless.

Introduction

Water is a primary natural resource, a basic human need and precious national asset. Water is essential to our daily lives and a principal compound in nature. A man can survive for a long time without food but cannot survive for a few days without water. Water is an important component of the structure of human body and atmosphere. The water we use must be adequate in quantity as well as in quality for its different tasks everything from personal hygiene to vast national water projects. We need water for drinking, personal hygiene, domestic consumption. Irrigation, industrial purposes, generation of hydel power, transportation and recreation. Water has played an important role in the development of man's culture and civilization. The ancient civilizations have flourished in the river valleys. 'Jal hi Jeevan Hai' and 'Jal hai to Kal hai' reveal its importance. The economic development of a region is determined by the availability of water in that region. Water is an important component in the development of agriculture sector. Industrialization and urbanization are not possible without water. Today hydel power is an important source of energy. In a nutshell, water is the foundation of human culture, civilization and economic activities.

Objective of the Study

The present study has been taken with the following objectives:

1. To study the impact of watershed management on land use pattern.
2. To compare impact of interventions of pre watershed and post watershed development on land, ecology and socio-economic condition of the region.
3. To highlight the problem pertaining in depletion of underground water resource and suggest the sustainable development.
4. To examine the changes in socio-economic and environmental status of the area.
5. To suggest the effective ways of restoring the ecological balance by conserving natural resources.

Research Methodology

The present research work is entirely based on the following information.

1. Natural physical resources: relief, soil, geology, geomorphology, drainage, watershed slope, land use, climate, rainfall etc.
2. Contemporary technology: agriculture, water management, water harvesting, ground water exploration, animal husbandry, minerals, energy etc.
3. Socio-economic demographic data: social, demographic cultural profile and economic status.

Following Tools will Be used for the Study

1. Primary and secondary data collection: sampling methodology sample size and questionnaire design will be key tools. The secondary data sources of the study include population census, district abstract reports, reports of directorate of the watershed development and soil conservation department. Pre and post watershed secondary data sources will be compared and contested for understanding and analyzing the changes observed after watershed implements in the area.
2. Statistical tools: statistical tools such as tables and various Statistical techniques will be used to study secondary data.
3. Impact, assessment and quantification through questionnaire: this will include choosing appropriate methodology for quantification of watershed impact on socio-economic and cultural environment.

Research Hypothesis

A proposition or set of propositions, set forth as an explanation for the occurrence of some specified group of phenomena either assessed merely as a provisional conjecture to guide investigation (working hypothesis) or accepted as highly probable in the light of established facts.

The following is the hypothesis of the research to be undertaken.

1. Micro watershed has changed the ecological status of the study area.
2. Socio-economic aspects of the study area have been changed due to implications of micro watershed development.

Profile of the Study Area

This is the eastern district of Rajasthan state lying between $26^0$22' north latitude to $27^0$50' north latitudes and $76^0$53' east longitude to $78^0$17' east longitudes. It forms the boundaries with Mewat district of Haryana in the north, Mathura and Agra district of Uttar Pradesh in the east, Alwar and Dausa district in the west, Karauli district in the south-west and Dhaulpur district in the south.

It is situated about 100 meters above mean sea level. This district covers a total geographical area of 5066 sq. kilometers. It covers 1.48% area of the total geographical area of the Rajasthan state. Total population of Bharatpur district is 25.48 lakhs persons according to 2011 census. It is equivalent to 3.71% share in the total population of the Rajasthan state. The sex ratio is 880 females per 1000 males which are for below the state and national ratio. The density of population is 503 persons per sq. km and this is the second most densely populated district after Jaipur district in the state. The district consists 80.57% rural population. Basically it is a rural population district.

Bharatpur district is divided into 11 sub divisions and 11 tehsils from the administrative point of view. The tehsils in the district are as-Pahari, Kaman, Nagar, Deeg, Nadbai, Kumher, Bharatpur, Weir, Bayana, Rupbas and Bhusawar.

The present day district of Bharatpur has been formed in many stages. First of all, as a result of the efforts of Sh. Sardar Vallabh Bhai Patel, the states of Bharatpur, Dhaulpur, Alwar and Karauli formed Matsya Union on 17th March, 1948. The Matsya Union was merged with the United States of Greater Rajasthan on May 15, 1949 and with Rajasthan on January 26, 1950. Then a separate district namely Bharatpur was formed by merging the old jurisdictional boundaries of the states of Bharatpur and Dhaulpur. On 15th April, 1982 a separate district of Dhaulpur from Bharatpur district comprising of the jurisdictional limits of Dhaulpur sub-division was formed. As a result of the jurisdictional boundaries of Bharatpur district was restructured upto old state of Bharatpur. The name of the district is derived after the name of its principal city Bharatpur, which is named as per local tradition and legend after 'Bharat', the younger brother of Lord Ram of Ayodhya. Laxman another younger brother of Lord Ram is worshipped as family deity by the rulers of this state and whose name was engraved in the state coat of arms and seal.

Physiographic Features

The northern part of the district is almost plain and leveled area, on the other hand southern part has hilly areas. These hills are residual parts of ancient Aravalli ranges. This region especially Bayana and Rupbas tehsils are also known as 'Dang Region'. The highest point is located at 405 meters above mean sea level in southern part also. The northern part that is also plain is divided into Banganga fertile plain and older alluvium region. This region is drained primarily by Banganga and Gambhir rivers in rainy season only. It is fertile plain where 70% to 75% area is under agriculture hence it is densely populated area of the district.

The southern part of the district is hilly region. These hills belong to Vindhyan Super Group. Important hills are Bansi, Paharpur, Bund Baretha and bayana Hills. Sandstone of light pink colour is mined from these hills. It is used as building material. It is used in the historical buildings of Agra, Fatehpur Sikri, Deeg and Mathura.

It is most essential to know about the climate of the district. Climate is an important geographical factor that affects the activities of a watershed. Bharatpur district falls in flood prone eastern plain 'Zone III-B'. The climate of the district is normally semi-arid. This region experiences three reasons; summer season (March to June), rainy season (July to September) and winter season (December to February). It becomes extremely hot during summer and extremely cold during winter. Rainy season is very short and occurs flood sometimes. The average annual rainfall is 670 mm. the rainfall is very variable in view of location, place and time. The uncertainty

and unequal distribution of rainfall in the district create drought and flood sometimes. So it is important to study the watershed management programme, drought management and surplus water management in the district.

The northern part possesses mainly loamy and clay soil. It is fertile soil on which thrives wheat and mustard crops. Clay soil is locally known as 'chiknot soil'. It is fertile soil need no fertilizers. Other soils are of less important in view of area and fertility. An intimate knowledge of soil is necessary for all agricultural operations and regional planning. Soils have a relation with the watersheds in this district. The study about the soil erosion and soil conservation are the main objectives of the watershed development.

Development through Watershed in the Southern Part of the District

There are mainly three tehsils in the southern part of the district namely Weir, Bayana and Rupbas. These tehsils have undulating hilly topography. These three tehsils possess about 38.73% of total geographical area of the district. Before the interventions of watersheds in the state, these tehsils have degraded forest cover and prone to soil erosion. These regions are converted into long and deep ravines which are locally known as 'Dang Region'.These are the shelter places of docoits (persons indulging in anti-social activities).After the watersheds interventions the ecological, social-economic scenario have changed drastically.The below table will represent the change in land use before and after the watershed interventions

Change in District (%)

Year	Land use Categories				
	Forest	Land not Available for Cultivation	Land Under Groves, Permanent Pastures and Grazing Land	Cultivable Waste	Net Sown Area
1995-96	5.09	11.50	2.35	3.94	77.13
2005-06	6.98	10.61	2.40	2.85	78.21

Source: Bharatpur district statistical handbook

The above table represents that area under forest has increased 1.89%.It is a substantial increase and credit no doubt goes to watershed activities in the region. Cultivable waste land has decreased from 3.94% to 2.85%. With the availability of means of irrigation, this waste land has been brought under cultivation. Net sown area has been increased from 77.13% in 1995-96 to 78.21% in 2005-06. Nearly 75793 hectares area was brought under cultivation during the decade. Double cropped area has doubled from 20.74% to 44.49% during the decade. This shows that watershed interventions have benefited the district. Now we shall focus on the three southern tehsils. The socio-economic-cultural and ecological importance of rain water is vital. Water is lifeline to all living being in this dry region. Importance of water management has increased due to rapid depletion of underground water. Watershed management implies the rational utilization of land and water resources for optimum production with minimum hazard to natural resources.

"A watershed is a topographical delineated area that is drained by a stream system, i.e. the total land area that is drained to some point on a stream or river." Generally a watershed can be defined as an area, from which run off resulting from precipitation, flows past a single point into stream, river, lake or an ocean.The term watershed,catchment area or drainage basin is used synonymously. The watershed boundary is called drainage divide.

The watershed programme started in the state during mid-1980 and in early 1990's. This was integrated watershed development programme with participatory approach. This approach had focused on raising crop productivity and livelihood improvement in watershed along with soil and water conservation measures. In southern part of Bharatpur district, the watershed projects have benefited the area. The below table shows the total area, No. of macro and micro watershed and area treated under watershed projects.

Tehsil	Total Area (Ha)	No. of Macro Watersheds	No. of Macro Watershed	Area Treated Under Watershed (Ha)	% of Total Area
Bayana	80386	04	104	53858	66.99%
Weir	61396	08	53	24752	40.31%
Rupbas	54911	04	27	18442	33.58

Source: Deptt. of Science and Technology GOR, Jaipur

The above table represents that area was treated in Bayana 66.99% of the total tehsil area, 40.31% in Weir tehsil and 33.58% in Rupbas tehsil. Watershed interventions have a tremendous change in land use pattern in these tehsils.This is represented by the following table.

Land Use Change (During 1995-96-2005-06)

Tehsil	Forest		Land not Available for Cultivation		Land Under Groves, Permanent Pasture and Grazing Land		Cultivable Waste		Net Sown Area	
	1995-96	2005-06	1995-96	2005-06	1995-96	2005-06	1995-96	2005-06	1995-96	2005-06
Bayana	14820	19302	16283	11743	4546	4707	6984	3901	38245	61904
Weir	6514	6558	5193	5200	2137	2138	2728	1606	44824	71703
Rupbas	646	646	5803	5806	2137	747	2245	1775	45268	63099

Source: Bharatpur district statistical handbook

After the watershed interventions the area under forest has stabilized in Weir and Rupbas tehsil. The forest degradation has been checked and in Bayana tehsil the area under forest has increased after the watershed interventions.

The area under cultivable waste land has decreased drastically. More land was brought under cultivation due to availability of water for irrigation in the crops. This net decrease in the area is due to reclamation of land during the decade. There is a significant change in the net sown area. It has increased from 44824 hectares to 71703 hectares in Weir tehsil, from 38245 hectares to 61904 hectares in Bayana tehsil and from 45268 hectares to 63099 hectares in Rupbas tehsil during 1995-96 to 2005-06 periods. This net increase in net sown area will definitely increase production and improve the economic conditions of the farmers.

The main crops in the study area are wheat and mustard in rabi season and bajra and jowar in the kharif season. The following table will represent the comparative production of these crops in Bayana, Weir and Rupbas tehsils.

Production of Different Crops (1995-96 to 2005-06) (Metric Tonnes)

Tehsil	Wheat		Mustard		Bajra		Jowar	
	1995-96	2005-06	1995-96	2005-06	1995-96	2005-06	1995-96	2005-06
Bayana	29276	43880	17753	25226	8496	34229	111	602
Weir	27050	22102	27080	58731	1405	34294	28	1699
Rupbas	19755	46860	26055	41523	3980	26258	182	923

Source : District Census Hand Book

There is a tremendous increase in the production of different crops in these tehsils during 1995-96 to 2005-06 periods. Only in Weir tehsil the production of wheat has declined. This is due to the shift of cultivated area from wheat crop to mustard crop. Bharatpur district is famous for the production of mustard in the state. It is also cash crop in the region.Watershed interventions have increased the water retention power of the soil and check soil erosion. Farmers of the region have converted these facilities into bumper production of crops.

So watershed projects have checked soil erosion, surface as well as ground water conservation, increase in soil-moisture retention capacity, increase in production and productivity. The forest cover has increased. It provides fuel, food, fodder, fruits and shelter. The wild life has increased in the study area. The availability of water and food has increased the number of herbivores and carnivores wild lives in the region. These forest cover also provides fuel and fodder to the native people.

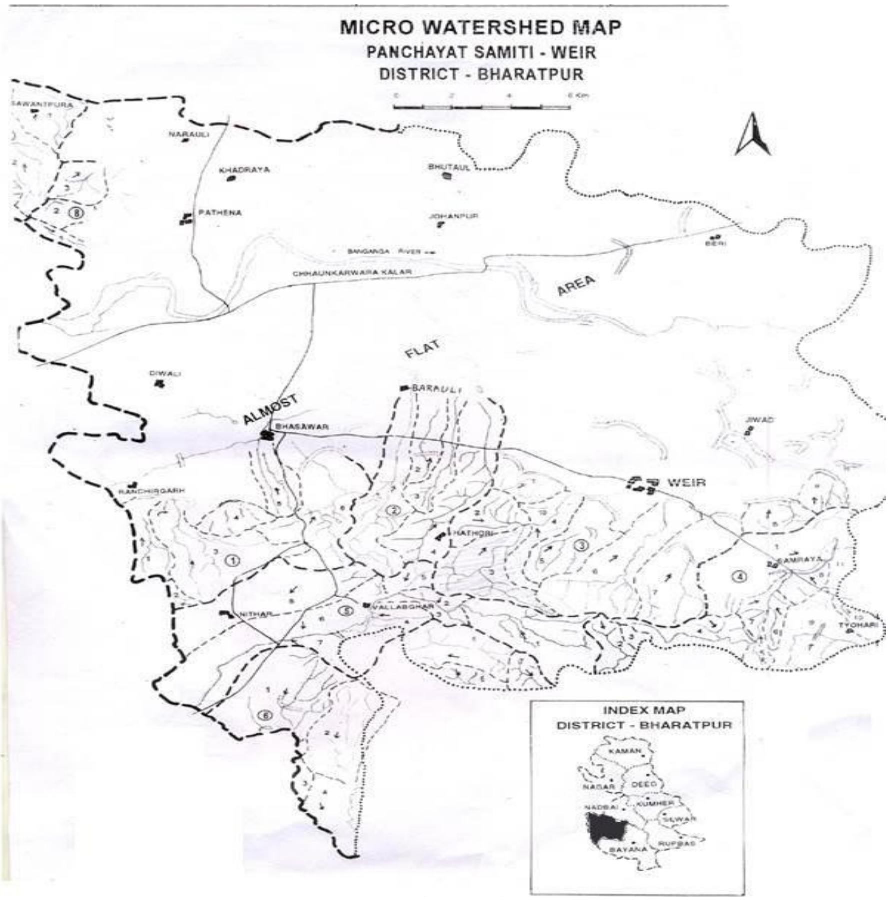
There is a tremendous increase in the cattle wealth of the region. They are grazed in the forest cover and also fed on green and residue fodder obtained from jowar, barseem, rejka and residue of wheat and bajra. Buffaloes are mainly reared in this study area. The production of milk has increased. The dairy development is in an advanced stage.

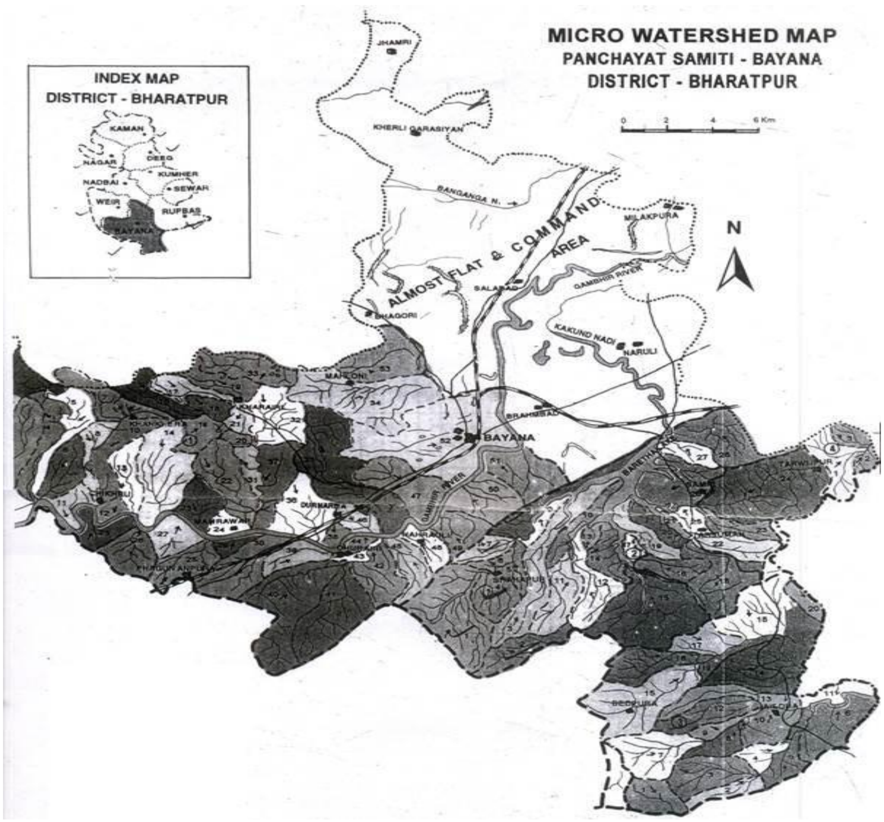
The socio-economic status has improved. The economic condition of the residents has enhanced. Due to availability of water after watershed interventions, farmers are applying modern technologies in agriculture, use of chemical fertilizers and high yielding varieties. Double cropped area has increased. Productivity per hectare has increased. Total production has increased. So the economic condition and social status has also increased. The basic amenities like school, drinking water, health, roads etc. have also improved in the study area. The social harmony has also improved. Prosperity brings happiness and harmony.

Impact and Suggestion

Impact

Forest cover has increased after the watershed interventions in the study area. The watershed development programme was launched in Bharatpur district in 1994. Maximum watershed interventions are operating in southern tehsils and maximum forest cover is also there. There is a high correlation between the number of watersheds and forest cover. It is evident that watershed interventions contribute a lot. It is observed during field survey and discussions that number of wild animals have increased. Some carnivores like panthers and leopards with their cubs were noticed by the local residents.


MICRO WATERSHED MAP
PANCHAYAT SAMITI - WEIR
DISTRICT - BHARATPUR
ALMOST
FLAT
AREA
BHASAWAR
WEIR
INDEX MAP
DISTRICT - BHARATPUR


MICRO WATERSHED MAP
PANCHAYAT SAMITI - BAYANA
DISTRICT - BHARATPUR
INDEX MAP
DISTRICT - BHARATPUR
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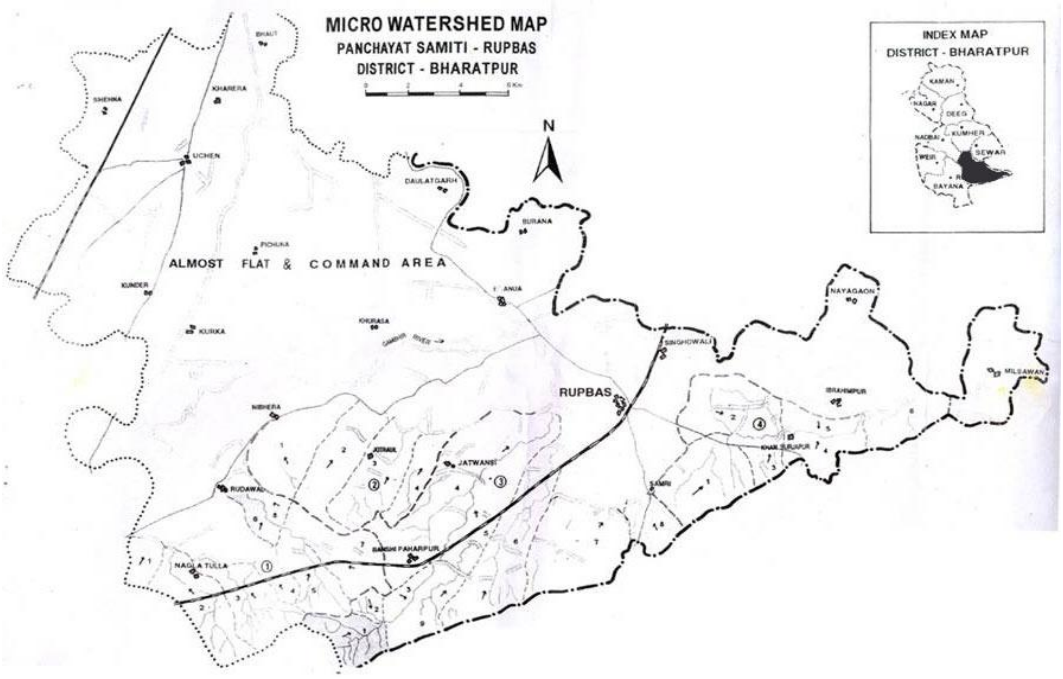

One of the major achievements of watershed programme awareness generation among the village community towards the importance of natural resources, their conservation and management. Awareness among women have improved through saving and credit activities. There is a gradual change in the traditional mindset towards women in the society. Farmers are benefited immensely with a bumper production of crops particularly in rabi season. The price of land has also increased in all watershed sites. The villagers benefited from the direct wage employment opportunities.

The growth of agriculture sector further generated labour opportunities for local poor specially women with higher wage rates. Dairy development and livestock rearing activities are flourishing after the watershed interventions. The production of milk, meat and wool has increased. There was an improvement in the fodder availability to some extent. These activities have brought additional income to the local residents. Small, marginal and landless labourers have derived immense benefits from it.

Suggestions

The strategies like land leveling (Samatalikaran) and drip and sprinkler irrigation system should be adopted to enhance water use efficiency. Dry farming should be encouraged. This study area lies in MOW (maize, oilseeds and wheat) crop combination region. Scanty and uncertain rainfall is suitable for the above crops. Soils should be maintained in good health. Select watershed sites where dire needs exist in term of soil and water conservations, enhancing productivity and improving livelihood. Reckless and illegal mining in watershed regions should be stopped with immediate effect. Bharatpur district is well known for the cultivation and production of mustard in the state. So this study area is most suitable for apiculture.

Conclusion

Bharatpur is rainfed district with 80.57% of the population is rural. The Govt. of Rajasthan has started watershed development and management in district in 1994 with the aim of reducing drought, improving livelihood and providing employment opportunity in rural areas. This programme was started in participatory mode. The study was designed to evaluate watershed with reference to land use and cropping pattern and its consequent impacts in terms of environment and socio-economic at the grass root level.

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