CHAPTER I

INTRODUCTION

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CHAPTER 1

INTRODUCTION

In India, where three fourth of its population is engaged in agriculture, water resources play a vital role in its economy. The success of agriculture depends on the extent to which the water requirements of crops can be met. This makes the conservation of water and its judicious and economic use as a matter of greatest national importance.

India's water resources are insufficient to meet the long term requirements of agriculture, industry and other uses. There will thus be increasing competition for available supplies as more and more water gets harnessed and committed. A well defined policy is needed for development of water resources of each region or basin to obtain the maximum benefit for the largest number of people. At the same time it should be realised that planning for development of water resources cannot be rigid. The demand for water and its availability change with time and at successive stages of development. It is therefore necessary to maintain an intelligent flexibility in planning to keep pace not only with changing circumstances but also with latest development in technology.
Multipurpose river valley projects offer the best method of using of surface water resources in India by storing the flood waters and supplying it at times of needs. Immediately after independence India took up many multipurpose river valley projects. Irrigation was given the paramount importance almost in all the projects. Due to these projects the net irrigated area which was only about 19.4 million hectares in 1950 increased to 42 million hectares in 1984-85 out of 27 million hectares of net sown area receive assured irrigation. Government of India plans to develop the full irrigation potential of the country which is estimated at 113 million hectares of gross cropped area by the end of this century. Even after the development of all possible schemes nearly half the net sown area will depend on rain only. Therefore the need for the efficient use of water in the command area of irrigation projects is stressed in each plan document. Apart from the efficient use of water in terms of increased production per unit of water, there is also a necessity for distributing the benefits of irrigation among as many people as possible. Thus water can effectively act as a catalyst for overall development of regions.

Reservoirs are highly complex features. The distribution of streamflow through space and the time from them not only forms foundation for agricultural development
but also it brings considerable changes in the environment. These effects include alkalinity, salinity, water logging sedimentation problems, flooding of the land and the need for rehabilitation of displaced persons.

Reservoirs are of great interest to geographers for a number of reasons. First they represent one type of human activity with far reaching impact both on the environment and the economy. Reservoir system can be viewed as a proving ground and a perfect laboratory for geographic research. Secondly the linkages and the interdependence of physical and economic factors can very well emerge from the study of reservoirs. Thirdly an established reservoir of an area highly affected by the human activity gives very good guidelines for future planning.

Any reservoir tend to undergo changes from the moment it is created and all the elements are in a state of flux, Hence creation of each reservoir system in the drainage basin tends to intensify or weaken within particular physical or geographical processes thus changing their economic significance.

1.1 Evaluation of the Benefits of Irrigation Projects:

Economic benefits arising out of reservoirs are usually classified into primary, secondary etc. The
classification rests mainly on the chronological sequence in which the benefits arise and the closeness of their connection with the investment whose effects are being studied. In each of these classes again the benefits can be divided into two classes direct and indirect. When for instance an irrigation of the area under its command. Irrigation results in higher agricultural production than before in that region and this is the direct primary benefit. The increased production results in increased incomes which are partly saved and partly spent, thus giving rise to increased demand. Economic activity increases resulting in more employment, trade etc. and this is the indirect primary benefit. When some of the agricultural produce begin to get processes in the area as for instance oilseeds into oil cake by oil mills it gives rise to further employment, trade, income etc. These are the direct secondary benefits. Indirect secondary benefits arise when the increased income arising from oil are spent on goods and services giving rise to further economic activity. When the oil produced in the oil mills begins to be used for making soap etc. there is further rise in employment income etc. There are the direct tertiary benefits. When the increased income arising from them are spent they increase economic activity further giving rise to indirect tertiary benefits.
This chain can go infinitely. But at every stage the benefits become more different and less specific as factors other than the primary one becomes more important. Therefore in the measurement and evaluation of these benefits therefore it has been recognised that the measurement of secondary and tertiary benefits becomes progressively difficult. Hence direct benefits in these categories again are easier to measure than indirect ones.

Hence benefits from an irrigation project are:-
1) Direct Primary benefits
2) Indirect primary benefits
3) Direct Secondary benefits
4) Indirect secondary benefits.

In the long period, on an average 25 years after completion of an irrigation project the primary benefits will attain their peak. The secondary, tertiary and further benefits will also be flowing in and arising towards their own highest levels. At that stage irrigation will have proceeded to the highest pitch possible and the adjustments of peasants, crops, etc will have fully taken place. As a result agricultural production in the area will attain the maximum. Besides this primary secondary and other effects will have followed the agricultural development
Based on the above facts, many works have been done by different authors and major works are done by the Planning Commission Research Evaluation Programme Committee which are reviewed and presented briefly below:

In the "Evaluation of Damodar Canals (1959-60)", an analysis has been done on the socio-economic development in which the functional relationship between enlarged irrigated areas and additional power resources on the one hand and larger output, greater yields and new industrial and urban development on the other hand were assessed as well as the secondary changes induced by these developments. Under analysis of primary benefits the survey has undertaken (1) increased yield on irrigated land (2) replacement of inferior crops by superior ones (3) increase in the double cropped land and (4) extension of cultivation to submarginal lands. In the secondary benefits the factors of growth in manufacturing, trade, commerce and services are studied.

In the "Multi purpose River Dam - Report of an enquiry into the Economic Benefits of the Hirakud Dam", a survey is directed towards assessing, as comprehensively as possible, the benefits that are likely to accrue to the state from the construction and related works on the Mahanadi at Hirakud. This report gives in the first instance a description of economic conditions in the region,
and attempts to estimate the total income of the area benefited by Hirakud irrigation and then analyses the economic benefits from irrigation, flood control and hydroelectricity.

In the "Evaluation of the Benefits of Irrigation of Ganga Canal" (Rajasthan) 1958, the economic benefits are given primary importance. The survey has dealt with the structure of the farmers, investment and employment from business and agriculture labour. In secondary benefits the survey examines only industry and trade.

The survey on "Benefit Cost Evaluation Cavery-Mettur Project" describes the history and economy of the project. Under the farm business survey the author has analysed the input-output and capital investment. Further a survey of landless agricultural labour and rural industries has been done. This has been followed by the survey on urban industries, commerce and services.

In the study of the "Influence of Mettur Irrigation and Hydro Electric Project on Agriculture and Agro Industries" an evaluation of the economic benefits of this project is done. The stress is given on the agricultural practices and the agricultural economy of the Tanjore District with reference to Pattukottai Taluk. This
is followed by a factual analysis of agriculture and small industries in the area surveyed.

In the "Evaluation of the Benefits of Major Irrigation Projects", eight projects were studied. They are:

1. The Kakrapara, 2. The Tungabhadra, 3. The Hirakud, 4. Gandpura, 5. Mahatila, 6. Lower Bhavani, 7. Malampuzha and 8. Mayurakshi. The extent of utilisation of the irrigation potential, the problems in optimal utilisation of the irrigation potential, the impact of irrigation on the command area and a cost benefit appraisal of these projects were discussed in this report.

The Report on "The Agro Economic Survey of the Parambikulam Aliyar Project Area" is a pre project survey conducted mainly on landless agricultural labour and rural industries. This has been followed by the survey on urban industries, commerce and services.

The Evaluation of the Benefits of the Nizamsagar Irrigation Project deals with an assessment of the primary effects of the Nizamsagar Project on the agricultural economy, farm operations on a few a selected land holding, an appraisal of the employment position particularly of the landless agricultural labour classes and certain demographic aspects. The report by the study groups of Irrigation and Power of the National Planning Council on the Chambal
Valley Project" discusses the technical and economic aspects of the project. It deals with the development of power, water use, water rates, water logging, and salinity. This report examines capacity survey in the reservoir area. This study excludes from its purview all problems relating to the construction of the project etc. It examines mainly the operation of the project and the measures relating to maximising benefits from the project.

The "Effects of Bakra Dam Irrigation on the Economy of Barani Villages in the Hissar district" tests the measure of the shift in the agricultural economy due to Irrigation. This report gives the prevailing geo-economic conditions of the region.

The Report on the Ad hoc Committee in connection with the investigations of the River Valley Projects deals with the Kosi, Narmada Valley, Tapti Valley, and Sabarmati. It deals with the Pre-planning and tests the work efficiency of the projects.

"This Report of the Irrigation and Power Team on Nagarjun Sagar Project" deals with the availability of water, engineering aspects of the dam and finally irrigation development and agricultural aspects. As it is a pre plan report very concise information is given.
LOCATION MAP
OF
LOWER BHAVANI PROJECT

Fig 1.1.
The Report of the Irrigation and Power Team on Koyna Project (Maharashtra) states the history of the project, power generation and utilisation, industrial and irrigation development and costs of the project.

"The story of the Hirakud Project gives an account of the project on Mahandi the direct and indirect benefits that the area will attain. Every aspect is given in a brief account.

The appraisal of so many project surveys so far done deal with the facts that these surveys are done either as pre-plans or post-plan surveys. These surveys mostly done by the Government agencies by a team examine whether the command areas attained economic benefits, if so at what stage the command area is or if it has reached optimum utilisation of the resource what is the next step to improve its performance.

Keeping this view in mind in this dissertation a vivid account of study is done clubbing both the hydrological properties and socio-economic factors, an interdisciplinary approach to study the impact of irrigation in Lower Bhavani Command area and the analysis is done taking both the pre irrigation and post irrigation analysis.
1.2 Objectives of the Survey

The Lower Bhavani Project in the Periyar District of Tamil Nadu is taken up as a case study. The assured supply of water over this semi-arid tracts has played a vital role in stabilising the agricultural economy of this region. The study analyses:

1. The history of Lower Bhavani Project.
2. The catchment characteristics of the Bhavani Sagar are studied in terms of the factors that control the inflow in the reservoir.
3. The water availability, the reservoir regulations and the real distribution of water over the command area.
4. Changes in the land use and land capability due to the assured supply of water.
5. Changes in the cropping pattern and the intensity of cropping.
6. Crop water use in the command area.
7. And the economy of the Lower Bhavani Command Area.

1.3 Methodology:

Since this study has got an interdisciplinary approach between hydrology and agricultural geography various methods pertaining to both of these disciplines are used.
The time series data from 1954-55 to 1974-75 (month wise) of the reservoir inflow is used for finding out the water availability. From this time series monthwise data, Gumbel's Probability curve is drawn for the probability occurrence of discharge data. To find out the consistency and to determine the efficiency of the dam a mass curve has been drawn. A detailed analysis of the rainfall is done for the command area.

Christiansen's model followed by Hargrave's method is used for finding out the water requirement of crops over the command area.

Simple percentage change in land use was calculated for the pre irrigation and post irrigation analysis. Land capability changes are used by using cartographic techniques both for pre irrigation period and post irrigation period. Finally an attempt is made to find out the Land use changes in the 9 sample villages chosen for the study.

Similarly the percentage changes during the pre irrigation and post irrigation analysis with reference to the crops grown are studied.

Finally 46 variable are chosen, taking 617 households of different from sizes., for the study of the
economy in this canal tract. Simple statistical techniques are used for analysing the agricultural economy of the command area as a whole.

1.4 Date Base:

The study having both hydrological and agricultural perspective, the data pertaining to both the studies have been used for the study.

The hydrological data, on water availability include inflow, discharge and storage data for the period of 32 years between 1954-55 to 1984-1985. The data pertaining to issues to Cauvery delta and old irrigation system and canal system were also used for the study. Similarly the storage particulars are also studied separately. The monthwise and seasonwise analysis for 20 years were also done.

In the case of catchment characteristics the whole catchment is divided into different small basins and the data pertaining to the above particulars are studied.

With reference to rainfall analysis, for the upper catchment, seasonal and annual rainfall for to different basins are analysed.

Christiansen's model is used for the station
Coimbatore and Evapotranspiration is obtained by finding out using different coefficients deserved from climatological normal data.

In the analysis of land use and cropping pattern the secondary sources of data for the year 1954-55 and 1955-56 are chosen as the representative years for the pre irrigation period and 1964-65, 1965-66, 1971-72 and 1972 and 1973 are chosen for the post irrigation period.

Finally for the primary sources of data, 9 villages are chosen, 2 villages located near the dam two villages in the middle of the canal, two villages in the tail end of the canal and one village in the old irrigation system chosen for the study and two villages are chosen as the uncontrolled villages for comparison. The data pertaining to landuse and cropping pattern for the above villages are chosen from the Patwari records and the analysis is done.

Extensive use has been made of the available tropographical and thematical maps. Catchment characteristics for the upper catchment of Lower Bhawani was done on the survey of India map published in the year 1926 and the map No. is 58A.

For the study of land use character during the
pre-irrigation period maps namely 58E/11, 58 E/12 58 E/7 and 58 E/9 published in the year 1928 are analysed and for the post irrigation period the edition of maps published by Survey of India for the year 1971 of the same area were analysed.

For the study of land capability changes during the pre-irrigation and post irrigation analysis, a comparison between the map compiled during the year 1930-34 for four taluks namely Bhavani, Gobichettipalayam, Erode and Dharapuram, done by the land use and soil survey unit, and the map for the year 1964 has been done. An analysis of the above maps gives an account of the land capability changes that have occurred during the pre irrigation and post irrigation analysis.

1.5 Chapter Scheme:

The results of the study are presented in seven chapters.

The II Chapter deals with the History of the Lower Bhavani Dam in which an account of the old irrigation system and the new one, the various proposals considered and the impediments due to world war are discussed and enumerated.

In the III Chapter an attempt is made to analyse the catchment characteristics and an analysis of the
environmental factors and their impact in the catchment area. A descriptive account of the abundant water supply of the upper catchment is discussed.

In the IV chapter, the water availability in the command area, the reservoir regulations so far practised in the command area, the ground water conditions, the rainfall frequency and the total water availability and modernization are discussed. The hydrologic analysis proves the water scarcity of the area.

In the Chapter V an attempt is made to find out the land use changes and land capability classification during the pre irrigation and post irrigation periods. For the selected sample villages of the command area an attempt is made to find out changes in the land use pattern due to irrigation.

The VI Chapter discusses the change in the cropping pattern during the pre-irrigation and post-irrigation periods.

The VII chapter deals with the crop water use in the command area. Cristainson's method is used followed by Hargreaves method is used to evaluate, the water requirements of important crops grown in the command area.
Finally in the VIII Chapter 9 villages are chosen depending upon the water availability in the Bhavani Canal area and it is analysed whether the water utilisation has an impact over the economy of the whole command area.

In the conclusion the need for the water management and its effects on the Economy is studied.

As the study was interrupted in the resurvey was undertaken in the year 1988. The hydrological data upto 1988 were collected. The modernization of the canal system and improvement made in the water distribution and its impart were studied in selected part of the command area.