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Historical Perspective of Watershed Management in India: A Participatory Rural Appraisal (PRA) based Assessment

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Watershed management activities are carried out with an aim to keep natural resources from deteriorating that ultimately safeguard ecological balance as well as consistent economic growth. In this paper, some important peculiarities of Participatory Rural Appraisal (PRA) procedures for watershed management have been comprehensively summarized. PRA's mission is to develop professionals, universities and state agency officials, and local communities to create context-appropriate programs. Several governments and non-governmental organizations (NGOs) have also been engaged in ongoing participatory watershed initiatives that have shown to be productive. PRA components include methodology, performance, and attitude, as well as exchanging ideas with other beneficiaries. PRA works was employed in semi-structured interviews and transect walks, timelines, wealth matrices, and other tools. Soil erosion, erosion management technologies, soil moisture conservation, groundwater recharge, soil fertility and performance, crop and cropping

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patterns, agricultural profitability, non-arable agricultural production, and community wellbeing were all investigated in the PRA. The lack of cooperation among donors, government entities, and non-governmental organization is the biggest hurdle to applying this strategy. Emerging technologies, such as the role of geographic information systems (GIS), are becoming more common, with a significant impact on farmers socioeconomic conditions.

Keywords: Watershed management; PRA approach; Transect walk; GIS.

1. INTRODUCTION

The concept of watershed management has changed more than its implementation during the last decade. The reversals from centralized uniformity to local variation and from the blueprint lo learning process are all examples of these transformations. Changes in learning styles have begun as a result of these developments. This trend is away from extractive survey questions, new techniques, methods for participatory assessment and analysis. Local people now carry out more activities traditionally realized by outsiders in rural and urban areas. Whether these techniques and tactics can make participation more realistic and the rhetoric more genuine (Ramprasad, 2021).

A watershed can be defined as a topographically delineated area drained through a stream system to a point in a stream known as an outlet [1]. A waterfront can range in size from a few hectares to several thousand square kilometers. The size of watershed designates it from micro watershed to river basins [2]. A drainage basin can contain many cities, regions, or even nations A watershed, in addition to defining a hydrological unit, can also serve as a social, economic, and political unit for managing the earth's limited natural resources [3,4]. By using the watershed as a unit of analysis, it is possible to establish a link between events that occur upstream and those that occur downstream. As a result, watershed management goals include increasing public awareness and participation in watershed management, creating productive land in a sustainable manner, and achieving optimal water supply in terms of quantity, quality, and sustainability [5,6,7]. Water, Soil, vegetation, livestock, and people all must be considered in watershed development plans. Around the world government and non-governmental organizations work together to develop watersheds (NGOs). Initially, watershed management programmes focused on soil conservation and rainwater collection. Top-down management contracts were initially used. As a result, there was less transparency and unfair benefits for community members. Water supply has increased for bore well owners. Weak landowners may fail to protect large areas of land [8].

Watershed management, like the management of natural resources and human life dynamics, is a continuous process, and the problems in managing watersheds appear to be endless. Because of changing human needs, various watershed problems arise alongside population growth [9-11]. As a result, watershed management, which focuses on soil and water resources, incorporates the dynamic development of social, economic, and environmental issues [12,13]. Recent developments in watershed management have included the use of biophysical modelling to gain insight into and assess variables that sculpt watershed features [14-18].

In order to implement watershed initiatives, the Ministry of Rural Development (MoRD) issued a series of recommendations in 1994. This encourages excellent NGO and policy practise, such as raising awareness, developing from the ground up, and collaborating with NGOs [19]. The primary goal of this progressive programme was to assist the common man. Watershed management incorporates environmentally appropriate technologies and practises to maximise human and animal well-being while minimising environmental harm within the natural boundaries of land, water, animals, and humans [20].

As a result of its residents' insatiable thirst for water, India will need to invest in water management technologies on an ongoing basis. Water use exceeds water availability, causing conflict [21]. The Indian government established the Drought Prone Area Programme in 1972-73. (DPAP). The Central Soil and Water Conservation Research and Training Institute (CSWCRTI) was founded in April 1974 to address soil and water conservation issues in both arable and non-arable areas, develop and test water conservation technologies, and build capacity through training. The Watershed Agricultural Development Project began in 1983.

47 watersheds were created in collaboration with the federal government to improve crop management and conserve soil and water resources. In response to the devastating drought of 1987, the Indian government launched the National Watershed Project for Rainfed Areas in 1990-91. (NWDPRA). Among the programmes and initiatives designed to put watershed-development ideas into action (IWDP) are the River Valley Project, the National Watershed Development Programme for Rainfed Areas, and the Integrated Wasteland Development Plan (IWDP). These projects relied heavily on engineering to construct percolation tanks and other water-collection structures [8].

This study seeks to provide an overview of watershed management implementation and obstacles by utilising a national synoptic assessment of documents and experiences. Management implications, case studies, and problem analysis to identify solutions are all part of the topic. The findings and issue solutions can be used by watershed managers and policymakers to assist them achieve their objectives. This paper is organised by research site and national level based on study findings and watershed management approaches in big and micro watersheds with varying biophysical conditions. This review looked at published research articles, unpublished reports, and books. Watershed management recommendations have been adopted as a result of the authors' research and findings.

2. WATER GOVERNANCE IN INDIA

Water governance as the range of political, social, economic and administrative systems that are in place to develop and manage water resources and the delivery of water services, at different levels of society [22]. India is a state union. In India, Indian constitution allocates the responsibilities between the State and Centre into three categories: The Union List (List-I), the State List (List-II) and the Concurrent List (List-III). In the Indian constitution, water in List-II, is a state subject (Entry-17). This includes water supply, drainage, storage, and water power. The river follows a topographic path toward a slope that is entirely based on physiography. The use and sharing of these rivers' waters are a source of inter-State disputes. A lot has happened since independence. The Central Government receives a request under Section 3 of the Act from any of the basic States regarding the existence of a water dispute. The ISRWD Act 1956 status of inter-state water disputes are followed. Because water is currently a state subject, there are numerous inter-state water disputes. Adding water to the Constitution's Concurrent List may be beneficial. Moreover, the Constitution's framers could not have anticipated today's water scarcity and crisis, as well as global warming. The right balance must be struck between centralization and state autonomy. It was recommended in 2011 by the Ashok Chawla Committee that water be included in the Concurrent List or be treated as a unified common resource. The parliamentary water resources and public accounts committees have both endorsed the change. Interlinking rivers and redistributing water according to need may be a solution to inter-state water disputes [23,24].

3. LIMITATIONS OF TRADITIONAL WATERSHED MANAGEMENT APPROACHES

In the past, reliance on natural resources in rural regions was widespread. Before the biophysical water basin occupation, watershed management had been under development and utilized a top-down method [20,25]. Top-down techniques in the traditional system failed to accomplish project goals because local people were not regularly consulted. When users embrace the role of custodian of watershed resources, the effect of watershed programs and activities become more influential and sustainable [14]. A wide range of products on watershed management and study is possible for an engaged user base. The prior methodology provided limited opportunity for learning, and top-down design reinforced the natural biological processes to provide the right of way to watersheds. More often than not, traditional planning is focused on the amount of land a city has, rather than the needs and skills of the people who live there [26].

The assumption of technology transfers rather than technology development on people's land and surroundings was a fundamental obstacle in the conventional watershed management method. Another significant shortcoming was in training and research, with agricultural research organizations and agricultural universities bearing the majority of the duty for training. They are strong in watershed technical features but lacking in social science parts of the institutional structure and establishing relationships with nonfarm sectors to develop value-added goods from watersheds [27]. A critical shortcoming overlooked the unique soil characteristics and

circumstances in the local environment while devising and executing projects. For watershed programs designed and implemented jointly by the users, scientists, and other stakeholders, it is better to implement on-farm research trails. Farmer involvement in agricultural research enables scientists and farmers to determine trial procedures and implement emerging technologies together, essential for effective technology adoption. The majority of community members involved in the conventional model focus on project execution, with just a brief consideration of institutional development to be done for the long-term sustainability of the community resource [28].

Historically, federal and state governments have supported supply-driven watershed development. These top-down tactics prevented stakeholders from getting their input into program design. The expectations of stakeholders significantly differed from the efforts needed to accomplish watershed development. Watershed efforts that lack public involvement often fail to achieve their aims. Participatory watershed management has grown into a new watershed development paradigm in India. The hope was that a change in paradigms would bring about more decentralization of governance and empower the participation of local communities to improve their capabilities to address new challenges [29-32].

4. PARTICIPATORY RURAL ASSESSMENT METHODOLOGY IN WATERSHED MANAGEMENT

An in-depth participatory rural assessment technique with a watershed management focus to help community members learn and take action. The methods of PRA and PLA (Participatory Learning and Action) are also used by field workers. Since the inception of the new paradigm of watershed management, an entirely new approach to sustainable rural living has emerged. It has asserted a central role in rural development in fragile and semi-arid regions of the developing world. Watershed management concept multi-sectoral, cross-sectoral, and multidisciplinary [26].

By definition, this kind of watershed management is "focused on building a self-sustaining system towards sustainability [33]. When watershed stakeholders work together to coordinate their goals, priorities, evaluate possibilities, and execute and monitor the results, it is known as participatory watershed management. This method was in widespread usage by the end of the 1980s. The system began to incorporate self-help organizations, watershed implementation committees, and Zila Parishad administrative divisions more thoroughly.

With increased financing for watershed development, many non-governmental organizations (NGOs) became more involved in carrying out watershed activities, a hitherto untapped resource. Since the PRA is constantly changing, no fixed definitions can be used and must be changed regularly. The many ways that researchers have defined and amended PRA are listed below: A expanding family of techniques and processes are known as a participatory rural appraisal (PRA) [34]. The PRA is built on the successes of the many communities around the country that manage their resources sustainably [35].

The practice of knowing people, their assets, and their socioeconomic conditions while also examining their aspirations and potentials in partnership with them is known as a participatory rural appraisal (PRA). For effective watershed management, you absolutely must have PRA (Partnerships for the Recovery of Arid Lands [36]. It is a study where an integrated group of learners work together to learn something outside of the classroom while being supported by and getting help from community members [37]. For instance, to help communities stay aware of the various changes happening around them, a rising family method has been referred to as an increasing home approach for enabling people to share, express, and assess their knowledge about life and situations so that they may strategies and act [38]. Participatory Techniques and Methods (PRA) is a family of practices that emphasizes local know-how and enable locals to formulate evaluations, analyses, and strategies [36].

5. THE PARTICIPATORY RURAL ASSESSMENT METHODOLOGY IN WATERSHED MANAGEMENT

A step in the making of the 1980s is the decade during which many quick rural evaluations took place in rural development (RRA). According to this definition, an RRA is defined as an assessment conducted by a multidisciplinary team that has lasted at least four days but not more than three weeks; the evaluation is based on preliminary information, and a shift from an RRA to a participatory rural appraisal has occurred [37].

The move to employ rapid rural assessments (RRA) instead of conventional surveys was based on the belief that RRAs were not very participatory. The information contained in the surveys was incorrect. Concurrently, a push to extend the participants' involvement in participatory rural assessments (PRA) took place. Placing emphasis on "passing the stick" (when participants drew map or transect) was a direct outcome of the focus on process control that PRA put [38].

Rapid Rural Accounting was established in the 1970s and 1980s in response to problems outsiders had in getting a grip on or comprehending local people during development projects [39]. PRA is a group that attempts to bring together government officials, development practitioners, and local citizens to devise locally relevant projects. Table 1 shows evolution of Soil and Water Conservation /Watershed Development Programmes in India.

India has a long history of non-governmental participatory watershed management and according to tradition, it was a small village in India's Maharashtra state titled Ralegan siddhi where the seeds of participatory watershed management were first sown. Several significant social changes took place in the village due to the efforts of village leader Anna Hazare, including soil and water conservation measures as along with other issues such as liquor prohibition, family planning, conservation of non-arable areas and volunteer labour for community welfare [40]. This brought about mass participation in watershed management, which resulted in a switch from a bottom-up approach that concentrated on social and institutional factors and biophysical attributes to a strategy that incorporated both social and environmental considerations. For many, understanding has now been reached that communities have a significant role in sustaining the production of natural resources in a sustainable way [41].

6. INDIA'S POLITICAL AND OTHER INSTITUTIONAL STRUCTURE

India has a population of about 1.38 billion people, it ranks second in the globe (US census bureau, 2021). There are 29 states and nine union territories in India that are managed by federal government [42,43]. Registration is done at each state's own registration assembly. The states have total authority over the natural resources in their own ranges. Founded on common sense, the water law in India is based on the belief that landowner rights are equal to those of other riparian owners and that water should be received by them without diminishing the flow, volume and quality [44].

In addition to their main role, the federal government was in control of national legislation and had taken on the task of correcting water resource imbalance in one state, such transferring water from one river basin to another. In sectors like as water system, irrigation, canals, draining, and embankments, water storage, hydroelectric, and fisheries, groundwater is regulated and managed by the state. The state government determines how groundwater is allocated throughout the state. The new water management strategy now encourages community members to take part in it [44].

According to MoRD guidelnes of 1995, a watershed development advisory committee is entrusted with managing the initiative at the district level even by district rural development agency (DRDA). Project Implementing Agencies (PIAs) would've been chosen from among the departments, NGOs, and companies interested in carrying out the initiatives by this committee. Each PIA is responsible for 10 to 12 watersheds, and an interdisciplinary watershed development team (WDT) is required to be established. Each watershed implementation is performed by the Watershed Executive Committee (WEC). Watershed development association (WDA) chosen a committee which contain representative members of user groups (UGs), self-help groups (SHGs), and panchayats. All persons whose livelihoods are linked to the watershed region and WEC members who advocate for the interests of these people are all members of the WDA. Once the Village Implementing Organization (VIO) receives the fund, it gets linked to Village Watershed Association (VWA) through an organizational structure. The VWA is made up of local SHGs and other community groups. WDA committee helps DRDA make decisions on where to set up new villages, provides training to those who are setting up new villages, and is responsible for monitoring. At the implementation level, the WDA undertakes watershed projects with the WDT consisting of PIAs. The VWA and WEC take over the administration and maintenance of the assets when the watershed project is finished through a Watershed Development Fund (WDF) created with contributions from UGs and SHGs [8].

Table 1. Progress of soil and water conservation/watershed development programmes in India

Pre- Independence Period	
1928	Royal Commission of Agriculture was established on July 24 Soil erosion problem recognized in ravine area.
1939	Dry farming development scheme introduced with contour bunding as an integral part
1945	Famine Commission was appointed Soil and water conservation (SWC) recognized as an important relief measure
Till 1948	Except Bombay presidency, SWC work was undertaken only on distributed basis. This continued even in the post-independence period
Post-Independence Period	
1950-60	Land development act enacted by different state legislatures, land development banks were made in a few states
1960-70	As a relief programme, SWC practices were initiated under special schemes for drought/desert prone areas
1967	National Scheme for Ravinous Watersheds made known
1974	Soil conservation in the river valley projects Scheme introduced
1982	To develop dry land agriculture, total 46 model watershed development projects were launched
1984	Watershed development projects in four states initiated by World Bank
1986	Ministry of Agriculture brought National Watershed Development Programme for Rainfed Areas (NWDPRA) in 16 states
1989	Integrated Watershed Development Project(IWDP) implemented by Department of Land Resources under Ministry of Rural Development/National Wasteland Development Board (NWDB) arranged
1991	World Bank started IWDP for plains in three states
1994	WSD by merging of various programmes under Drought Prone Area Programme, Desert Development Programme, Integrated Wasteland Development Programme, Jawahar Rojgar Yojana and Employment Assurance Scheme (Ministry of Rural Development)
2001	Panchayat Raj Institutions empowered by Hariyali Project in implementation of Watershed Development Programmes
2006	for setting up a National Authority for Sustainable Development of Rainfed Areas (NASDORA), Neeranchal Project was organized

7. PRA'S PRINCIPLES AND COMPONENTS

7.1 PRA Fundamentals

Participatory Rural (or Rapid) Appraisal (PRA). It was quite popular in the 1980s and 1990s, and it still is. PRA was created for use in rural evaluations and needs assessments. It is now employed in both urban and rural locations, and at any step of the project cycle (design, planning, monitoring, review, and evaluation). Changed name to Participatory Learning and Action (PLA) to reflect broader use and emphasis on local-led action. PLA has two distinct but complementary definitions. First, it is a method of thought that emphasizes power reversals between communities and outsiders (such as researchers, evaluators or programme planners). Second, it provides a spectrum of participatory tools and processes for working, planning, and reflecting with communities. PLA philosophy In this subject, participatory approaches are defined as “a family of approaches, methods, attitudes and behaviours that enable and empower people to share, examine and improve their knowledge of life's conditions” [38]. In its purest form, PLA emphasizes the necessity for outsiders to learn from insiders. This ethos tries to rebalance power between communities and outsiders It emerged largely in opposition to 1960s and 1970s top-down planning methods.

7.2 Constituents of PRA

Constituents of PRA are mainly composed of mechanism, action and attitudes, and sharing. First of all, it is necessary to recognize that people in rural areas needed participatory ways to foster their analysis. Methods have given a professionally approved entrance point for distributing PRA [38]. Community-level solutions currently include several different techniques for watershed management.

This list includes approaches such as:

Sl. No	Approach	Description
1	Interviewing in a semi-structured manner	Interaction is encouraged in unstructured interviews. Ask the locals about their interests. For example, SSI assists crucial informants. Semi-structural inquiry into the study's origins and group policies Open-ended questions allow respondents to debate and express themselves. While the questions are simple, the answers might be elusive. Test interview questions first. Interviewing techniques must be modified to teach semi-structural interviews. Work with others to prepare teams and perform interviews.
2	Social mapping	Roads and irrigation systems can be shown on social maps alongside temples. The community vision or local land use maps may not address these qualities. Infrastructure helps visualise and distribute dwellings. It can assist create, executing, monitoring, and evaluating a village plan (including the selection of village organising strategy).
3	Transect walk	Locals were educated about their environment. Villagers use transect walks to learn about natural resources. Land use and property ownership are also evaluated. They are great at developing property around sub-zones. Changes made before, during, and after the study can be tracked (within the same season). A transect walk might indicate the reactions of local politicians, NGOs, and citizens. It is a verification. Planning the route is done by knowledgeable locals. Involve all agro-ecological zones. Or it can go straight down the slope. Covered It can go from ridge to valley or straight over the hill.
4	Spider web diagram	It's a nice approach to track an intervention's progress. The web frame's attributes are ranked from 1 to 10. The spider web graphic is also known as a participation wheel. It's a visual approach to following a project. This practice can help plan, measure, and evaluate future projects. In the web frame, each aspect is assigned a score from 1 to 10. A project's ranking of an organisation or performance might be done during or after the project (assessment). The spider web graphic rapidly and simply displays the comparison impact. Quantitative estimations obstruct qualitative estimations.
5	Participatory resource mapping	Volunteers create a map of the town using participatory resource mapping. Notable is the manner area is shown. Normally, major locations are portrayed more clearly. A resource map is a tool for locating resources in a community. Local resource views require relevance, but not accurate maps. Everyone can contribute content to the map based on their interests. A resource map has been built to collect data on local perceptions of natural resources and their use.
6	Photographic comparison	It’s a simple way to get people thinking about how things have changed over time. Changes in land use and land cover, land molecule changes, and aquatic body changes can all be compared. Photographs are better at catching important changes in nature, but less good at recording changes in people and institutions, especially in attitudes and techniques. Group talks are needed to adequately depict social change.
7	Matrix ranking	Matrix grading for crop types delivers vital information with beautiful tables and figures. Scientists and others who adopt a more participative approach may be more impressed by farmers' criteria, judgements, and skills. In matrices, rows are determined by criteria, but columns are filled by individuals. Participants are given seeds to represent each item's relative value. Villagers and development practitioners alike benefit from placement activities. Problems must be shown visually to illiterate farmers. Agricultural issues were ranked and ranked. The subjects for the workshop were found through casual

Sl. No	Approach	Description
		interviews.
8	Timeline	Community facilitators perform small-group conversations with villagers, describing the most crucial events in the community's past and helping develop a historical chronology based on the information. Diverse perspectives from community organisations must be sought to fully reflect the community. For example, a community's history can assist people overcome tough experiences in the past.
9	H Form	This rating system is used to evaluate a situation's good and negative aspects. A balanced presentation of both sides helps people decide. This is a focused review and monitoring strategy. It was created in Somalia to help local populations monitor and assess environmental management. This method can help construct indicators, organise activities, and conduct individual or group interviews. This strategy is best used with literate participants, although it can also be used with non-literate individuals.
10	Wealth ranking	To assess the village's economic status, PRA uses wealth ranking. It represents a family's financial and lifestyle status. In addition, it may analyse a city's socioeconomic and social status. That will assist the village identify the most vulnerable. It allows for planning, implementation, monitoring, and evaluation. Ranking well-being includes physical health, availability of needs, and debt.
11	Attitude and behaviour	It studies behaviour outside the PRA. Residents have to get off their high horses and sit down to collect external data. Professional training and self-esteem prohibit it. A lot of individuals find it difficult to be silent, abstain from interrupting, refrain from criticising. With this knowledge, the emphasis shifted from classroom training to on-the-job training. In India, Anil Shah, CEO of the Aga Khan Rural Support Programme, invented "shoulder tapping" (Shah, 2001). When a community member asks or comments, they tap their shoulder. Worker training programmes are available for anyone who want to learn new skills. Outsiders are filmed and a repeat shown to them and other communities. This place will impact both natives and non-natives.
12	Sharing	Sharing was one of PRA's three core values. There is now a better way to reach practitioners and students. It's two-fold: information exchange and pleasure. Locals will help each other out by using group analysis and visual displays to pass on knowledge. Outsiders profit from the residents' expertise.

Initially, those outside the community of practice are requested to refrain from introducing their ideas and methods of thinking or imposing their own reality. The outsiders and locals share their knowledge. Many organisations, corporations, governments, and countries have followed this method. A culture of giving has been formed and spread by various Indian NGOs, such as Action Aid, Aga Khan Rural Support Programme (AKRSP), Mysore Resettlement and Development Agency (MYRADA), OUTREACH, and SPEECH.

Training camps organized by nonprofit organizations commonly involve participants from other nonprofits, the government, and other local groups and those who run the organization. The exchanging experience was a component of the camp's day-to-day activity. Beyond people providing information and sharing it and strangers, the objective was to actively engage in everyday activities such as sharing meals and celebrations. South-South collaboration has been about the same. 11 South Asian nations attended the first worldwide PRA workshop, organized by three Indian NGOs - Action Aid, AKRSP, and MYRADA [45,46].

8. ORGANIZATIONS PRACTICING PRA FOR WATERSHED MANAGEMENT IN INDIA

In India, several organizations employ participatory techniques when working in the

watershed. These five NGOs in India operate the following water-related projects: The Aga Khan Rural Support Program (AKRSP), the Indo-German Watershed Development Program (IGWDP), a Watershed Support Services and Activities Network (WASSAN), the Water Organization Trust (WORT), and the International Crop Research Institution for the Semiarid Tropics (ICRASAT). While the Government of India typically sponsors and partners with NGOs such as World Wide Fund for Nature (WWF), Greenpeace, and Greenpeace India, UN institutions such as United Nations Development Programme (UNDP) and United Nations Development Programme (UNEP), and foreign governments such as United States Agency for International Development (USAID), Department for International Development (DfID) from the United Kingdom, German Agency for echnical Cooperation (GTZ) from Germany, and the bi-lateral Indo-Canada Environmental Facility, these NGOs are sponsored and partnered with the Ministry of Rural Development (MoRD) headquarters of the Indian government, UN organizations such as UNDP and UNEP, and foreign governments such as USAID, DfID from the United Kingdom, GTZ from Germany, and the bi-lateral Indo-Canada Environmental Facility [47].

The AKRSP is well-known for publicizing its work. When employing the AKRSP PRA approaches, planning teams need to identify a goal for the project, pick a methodology for getting the job done, tell the villagers about the plan, assemble a transect map, conduct transect walks, look into equity issues, hold village meetings, and write up management plans for submission to the government (PLA Notes, n.d.).

8.1 Impact of PRA on Watershed Management

Watershed development has emerged as a critical component of rural development strategies in many developing nations. For example, India is making a significant effort to resolve dry and semi-arid regions, such as soil erosion, water table, especially drought-related rural unemployment and poverty, by supporting large-scale watershed development efforts. Because watershed projects are likely to improve farm profitability, boost agricultural production, and safeguard soil and water resources, it is safe to say that watershed projects may all be thought of as watershed management projects. In India's several agricultural eco-regions, watershed projects have begun. Such programs are assisted by both national governments and international organizations, among others.

Many development organizations and international funders were attracted to funding participatory watershed programs after the Earth Summit because of their popularity [26]. The watershed development paradigm shift aims to help rural people live more sustainably and improve rural poverty levels.

It was most commonly done because: increasing the profitability of agriculture increasing the production of agriculture; conservation with soil and water; putting people to work in remote locations in rain-fed regions to minimize the risk of crop failure due to drought.

Several studies conducted by Wani et al. [48] Turton et al. [41] Kerr et al. [40] Joshi et al. [49] and Reddy et al. [47] aim to gather the information on the importance of participatory watershed initiatives, and this information is provided in this article. Farm output was found to benefit from participation in watershed efforts in numerous studies. Higher agricultural productivity was due to more irrigated land below the watershed [45]. Rain-fed crops had better production gains, particularly concerning yield.

Crop yields from rain-fed crops increased by as much as 280%. This research indicates that people's involvement in watershed management has helped boost agricultural profits and improve the financial security of the needy [50]. The watershed operations have helped increase the moisture in the soil by increasing the moisture of soil. Number of farmers in the zone of watershed development zone recorded an increment in moisture of soil. Improved soil moisture will allow diversification of farming activities in rain-fed regions. This increased cropping intensity is predicted to range from 13 - 25 % [51].

In land-use planning projects, the adoption of techniques to reduce runoff and promote groundwater recharge allowed for increased water storage capacity and better local drinking water [36]. Rural dwellers have a greater chance of landing a job if watershed development measures are implemented. The enhanced availability of water and a more diversified cropping pattern, which included agriculture, all contributed to this improvement.

8.2 Current Challenges to PRA

The government of India spent thousands of crores on watershed anagement initiatives.On the other hand, collaboration is difficult to achieve because of the paucity of funding, governmental bodies, and non-governmental organizations (NGOs). The fact that there is no policy-level communication between the many ministries concerned with watershed management is also a barrier to effective policy-level communication across the different levels of government [21].

Many departments are involved in watershed management, with varying objectives of policy running them [52]. The public will also be affected because many of the initiatives are in the program-style, and everyone will have an opportunity to get involved. When disparities already exist, superficial involvement is just adding to the problem. The rules even contain estimates for how much a hectare will cost. A person's right to groundwater access is linked to their land ownership. No work has been done to help landless farmers deal with all of these issues. As a result, participants have no sense of ownership, and the project's long-term survival is at risk. An additional issue is a failure to give appropriate attention to environmental water limits, a lack of understanding of ecological sustainability, and adequate monitoring and assessment of the effects. Low-cost and effective local infrastructure is completely overlooked, while indigenous wisdom is ignored. Innovative methods based on geographic information systems (GIS-based) watershed management is currently being used. It is employed in both the planning and measuring stages as well as the subsequent assessment. The tracking and prioritization of water and sediment flow in a watershed has been done with this. In addition, watershed management activities are tracked and assessed [23,24].

The government schemes using PRA in different modes, by different ministries with various schemes. The Ministry of Human Resource Development's flagship initiative, Unnat Bharat Abhiyan (MHRD). focuses on the adoption of a village engagement in self-reflective and community-beneficial development practices by a higher educational institution. Putting thoughts into action is a necessary step under this participatory approach by emphasizing learning by experience (i.e., experiencing and learning). The goals of this activity are twofold: to inspire students and faculty to take action that will benefit society, and (ii) to help participants develop their skills and potential. With the release of the new National Rural Sanitation Strategy 2019-2029, the Swachh Bharat Mission has shifted its emphasis to Open Defecation Free. Similar schemes are of the Ministry of Jal Shakti, which has launched the "Catch the Rain" campaign, with the tagline "Catch the rain, where it falls, when it falls," to encourage states and all stakeholders to build Rain Water Harvesting Structures (RWHS) that are appropriate for the climatic conditions and sub-soil strata, with people's active participation [53].

Advantages of PRA watershed interventions included better farm income, more excellent agricultural production, improved soil and water conservation, the creation of rural jobs, and a reduction in risk in rain-fed areas. Nongovernmental organizations (NGOs) and self-help groups (SHGs) are key players, as they need lower investment and have shown positive effects on the socio-economic well-being of rural or local people. While stakeholder’s cooperation and local people's lack of interest are necessary factors to implement the PRA strategy in watershed management, it must be said that stakeholders' lack of cooperation and local people's lack of interest are roadblocks to implementing the PRA strategy in watershed management.

9. CONCLUSION

This discussion made it evident that a more thorough and better-supported empirical evaluation of PRA strategies employed in watershed development efforts is needed in India. A project of this sort has to have baseline data, impact data, and participatory monitoring techniques used in it. Additionally, recent studies have found that organizations and communities with vested interests in watershed development partners, including the government, non-profit organizations, and communities, require a long-term support network to maintain programs. In principle, the ability to relocate landless and resource-poor persons should be improved by all of these approaches.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and

producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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