

Watershed Management: An overview

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Water is an important and essential factor necessary for the survival of the human life. Water resource is a natural resource and depends on the rainfall every year. Water bodies cover 2/3rd of the earth's surface of our planet. Out of 70.7%, only 0.052% is fresh water whereas remaining is salt/sea water. The potable water available on the earth is very less and hence there is an urgent need to protect and manage the available potable water resource for effective use for human life. Watershed Management is a concept which directs and coordinates the use of land and water resources for its optimum utilization. Watershed management is sustainable distribution of resources and the involves various processes which includes creation and implementation of various plans, projects, programs etc. to sustain and enhance utility of water resources for different living beings and organisms. This paper presents an overview of watershed management, different development programmes in it and the efforts of Government of India in this direction.

Keywords: Watershed management, Watershed programmes, integrated watershed management, Watershed management initiatives.

Introduction

Water is the basic need for human existence which is also used for different purposes. Due to increase in population and explosion of available resources India is facing major water crisis. It is very difficult many times to provide proper water supply for the agriculture, industries, business houses etc. The availability of potable drinking water for the citizens many times becomes a major priority than any other industries.

The three main natural resources available on earth are: soil, water and vegetation. There is a need to effectively manage these resources for its proper utilisation and organisation. The effective management of these three resources is popularly known as watershed management. In case of water the main source is rainfall and it varies in country as it is based on climate of the region. The rainwater or water melted from snow runs downhill, and it is collected in the watershed along with sediment and other materials which are simultaneously deposited into the watershed which acts as a

receiving body. Thus, watershed is the area of land which drains or sheds water into a specific receiving body constructed for that purpose such as a lake or a river. Any spatial area from which running water is collected and drained through a common outlet is known as watershed. In other words, it may be defined as a unit of area which covers all the land and the running water, which is diverted at a common point. It is also similar to a water catchment area.

Watershed Management: concept and overview

A watershed is geographic area through which water flows across lands and drains into a common body of water may be stream, river, lake or ocean. The watershed boundary follows the highest ridgeline around the stream channel and meets at the bottom of the land where water flows out of the watershed.

Management is the science and art of getting people together to achieve some goals which have been set in form of objectives by integrating the available resources efficiently and effectively. Thus, management is a process of planning, organizing, directing, coordinating the available resources (man and natural) in timely manner and achieving goals sets with available monetary resources. The concept of watershed management incorporates all the principles of management science as it implies the effective use of soil and water resources within a given geographical area to achieve sustainable production and minimize floods to save draining water for using it for the betterment of the society needs. Watershed management is an activity in which creation and implementation of various plans, programs and projects to sustain and enhance watershed functions that affect the plant, animal and human communities within a watershed boundary. Thus, it implies rational utilization of land and flowing water for optimum production with minimum hazard to the existing natural resources (Murthy 1994). Watershed management underlines the effective use of soil and water to maximize crop production and minimize the flood situation. While creating and maintaining a watershed, the basic focus should be on maximizing the agricultural production while conserving the wildlife in and around the watershed. Availability of more water for agricultural activities, is likely to create an opportunity for agro based industries like dairy, poultry and goat/sheep farming apart from Post Harvest Technology (PHT) and food preservation, leading to more opportunities for employment. Since the purpose of watershed is to hold on the running water and conserve it for productive use, the flood situation which is otherwise a common scenario in high rainfall area of Konkan in general and Sindhudurg district in particular, can be brought under control, if we will create and maintain more number of watersheds. As the running water is stored and conserved, the velocity and quantity of running water is reduced considerably, effectively reducing soil erosion and maintaining the fertility of the soil. This will not only help in raising the ground water table but will also lead to maintain

healthy soil micro-flora. A well maintained watershed protects the ecosystem by ensuring environmental balance. In other words, the watershed management leads to water harvesting and conservation, increasing ground water level, increase in soil fertility and productivity, facilitating increase in cultivable land and employment generation which ultimately will help in flourishing the rural economy. Site for the watershed should be selected carefully. Generally the selected site should be away from the residential area, but surrounded by agricultural land. As far as possible, it should be at a higher elevation and land with moderate to stiff gradient with a valley location, where the land is a waste land and difficult to cultivate. Such site is generally considered the ideal site as construction of check dam on one side will help to conserve large quantities of water. After selecting a suitable site, the storage capacity of the project should be estimated, to decide on the strength of the construction. Then study the available technologies and finalize the best technology with lowest cost. A due consideration of beneficiary area will help to arrive at a decision of finalizing the technology and its cost. Larger the beneficiary area will give more liberty of higher investment. The watersheds are classified on the basis of their size as follows:

1. Mini watersheds: The size of watershed ranges from few hectares to hundreds of hectares. These can be designed within the crop fields. The size ranges from 10-100 ha.
2. Micro watersheds: The watershed has few thousands of hectares as drainage area. The size ranges from 100-10s00 ha.
3. Macro watersheds: The river basins are considered as macro watersheds. The size ranges from 1000-10,000 ha.

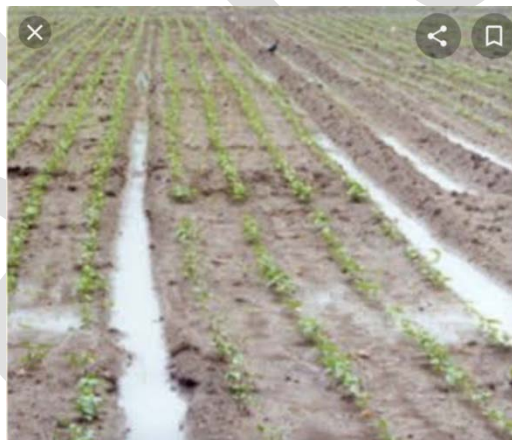
Literature Review:

The study conducted by Sreedevi et. al. (2006) revealed that the importance of integrated water resources management which may be adopted in watersheds by discarding the artificial divide between rainfed and irrigated agriculture. A study was conducted by Gosain, (2009) on Fallacies in Indian watershed Management Programme reveals the philosophy of watershed management offers a great deal in handling the various complexities related to weather conditions and landmass and has been globally accepted but the philosophy has not been implemented effectively. Joy, et. al. (2009) in their study on “Common guidelines for watershed development: Some reflections” have highlighted some of the major features of the guidelines for Watershed Development Projects which can be adapted. The Parthasarathy Committee report have also discussed the ways to take forward the main concerns that have engage much of the recent policy discourse on watershed development. Murugan, et. al. (2014) elaborated and discussed issues on Water Management Policies in India. The Current Trends and Future Policy Options revealed by author pointed out that people are accepting the

watershed management initiatives as a need of hour to sustain agriculture and the study also provides policy recommendations for the future watershed management in India. A similar study conducted by Wang, Guangyr et. al. (2016) on Integrated watershed management: evolution, development and emerging trends has presented three case studies aiming to improve watershed management strategies and apply them more efficiently and successfully to achieve ecological and socio-economic objectives of its management.

The literature reviews also highlighted the need of the different projects and activities related to watershed management to preserve valuable natural resource water. There are different types of watershed management structures available to manage protection of water resource which are constructed according to the type and size of farm, the topography of soil and the amount of rainfall. Few watershed management structures have been described and the respective images are taken from Google images:

1. **Broad beds and furrows:** These control the erosion of soil and help to conserve moisture of the soil and prevent soil erosion during heavy rains. The broad beds and furrows are laid within field boundaries.



2. **Contour bund:** The main function of contour bund is to intercept the run off of water flowing down the slope by an embankment. The embankments may be closed or open. The contour bunds can be adopted on all soils and they help to retain moisture in the fields.



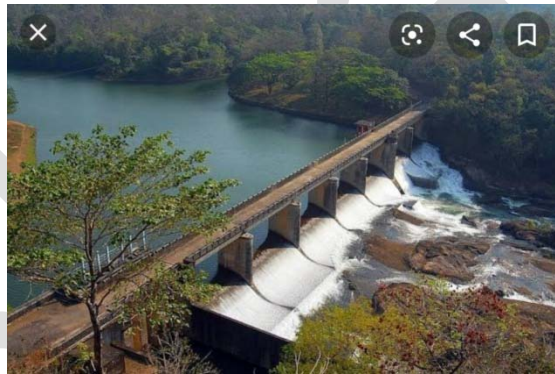
3. **Bench Terracing:** The bench terracing helps to bring sloping land into different level strips to enable cultivation. The construction of steps like fields along contours by half cutting and half filling. Original slope is converted into level fields. They are mostly suitable for hilly areas. The benches may be inward sloping to drain off excess water while the other benches help to reduce the existing steep slope to mild one.



4. **Micro catchments for sloping lands:** They are useful for conservation of moisture and help to control soil erosion for tree crops. They are suitable for dry land horticulture and agroforestry.



5. **Check dam:** They are constructed on small streams and are in the form of low weir which are normally constructed across the gullies. The water which is stored improves moisture of soil of the adjoin area and allows percolation to recharge aquifers.



6. **Percolation pond:** They augment the ground water recharge. They are in the form of shallow depressions created at lower portions in a natural or diverted stream course. They are located in soils of permeable nature.



Watershed Management Programmes in India:

In India, watershed development has been managed by the Central Ministries mainly the Ministry of Agriculture, Ministry of Rural Development and the Ministry of Environment and Forests. The integrated watershed programme has been adopted as a part of the National Water Policy, 2002 for conservation of natural resources. The ‘Haryalli’ guidelines issued by Ministry of

Rural Development in 2004 have ensured that the local level users participate in the planning and management of the natural resources at the watershed level. The Natural Resource Data Management Systems programme of the Department of Science and Technology is working to develop methodologies and technological tools to enable local bodies to prepare and implement plans. The Ministry of Rural Development funds for watershed development schemes under DDP, DPAP and IWDP programmes. A brief overview of few programmes are mentioned below:

1. **The Drought Prone Area Development Programme (DPAP):** It was started in 1970-71. The main objectives of this programme are development of area through restoration of ecological balance and optimum utilisation of land, water, livestock and human resources to mitigate the effect of drought.
2. **The Desert Development Programme (DDP):** It was started in 1977-78. The main objectives of the programme are to mitigate the effect of drought in the desert area and restore the ecological balance.
3. **Integrated Wasteland Development Programme (IWDP):** This scheme is under implementation since 1989-90. The main objective of this programme is the development of wastelands in non-forest areas and to keep a check on land degradation by putting these wastelands into sustainable use and also increasing bio-mass availability mainly of fuelwood, fodder, fruits, fibre and small timber. It is in the form of people’s own programme which aims to give them decision making powers in terms of project implementation and fund disbursement.
4. **The National Watershed Development Programme for Rainfed Areas (NWDR):** The programme was started in 1986-87. The main objectives were to conserve and utilize rain water both from the arable and non arable lands on watershed basis. The programme helped to increase the productivity of crops and also increase the fuel, fodder and fruit resources through appropriate alternate land use system.
5. **World Bank Assisted Integrated Watershed Development Project:** The programme was started in 1990. The main objective of this project was to consider the problems of environmental degradation and promote sustainable increase in agriculture production and to enhance vegetative technology of soil and water conservation.

Conclusion:

Watershed is an effective way of water harvesting and conservation. It helps in reducing soil erosion, increasing soil fertility, maintains ecological balance, can bring more land under cultivation apart from reducing the risk of flood and increasing availability of water for domestic consumption and agriculture.

The efforts made by Government have proved useful in reduction of soil erosion in watershed areas but the percentage of reduction is again primarily dependent on the quality of soil and activities of moisture conservation in those areas. The programs also brought a positive change in the direction of land use pattern as more wasteland was converted into productive land and which proved useful for the farmers. This in return increased the net sown area in most of the states and all this enhanced agricultural production. The programs undertaken by Government also reduced the workload of women in terms of fetching water for drinking, collecting fuel wood and fodder for livestock. The participation of the local villages is a major key which leads to the success of watershed projects. There is a need to find out the gaps and reasons so as to make the programmes more effective and retrieve full benefits as it was found that in certain areas the programs did not prove much effective to reduce soil erosion etc. The programs by the government have shown a positive trend towards growth in water level, land use patterns, cropping patterns, livestock breeding etc. There is a need to address the social achievements of the watershed management programs. Conscious efforts should be taken to maintain good health of available watersheds and create new as it will lead to flourishing rural economy.

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