

## Chapter 3

# Review of Literature: The Work and Citation

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A comprehensive and systematic review of the relevant literature is a prerequisite in carrying out any research in a scientific manner. References to the past studies provide guidelines not only to frame areas of research and methodologies to be adopted, but also to confirm and repudiate research outcomes with all possible reasons. The main functions of the review chapter are:

1. To provide a basis for the development of theoretical frame work
2. To provide an insight into the methods and procedures
3. To suggest operational definitions
4. To provide the basis for interpretation of findings

The present investigation, **“IMPACT OF WATERSHED DEVELOPMENT PROGRAMME ON SOCIO-ECONOMIC UPLIFTMENT OF TRIBAL PEOPLE IN WESTERN UNDULATING ZONE, ODISHA”** is of current interest. Attempt has been made to review available research work directly or indirectly related to the present study.

The available literatures related to the topic have been presented under the following headings.

- i) Concept of Watershed Development Programme
- ii) Knowledge and perception of the beneficiaries about watershed development programme
- iii) Involvement of the people in the process of implementation of the watershed development programme
- iv) Role of stakeholders associated with watershed development programme
- v) Extent of socio-economic development of the watershed people
- vi) Constraints impeding the successful implementation of the programme along with suggestions for improvement

**(i) Concept of Watershed Development Programme**

Watershed management is an approach for integrated development of any area. The basic consideration of this approach is centered around land and water resource management. The production activities though appear secondary but in real sense, emphasis is on appropriate land use(s) based on the potentialities of land and preference of the farmers. Some of the literatures cited by the researchers are indicated herewith.

According to Tolley and Riggs (1967) watershed is defined as a drainage area of river, stream, nallah, tank or lake. The watershed has a clear conceptual entry in hydrology and physical geography which is considered ideal for natural resource planning and management.

ICRISAT (1977) referred that water being the first limiting natural factor for the crop production in the semi-arid tracts, importing the management of the water and soil for increasing crop production becomes the primary aim of the watershed based resource utilisation research.

Jaiswal *et. al.* (1985) stated that Watershed is an area of land that contributes run-off to common point. For practical purposes, watershed is claimed to be the most scientific unit for efficient management of land and water resources as it is basically an agro-climatic unit with relatively more homogeneity of land and other resources than revenue district.

Bali (1987) while emphasising the concept of watershed stated that it is the planning unit for development of land and water resources. He also introduced a concept of carrying the two separate approaches of agro-industries development and watershed management for removal of poverty in India. The primary importance in the concept is not in the industry or in the watersheds but it is on the man who is struggling to extract a living from the harsh environment.

Koons (1988) observed that women and men did not benefit equally in watershed development programmes due to various gender issues.

Dhruvanarayan *et. al.* (1990) stated that the watershed is a manageable hydrological unit that makes a harmonious use of prevailing climate, soil, water, locally available materials and human resources towards stepping up crop yield.

Zam and Benerjee (1993) stated that location specific technologies based on soil and water conservation and watershed basis is playing major role in sustainable food production in dry land farming.

Bhusan (1994) reported that voluntary work is the only true measure of the inner strength of a society because it embodies a certain degree of social commitment without which no society can sustain itself.

Krishinapa and Hegdae (1994) reported that non-involvement of weaker section and local statutory institutions and sectarian disparities in financial procedures were handicapped for successful implementation.

MANAGE (1994) was in view that watershed management is a holistic approach which aims at optimising the use of lands, water and vegetation in an area to alleviate drought, mitigate floods, prevent soil erosion, improved water availability and increased fuel, fodder and agricultural production on a sustained basis.

Tideman (1996) opined that watershed management implies rational utilisation of soil, water and vegetation for sustained productivity with minimum hazard to natural resources.

Schreier *et. al.* (1997) defines watershed as an area of land bounded by topographic features that drains water to a shared destination such as

lakes, streams, estuaries and oceans. It captures precipitation, filters and stores water and determines its release.

Oswal (1999) in his study on watershed management observed that watershed is a natural hydrological entity that covers a specific area, expands of land surface within whose boundaries, the entire rainfall run-off ultimately passes through a specifically defined stream. So it is a unit of land on which all water that falls collects by gravity and runs via a common outlet. It is thus an area of land that contributes run-off to a common point and is separated from adjoining areas by a natural elevation ridgeline.

Wagenet *et. al.* (1999) evaluated certain knowledge levels of residents of the New York City watershed and attitudes of participants and compared three groups: individuals who utilised the educational materials completely (full users), those who received the materials but did not use them completely (partial users), and watershed residents who did not receive the educational program (nonrecipients). Full users displayed a higher level of knowledge concerning specific watershed processes than did partial users and non recipients. The findings from this project have implications for educational and regulatory institutions and program development relating to watershed protection.

Kerr *et. al.* (2000) stated that watershed is a geographical area that drains to a common point, which makes it an attractive unit for technical efforts to conserve soil and maximize utilisation of surface and subsurface water for crop production.

Sanghi (2000) opined that sustainable development in watershed can be achieved through indigenous low cost technologies.

Singh (2000) in his study on economic evaluation of Manchal watershed opined that watershed as a geographic area drained by stream or a system of connecting streams such that all surface runoff originating due to the precipitation in this area leaves the area in a concentrated flow through a single outlet.

Purusottam and Singh (2001) stated that conflict on sharing common benefits, improper selection of beneficiaries, problems in convincing

people and negative attitude of beneficiaries towards government works were the important issues affecting implementation of watershed development projects.

Padmavathi and Reddy (2002) found that among majority of mitra kisans, social participation was low and their exposure to mass media and contact with extension agency were medium.

Rajora (2002) in his study on impact of national watershed development programme stated that watershed management is the process of formulating and carrying out course of action involving manipulation of natural , agricultural and human resources of a watershed to provide resources that are desired by and suitable to the watershed community , but under the condition that soil and water resources are not adversely affected. Watershed management must consider the social, economic, and institutional factors operating within and outside the watershed.

Singh (2003) defined watershed as an area from which runoff resulting from precipitation flows through single point into a stream, river, lake or an ocean. The term watershed, catchment area or drainage basins are used synonymously.

Poonia and Singh (2004) stated that watershed is a well defined territorial unit, not too large, maintained by a certain degree of uniformity in ecological conditions and in social background. The terms 'watershed', 'catchment area', or 'drainage basin' are commonly used synonymously.

Rao *et. al.* (2004) stated that decentralised public administrative structure with reallocation of efforts to the level at which the problem is being experienced and linking them to the legally elected bodies at the village level is essential for sustaining the watershed development programme.

Reddy *et. al.* (2004) concluded that the officials of the implementing agency and extension personnel must concentrate on discrepancies to correct the defects and enhance the utilisation levels of the Government

organisations to higher levels at par with NGOs in watershed development programme.

Patil *et. al.* (2006) stated that Watershed development programme is aimed at improving the productivity, production through water harvest, resource conservation and pasture development. It is also emphasised that the benefits of watershed development programme are manifold.

Vaidyanathan (2006) stated that the broad thrust of the changes suggested by the Parthasarathy Committee is necessary to get the government watershed programme out of the wasteful, fragmented and corrupt rut it is mired in. The programme is far too important for reviving agricultural growth, especially in rainfed areas to allow the present situation to continue by default.

Gregersen and Brooks (2007) stated that Integrated watershed Management (IWM) is to develop, manage and sustain production system that are well suited to the existing environment and resource base and that can be sustained for future generations, preventing excessive soil erosion to protect the productive potential of the land and reduce downstream sedimentation .

Ghosh (2008) summarized the benefits which accrue through rain water harvesting techniques in watershed areas are as follows

- i) The surface runoff is arrested during rainy seasons and this improves the groundwater storage
- ii) The soil erosion is prevented, as the runoffs interrupted by the pond
- iii) The silt deposition in the tanks and lake are reduced, as the runoff water is held in the percolation pond
- iv) This also prevents flooding during rainy seasons
- v) It generates rural employment to the landless labourers during off season
- vi) There is possibility of increasing the area under irrigation and thereby increasing the agricultural production

- vii) The socio-economic condition of the downstream is quite improving

Verma (2008) opined that Watershed management is a comprehensive term meaning the rational utilisation of land and water resources of a watershed for optimum production with minimum hazards to natural resources. It relates to soil conservation, proper land use, protection of land against all forms of deterioration, building and maintaining soil fertility, conserving water for farm use, proper management of local water for flood protection and sediment reduction as well as increasing productivity from all land uses.

Gupta *et. al.* (2010) stated that concept of water saving agriculture refers to a farming practice that is able to take full advantage of natural rainfall and irrigation facilities. The core problem that water saving agriculture research has to solve it, how to raise the water utilisation rate and water use efficiency , that to achieve high yield on irrigated farm land with minimum input of water and in rainfed agriculture to maximise the rainfall use efficiency.

Murthy (2013) opined that watershed is an area draining into a stream. It is a small catchment from which all precipitation, rainfall as well as snowfall flows into a single stream. It forms naturally to dispose the runoff of rainfall as efficiently as possible. In other words, it is an area encompassed by surface water divide of a stream. It is a pear shaped area bounded by high topographical divides carved out of rainfall, the flows of which form the stream.

Satishkumar and Tevari (2013) stated that the watershed program is a land-based program, which is increasingly being focused on water, with its main objective being to enhance agricultural productivity through increased in-situ moisture conservation and protective irrigation for socioeconomic development of rural people. An important concern in watershed development is the equitable distribution of the benefits and sharing of the costs of land and water resources development and the consequent biomass production. Watershed development programme is the strategy for uplift of the resource poor farmers in a sustainable mode.

Kumar and Bansal (2014) stated that Watershed Management brings about the best possible balance between natural resources and basic minimum needs of the people in a sustained manner. The common basic objective of this programme is land and water resource management for sustainable development. In new common guideline for Integrated Watershed Management Programme (IWMP), cluster approach of area treatment has been followed and livelihood enhancement has been given preference.

**ii) Knowledge and perception of people about watershed activities**

People's participation has been emphasised in India since the inception of economic planning. All the plan period has given due importance to participation and considered it as an essential requisite for proper implementation of planned programmes. It helps in mobilising resources, proper implementation of programmes, organising people's power and optimum use of available resources to achieve the targets. The goal of the development is no longer defined in terms of increments to physical quantities of goods, but in terms of development of people. In the context of development planning, involvement of the beneficiaries in decision making, planning, implementing and evaluation of activities of the project is very much essential to achieve the objectives. Knowledge about the project and programmes are also equally important. If the people do not possess adequate knowledge, their involvement becomes passive inhabiting effective implementation of programme. Therefore, knowledge and involvement of people are the priorities for achieving successful results. The literatures collected in support of this are detailed here with.

Schumacher (1973) expressed that development does not start with goods, but starts with people, their education, organisation and discipline. An entirely new system of thought needed i.e. system based on attention to people not to goods and their involvement in the programme is essential.

Singh (1986) stated that man is the cause and consequence of development. The purpose of development is man. It is the creation of conditions both materials and spirituals; which enable man, individuals and



species to be at his best. There are at least three basic elements that constitute the true meaning of development like substance, self-respect and freedom, which can only be achieved with participation and involvement.

Singh (1988) stated that in managing dry land watershed programme, some weakness were identified as lack of appropriate mechanism for enlisting peoples' participation, omission of animal husbandry activities and paucity of studies to determine farm profitability of different technologies.

Stone (1989) pointed out that concepts of development and participation ideas must be taken into account before participatory development schemes which can be realistically attempted.

Rao and Reddy (1990) observed that under watershed programme, the farmers gained more knowledge on technologies; adoption of improved practices, need based relevant technologies, accessibility to inputs, availing subsidy facilities and above all increasing their production, productivity and income.

Karam *et.al.* (1993) pointed out that watershed development project is an integrated project involving close co-ordination of different departments. The most challenging aspect to such project is the effectiveness of interdepartmental co-ordination.

Naidu (1992) observed that participation and involvement begin in the initial stages of designing and planning through the implementation, monitoring and evaluation stages and lost up to the continuous follow-up stage of maintenance and benefit sharing among participatory groups.

Joshi (1994) Observed that participation and involvement begin in the initial stages of designing and planning through the implementation, monitoring and evaluation stages and lost up to the continuous follow-up stage of maintenance and benefit sharing among participatory groups.

Srinivasaramanujan (1994) stated that in order to secure maximum involvement of the people in any programme, development agencies should seek answer to the followings:

- i) What do the people think about development
- ii) What kind of development they want and anticipate
- iii) When they know about the resources they are endowed with
- iv) In what way do the people intend to make use of such resources
- v) In what way do the people expect from development agencies

Gore (1995) stated that with limited scope of development of irrigation potential, rainwater management plays an important role to supplement the surface water for domestic, irrigation and industrial uses. Therefore, efficient conservation and scientific management of harvested water is crucial for optimum utilisation for crop production. Watershed development is the only way to make efficient and judicious use of rain water.

Hemalatha and Surekha (1996) stated that the overall knowledge index of farmers in watershed development was 31.97 percentage. The majority of farmers had moderate knowledge on watershed development (70%). Significant association was observed between farmer's education and their knowledge on watershed development and soil conservation.

Hinchcliffe (1999) cited the evidence regarding the importance of involvement of local people in natural resource planning and management and pointed to practical ways forward for both governments and external support agencies for sustainable natural resource management.

According to the Karnataka Watershed Development Project report (2001) water harvesting is a benign technology. In specific cases, water harvesting structures can produce benefits. However, intensive drainage line treatment can cause significant reductions in downstream water resources, inducing severe hardship for people in lower down the catchment.

Liniger and Schwilch (2002) stated that there was a huge knowledge gap exists with respect to the impact of soil and water conservation technologies in particular, such as the effectiveness of on-farm technologies in controlling soil erosion, their impact on human and natural

resources, cost-benefit ratios or the level of integration into prevailing farming systems .

Joshi *et.al.* (2004) in the study on watershed development in India revealed that the benefits were highest in the watersheds where people's participation was high.

Ragupathy (2004) in his study on participation of people in maintaining irrigation tanks in state of Tamilnadu stated that in India, people's participation in the development process has been recognised as a major factor in determining the destiny of people. For maintenance of Natural Resources such as irrigation tanks, ponds, grazing lands, fisheries, wasteland, tress and forest, the participation of people considered as the most important requirement. People can participate as individuals or in groups in the maintenance of natural resources. It will be more effective, useful, and sustainable, if their participation is institutionalised legitimately at the local level.

Rama Rao *et.al.* (2004) in his study on a comparative analysis of performance of watershed development programme observed that the participation of people would be better and hence more sustainable in those programmes implemented by the NGOs.

Naberia and Khare (2006) stated that the tribal women play an important role and have medium participation in watershed practices. However in the category of other practices, their participation is maximum in self help group, saving scheme and small scale industry respectively. Their participation is affected by education, type of family, land holding, material possession, occupation, annual income, social participation, extension contact, economic motivation and knowledge of watershed practices.

Seema and Khare (2006) observed that the tribal women play an important role and have medium participation in watershed practices. Their participation is affected by education, type of family, land holding, material possession, occupation, annual income, social participation, extension contact, economic motivation and knowledge of watershed practices.

Sharma *et. al.* (2007) observed that the role of people participation in the management of watershed programme has a positive impact on project officer as well as local farming community.

Sharma and Chauhan (2007) revealed that to ensure people participation in watershed programme, visit of top officer must be ensured and there should be proper marketing facilities so that farmers could make marketing for input and output and also observed that lack of time, visit and advice by the supervisory staff results into poor participation and progress.

Dadheech *et. al.* (2008) stated that education, health and load of work were the major personal factors affecting farmers' participation in NWDP. Study also revealed that age and level of living were the factors which have relatively less effect on farmers' participation. Among educational factors, illiteracy and coverage on local media were found major factors which affects farmers' participation in watershed development activities.

Desai *et.al.* (2008) revealed that medium and large farmers had comparatively grater contact with research and extension services and 57 % of the farmers had contact with extension officials. Participation and involvement of the marginal farmers in different extension activities organised by Government departments were limited.

Gabriela (2011) studied Community-based watershed management (CBWM) programme financed by Canada in some Latin American communities and stated that participatory and collaborative watershed management depends on institutional decentralisation and encourage social participation so as to build more effective responses to environmental changes.

Pandey and Singh (2012) conducted study in Panchkula district of Haryana and revealed that majority of respondents were having medium level of awareness (60.83%) about the watershed practices, while very few numbers of respondents were having low level of awareness. High rate of literacy among respondents and frequent contact with extension agencies were the major factors behind the high level of awareness among the respondents.

Singh *et.al.* (2013) revealed that the farmers of the Bundelkhnda area have gained considerable knowledge on the improved crop production technology for different crops. Good yield in frontline demonstration was due to better package of practices and better return of their produce brought about a spurt in area under oilseed and pulse crops.

Patel *et.al.* (2013) stated that education, occupation, herd size, irrigation potentiality, extension participation, scientific orientation and risk preference had significant relationship with their extent of adoption on watershed crop production technology and majority of the framers fall under the category of medium level of adoption.

Pandey and Singh (2014) stated that People's participation is very important to make the watershed development programme successful at different stages i.e. planning, implementation and continuance. Majority of the respondents had moderate level of participation in different stages of the watershed development programmes. The participation level in planning stage was 70.0 per cent, whereas in implementation stage and maintenance stage were 60.83 percent and 60.41 per cent respectively. The overall participation level of the respondents in all the three stages of the programme was moderate i.e 51.25 per cent, whereas only 18.75 per cent of the respondents had higher participation.

Sikka *et. al.* (2014) stated that people's participation in watershed management project is an important index for its sustainability and it measured through People's Participation Index (PPI). The overall People's Participation Index (PPI) was 62% indicating that the stake holders' overall participation was high.

### **iii) Involvement of the people in the process of implementation of the watershed development programme.**

Chakravorty (1978) recognised that small sized watersheds are easily manageable and all treatments can be completed in few years.

Santham *et.al.* (1982) found that aspects like self esteem, personal efficacy, need for achievement and internal conviction to participate in

social activities were responsible for ensuring people's participation in watershed programme.

Choudhury (1986) observed that traditional attitude and illiteracy were the main hurdles for the rural poor's involvement in small scale watershed projects.

Rao and Reddy (1990) stated that farmers had medium participation in watershed projects. They had comparatively high participation at implementation stage and very low at pre-project stage. Big farmers have comparatively more participation than small and marginal farmers.

Deshpande and Reddy (1994) stated that a moderate impact of the watershed development programme for the passive beneficiary process as compared to the better results achieved from the active beneficiary process.

Tideman (1996) stated that people's participation is a method where the associated communities are motivated to function and contribute as group to perform a predetermined task. All the adults living and making their livelihood from within watershed area are referred as the community.

Nagbhusan (2001) observed that the people in the watershed area and their participation have greater emphasis to sustain the agriculture developments in watershed areas.

Purusottam and Singh (2001) observed that the overall awareness about the programme was very low in the watershed area and approach as some body says that "at initiation stage, the watershed concept had hundred percent values and at execution, it was only fifteen percent" which indicates that the programme did not involve people as expected.

Nagabhusanam (2003) stated that the prime importance is the adequate technologies to be generated on the optimum preposition with the managerial capabilities of all categories of the farmers for improving socio-economic level and suggested for transfer of low-cost and eco-friendly practices in the watershed area.

Singh (2003) stated that one of the most important features of watershed development project is beneficiaries' participation as well as insistence on every family in the watershed getting the due benefits. For people's participation, it is important that village level bodies are to be well informed and educated regarding all activities held in their areas. For successful implementation of watershed development programme, each member of the watershed community should actively participate. It is also necessary that watershed development projects should focus on activities of women for reducing their drudgery and increasing their efficiency and women's group should be encouraged to take up income generating activities especially for weaker sections of the society.

Tucker *et. al.* (2003) viewed that participation of women in the watershed programme is negligible in most watersheds. This was in spite of the fact that women play a key role in management of natural resources and livelihoods. It is also being realised that in rainfed areas, attention of men toward management of natural resource (as well as livelihoods) is gradually reducing due to seasonal migration and alternative opportunities in urban areas. It has therefore been proposed by some of the innovators that a participatory approach may flourish better in situations where women play a key role in the management committee of the watershed projects. This may of course, happen if, they are empowered properly.

According to Mid-Term Appraisal of the Ninth Plan, Government of India (2001) Watershed projects have not been succeeded to generate sustainability because of failure of implementing agencies to involve the people. For watershed projects to be sustainable, community management systems are needed and they can succeed only with farmer's contribution and their commitment to time and resources.

Rai and Singh (2008) revealed that majority of farmers belonged to low socio economic status and having partial level of awareness and more favorable attitude towards watershed development programme.

Reddy *et.al.* (2008) revealed that there was poor knowledge and involvement of the people about various activities of National Watershed

Development Programme. The socioeconomic variables had much influence on knowledge and involvement.

Dolli *et. al.* (2009) stated that the major problems experienced during entry point activities were low participation of the farmers and no choice of activity by farmers. People's participation would be low in the beginning, however as suggested by members, considering the activity based on people needs and its implementation with the involvement of villages leaders would help in enhancing people participation.

Palanisami *et.al.* (2009) suggested that people's participation, involvement of Panchayati Raj Institutions, local user groups and NGOs alongside institutional support from different levels, viz. central and state government, and district and block levels should be ensured to make the programme more participatory, interactive and cost-effective.

George *et.al.* (2009) concluded that provision of better education and training, greater credit access, providing linkages between productions and marketing and providing farmers technical and market information through better extension services would lead to a greater level of economic efficiency in watershed areas.

Nataraju and Reddy (2010) revealed that majority of the Government watershed beneficiaries had medium level of participation (36.7 per cent) as against NGO, who had high level of participation (58.4 per cent). A high level of participation was observed in collection of facts, analysing the situation, identifying the problem, deciding on objectives, developing a plan of work and execution of a plan by NGO beneficiaries. On the contrary, the Government watershed beneficiaries were found to have a low level of participation such as collection of facts, identifying the problem, deciding on objectives, developing a plan, execution of plan and evaluation. A majority of the beneficiaries expressed about lack of knowledge as the major constraint to participation and suggested for conducting effective educational activities as well as creating an awareness of the programme.



Prabhakar *et.al.* (2010) suggested that people's participation is considered to be an important component for successful implementation of watershed programme.

Thomas (2010) suggested that participation of people is a pre-requisite for the effective implementation of watershed management programmes. Without active co-operation and involvement, the programmes may fail in the long run. Participation of people should therefore starts from the collection of basic data on resources, implementation and monitoring as well as follow-up of works already executed.

Venkateswarlu (2010) stated that people's participation including the resource poor and women in preparing the action plan provides sustainable development. It should be realised that watershed development revolves around two cardinal principles i.e. resource conservation and their effective use. Continued association of GO-NGO for providing technical support and for capacity building would lead to sustainability of the benefits accrued in the programme.

Prasad and Prasad (2012) stated that without effective and adaptable local institutions, the long term sustainability of watershed investments will remain one of the key lingering question .In order to improve active participation of the resource users and the poverty impacts of watershed programmes, there is a need to promote and pro-poor interventions as well as institutional arrangements that enhance equitable sharing of both costs and benefits.

Fiona *et. al.* (2013) on their study from the Ngenge Watershed, Uganda stated that the success of Integrated Watershed Management programmes heavily depends on stakeholders' participation and their ability to make decisions. There is a need to establish which stakeholders should take part in the design and implementation of Integrated Watershed Management.

Mondal *et. al.* (2013) indicated that in the watershed area, overall People's Participation Index (PPI) was 27% to 41%. The highest level of participation was observed in programme planning stage in most of the projects which got reduced during subsequent stages of the programme.

Socio-economic and institutional variables affecting people's participation were identified through multinomial logit analysis. It was observed that age and education, land holding size and extension contact were the influential factors which affected the participatory decision of the farm households.

Parvathi (2013) opined that watershed development programmes depend upon the participatory approach. It envisages integrated and comprehensive plan of action for the rural areas. People's participation at all level of its implementation is very important.

Kumar *et. al.* (2014) concluded that People's participation was fairly high at resource analysis, planning and execution stages. He revealed that majority (48.75%) of the respondents represented to medium level of participation followed by 28.75% and 22.50% represented to low and high levels of participation, respectively at resource analysis and planning stage of integrated watershed management programme. During the execution stage, majority (56.25%) of the respondents reported to medium level of participation followed by 27.50% and 16.25% to low and high level of participation respectively.

**(iv) Role of stakeholders associated with watershed development programme**

In India, the need for involvement of voluntary organisations has been acknowledged since the very beginning of the planning era in 1952. The famous Balwant Ray Mehta Committee of 1957 observed that , "Today in the implementation of the various schemes of community development, more and more emphasis is laid on non-governmental agencies and workers and on the principle that ultimately people's own local organisations should take over the entire work."

Jairaj (1988) emphasised the role of local institutions in promoting new technology .He envisaged the participation of credit institutions and voluntary organisations as an essential pre-requisite for the success of the watershed programme. Public participation would assist in better planning and implementation both on arable and non-arable lands.

Dhillon and Sangha (1990) reported that voluntary agencies can play a vital role in educating, building awareness and organising rural poor at the grassroot level so as to enable them to avail of the benefits collectively for community welfare.

According to National Planning Commission (1992) in order to increase the effectiveness of the voluntary organisations, Government has to define specific areas and sectors in which they could contribute more effectively based on their expertise, comparative advantage and track records. Rules and regulations pertaining to their registration have to be simplified and making appropriate modification in tax laws including giving full autonomy to operate in priority areas designated by the Government.

Chambers (1994) suggested that unless the stakeholders were involved in the whole process of a development project including its problem identification phase, they were less likely to participate actively in implementation activities.

Deshpande and Narayanmoorthy (1999) in their study on the NWDPR in Gujarat reported five important constraints for implementation of watershed programme. Firstly, the credit, infrastructure provided, demonstration and extension network, the 'Chetan Kendra's' and assessment of suitable horticultural crops were not adequate. Secondly, the programme has given indicative unit costs for almost every component. Thirdly, the procedure fixed for sanctioning the components of the programme was quite elaborate and this causes time lapses. Fourthly, the multidimensional integrated approach of NWDPR does not seem to be functioning as a co-ordination multi-disciplinary programme due to lack of horizontal coordination. Lastly, the research team reported that even though the programme guidelines were well prepared but these were not effectively implemented.

Mascarenhas (1999) concluded that basically there are two kinds of institutions that need to link and interact frequently with each other in watershed management, one involving the internal stake holders and the other involving the external stake holders .The first is at village or community level in the form of SHGs or user groups. Obviously, these need

to be federated at the watershed level for providing a forum for collective action.

Jaya *et. al.* (2002) stated that creation of new institutional setup at village level empowers the community to take need based decisions; enables them to receive funds to implement the project; helps them to facilitate group action and conflict resolution; makes it easier for outsiders to interact with the community; creates adequate space for resource poor families; provides an institutional mechanism for post-project maintenance of assets in watershed areas.

Ward (2002) stated that the economic advancement of India and many other countries depends directly on how these countries handle their mounting water crisis and the problems are no less at the international level.

Rajora (2002) stated that Watershed management must consider the social, economic, and institutional factors operating within and outside the watershed.

Arora (2003) suggested that for better implementation of watershed development programmes, exposure to technologies, need based training, effective linkage ,co-ordination with local institutions, minimisation of information gap and regular quarterly review meetings by the implementation staff as well as steering committee are essentially required which could be considered on priority basis.

Poonia and Singh (2004) stated that there is a need to improve the existing level of technology; linkage between research, extension and farmer training, appreciation of farmers, flow of credit, post harvest technology for ensuring stability in return as well as sustained growth and employment in watershed areas.

Bandaragoda (2005) stated that there is a natural tendency of local stakeholders to readily provide local knowledge, information, and participate in action planning for developing appropriate strategies, as long as they are convinced that the efforts are for their own interests.

Chowdhary and Singh (2009) revealed that one of the major impediments to the success of most watershed programmes was the lack of co-ordination among the many governmental institutions mandated to run these developmental plans. Watershed programs can become much more efficient and cost effective, if the roles and responsibilities of all the partners and stakeholders are clearly defined and followed up for ensuring accountability.

Wani *et. al.*(2005) pointed out that to reach a common goal of increasing agricultural productivity and incomes of the farmers in rain-fed areas with protecting the environment, there has to be a strong partnership through consortium approach with shared vision, trust, mutual respect, good communication and dedication of the partners. Through a public –private partnership, a multiplier effect could be created which could result in a win-win situation.

Lekorwe and Mpbanga (2007) stated that the term NGO is broad and ambiguous which covers a range of organisations within civil society, from political action groups to sports clubs. However, it can be argued that all NGO's can be regarded as civil society organisations though not all civil society organisations are NGO's.

Singh *et.al.* (2007) stated that the constitution of Co-operative societies in the watersheds would be useful in equitable distribution of available and generated resources.

Rani and Maheswari (2008) stated that during the project life time, the PIA and WDT will work to develop linkages with the credit institutions such as Regional Rural Banks, Co-operative Banks, and Service Area Banks etc. The credit requirements of the watershed should get reflected in the District Credit Plan. Linkages with credit institutions should be facilitated during the initial years of the project, soon after the SHG/UG has started operating their own credit and thrift activities successfully. They also emphasised that project sustainability can not be ensured by maintaining created assets alone. It also requires the envisioning of the community and other village level institutions formed in their specific areas which could be

able to address new and emerging concerns of development in the post project scenario.

Sisodia and Sharma (2008) revealed that the watershed beneficiaries not taken into confidence during budget utilisation, progress and future plans not discussed among the beneficiaries were the major institutional constraints faced by the watershed beneficiaries.

Jat *et. al.* (2008) stated that better co-ordination between development agencies and voluntary organisations were essential for effective implementation of watershed programme. Lack of effective co-ordination among project officials, agriculture extension department, agriculture research station and farmers are the constraints in the adoption of watershed technique.

Ramachandran *et. al.*(2009) in their study on Chevella watershed in Rangareddy District of Andhra Pradesh stated that in order to convert the intangible aspects of agricultural management into tangible results, institutional support by way of increasing access to institutional credit and creation of farmer associations to protect their interests were found to be vital for achieving livelihood security.

Dash and Kara (2011) suggested that institutional sustainability can be ensured with the active participation of the local people. The integration of indigenous knowledge in project design, the inclusion of men in Self-Help Groups and above all the incorporation of adequate gender responsive policies in local institutions are perhaps the most important components that need attention for the sustainable management of natural resources.

Indumathy *et. al.* (2013) stated that 44 percent of the respondents were found to possess moderate favourable attitude towards different tribal developmental programmes. More than one fifth of the respondents (31%) less favourable followed by more than 25% of the respondents less favourable attitude towards developmental programmes.

Murthy (2013) stated that the impact of watershed management depends on effectiveness of the technology in the background of needs, priorities, cultural practices and community participation. The Impact

depends on political will of the Government, acceptability of the people and co-operation between officials, NGOs and Public along with involvement of the women.

Yadav *et. al.* (2013) stated that, once a good linkage with the market or marketing channel will develop, infra structure facilities will increase rationally. Where as, provision of long term loan at low rate of interest to the farmers of watershed area can help in increasing agricultural assets.

Kulshrestha *et. al.* (2014) studied the Budhara micro watershed in Ambah block of Morena district of Madhya Pradesh and concluded that better co-ordination between development agencies and voluntary organisations was essential for effective implementation of watershed programme.

Rodriguez *et. al.* (2014) suggested that watershed management involves diverse groups including farmers, state and central government institutions, quasi-government agencies and NGOs. Each group differs widely in objectives and interests but together, they shape the face of watershed development. Inter-Institutional Linkages in Watershed management is a multi disciplinary and multi institutional effort. Therefore, the crucial role of coordination and collaboration among various disciplines and institutions involved need not be overemphasised. For watershed management activities to be carried out on a sustainable basis, it is important to consider the inter-institutional linkages.

#### **(v) Extent of socio-economic development of the watershed people**

Appropriate organisational structure holds key to successful planning and implementation of multi-sectorial watershed development programme. Planning itself doesn't yield results, unless it is translated in to action through a well designed system of management. National Watershed Development Programme formulated a well defined guideline where implementation of various activities carried out in a manner with emphasis on participatory approach. The Watershed people will implement programme and utilise the sanctioned funds with proper guidance through a multi-disciplinary Watershed Development Team ensuring maximum development to the people and watershed as a whole.

Gowda (1988) found that the watershed development programme was beneficial to small and marginal farmers in dry land area. It has increased the hopes of poor farmers in improving their productivity potential and income.

Singh (1989) stated that an analysis of NWDPRA showed that more attention was paid to water conservation work than soil conservation work. The area irrigated by the concerned water was higher than all other improved irrigated resources in the study area.

Eswarappa and Reddy (1991) stated that efficiency of management is bound to bring not only improvement in the watershed development programmes and activities, but also benefit to the beneficiaries in terms of increased income, increased yield and better employment generation.

Karam *et. al.* (1991) found out the forestry, animal husbandry, soil conservation, horticultural components of the integrated watershed development project to be economically justifiable. The rate of return was more than 12 percent in all above components except for soil conservation in Maili watershed.

Bagchee and Bagchee (1992) concluded that institutional development is important than the physical development (afforestation, construction of bund etc) of watershed but, is generally neglected aspect of watershed development programme of the government.

Rajput and Verma (1993) found that the introduction of the watershed development programme has helped farmers to shift cropping patterns in favour of high yielding crops and cash crops and to raise cropping intensity. There was a positive impact on income, employment and productivity.

Rajput *et. al.* (1994) stated that the integrated watershed management approach had a distinct impact in changing farmer's attitudes not only in project area, but also outside the watershed.

Purohit and Verma (1995) stated that there was a positive impact of the watershed programme on cropping pattern, input use, yield levels and farm Income.



Shah and Patel (1996) stated that the NWDPRRA programme contributed positively in enhancing agricultural productivity, moisture retention capacity of soil, recharging of water, income and employment generation, improving the environment, prevented degradation of soil and the programme was economically feasible and encouraged empowerment.

Ninan (1998) evaluated the European-aided watershed development project in India and viewed that there was improvement in crop-yield, income, conservation of natural resources and the benefits tended the landed groups with marginal benefits to the landless, scheduled caste and scheduled tribe communities.

Ram Babu and Dhyani (1998) evaluated the watershed projects and stated that Watershed Management Programmes are economically sound, socially acceptable and environmentally desirable.

Fouzdar (1999) stated that injudicious use of land in watersheds may damage the existing limited resources on which people are sustained.

Pandke and Jallwa (1999) revealed that after watershed development programme, the yield of crops have increased by 30 percent over average yield of crop before watershed development interventions. Small and marginal farmers were highly benefitted with respect to increase in cultivated area under irrigation, increase in area under pasture land in post project stage. Most of the farmers were moderately to highly benefitted by the project.

Singh (1999) studied the Chajawa watershed and adjacent villages of Baren district of Rajasthan management efforts in the farmers' income. The study revealed that family income inside the watershed was 21.5 per cent higher as compared to those outside the watershed. Profession-wise the contribution of labour sector to family income was more in the families residing outside the watershed area while the contribution of service sector was 7.64 per cent more inside the watershed over that of outside the watershed. The income from agriculture sector was higher by 21.89 percent inside watershed, compared with the outside watershed area.

Dhaka and Nitharwal (2000) stated that Watershed development programme has proved advantageous in rainfed areas for improving agricultural productivity. With the improvement of land as a result of soil and water conservation treatments and subsequently improvement in the moisture storage in soil profile, the productivity of land increased.

Pandke and Jadhav (2000) studied Ghodagaon watershed located in Aurangabad District of Maharashtra state and pointed out that the watershed technology had showed positive impact on various sources of income. The change in cropping pattern, increase in yield levels and introduction of new crop were the good indication of development.

Lal (2001) stated that watershed projects have helped significantly in raising the underground water table in the area under study. A shift in area under low productive crops to high productive and more remunerative crops was observed in case of beneficiaries. The average productivity of almost all crops was found to be higher side for beneficiaries than those for non-beneficiaries.

Palande *et. al.*(2001) concluded that national watershed development programmes had definitely benefited the marginal, small and big farmers both in improving their farm power and helped in increasing irrigation potential.

Ahire *et.al.* (2002) found that the beneficiaries of Umari Watershed Development project had followed improved practices like proper sowing time, spacing, fertiliser application and on-farm water management to the highest extent which enabled them to harvest more yields as compared to non-beneficiaries.

Dhaka and Sharna (2002) found that the watershed projects had helped significantly in raising the underground water table in the area and the average productivity of almost all the crops were at higher side of the beneficiaries than non-beneficiaries.

Shiyani *et. al.* (2002) revealed that the watershed development played an important role in increasing cropping intensity, productivity of various crops, profitability and employment generation. The watershed

development also reduced the income disparity among the beneficiaries. Reduction in yield gap and unit cost of production were the added advantages of watershed development.

Kakade *et. al.*(2003) undertaken a case study from Adihalli-Myllanhalli villages in Hassan District,Karnataka, India and concluded that after the implementation of farm-pond based watershed development project ,the whole ecosystem and socio-economic scenario had undergone a major change in the area. The availability of water for drinking and agriculture, the establishment of orchards and agro-forestry in farm lands, the increase in overall agricultural production and creation of local self-employment were some visible impacts.

Hanumanthaiah and Pokuri (2003) stated that watershed programme had opened new wishes by exploiting and conserving the scarce resources and brought major changes in the cropping pattern, generating employment opportunities to the marginal and small farmers enabling to raise their incomes as well as standard of living.

Bangar and Sthool (2004) in their study in Anjale village in Maharashtra stated that participation of watershed people in pomegranate plantation greatly improved the standard of living and income of the villagers.

D' Silva *et al.*(2004) stated that watershed interventions in Shekta, Ahmednagar district, Maharashtra reduced seasonal migration by 15% in skilled labours and 60% in non-skilled labours. The result of meta-analysis of watershed programme in India revealed that about 175 and 132 person-days/ha/year of employment could be generated in low and high income regions respectively.

Chowdary *et. al.* (2005) stated that as a result of watershed management on the Goriajore Nalla watershed of Nawarangpur district of Odisha, there had been an increase in the area under cultivation, water bodies, plantation and tree.

Dhyani *et.al.* (2005) stated that the watershed management project had improved the resource utilisation of farmers, enhanced eco-friendly

resource use pattern and generated ample regular employment opportunities in the watershed.

Nasurudeen and Mahesh (2006) found that the labour requirement for one unit of paddy was found as 0.38 human days and 0.36 human days and the total income from crop and live stock was Rs20,485 per hectare and Rs18,595 per hectare in the water shed and conventional system respectively.

Kumar and Hosamani (2007) revealed that the total cultivated area, yields of the crops, output and returns obtained in all the selected crops, total employment and total income generated in the post implementation was considerably higher than prior to implementation of watershed project.

Krishnaji and Venkataramaiah (2007) on his study on functioning of micro watersheds in Andhra Pradesh revealed that the micro watersheds were functioning satisfactorily scoring reasonable achievements in agriculture, forestry, engineering and community organisation sectors.

Jain and Rajput (2008) observed that watershed had contributed in raising income, generating employment and conserving soil and water resources. The returns on per rupee of investment of crops were higher as compared to previous year.

Mula and William (2008) stated that Watershed interventions in India increased crop yield by three to four times. In Rajasamadhiyala, Gujarat two downstream villages benefited by increase in crop productivity of 20-30% and income by 84% (from US\$857 to US\$1,578) and in Kothapally, household agricultural incomes doubled in three years due to watershed activities. Household average incomes in a tribal village, Powerguda, Andhra Pradesh increased by 77% in three years due to watershed interventions.

Sengar *et. al.* (2008) observed that average annual income of beneficiaries was recorded more as compared to non beneficiary respondents. Mainly productivity level of paddy crop was increased among beneficiaries due to use of high yielding varieties and other agronomical

practices as well as productivity level of other crops was found more or less similar

Chakraborty *et.al.* (2009) revealed that the participatory approach had notably contributed towards the sustainability of livelihood for the community as a consequence of natural resources stabilisation. The beneficiaries have been able to improve their livelihood options in the process together with reversing significantly the degradation of natural environment like those of arresting severe soil erosion resulting in preservation of soil fertility so essential for crop production.

Palanisami *et.al.* (2009) revealed that the value of crop diversification index, CDI was higher in case of watershed treated villages than control villages confirming that watershed treatment activities help diversification in crop and farm activities.

Singh and Prakash (2010) stated that the watershed project could increase the income and employment opportunities of the households in the watershed. However, the most crucial thing is that this increased income was not distributed uniformly to all sections of people in the area satisfactorily. It necessitates proper attention to the landless, marginal and small farmers while planning for watershed development projects. Self employment schemes such as village level small scale industries, post harvest technologies and value addition, livestock and poultry etc. need to be developed.

Upadhye *et.al.* (2010) stated that the area under agriculture in the watershed had increased and the fallow land decreased after implementation of the watershed development programme. The watershed development had resulted in decrease in runoff from the watershed and slight increase in water harvesting. On the socio-economic front, the literacy and the level of education of the people in the watershed had increased. All these favour in uplifting the economic standard of the people in the watershed.

Palsaniya *et. al.* (2012) in their study on Garhkundar-Dabar Watershed stated that the average productivity of major crops and cropping intensity

had been increased in the area due to integrated watershed management interventions in this area.

Prasad and Prasad (2012) revealed that there has been an increase in vegetation, crop productivity and ground water levels after the project interventions. They also concluded that average net returns per hectare for dry land cereals and pulses were significantly higher in the watershed area. The increased availability of water and better employment opportunities in watershed development related activities had contributed to the diversification of income opportunities and reduced vulnerability to drought and other shocks.

Raju *et. al.*(2012) stated that watershed development has substantial socio-economic impact, increased risk orientation of farmers, higher socio political participation, reduction in women' perceived drudgery, bringing of water, fodder and fuel as well as in pulling of water from wells along with increased knowledge of soil and water conservation practices. The impact was also visible in terms of increased income from agriculture, capital accumulation, increased productivity and employment opportunity along with increased B: C ratio and land value of agricultural land. Watershed development also led to conservation and preservation of nature and natural resources

Wani *et. al.* (2012) stated that the Integrated Watershed Management approach enabled farmers to diversify the systems along with increasing agricultural productivity through increased water availability while conserving the natural resource base. Household incomes increased substantially leading to improved living and building the resilience of the community and natural resources. Watershed interventions increased the additional net returns significantly from crop production as compared with the pre-watershed intervention period. Increased water availability opened up options for crop diversification with high-value crops including increased forage production and boosted livestock-based livelihoods.

Agnihotri and Grewal (2013) studied the watershed programme in Arabali ecosystem and observed that Crop production and planting of forest and fruit trees in the watershed area have gained favour on

economic grounds. Over all benefit cost ratio of the watershed project worked out to 2:1 and Employment generation to the tune of 70 thousand man days per annum could be possible through the project and concluded that watersheds could be developed profitably and at the same time mitigating the problem of ground water depletion and sustaining irrigation system of the drought prone area.

Bagdi and Kurothe (2013) under their study on Antisar watershed in Kheda district of Gujarat State, where Participatory Technology Development (PTD) was adopted in watershed activities and concluded that Check-dam and well-recharge filter technologies increased water availability in the wells for irrigation, drinking water and resulted in increase of crop yield by 50%. The developed and tested technologies were also disseminated to farmers in neighbouring villages for the benefit of farming community.

Bhalla *et. al.* (2013) stated that watershed development programme has not resulted in a significant increase in productivity in treated micro watersheds at any grouping when compared to adjacent untreated micro watershed or the same micro watershed prior to treatment.

Radhakrishna (2013) revealed that many benefits have been accrued by the farmers after execution of watershed programmes in dry land agricultural areas of Andhra Pradesh. The study found that the impact of watershed development was positive with respect to crop yield, livestock, green grass, drinking water, ground water level and agro related economic activities

Grewal (2014) stated that the intensive soil conservation measures consistently taken over a period of three decades improved vegetation cover of trees, grasses, bushes and control of forest fires along with helped in organic matter build up, improving soil fertility and soil health.

Kulshrestha *et. al.* (2014) under their study on Budhara micro watershed in Ambah block of Morena district in Madhya Pradesh stated that due to the participation in the watershed management activities, farmers were able to gear up their adoption on soil and water conservation practices.

**vi) Constraints in effective implementation of the programme with suggestions**

In implementation of any programme as per the guidelines, some inconveniences are usually experienced in field conditions. Unless these difficulties are rectified, the programme could not be implemented in a desired way. National Watershed Development Programme is a new approach for integrated development of an area. There may be some lacunae which may stand as barrier in effective implementation of the programme. Some of the past research work carried out earlier are presented for justifying the research work.

Bhata (1982) found that the lack of political commitment, lack of co-ordination between the Government authority and weak personnel strength at district level were the major bottlenecks in implementation of the watershed programme. To make the programme more effective, power must be given to the line agencies functioning at district level.

Sanghi and Rao (1982) emphasised the indifference approach of the local farmers and lack of participation in the programme as the greatest hurdle in the implementation of dryland technology. The farmers were found to revert back to their traditional systems once the project support was withdrawn. Extension services did not keep pace with the requirements of the situation as the project advanced

Chitnis and Bhailagankar (1987) in their study on the constraints in adoption of new technology in Shekta, Aurangabad district of Maharashtra found that the lack of adequate credit, unsatisfactory extension services, inadequate and erratic input supply mechanism, lack of communication between the cultivators and the lower level functionaries and unsatisfactory testing of technology were the main hurdles in the adoption of technology. The administrative and organisational setup was also found to be weak and fragmented.

Reij (1987) reported that in Sub-Saharan Africa, the main elements identified participatory conservation programme which includes the selection of simple but efficient technology, use of indigenous



conservation technique which are popular among the people as well as involved them in experimentation.

Bali (1987) pointed out that soil and water conservation policy initiatives could become a reality, if the present programme oriented planning replaced by integrated agro-industrial watershed projects breaking the presently non-coordinating programme and departmental agencies as well as converting them into multi-discipline integrated area projects. Biomass processing pattern should become essential feature to increase rural income, full employment and checking off rural urban employment.

Singh and Reddy (1987) found that in-adequacy of capital as a serious constraint for adoption of dry land technologies. Extension services were inadequate and inefficient. Seeds, plant protection chemicals and storage facilities were inadequate

Singh (1988) stated that in managing dry land watershed programme, some weakness were identified as lack of appropriate mechanism for enlisting peoples' participation, omission of animal husbandry activities and paucity of studies to determine farm profitability of different technologies.

Saraswat *et. al.* (1990) found that only a marginal impact was observed regarding labour utilisation and no impact for seed rate, fertiliser utilisation and a very slight change observed for a productivity of crops grown in the watershed area. The main constraints were inadequate staffing, lack of proper infrastructural facilities, meagre funds etc.

Naidu (1992) observed that low level of awareness was due to non-awareness to programme, caste and ethnic differences, bureaucrat's tendency to ignore the poor and in promoting participation, appropriate education, communication, persuasion and demonstrations were important factors in promoting development.

Narayanagowda (1992) reported that the adoption level of soil and moisture conservation practices was higher among the participants of Chitravathi watershed area as compared to non-participants. However, he

observed that a higher percentage of farmers had not adopted the practice of stabilisation of bunds with vegetative species. Lack of conviction and difficulty to establish were the dominant reasons for their adoption

Singh (1993) analysed that lack of adequate information, absence of people's participation, subsidies, inadequate supply of modern inputs, lack of group action, poor marketing and processing facilities of new products, inadequate price incentives, lack of timely and adequate credit facilities were the constraints that plague watershed technological adoption. He also observed that the farmers were reluctant to accept some watershed technologies because they take up too much space, create backward concerns in their plots that hamper cultural operations.

Reddy and Reddy (1994) stated that major chunk of farmers had high risk perception about dry land technologies, medium level knowledge, need for skill training and adoption of dry land technologies.

Sanghi and Sharma (1994) identified few constraints in adoption of indigenous soil and water conservation practices such as lack of finance ,dispute over demarcation of ownership boundaries, difficulties in organising group action, lack of availability of inputs and low socio-economic condition of the people.

Shah (1996) stated that many project implementing agencies know that rainwater harvesting needs to be a priority in low-rainfall regions. However, *in situ* conservation does not help much if rainfall is scanty and erratic. Consequently, most watershed projects mainly concentrate on installing water harvesting structures such as check dams. The literature shows that the success rate of technology-based projects was not more than 25 percent.

Ingle and Kude (1997) stated that non-participation of watershed people due to lack of motivation was the major constraint in the adoption of soil and water conservation practices.

Prasad and Mrityunjayan (1998) stated that timely supply of quality seeds in sufficient quantity, timely guidances, providing irrigation facilities,

subsidy on inputs and credit facilities were the suggestion given by the farmers to overcome the constraints in watershed area.

Ramanna and Chandrakanth (2000) while studying the watershed programme implemented by the government reported that lack of knowledge about programme (62%), uneven distribution of incentives (58%), supply of poor inputs and materials, groupism and politics at village level (48%), poor quality of work (42%) by implementing agency, improper location of soil and water conservation structures (21%) and planning was not based on felt needs (13%) were the major problems /constraints in implementation of the watershed project as expressed by beneficiary farmers.

Singh (2000) reported that the important barriers to people's participation in watershed programme were illiteracy and lack of awareness among the watershed users committee group, prejudice and discrimination against farm women by their male counterparts, factionalism, casteism and heterogeneity of the watershed population

According to the report of KAWAD (2001) the groundwater extraction, soil water conservation and construction of water harvesting structures had contributed to a further reduction in mean annual runoff.

Ostiani and Warren (2001) stated that rural women play a pivotal role in CPR management (Common Property Management), which is however often overlooked because of the gender roles and the power structure prevailing in the community. However their participation in activities for increasing the efficiencies & sustainability of local agricultural production is affected by their insufficient decision making power within the house hold and farm.

Patel and Saiyed (2002) reported that proper technical guidance, training programme along with motivating farmers and strengthening extension system to disseminate watershed technologies should be done to improve the knowledge of the watershed people.

Singh and Poonia (2003) stated that non-cooperation by the people was the most important negative factor responsible for the effective

implementation of watershed programme. People's apathy hampers management and development activities in watershed.

Tucker *et. al.* (2003) revealed that equity has not yet become an important agenda in most watersheds, particularly those that are funded under the public sector. It was also realised that this aspect may not get addressed on its own, since the programme deals with development of land and water resources, which are mainly owned by resource rich families.

Arora (2003) expressed that due to insurgency prevailing in certain states, disadvantaged groups particularly SC, ST, OBC and women communities were deprived of the benefits of watershed development programme.

Kakade and Petare (2003) stated that after implementation of farm pond based watershed development project between 1996 to 2000 in Hasan district of Karnataka, the whole eco-system and socio-economic scenario has undergone a major change, particularly in water availability, development of orchards and agro forestry, increase in agriculture production and creation of self employment vocations.

Sudhishri *et. al.* (2004) stated that the stakeholders were neither involved in selection of project ingredients nor encouraged to participate in various project activities. The entire process of watershed development involved participation by Government Departments and local contractors with a clear top down approach with least involvement of the watershed communities. Consequently, there has been a supply demand mismatch leading to inadequate attention to local needs and aspiration of the watershed communities resulting inefficient implementation and inadequate sustainability.

Mahesh Kumar *et. al.* (2005) revealed that the remote sensing helps in providing accurate information on various resources of watershed which helped in planning development activities for sustainable development of watershed.

Bouma *et. al.* (2007) found that investments in community organisation failed to ensure household commitment to maintenance in

the longer term. Without better returns to investment in soil and water conservation, and without local institutions to co-ordinate investment in the long run, the sustainability of participatory watershed management is seriously threatened.

Indrajeet and Kushawaha (2007) revealed that lack of awareness, poor economic conditions of the farmers, high cost of inputs, indifferent behaviour in the administration, lack of guidance, non-availability of staff at the time of farmers need, lack of technical supervision and non availability of labour in time were the major constraints which affects the participation and working of farmers in Watershed Development Programme.

Sisodia and Sharma (2008) revealed that watershed beneficiaries were not taken in confidence during budget utilisation. Budgetary provision, progress and future plans not discussed among the beneficiary farmers were the major institutional constraints.

Chand and Sharma (2009) conducted a study in the “Chaura Watershed” of Kinnaur district of Himachal Pradesh revealed the main constraints such as (i) non-availability of inputs timely such as improved varieties’ seeds / seedlings, fertilisers, pesticides, etc. (ii) high cost of inputs and lack of finance for purchasing them (iii) undulating small land holding having low fertility due to frequent soil erosion (iv) inclement weather conditions particularly at critical stages of crop growth (v) road blockade at the time of transportation, inadequate supply of packaging material and lack of remunerative prices for quality produce (vi) lack of technical guidance in complete package of technology (vii) lack of farmers’ participation in the development work (viii) low frequency of on-campus as well as off-campus training for farmers particularly for Mitra Kisans (Friend Farmers) and Mitra Gopals (Care-takers of common/waste land development activities) and (ix) lack of adequate publicity regarding implementation and functioning of the project.

Kulshrestha *et. al.* (2010) stated that illiteracy, lack of capital, complexity of loan procedures, high cost of fertilisers and seeds, lack of

training, lack of transport and irrigation facilities were perceived as the major constraints in adoption of watershed technologie.

Thomas (2010) stated that inadequate funding and maintenance of work were the major constraints in Watershed development programme. In most watershed projects, funds may not be even sufficient for comprehensive protection or rehabilitation of a Watershed.

Kale and Wankhade (2012) stated that low education level, low cropping intensity coupled with rainfed farming and lack of irrigation facility as well as absence of any supplementary occupations pushed the farmers towards unsustainable livelihood and debt trap.

Dhyani *et. al.*(2013) evaluated 45 numbers of IWMP in Uttar Pradesh and stated that entry point activities were quite helpful in establishing identity of the Project Implementing Agencies in the watershed area. Village level institutions have been constituted but lack of awareness was obvious in such situation. Impact of technical manpower support to the Project Implementing Agencies was partially successful because experts were not fully devoted in watershed area rather they were frequently attached to the office.

Gouda and Maraddi (2013) revealed that in rainfed ecosystem, enormous constraints faced by both small and marginal farmers to get livelihood security, which need some special programmes during off season and more of product subsidy to meet their demands and provide employment through non farm activities and agri-based enterprises.