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Chapter I

Introduction and Database

1.1 Introduction :-

Water is one of our most precious resources. In dry regions access to water lies at the heart of much conflict. The significance of dry land development through watershed management had been realized from time immemorial in India, and attempts were being made to harness the water resources for this purpose.

Watershed Development has been identified as major strategy for integrated development of both arable and non-arable lands in rainfed regions for increasing and stabilizing production of crops. Watershed Development is to promote the economic development of the villages community directly or indirectly.

Government of India initiated three special programmes called a Drought Prone Area Programmes (DPAP), Desert Development Programme (DDP), and Intensive Watershed Development Programme for overcoming the problems of drought desertification and degradation of land respectively.

The Watershed Development Programme in the modern form has been being implemented since the drought of 1970's. The evolution of WDP begins through a centrally sponsored scheme of soil conservation in the catchment of river valley projects in 1972. The 46 model watershed projects were developed by ICAR in 1982. The four World Bank funded Dry land Watershed Development Projects (one each in Andhra Pradesh, Karnataka, Madhya Pradesh, and Maharashtra) during early and mid 1980's were instituted. National Watershed Development Programme for rainfed agricultural by Union Ministry of Agriculture has been designed in 1986 for 99 districts of 16 states of India. Eighth five year plan has given high priority to watershed approach which has been centime hence forth with more emphasis.

1.2 Definition of Watershed :-

Watershed is synonymous to catchment area. It refers to, "A hydrological unit area draining the runoff into a river or a reservoir or a pond or a respond more effectively to the various management techniques to maximize production."

According to Padmanabhan, "Watershed is a natural hydrologic entity that covers a specific areal expense of land surface which the rainfall runoff flows to a defined drain, channel, stream or river at any particular point. It has its own natural drainage system and responds more effectively to the various management techniques to maximize production."

1.3 Delineation of Watershed :-

The river basin has been further divided into watersheds, sub-watersheds, and macro and mini watersheds.

The size of the watersheds had varied according to the size of the river of streams of reservoir or a pond for which it formed a catchment. The following table shows that the details of the different types of watersheds.

Types & Sizes of Watersheds

S.N.	Hydrologic Unit	Size ranges (Hect.)
1.	Macro Watersheds	50000 – 200000 Hect.
2.	Sub Watersheds	10000 – 50000 Hect.
3.	Micro Watersheds	100 – 10000 Hect.

(Source :- All India Soil and Land use Survey Organization, Ministry of Agriculture and Irrigation)

In the Watershed Management Programme, the factors such as, Shape, Topography and Slope of lands, Soils, Amount of Precipitation and storm patterns, Land use on the Watershed Lands, Types and quality of vegetative cover, Drainage, Size of Watershed should be studied thoroughly before taking up a project on Watershed Managements, which refers to the development and application of a well – drawn – out operation programme specifically relevant to the land and water resources in a particular watershed area keeping in view the agro-climatic and physical conditions, requirements and problems of the people of the particular area.

1.4 Objectives of the Watershed Development :

I. To conserve soil by mechanical and biological measures;

II. To increase infiltration of rainwater into the soil;

III. To control the damages due to excess runoff;

IV. Employment generation and development of the human and economic resources of the village.

1.5 Advantages of the Watershed Development :

I. Improved utilization of the rainfall and crop drainage;

II. Stabilization of the area under cultivation and increased production;

III. Reducing flooding and water logging;

IV. Reducing soil erosion;

V. Increased agricultural productivity and,

VI. Augmenting and facilitating dependable water supply for domestic and industrial uses.

1.6 Objectives of the Study :

I) To study the Nature and scope of watershed development in solving the problems of water for agriculture use in study area.

II) To study the impact of watershed development programme on conservation of land, utilization of water, change in cropping pattern, Crop production etc.

III) To study the various watershed development programme.

IV) To study the economics of watershed development in the study area.

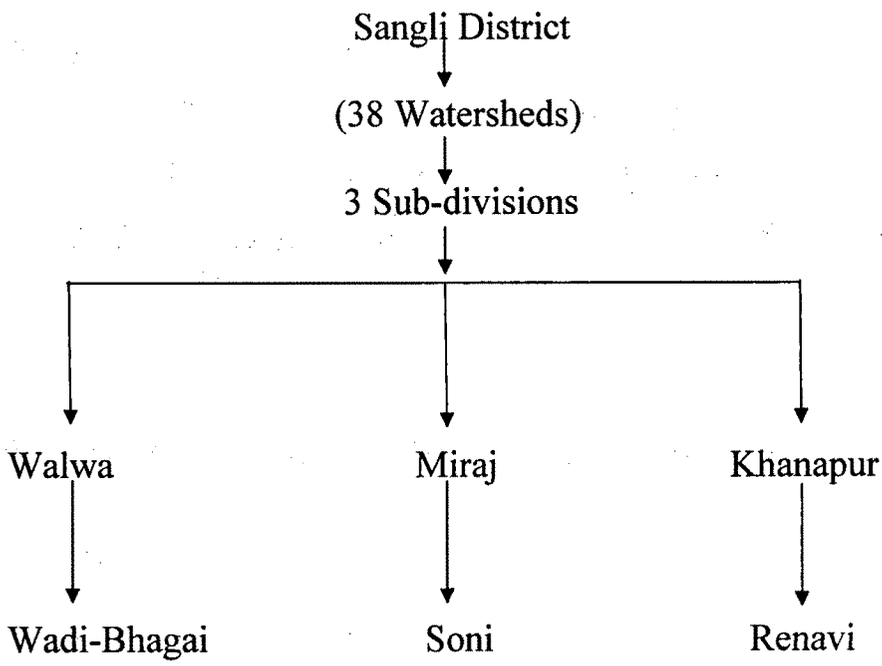
1.7 Hypothesis :

The Watershed Development Programme is very much beneficial in Drought Prone Area.

1.8 Research Methodology :

I) Sampling :- In Maharashtra there are 1504 watersheds presently working in 29 districts. We have selected the Sangli district for study purpose. There are three sub-divisions of Sangli district.

In these three Sub-divisions 38 watersheds are presently working. We have selected one watershed in each subdivision by random sample method.



1.9 Sources of Data Collection :

A) Primary Data :

I) Survey of Sample Watershed.

II) Interviews of Watershed Beneficiaries.

III) Field observation/site visits.

B) Secondary Data :

I) Gazettes of District

II) Departmental Publications

III) Project Reports

IV) Data from section offices of Agriculture, Irrigation Department, Water and Soil Conservation department Sangli.

1.10 Tools of Analysis :

Before And After Method :

The present study has followed the Method of "Before and After (BA) Method" for testing some of the suitable variables and accounting for the cumulative effects on Drought Prone Areas which has been recorded with some data support in respect of watershed development.

1.11 Chapter Scheme :

Chapter I - Introduction and Research Methodology -

This chapter explores the Introduction of watershed and watershed development. And also explores the research methodology and review of literature.

Chapter II - Watershed Development in Sangli District –

This chapter deals with the various watershed development programmes of the Sangli District.

Chapter III - Economics of Watersheds in Study Area –

This chapter explains the expenditure on selected sample watersheds and its impact on agriculture development.

Chapter IV - Social Background of watershed Beneficiaries in The Study Area -

This chapter explains the social background of watershed beneficiaries and it also deals with the impact of watershed development on beneficiaries.

Chapter V - Conclusions and Suggestions –

In this chapter we conclude some conclusions from the field observations and study analysis and give some suggestions.

1.12 Review of Literature :

Shri Niwas Sharma, P.K. Mishra and A.Siva Prasad,[1] Showed that, The Integrated approach of watershed has helped to improve water resources, in addition to increasing crop yields as well as providing additional forage. Particularly, by the introduction of major engineering structures, the recharge of ground water is clearly seen from the water level observations in the well, such buildups of ground water were never noticed in that area before the inception of watershed programme. Obviously, it calls for active peoples participation in maintaining the effectiveness of soil and water conservation structures to serve the society and safe guarding the environment.

Pradeep Kumar Mishra,[2] in his paper clear that planning is an important component of Watershed Development Projects (WDP), Policy guidelines suggest that planning should be participatory without undermining the technical soundness of the plan. To fulfill this objective different organizations have developed their own approaches, like Land use planning, Participatory Rural Appraisal (PRA), Net Planning and Logical Framework Analysis (LFA) based planning. A review of experience at field level shows that planning

in watershed projects is a weak area and there lies a large gap between policy intent and practice followed in the government funded projects. To bring effectiveness in the Watershed Programme, the planning aspect needs to be strengthened. In order to achieve this, the policy makers and implementing agencies must look beyond the existing procedures.

B.K. Panda, R.K. Panda and Sarangi,[3] It has been concluded that, In recent years, there is growing opinion on the need of initiate soil and water conservation, to develop watersheds and to protective and supplementary irrigation particularly to wasteland, dry lands, hill terrains etc. for enhancing production and productivity. Watershed is usually employed as an umbrella term describing a whole range of methods of collecting and conserving various forms of runoff water from different sources. Particularly for dry land agriculture, it is collection of excess runoff water in a storage tank and using it for better crop production. Though the basic objectives of watersheds is soil and moisture conservation, simultaneously it influences the cropping pattern yield rate of crops, cultivated and consequently livelihood sustainability and food security of the people.

Manipal, M.S. Prasad and M.V. Padmanabhan,[4] It has been clear that, a majority of farmers has adopted the soil and water conservation technology to a medium level in the watershed area. Hence, more efforts are needed by the implementing agencies to persuade more number of farmers to follow soil and water conservation measures by reducing the constraints and increase adoption to a higher extent. Since, a number of factors, namely age, herd size, knowledge, attitude, and economic motivation, mass media, exposure and information source utilization were found to have significant influence on the adoption, implementing agencies of watersheds should invariably manipulate these variable in order to increase the adoption level of farmers of various soil and water conservation practices.

M.K.Jally, D.K. Marothia and D.K. Agrawal,[5] An attempt has been made in this paper to evaluate socio-economically Nartora Dry Land Watershed Management Project (NWP) using Net Present Value (NPV), Benefit Cost Ratio (BCR), and Internal Rate of Return (IRR) criteria of Cost Benefit Analysis. NWP are also estimated using Lorenz Curves and Gini's Ratios. Extra market benefits or intangible benefits are also quantitatively assessed. Based on the

NVP, BCR, and IRR the NWP is an economically viable development project. The social impacts in terms of income distribution derived from Gini Ratio and Lorenz Curves indicate a marginal shift away from egalitarian. The NWP yielded intangible benefits in terms of involvement of beneficiaries through collective management in degraded land and other natural resources. Some policy interventions for effective management of NWP has also been suggested.

K.K. Datta and Bhu Dayal,[6] It has been concluded that Under present conditions, the small and marginal farmers cannot afford the use of water conservation technologies, such as sprinklers due to heavy initial investment requirements. There is also an emerging need to encourage community approach improving active farmer's participation along with government interventions through its Incentive Oriented Supportive Programmes. A strong linkage between research and end user of technologies, i.e. the farmers and the extension workers, is also urgent as is a good technology transfer network for promoting the management of poor quality waters for sustainable use of land and water resources in agriculture.

Dr. A. Ranga Reddy,[7] in his seminar paper he clear that, In overall, watershed of micro nature at farm level and macro level at village level were observed as a healthy remedy for chronic drought prone areas. It should be implemented as holistic approach by bringing farmers, bureaucrat's politicians and Non-governmental organizations at one point, in spite of umpteen hurdles. This is considered as low cost – high benefit scheme, which is to be propagated at grass root level farmers, who are the lion-share holders of the farming society.

K.M. Naidu and V.P. Reddy,[8] It Showed that, All the watersheds that are promoted and encouraged to ensure equity, efficiency, economy, ecological balance, empowerment sustainability etc. So as to help the disadvantaged farmers earn more income to overcome poverty and make the backward and drought prone areas as green fields, cultivating suitable crop for achieving sustainable agriculture growth. Farmers are engineers in their own way and their skill have been not used properly and the watersheds expected to utilize their engineering skill for the benefit of stakeholder reach the level of rich farmers and develop their areas with suitable crop, horticulture, organic culture for promoting

appropriate agriculture through integrated holistic approach by establishing proper linkages with market inputs technology etc. to achieve the maximum results for the benefit of rural people and rapid growth of agriculture on sound bases with the active support of government.

Y.V. Malla Reddy,[9] in his seminar paper he explain that, there are three constituents involved in watershed development. They are a) People, b) Government, c) Non-governmental organizations. Each of these constituents have certain strengths such as, people have local knowledge, government has technique competence and financial resources and NGO's have better awareness and skill in participatory approaches. It is necessary to coverage these strengths in watershed management system.

Jayesh Ranjan,[10] in his seminar paper he concluded that to operational the principles of peoples participation, transparency, accountability, equity and democratic functioning there is a need to go beyond the common guidelines and identify necessary steps that would be pragmatic, and at the same time, be in tune with the essential spirit of the guidelines. These concepts can be operationalised meaningfully and with success in the ongoing

watershed programmes through a focused effort on training and capacity building. In addition, specific institutional arrangements like Grama Sabha meetings on fixed days every month, quarterly publication of watershed accounts, peoples estimates, enhanced women representation in watershed committee, compulsory execution of a fixed proportion of work on common resources, would further buildup the gains achieved through the capacity building initiatives.

Katar Singh[11] (1997) The case study showed that the project had a positive impact on crop yields, net benefits from crops, and availability of water in the project area and that it was financially viable even when benefits from horticulture and social forestry activities were not considered. In so far as Mittemari was the typical dry land watershed, similar results could be expected of watershed projects in other dry land watershed.

Karam Singh, H.S. Sandhu, Nirmal Singh and Balbir Kumar,[12] It was conclude that, the forestry, animal husbandry soil conservation and horticultural components of the integrated watershed development project in Kandi tract of the Punjab proved to be economically justifiable. The rate of return (IRR) was more

than 12 percent in all these cases except for soil conservation in Maili watershed where it was not adequately complemented by the irrigation component. For forestry, the survival rate was less than expected and the plantation of bhabhar and fodder grasses was not given adequate attention. For animal husbandry, there was exodus of improved animals supplied and there was a successive decline in the milk yield of these animals. To compare the cost benefit parameters of the two watersheds, the NPW, BCR and IRR were computed for Maili watershed by excluding and including the irrigation component. The BCR at 12 percent discount rate was 1.81 for Maili (excluding irrigation) and 1.66 for Chohal. The rate of return for both the watersheds was more than 15.5 percent. However, when the irrigation component was included in Maili, the project was not feasible at 12 percent discount rate.

V.Rajagopalan,[13] In present study, an attempt has been made to examine the problems and prospective of IWD. Integration in IWD has two major aspects : first, financial related to how incremental funding for IWD is dovetailed with the ongoing programmes for irrigation development rural and for development of agriculture, animal husbandry and horticulture and forestry. Funds need to be

reallocated to support IWD projects. The other related question is what type of amalgamation of ongoing programmes would be effective and what are the other options available? Then how to new investment could be scheduled in relation to short term contingencies and long term growth? What kind of institutional finance-scale, mode and procedure, for lending and recovery are relevant and facilitating for IWD? The pattern and financing has to be considered as a special case for IWD.

R.Ramanna,[14] In this study he explain the effective watershed development programme involves participation of all existing institutions including farmers for sustained development of the watershed. Establishment of 'Micro-Watershed Sanghs' in Karnataka has demonstrated how non-governmental agencies can fruitfully involve themselves in watershed development, hopefully even after the withdrawal of the project staff. The watershed development on arable and non-arable lands should be evaluated in terms of rise in water table, change in cropping patterns, use of cash inputs and change in income and employment. The assessment of credit under the 'Service Area Approach' should be received for likely gaps between targets and achievements and determine the

reasons there of. The adequacy of credit and its timeless should be evaluated for effective operation of the crop insurance programme, the question of considering the watershed as a unit for determining premia and indemnities should be evaluated.

R.S. Deshpande and Ratna Reddy,[15] In this study they explain that, The resource region like watershed is the ultimate planning unit for the agriculture sector since it internalizes the linkages between various system flows. It however should be concluded that planning for development of a watershed is not simply a multi-disciplinary task, but it involves all the interdisciplinary linkages. Development of each project is unique in itself, through certain broad philosophical traits are common roughly, water-soil and biomass interaction has to be carefully mapped keeping in view the reaction of the population, the level of market interventions and a number of other non-economic parameters. Lastly, the community participation is the social group dynamics gets reflected in impact analysis parameters.

K.G. Kshirsagar and R.D. Ghodake,[16] This study explains that, the on-farm watershed trials in a few agro-climates of the Indian semi-arid topics with moderate but dependable rainfall showed that

gross profits from improved technology were one and one half to two times higher than those from the traditional technology as long as management support and adequate inputs were made available. The experiences shows that the continuing need for management support for watershed development credit supply, wheeled tool carries, infrastructure facilities, for supply of seeds, fertilizers and the need of farmers participation and their training are some of the constraints which seems to impose narrower limits on the technology spread than had earlier been anticipated.

Katar Singh,[17] It is conclude that how to enlist peoples participation remains one of the most baffling problems presently confronting planners and managers of watershed development programmes all over the world. This study shows that, the most important pre-requisite for people's participation is that the expected private costs of participation. Other important determination of people's participation include organization of people into small groups, good local relationship, existence and enforcement of rules for equitable sharing of benefits from collective action, and willingness and ability of government to make the needed investment in watershed development and provide technical

information, training and guidance. Non-governmental organizations are better oriented to enlist peoples participation and have necessary skills and patience to work with people, to organize them, to motivate them to train them and thereby to empower them so they could identify their problems and resolve them on their own eventually.

D.K. Mahandule, Jg.R.Pawar, D.L. Sale and S.A. Kadam,[18] An attempt has been made in the paper to examine the changes in resources use structure and returns in respect of crop production activity consequent upon the implementation of watershed development programme in the drought prone area of western Maharashtra. The study is based on the micro-level information obtained from 162 farms (45 nala bunding, 43 contour bunding & 70 land shaping) in the watershed area at two points in time i.e. before(1983-84) and after(1989-90) completion of watershed development activities. The various activities of watershed proved to be effective in the conservation of soil and water resources as a result of which the proportion of irrigation area and the cropping intensity increased by 30 and 53 percent respectively. The use levels of human labour, bullock labour, organic manures, nitrogen and

phosphorus increased by 6, 6, 22 and 156% respectively during the period. This has resulted in an increase in gross returns and returns to different factors of production in a positive direction in the area under study.

D.V. Jahagirdar,[19] This study explains the three growth parameters, viz, a) increase in cultivated area, b) irrigational facilities and c) increase in per ha. of crop yield have been tested. During 1985-86 to 1990-91; the area sawn under kharif as well as rabi crop increased. Cropping intensity increased from 104 to 115 during the same project. The area under well irrigation is increased by 206 ha. Adoption of in situ moisture conservation technologies and in particular vegetative barriers helped in increasing the yield per ha. of various crops.

Sitesh Bhatia,[20] It is argued in this paper that watershed approach opens up new vistas of productive and remunerative employment and therefore increase in agricultural incomes. The construction and repairs of storage structures, guhls, canals, terraces, etc. involved in watershed development generate employment opportunities. The increase in the intensity of cropping due to supplementary irrigation also increases employment opportunities in

the farming sector. Forestation, another component of watershed project, generates employment in nursery development and maintenance, plantation and follow-up and maintenance activities. Further, the increases in forest area would provide opportunities for the development of several agricultural and allied activities like dairy and poultry farming, sericulture, apiculture, horticulture and agro-based industries like paper-pulp, lac, resins and oils and silk and silk dyes, leather and leather products etc. Soil and water conservation programmes themselves would induce employment generation to a large extent not only in the form of survey staff etc., but it indirectly by increasing the productivity and cropping intensity and thus incomes of the people.

G.V.K. Rao, Shaik Haffis, P.B. Parhtasarathy and C. Sriram,[21] The study was undertaken to workout the output-input energy relationship for the data collected for different inputs used in the cultivation of crops and outputs obtained from each of the crops from different categories of farmers for 1987-88 in watershed and non-watershed villages of Maheswaram region in Ranga Reddy district of Andhrapradesh. The results indicated that farm yard manure and fertilizer were the major items of energy input factor out

of total input energy used in different categories of farmers and in crops under watershed programme villages. While in non-watershed villages, both human and bullock labour were identified as the major energy input factors. The energy utilized through the use of pesticides was the lowest in total input energy used in watershed villages where as in non-watershed villages; the use of this factor was totally neglected.

S.D. Suryawanshi, B.N. Patil and B.P. Tuse,[22] The economic assessment of this project indicates an increase in the incremental income discounted at 10% rate. The pay-back period of the project was 3 to 4 years. The benefits from alternate land use were not accounted because the returns were yet to start. The important development activities, such as nala bunds and percolation tanks were effective in recharging well-water. Compartment bunding is proved effective in water conservation is situ and gave higher yields. The pay-back period of the watershed activities showed significant contribution of the programme.

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