STUDY OF WATERSHED MANAGEMENT AND DEVELOPMENT ITS STRUCTURES

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ABSTRACT

The project site located at a distance of 5.5 km from yavatmal, infront of jagadambha college of engineering and technology yavatmal. It lies between north latitude 20.3547° and east longitude 78.0859°. The aim of this project is to developed the catchment area with use of proper method and implementing the structure in proper way over a site to increase the watershed functions that affect in the plant life, animal life, as well as human being inside the watershed area. In this area the rainfall occur is medium type and the after rainfall the runoff is more also the soil erosion is more and less amount of water is stored in this area. To overcome this problem we create a watershed plan and developed the plan in this area. The objective of project to increase the ground water level, recharge the wells etc. which is usefull for the agriculture near the area.

Keywords - watershed development, method of watershed, structure of watershed.

[1] INTRODUCTION

A watershed is a structure, which drainage the water at a common point on the watershed boundary. Rain falling on the catchment area of mountains region, the mountains water starts flowing down into small rivulets as there is no diversion to hold the rain water the water flow downward side and small quantity of water store at some natural structure on the mountains. The water flow downward side with some velocity due to slope of mountain are join to form a small stream. The many small stream are join at a point and form a bigger stream.

Watershed is a area with a well defined topographic boundary and outlets. The topographic feature are define in such a way that the more quantity of water are hold or a drain at a particular point without hazard to natural resources. The rain water flow in mountain area to a downward side the soil erosion will take place, to reduce the soil erosion the various structure is provided as like continuous contour trenches, graded bund, loose boulder structure, gabian structure, nala bandh, earthen structure etc.
[2] OBJECTIVE OF WATERSHED

1. To develop a watershed in rural areas for storing water for agriculture and other purposes during non-rainy seasons.

2. To analyze and recharge water levels of groundwater tables.


4. Generation of action plans through suggestions of watershed treatments like rainwater harvesting structures and erosion prevention methods. IRC Class B Loading.

[3] VARIOUS TREATMENTS OF WATERSHED

Following are the different methods of treatments of watershed management:

1. Continuous Contour Trenches
2. Graded Bund
3. Loose Boulder structures
4. Earthen Structure
5. Nalah Bandh
6. Cement Malah Bandh
7. Gabian Structures

[3.1] CONTINUOUS CONTOUR TRENCHES (CCT)

The trenches excavated perpendicular to hill slope and maintained at the same level are called Continuous Contour Trenches (CCTs) (Fig. 3.1). By maintaining specific distances between two CCTs, it is excavated one below another on the whole hilly area.

[3.2] GRADED BUND

At the end of the hill slope, at the hill base where land is used for crop cultivation, a farm bund is provided transverse to the slope of the land. These are helpful in maintaining soil moisture for a longer period. Thus, increasing crop production. The cross section generally maintained is 0.75, 1.05, and 1.20 sqm. (Fig. 3.2).
[3.3] LOOSE BOULDER STRUCTURE
After steep slope of hill, where the slope get reduced we provide loose boulder structure. These are just like guly plug except that these are made in systematic manner with specific slope on both sides. (Fig. 3.3)

[3.4] EARTHEN STRUCTURE
This structure generally taken for 1hecto catchment area. The main purpose of this activity is to retain the water to increase the ground water table. It is constructed in black cotton soil and murum. The top width 1.0 m the base of bandh calculated with side slope 1:1 m both side. The outlet is provided for wipe out the surplus water. The pitching is provided on water storage side of bandh. Due to this activity ground water table increases as well as the soil conservation is possible.

[3.5] NALA BANDH
It is constructed at a site where murum and black cotton soil is available in abundant quantity. The gorge is made of well compacted black cotton soil and murum is used on outer side of this. Outlet is provided to drain out extra water. (Fig. 6.1.5)
[3.6] CEMENT NALA BANDH

This activity generally provide donmaind rain. The slope of the Nallah bed should be 1t o3%. Cement plug consisting construction of main wall, wind wall, side wall, kee wall, head wall, header, panushi. In plug water stored from 1 to 2.0 meter. Due to the storage of water the ground water table recharges, the lift irrigation canal so possible through this activity. (Fig.3.6)

[3.7] GABIAN STRUCTURE

These bunds are constructed across the Nallah with available uncoursed rubbes covered in mesh (Fig. 3.7). If Nallah bund and Cement plugs are not possible to construct then construction of Gabian structure is easy and low cost. It helps to minimize the speed of runoff, minimize the soil erosion and also increase the water table.

[4]. METHODOLOGY OF WATERSHED

- Selection of site.
- By observation and collection of data of this area.
  i. Topographical map.
  ii. Cadastral map.
  iii. Rainfall data.
- Survey work.
  i. To calculate the area.
ii. To prepare the contour map.

- Laboratory work.
  i. To find water quality.
     a) PH.
     b) Total hardness.
  ii. To find soil properties.
     a) Moisture content.
     b) Specific gravity.

[5]. RESULT

The various laboratory test are calculated and also the survey work are calculated are as follows.

[5.1] SURVEY WORK.

In this project we calculate area of the site and collect the contour map are as follows.

[5.1.1] TO CALCULATE THE AREA.

![Fig 8.1.1: Site area](image)

The area of the site is 13629.65 m²

[5.1.2] COLLECTED CONTOUR MAP FROM WCD DEPARTMENT.

![Fig 8.1.2: collected contour map](image)
[5.2] LABORATORY WORK.

The field water quality and soil property are found in the laboratory as follows:

[5.2.1] PH TEST.

The PH value of field water is 6.80.

[5.2.2] TOTAL HARDNESS TEST.

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Volume of water sample taken</th>
<th>Volume of 0.01ml total hardness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>10 ml</td>
<td>5.2</td>
</tr>
<tr>
<td>2.</td>
<td>10 ml</td>
<td>5.8</td>
</tr>
</tbody>
</table>

The total hardness of field water is 550 ppm.

[5.2.3] MOISTURE CONTENT.

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Empty weight of container in gm</th>
<th>Container with soil</th>
<th>Dry weight of container</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>54</td>
<td>211 gm</td>
<td>178 gm</td>
</tr>
<tr>
<td>2.</td>
<td>54</td>
<td>248 gm</td>
<td>204 gm</td>
</tr>
</tbody>
</table>

The water content of field soil sample is 27.96%.

[5.2.3] SPECIFIC GRAVITY.

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Empty wt of pycnometer (W1)</th>
<th>Soil + wt of pycnometer (W2)</th>
<th>Water + soil +wt of pycnometer (W3)</th>
<th>Water + Pycnometer (W4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>636 gm</td>
<td>832 gm</td>
<td>1438 gm</td>
<td>1308 gm</td>
</tr>
</tbody>
</table>

The specific Gravity of Field Water is 2.90.

[6] LITERATURE REVIEW

Mr. Chetan B. Bansode1, Mr. Vishal B. Bhosale2(2018):- The objective of the paper is to develop an action plan for watershed management. Watershed management is the process of creating and implementing plans, programs, and projects to sustain and increase watershed functions that affect the plants, animal and human communities inside watershed boundary. The recent technologies like remote sensing and GIS support us to giving a quicker and cost effective analysis of various applications with accuracy for planning. It also gives a better perspective for understanding the problems and therefore helps planners evolve a better solution for sustainable development. From the final output of these themes generate, recharge
wells, percolation tank and check dams are recommended for the study area, mainly to control sedimentation from the catchments. To increase the ground water recharge and vegetative cover to control soil erosion, various action plans like construction of recharge structures, afforestation etc. has been proposed.

**P. Srinivas, C. Sarala*, P. Prabhakara Chowdary(2007):** In this paper we study the Watershed is a geo-hydrological unit draining at a common point by a system of streams. Watershed management is the rational utilization of land and water resources for optimum production with minimum hazard to natural resources. Remote sensing (RS) and Geographical Information Systems (GIS) techniques can be utilized for effective management of land and water resources in a watershed. The study area was Boothpur Mandal, which is one of the 64 mandals of Mahaboobnagar district. These areas have been identified as chronically drought affected areas in the State because of scanty and erratic rainfall. Collection of source data like satellite data of two seasons, SOI toposheets and village maps were carried out. Secondary data like ground water levels, agriculture, population and socioeconomic data were collected. Various thematic maps like base map, contour map, drainage map, soil map, geomorphology map, slope map and land use/land cover map were prepared by using SOI toposheets and satellite imageries. After analysing all maps, action plan map was generated for the soil and water conservation in the study area.

**Rajeev1,(2015):** In this paper we study the Watershed management decision making is a complex process. Cooperation and communication among federal, state, and local stakeholders is required while balancing biophysical and socioeconomic concerns. The public is taking part in environmental decisions, and the need for technology transfer from public agencies to stakeholders is increasing. Information technology has had a profound influence on watershed management over the past decade. Advances in data acquisition through remote sensing, data utilization through geographic information systems (GIS), and data sharing through the Internet have provided watershed managers access to more information for management decisions. In the future, applications in incorporating hydrologic simulation models, GIS, and decision support systems will be deployed through the Internet. In addition to challenges in making complex modeling technology available to diverse audiences, new information technology issues, such as interoperability, Internet access, and security, are introduced when GIS, simulation models, and decision support systems are integrated in an Internet environment. Morph metric analysis is a quantitative description and analysis of landforms as practiced in geomorphology that applied to a particular kind of landform or to drainage basins. Remote sensing (RS), Geographical Information System (GIS) has proved to be an efficient tool in delineation of drainage pattern and water resources management and its planning.

**S. P. Suryawanshi and Abhijeet Kamble (2012) :** The objective of paper the Water resources in India occupies approximately 2.4% of the total geographical area of the world, while it supports over 15% of the world population. Unprecedented population pressure and demand of society on scarce land, water and biological resources and the increasing degradation of these resources is affecting the stability and resilience of our ecosystems and the environment as a whole. Therefore, the productive agriculture lands in the country are in constant process of varying degrees of degradation and are fast turning into wastelands. It is precisely to restore this ecological imbalance by developing the degraded non-forest wastelands. To harness the full potential of the available land resources and prevent its further degradation, wasteland development is of great significance. The problem of degraded land, water and its management is complex and multi-dimensional and its development aims to
develop human resource in watershed development and management and generate awareness about the importance of sustainable development and maintenance of existing work force working in the watershed development and develop skill in the rural youth to work in the watershed development based on watershed management approach and developing natural resources on sustainable basis.

CONCLUSION

Watershed management involves the coordinated use and management of water, land and other biophysical resources within the entire watershed with the objective of ensuring minimam land degradation and erosion and causing minimal impact to water yield and quality and other features of the environment. Therefore, an integrated watershed management strategy must be developed for any watershed for the success of the actions towards achievement of sustainability goals. Increasing populations and higher living standards will requires heavy demands on natural resources in the future. Much greater local, national, and international efforts, cooperation, and expenditures are needed to meet future vital requirements. IWM should be flexible enough to accomodate future changes and perspectives.

REFERENCE


