

Watershed and Agriculture Management in Rajasthan

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ABSTRACT

Scarcity of water, poor natural resources and desertification are the most critical issues of Rajasthan. The state has the highest probability of drought occurrence in the country. Agriculture and animal husbandry are the major sources of livelihood. However, scanty rainfall and low availability of underground water make the occupations uncertain and generate low returns. Poor income has led to several other challenges in the region, including malnutrition, women's drudgery, distress migration and exploitation of natural resources. A large number of farmers in Rajasthan still practice traditional farming which impacts yield due to the limited availability of irrigation water and extreme weather conditions. The majority of the population are poor and marginalized farmers who depend primarily on agriculture and livestock for livelihoods. Traditional rainwater harvesting systems such as johads, paals, and bandhs are in a neglected state, so the water from monsoon rains is not collected and is lost through runoff. And there are no perennial rivers that can meet the needs of the people. COVID-19 has caused widespread uncertainty throughout the population. A drought scenario with lack of water would increase the anguish among the population. Communities need adequate access to water for livelihood and for domestic use, especially during harsh summers. Traditional community water conservation practices will be considered when planning solutions for watershed management.

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INTRODUCTION

The Community in Rajasthan will also participate in the selection of water bodies suitable for development in order to improve the impact for the beneficiaries.

In accordance with government protocol, low-income community members enrolled in the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) will be employed in certain project activities such as embankment strengthening, shrub pruning, and reforestation. Thus, helping day laborers will contribute to improving the financial security of the community.

Planned implementation methods and their advantages are:

1. Combination of community based labour and use of machinery for for speedy implementation of the project.
2. The course of the watershed is looked into to get the maximum amount of water during monsoon rains. Water collected during the rains will help for surface water storage and lead to percolation of water to improve ground water levels.
3. The project includes the important aspect of soil conservation and improving the green cover to mitigate the impact of climate change. Communities will be mobilized to understand and act on the importance of planting trees and improving green cover. Triggering slow growing tree stumps for faster growth has been a successful strategy in enhancing the green cover.

As communities mobilize through the water user committees, they are empowered to manage the watershed in the future. This project will work closely with community organizations, farmer groups, the Department of Agriculture - Krishi Vigyan Kendra (KVK), the Panchayat village, the District and State Governments.[1]

Women are important stakeholders and are negatively affected during droughts, as the burden of collecting water for the home falls on them. Addressing women's issues by involving them in water user groups and promoting leadership and decision-

making roles among them will facilitate their long-term ownership of the project and its sustainability.

The agriculture in low rainfall areas of eastern Rajasthan, India is characterized by high risks from drought, degraded natural resources and pervasive poverty, food insecurity and malnutrition. In this region, water is the main limiting factor for upgrading rainfed agriculture. For such areas integrated watershed management is recognized as a potential approach for agriculture growth and rehabilitation of fragile and degraded lands. At Gokulpura-Goverdhanpura village in Bundi eastern Rajasthan, India an integrated watershed project was implemented using the holistic systems approach. We discuss the impacts of this watershed program on biophysical, socio-economic, environmental and ecological parameters. Results indicate that due to watershed interventions the groundwater availability has substantially increased which brought changes in cropping patterns with high value crops. Significant increases in irrigated area, cropping intensity along with diversification of crops from traditional to commercial cash crops were recorded. The watershed program also significantly improved the socio-economic status of the watershed community. It has increased the income and reduced poverty of the people in the watershed. The watershed interventions generated good employment opportunities and significantly reduced the migration of both skilled and unskilled labor from the watershed village to urban areas. It has also improved the environmental quality and ecological status in the watershed. The watershed interventions increased the vegetative index or greenery, reduced runoff, soil loss, and land degradations and improved the bio-diversity in fragile ecosystems. Overall, the integrated watershed program at Gokulpura-Goverdhanpura provided resilience by ensuring continued and sustainable multiple outputs, besides soil and water conservation and other positive environmental effects.[2]

The integrated watershed management program at the Gokulpura-Goverdhanpura watershed made significant positive impact on water resources, rural livelihoods and environment and ecology. The major impact of watershed program was on improved surface and groundwater availability even during the critical periods of post-rainy and summer seasons. Increased surface and groundwater availability resulted in increased cropping intensity and diversification to more remunerative land use systems involving livestock, horticultural and vegetable production. Watershed program increased the productivity of most of the crops, resulting in higher profit margin. It also significantly decreased the

adverse impact of drought and provided more food, water and fodder security to the community. Due to watershed activities, the livestock population and their productivity increased substantially particularly in the case of the marginal and small farmers. The socio-economic status of population significantly improved due to the impact of watershed program. The watershed program also increased the income and reduced poverty of people in the watershed. The small and marginal farmers got relatively greater benefits from the watershed activities. It increased the working days of all categories of farmer; and achieved good success in reducing the seasonal as well as long-term migration from rural to urban areas by providing better employment opportunities to farmers within the village itself. In summary the watershed program improved surface and groundwater resources, minimized land degradation, reduced runoff and soil loss, enhanced vegetative cover and improved ecological status; and finally brought prosperity to the people in the watershed villages.

Discussion

The world as a whole, experienced remarkable economic growth, technological development and scientific progress, but development has harmed the environment and now the environmental harm has been adversely affecting the development. There is also an attempt to have an appraisal of watershed management for exploring its impact agricultural land use pattern in Thanagazi tehsil. Furthermore, the study aims to investigate rationally and objectively the dynamic nature of land use and agricultural land use pattern and its findings and queries to make useful suggestions for better crop pattern because the change in cropping pattern is the best indicator of socio-economic and cultural development of an area. A watershed is the most scientific agro climatic and hydrological unit bounded by natural ridges and allows the run-off due to rainfall to drain in well defined drainage pattern of streams formed within the watershed boundary. The watershed approach creates sustainable development aimed at eradicating poverty, increasing the standard of living, and improving the overall welfare of the rural population that is dependent on the geographical land area. The trapping of surface runoff water, watersheds have emerged as the growth engines in entire the fragile Bairath region.[3]

The rapid depletion of underground water, growing mining and industrial activities and increasing population are severely affecting environment of Thanagazi tehsil and agrarian and rural society consequently.

Ever-increasing pressure of population coupled with poor, management of land and water resources in Thanagazi tehsil also is putting immense stress on the fragile environment of Bairath region which is the part of Aravalli mountain ranges. Land use data hold great potential for deriving timely and reliable information on the nature, extent and magnitude of agricultural land with reference to impact of watershed development at the micro level.

The watershed development helps in rehabilitation/revival of degraded land, forest water resources through various technological inputs (both Indigenous and technology) along with development of agriculture, horticulture, pisci-culture et cetera, to make people self-sufficient and self-reliant in food, fuel, fodder, forage, fiber and fertilizer.

Oils in the watershed are shallow to medium deep brown soils. Physiographically, watershed is having terrace like sloping pattern where gentle to moderate sloping pattern is observed specially in the middle and lower reaches. Geologically, the area is mainly occupied by Aravalli hills. Groundwater occurs under unconfined conditions in the weathered and fractured rocks and under semi-confined to confined conditions in the undulating terrain. Demographically the watershed area is having a total population of 750 with 150 household with an average family size of 5 members.

This watershed is comprised of Sanwatsar part of Thanagazi and Rundh-Jhiri the having communities of different socio economic background therefore; separate efforts were adopted to mobilize the villagers and to convinced them for Sharamdan and other guiding principles like Ban on tree cutting and open grazing. For example village Kabligarh and Rundh-Jhiri which located in the upper reaches of the watershed is predominantly Gurjar community where as is in Sanwatsar lower part of the watershed is having mixed community mainly comprised of Meena, Gurjar, Brahmin and SC. For example village Sanwatsar and Kabligarh which located in the upper reaches of the watershed is predominantly tribal villages have taken a lot of convincing to adopt social fencing as most of the households were having cattle and the villagers was excessively dependent on forest for the livelihood. The farmers were reluctant to adopt the watershed principles as per the guideline therefore in this part of the watershed different strategy was adapted to convince the villagers and to implement the project.[4]

The major impact of watershed is the change in cropping pattern and preference of farmers for vegetable crops. Now village is one of the main suppliers of vegetables to close by Alwar and

Thanagazi. The assured market in Alwar city, and Thanagazi and Narayanpur other neighboring tehsils have promoted all the farmers to go for vegetable and fodder cultivation. This reflects that people of the watershed village have responded positively to the market need.

The significant change in cropping pattern is seen in the Sanwatsar. The Wheat, Bajra, Barley, Gram and Mustard and Maize has shown the maximum increase ranging from 25.66% to 21.50% to whereas no change is observed in fodder crop whereas spices are not grown. Surprisingly vegetables area has not shown any change and cropping in the watershed area which is required after development of watershed programme. The spices and Jowar are also not grown in the Sanwatsar watershed.

Rajpura watershed is located in Thanagazi Panchayat Samiti of Alwar district of Rajasthan and lies nearly 90 km away from the district headquarters. The area is connected by metallic road as watershed. The watershed area consists of three villages namely Rajpura, Basai Abhayram and Gudha-Chotti Chind. The village has a total population of 1623 and the watershed covers treatable area of 1216.34 hectares. The literacy rate in the village is 66%. The watershed area belongs to mixed villagers with majority of Gurjar and Meena. The different communities in the area have maintained their own identity with their peculiar culture and traditions. There are total 17 landless households in all the watershed villages.

The people have to depend on rainfed agriculture and crops like Bajara, Moong, Moth and Guar are grown during Kharif. Agro-Forestry and Pasture development activities have not yet been carried out and horticulture has not been also picked up in a right way in the watershed. The watershed activity has made marginal impact on crop productivity and underground water table and ensuring the safe drinking water. The treatment has also helped to withstand the adverse effects of erratic rainfall. Further, it has also ensured the livelihood for entire year. Seasonal migration has become restricted. The indirect impact, is visible in the overall improvement of standard of living like improvement in the dwellings, household level assets have increased. The first glance of result reflects their overall marginal positive interaction productions for crops but forestation and pasture development progress is very poor but subcutaneously there is marginal increase in water level in the watershed area. Additional area also has been brought under cultivation. The overall impact of the measures undertaken till date have been resulted into raising of ground water table, increase in productivity of crops as well as wage employment generation.[5]

The watershed intervention has brought an overall improvement - in productivity, cropping pattern, sustainable drinking water supply socio economic conditions and reduction in the seasonal migration. Now, this area is known for Tomato, Onion and Potato cultivation, which has helped the farming villagers to attain self-sufficiency in term of assured livelihood. [12]

The major impact of watershed is the change in cropping pattern and preference of farmers for vegetable crops. Now village is one of the main suppliers of vegetables to close by Alwar. The assured market in Alwar city, and Thanagazi and Narayanpur other neighboring tehsils have promoted all the farmers to go for vegetable and fodder cultivation. The significant change in cropping pattern is seen in the Rajpura. The Gram, Fodder, Mustard, Barley and Bajra have shown the maximum increase ranging from 28.57% to 13.19% to whereas marginal change is observed in Wheat (7.75%). Surprisingly vegetables area has not shown any change and cropping in the watershed area which is required after development of watershed programme. The spices and Jowar are also not grown in the Rajpura watershed. Almost all major crops like heat, grain mustard, bajara, fodder etc. have shown positive impact on area but percentage of the Urad and Bajara has shown decreased trend of total cropped area whereas wheat, gram and odder percentage of the total cropped area has increased.

However, it is observed that the area has already been declared as dark zone and as a result, farmers are not getting loan for the construction of dug wells. Now farmers have resorted to bore well drilling and after watershed intervention around 27 new bore wells are drilled and they are causing serious overexploitation to the ground water regime.

The overexploitation of groundwater and erratic rain fall in the last few years have adversely affected the groundwater availability in the watershed area and it is reported that out of 110 bore wells drilled at present only 25-30 are functional and rest of them are either defunct or have little water. At the time of field visit, a vast tract of fallow land was observed and the reason cited was non-availability of groundwater and very less rainfall over last couple of years. This clearly indicates that at present the watershed interventions are not able to contribute towards drought proofing during long dry spells[6]

The programme has brought prosperity in terms of improved income, which has increased many folds mainly due to agricultural activities. Since this watershed is situated nearly the Alwar-Narayanpur district high way and having close proximity to the

market of Thanagazi, Narayanpur and Alwar which has resulted in the improved income for the farming villagers of the area. Moreover, village has also taken few steps forward by initiating other development work specially to improve the drinking water facility. Now the new water supply scheme at Vijaypura is nearing the completion.[11] At present village is also getting input from agriculture department, which has resulted in improved irrigation practices and adoption of horticulture activities in a big way. At present almost 30%, tomato growers have adopted to drip irrigation. Though Rajpura watershed have achieved many landmarks but still issues like over exploitation of ground water, migration of land less in summer season, non functional institutions and non utilization of maintenance fund are causing serious concerns to the sustainability of watershed intervention and needs to be tackled on priority basis

Results

Rajasthan is characterized by erratic and low rainfall with varying intensity and uneven distribution of heavy intensity rainfall in short spell. In addition, the steep slopes with sandy soils make livelihoods of small and marginal farmers from natural resources a very challenging task. A major portion of rainfall goes off as runoff, which also takes the top layer of soil away from the fields. The water tables in general are very deep and are declining further on account of overdraft. Combination of all these factors makes agriculture a very difficult proposition in the region. Hence, the central focus of this project is on works related to water and soil conservation and watershed development.

Soil Conservation and Watershed Management, Animal Husbandry, etc. The specific objectives are as follows:

- Imparting teaching and training in different branches of agriculture and allied fields particularly Horticulture, Fisheries, Dairy, Forestry, Engineering, Community and Applied Sciences etc.
- The advancement of learning and conducting research, seeking solutions to emerging problems in Agriculture, Agricultural Engineering, Animal Science, Community and Applied Sciences, Dairy and Food Science and other allied sciences.
- Transfer of technology to farmers and farming community and government and non-government agricultural organizations through various extension programmes especially for the rural people of the state of Rajasthan.
- Providing diverse technical services and consultancy in industries allied to agriculture to

optimize resource utilization and for proper harnessing of technologies generated in the laboratories and fields.

- Developing linkages nationally and internationally for education, research and extension education.

The extension and research programmes have regional functions and are based upon priorities and requirements of identified micro-farming situations in three agro-climatic zones of the state.

To achieve the above objectives, the university has made untiring efforts and all developmental plans were strategically and effectively implemented, which resulted into rapid and systematic progress in all spheres of teaching, research and extension. The university has a good status among the Agricultural Universities in the country.[10] This has become possible with the unstinted and genuine support of Government of Rajasthan and the Indian Council of Agricultural Research. University is now actively involved in upliftment of socio-economic conditions of farming community particularly tribal in the south and south eastern Rajasthan by promoting efficiency in use of natural resources, ecological security and sustainability in productivity by crop diversification, quality seed production etc. Concerted efforts are being made on utilization of indigenous resources of energy, integrated nutrient management involving bio-fertilizers and vermi-composting, diversification of cropping systems, integrated pest management, judicious use of scarcely available irrigation water, rainwater harvesting management, processing and value addition, farm mechanization, women empowerment and ergonomics of farm women, entrepreneurial promotion, livestock improvement and production in order to attain a sustainable farming system. The university also supports the Commission for Agricultural Costs and Prices with the data base for cost of production estimates of major crops required for minimum support price policy of the Government of India.[7]

To start with, Rajasthan College of Agriculture (RCA), College of Community and Applied Sciences (CCASc), College of Technology and Engineering (CTAE), College of Dairy and Food Science Technology (CDFST) at the erstwhile Udaipur campus of Rajasthan Agricultural University, Bikaner, Agricultural Research Stations, Sub-Stations, Livestock Research Stations as well as Krishi Vigyan Kendras in 10 districts in earmarked service area of the university were transferred along with staff and facilities to this newly created University as its constituent units. Later on the College of Horticulture and Forestry at Jhalawar

(CHF) in 2004 and the College of Fisheries at Udaipur in 2010 were established. In order to address the socio-economic and policy planning research related issues of agriculture and allied areas a separate cell named as “Socio-Economic and Agricultural Policy Planning Research Cell” has been established in the university. [8]

The university has a full-fledged Directorate of Research with comprehensive infrastructure for research both at headquarters and at different research stations. A number of research projects are in progress where in postgraduate students do participate by taking up their research problems under the main project with a specific objective(s). Many a times, the postgraduate students get financial help also in the form of research fellowship as provided in the project.

The Directorate of Extension Education is another important component of the university responsible for the development of extension education processes and transfer of technology to the stake holders. Farm advisory service, organization of field days, various trainings etc. through a number of Krishi Vigyan Kendras are some of the major activities of the directorate.

Keeping in view the above extensive academic programmes, the university has created a Directorate of Student’s Welfare with the aim to plan and organize the co-curricular activities for the students at the University and College level. The main objectives of the Directorate are to coordinate different activities of NCC, NSS, Sports, Literary, Cultural, Moral Education, Placement and Counseling etc. to facilitate the overall personality development and to inculcate the basic values amongst the young students of the university to groom them as a good citizen of the nation. The Directorate is also supervising the Students’ Union activities to allow them to work in a democratic way to solve the genuine problems of the students and to bridge the gap between the students and university administration.[9]

Conclusions

Ministry of Jal Shakti is taking up a nation-wide campaign “Jal Shakti Abhiyan: Catch the Rain” (JSA: CTR) focusing on saving and conserving rainwater with the theme “Catch the rain, where it falls, when it falls” from 29 March 2022 to 30 November 2022 in the pre-monsoon and monsoon periods of 2022, covering both urban and rural areas of all the districts in the country.

National Water Mission, Ministry of Jal Shakti launched a campaign “Catch the Rain” with the tag line “Catch the rain, where it falls, when it falls” in

2020 & 2021 to nudge the states and all stakeholders to create Rain Water Harvesting Structures (RWHS) suitable to the climatic conditions and sub-soil strata, with people's active participation. As a preparatory step for the "Jal Shakti Abhiyan: Catch the Rain" campaign in 2021, a massive awareness drive was launched on 21st December 2020 in collaboration with the "Nehru Yuva Kendra Sangathan" (NYKS) involving Youth Clubs in 623 districts across the country.[13]

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