# Chapter I

# INTRODUCTION

## 1.0 Introduction

Water availability is declining day by day and we are experiencing the signs of water stress. Per capita availability of water per year was estimated as 2214 cubic meters in 1991 against global average of 9321 cubic meters and it is likely to come down to 1496 cubic meters by 2025. Of the per capita, availability of water is less than 1700 cubic meters per year, it is considered as water stress area. This leads to the conclusion that India is going to face deep water resources crisis. Hence, every potential source of water would need to be exploited, its conservation, proper utilization and its efficient use has become the need of the day. This will be of more true in case of agriculture which will place maximum pressure on water resources. Optimum utilization of water resources in agriculture sector will give up water for alternative uses. "Water is an indispensable agriculture input and often referred as the important factor of production in agriculture"[1].

The green revolution strategy has been exceptionally successful in increasing the food production, productivity and creation of farm and non-farm employment opportunities. Thus as a part of this strategy, development of irrigation facilities has made a major contribution to sustained agricultural growth for the last five decades. This growth has been largely confined to irrigated areas. However, the impact of irrigation systems particularly canal irrigation has been facing a number of problems, like lack of efficient irrigation management, inordinate delay in completion of large irrigation projects, large gap in potential created and potential actually

[1] Clark, Colin, (1970), The Economics of Irrigation, 2nd Edition, Oxford, Pergomom Press.

utilized, low quality of irrigation, low cost recovery, ecological and social consequences of pattern of irrigation development. These problems are compounded by poor maintenance of irrigation systems and degraded infrastructure. The gains from these irrigation systems are not commensurate with the large public investments and subsidies given to the farmers.

Agricultural growth rate and agricultural production largely depend upon the irrigation facilities for tropical countries like India, where average rainfall varies from year to year and region to region within the country. The agriculture growth largely depends upon the growth in net sown area, growth in per acre productivity, which are declining for the last two decades. While the growth rate of agriculture sector is declining, the population growth rates remain high. The per capita cropped area is at a declining trend. So, to achieve higher rate of growth in agricultural sector, productivity of land and cropping intensity has to be increased. There is a limit beyond which it is not possible to increase productivity and cropping intensity. There is no alternative except to increase irrigated area by way of increasing the efficiency of the irrigation system.

Irrigation generates significant employment in rural areas by enhancing agricultural production. Irrigation has powerful Multiplier effect. World Bank study (1990) revealed that a 100 rupee worth of irrigation induced agricultural output is estimated to generate Rs.105 and Rs.114 worth of additional output in manufacturing and tertiary sectors respectively. The direct relationship between irrigation and poverty

alleviation is well established by many scholars. Irrigation affects the livelihood of the people living in rural areas. Chambers found that increased irrigation, higher cropping intensity and associated changes in cropping pattern all affect different groups in different ways. For small and marginal farmers, irrigation means more productive work on their land and increased intensity means productive work for more number of days. Production and income are more stable and higher for irrigated lands. Irrigation provides more livelihood gains in the form of more employment, income and better quality of life.

The population in this country has crossed 100 crore mark recently. The growth rate of production and productivity of agriculture do not match with the growth rate of population to meet the growing demand for food. The production of food grains is not increasing as much increase in population. To meet the demand for the food grains for the increasing population, the role of irrigation is imperative.

Thus water is considered as strategic resource to provide employment and food security for the growing population and to the state considered it as a public good. The state assumed ownership on water resources and undertook the construction of irrigation projects to increase food production and rural incomes. It has become the duty of the state to develop and maintain irrigation projects to meet the above objective. After independence, State has played an important role in the construction of irrigation projects and massive public investments were made on irrigation sector.

However, after three decades of rapid growth between 1950 and 1980, due to large investments in irrigation systems, the rate of growth has declined for the last two decades. This was due to declining availability of financial resources. The decline in the availability of funds has led to poor maintenance of irrigation systems. The deterioration in physical structure of the irrigation system due to poor maintenance has led to under utilization of potential created. The public sector irrigation development and maintenance is suffering with following problems.

1. The policies of irrigation development have concentrated only on construction of irrigation projects and it had neglected the maintenance of the systems after construction.
2. Lack of proper planning in project formulation and implementation have led to long time process for completing projects and it leads to increase in expenditure than actual planned expenditure. It further leads to delayed relation of planned benefits.
3. Lack of water management, rather over emphasis on 'works' component is a result by large gaps in irrigation potential created and actual utilization.
4. Lack of proper management and inadequate maintenance of many irrigation systems leads to rapid deterioration of systems and finally it led to total collapse of the system.
5. The water rates for irrigation are very low in India. Added to this, the poor recovery of charges leads many questions on maintenance of the system. In the Budgets of the state governments the allocations for

irrigation is very limited. Within these limited funds, 90 per cent of the funds would go to the administrative purpose in the form of wages etc. and only negligible amount is spent on operation and maintenance (O & M).

6. In India there is an inequitable distribution of water between head, middle and tail end farmers in the command areas of irrigation projects. It is now recognized that distribution of water in an equitable manner with a very large number of farmers having relatively small holdings is one of the principal problems in irrigation system.

Though these problems are common in all the states and in some cases, this intensity in Andhra Pradesh is more. The reasons put forward by the experts are common in its nature. The irrigation systems are managed by bureaucracy. They have managed the system in more administrative and revenue point of view. Farmers completely depend on the ID Officials. There was practically no effort on the part of the farmers even to maintain field channels constructed by government. There was no source of optimum use of water available to them. Under the state managed irrigation systems, it is reported that large benefits are, by and large derived by the privileged class. Under this system socially, economically weaker sections and tail-end farmers are deprived of the benefits of the irrigation. These disparities in water sharing system led to growth of income inequalities among the farm household even within the command area. This may be due to the fact that

farmers are not properly organized and are not conscious of their water sharing.

When the irrigation management is under state control, the irrigation department has to deal with the every farmer in command area, it will have the responsibility of maintaining the main system, planning for water distribution through branch canals and it has to prepare the water schedule for individual farmers. Irrigation department is not able to perform all these functions effectively. As a result, the objectives of equity in water distribution, optimum utilization of irrigation potential and increase in crop productivity can not be achieved on sustainable basis.

Hence, policy makers and irrigation experts realised the need for new initiatives in policy reforms and thought that irrigation management responsibility and authority should be transferred to water users' associations. It is thought that the farmers could not play a crucial role in the management of irrigation, unless they were actively involved in the levels of management. It reduces cost of maintenance, cost of distribution and ensure efficient and optimum utilization of water potential at micro and macro levels. It is expected that participation of water users in management would motivate economic use of water, ensures assured and timely supply of water; induce the farmers to use higher levels of inputs leading to higher productivity. User participation will reduce the cost of irrigation. The water users' associations can also eliminate the system of contracts in the construction and repairing of structure, which will ensure quality and durability of the structures. In user participation, more efficiency is

expected in dealing with the problems related to water scheduling, equity in the distribution of water, efficient water use, resolving conflicts and collection of irrigations taxes. In this process number of countries has made attempts to transfer management of irrigation systems to the water users. Some countries like Philippines, USA, Mexico and Sri Lanka and etc. has transferred the management of irrigation systems to water users. According to reviews the impact of such transfers has been a mixed one.

### 1.1 Status of Irrigation Reforms in India

Farmers' participation in irrigation management is not entirely new to India. There is considerable evidence that farmers in pre-independent years had been involved in irrigation management in different parts of the country. The Phad system of Nasik and Dhule districts and the Mulgujari tanks of Chandrapur and Bhandara districts of Maharashtra, the Ahar-Pyne system of Bihar, the Kuhl sytem of H.P. and the Kudimaramath of Tamilnadu are some of the important examples of PIM under traditional irrigation. A few formal water users associations were also formed from time to time like Vadakku Kodai Melazhahian .Channel Land Holders Association in Tamilnadu in December 1959, Malinagar Irrigations' water cooperative society in Mahararashtra in 1967, Vaishali Area small Farmers Association in Bihar in 1971, Mohini Water Cooperative Society in Gujarat in 1978. Irrigation Management from top to bottom remained concentrated in the hands of the government after independence. It may be said that since 1972, after establishment of CADA, a large number of farmer organizations

at the outlet level were formed under the CAD projects. These were variously described as Pipe Committees, Outlet Committees and WUAs.

Farmers' participation in irrigation management continued to be non-existent or almost nominal in a limited number of projects, water users were continued to be exploited, harnessed, controlled, regulated and disturbed by the government agencies. A change took place in mid-eighties when the need for introducing PIM on the lines of similar measures introduced in some foreign countries was increasingly realized by social thinkers and irrigation professionals. The Government has announced National Water Policy in 1987 by supporting PIM in India. International donor agencies like the World Bank, the USAID and the Ford Foundation also came forward with funding support to initiate experiments in different parts of the country. The leadership role in this respect was assumed by the CAD wing of Ministry of Water Resources, Government of India, which issued guide lines from time to time to State governments on farmers' participation in irrigation management.

In 1985, each CADA was requested to introduce PIM at least one small part of each command area as an experiment. WUAs are being set up under water resource consolidation projects implemented in Tamilnadu, Orissa and Haryana with World Bank assistance. Andhra Pradesh Government was ahead in implementation of PIM among states in India.

## 1.2 Irrigation Reforms in Andhra Pradesh

Andhra Pradesh is leading in introducing reforms in irrigation sector. It has started introducing reforms in 1980's. In 1984, the Andhra Pradesh government passed the Andhra Pradesh Irrigation and Command Area Development Act 1984, which authorized the creation of Command Area Development Authorities and Pipe Committees. These Pipe Committees were formed under the CAD Programme for the internal distribution of water below the minor outlet and the maintenance of the micro network. The pipe committees, however, proved to be unsustainable and powerless. The water supply at the minor outlet was not reliable because of lack of coordination. The pipe committees were too small to have any say in the maintenance of the main system. They had neither clear cut rights and responsibilities nor any means to raise resources. They lasted as long as they had the support of the Command Area Development Department and became non-functional once this support was withdrawn.

In 1997, the state embarked on an ambitious programme of reforms in its irrigation sector and passed the Andhra Pradesh Farmers' Managed Irrigation System Act (APFMIS). As a large agriculture state, irrigation management has been revolutionised by transferring responsibility for the operation and maintenance of irrigation schemes to the water users or farmers. In total 10,292 WUAs has been formed. The reforms witnessed a lot of changes on the role of Irrigation Department as it is gradually shifting from service provider to facilitator. At the same time, it has witnessed some resistance from irrigation officials who were opposing the reforms.

The WUAs and 174 Distributory Committees (DCs) were created through the democratic process of elections. Reforms have made the Irrigation Department accountable to Farmer Organizations. The irrigation reforms made the water charges increased by 3 times and linked the money collected to the costs of operating and maintenance of the irrigation systems.

The eight years of irrigation reforms is expected to bring revolutionary changes in irrigation sector. The irrigation reform programme aim at making irrigation sector accountable to users. Reforms have to go a long way in making the irrigation sector sustainable. The WUAs has to become sustainable by raising funds for operating and maintenance on their own to achieve the goal of reforms.

**1.3 Need for the Study**

In this background, the experiences gained so far need to be analysed systematically so as to evolve suitable approaches. Although, some studies are made for the country and for Andhra Pradesh, most of them are descriptive and deal with experience of one or two associations, they are confined to specific projects located in a different agro-economic region of the state. Most of them are based on secondary information. They are government reports, which concentrate on administrative and procedural aspects. They do not provide any assessment of the working of the farmers' associations and the impact of WUA on farm production and productivity. Most of the studies made so far concentrated more on process of formation and less on the impact. There is no comprehensive study on Andhra Pradesh that provides any quantitative information on the impact of water

user associations through a standard scientific methodology. All the studies are made when the reform process is in the initial stages. In this backdrop, there is a need to make a comprehensive study on the impact of the irrigation reforms in Andhra Pradesh covering all the agro-climatic regions and different types of projects viz. major, medium and minor.

The key objective of irrigation reform programme was to improve the efficiency of irrigation systems. The parameters that are used to measure the efficiency of irrigation management are (1). Coverage of area under irrigation, (2). Quality of irrigation, (3). Changes in cropping pattern in favour of high value crops, (4). Productivity of land and (5). Net income to farmers. The impact can also be assessed in qualitative terms with respect to distributional, organizational and functional aspects.

### 1.4 Objectives of the Study

The main objectives of the study are

1. To analyse the status of reforms
2. To analyse the impact of reforms on farm economy
3. To analyse the impact of reforms on water use efficiency and equity in distribution.
4. To analyse the performance and sustainability of the Water User Associations (WUAs).

Although all the objectives are equally important, due to data constraint, it is not possible to give equal space to all the objectives in the study.

## 1.5 Hypothesis of the Study

The hypothesis of the study is that the formation of water users' associations results in

1. Increase in area irrigated, value of irrigated land and average income levels.
2. Increase in the cropping intensity and irrigation intensity.
3. Changes in cropping pattern in favour of high value crops.
4. Increased the efficiency in irrigation management
5. Increase the productivity of land, more in tail-end farmers and, small and marginal farmers.

## 1.6 Methodology and Sampling Design

The measurement of impact of WUA can be done in two ways, cross section comparison of farms, with and without WUA. The reference period for such type of study is generally one agricultural year. And the other way is comparison of changes before and after formation of WUA.

A limitation of the cross-section comparison is that it is difficult to select a sample of farm households that are homogeneous in all respects. Farm households without WUA and with WUA differ in respect of farm size, crops, accessibility to water and other inputs etc. Difference can also be observed in the quality of management of these two categories of farms. Because of these dissimilarities between farm households with WUA and without WUA, cross section comparison studies face conceptual problems in identifications and quantify the impact of WUA.

Comparison of changes before and after formation of WUA, though these type of studies does not suffer from the deficiencies arising out heterogeneity in the farm holdings, encounter different types of problems. The reliability of the information relating to before formation period depends on the ability of the farmer to recollect and report necessary details with accuracy.

Since the entire command area in the State is brought under WUAs there is no option except to compare the changes before and after WUAs formation. In order to overcome this difficulty the sample households selected earlier for a study entitled "Equity in irrigation" has been again taken as a sample for the present study. The data on the variables like area under irrigation, productivity, cropping pattern, income levels of the households, which was collected for the earlier study during 1996-97 is again collected on the same variables from same sample households after formation of WUAs. To overcome conceptual problems in quantifying the impact of Water Users' Associations at two points of time, the value of inputs and produced was estimated at constant prices based on Survey years' prices.

Andhra Pradesh is a state of regional dimensions, there is a marked difference between the regions, the manner in which, rainfall, natural resources and irrigation infrastructure and agro-economic conditions are distributed. Agro-climactic variables are critical to the success or failure in the performance of an irrigation system. The performance indicators like

organizational functions of institution largely depend upon the socio-economic variables. Similarly the performance indicators like production, productivity, income and area irrigated largely depends upon the agro-climatic conditions. Basing on these variables the study area is divided into three zones such that there is near homogeneity in the above variables with in each zone. Although the constraint is that it is not possible for absolute homogeneity in all respects. Multi-stage random sampling method is adopted for the selection of sample. From each of the zone, one major, one medium and minor irrigation systems are selected at random. Three WUAs from each of the major irrigation projects, such that one from upper head, one from middle and one from tail-end and two WUAs from each of the selected medium irrigation projects, such that one from head reach and one from tail-end of the project were selected at random. Since, only one WUA is formed for each of minor irrigation systems, that WUAs from each of the selected minor irrigation system were selected.

From each association, 15 farmers on an average were selected as respondents. The selection of farmers was done by the method of stratified random sampling so as to provide representation to all categories of farmers within the project area under study. To get feedback from farmers from different locations of the cropped area, equal number of farmers were selected at random as far as possible from head, middle and tail end.

Information was obtained from both primary and secondary sources. State wise and Project wise information were obtained from secondary sources. In addition to Government publications, considerable information

was obtained from unpublished sources of Irrigation Department and WALAMTARI. A structured questionnaire was used for collection of primary data from water users, presidents of WUAs and project officials. The quantitative and qualitative information before and after formation of WUAs were collected from the respondents so as to check the information collected from them earlier.

To study the impact of WUAs, the information on the following variables like (1). Area under irrigation, (2). Quality of irrigation in terms of adequacy and timeliness of water availability, (3). Changes in cropping pattern in favour of high value crops, (4). Changes in per acre productivity (5). Changes in the value of land and (6) Changes in the average income levels is collected. Further, the data on distributional, organizational and functional aspects of WUAs were also collected.

### 1.7 Techniques Used in the Study

The impact of WUAs were analyzed by comparing the agricultural status of the farmers in terms of the above variables as prevailing before formation of associations (1996-97) with that of after formation of associations (2004-05). A decomposition analysis is used to capture the net impacts of irrigation reforms on the farm economy, water use efficiency and equity in the water distribution. The econometric model is used to study the productivity changes.

## 1.8 Plan of the Thesis

Introduction and theme of the study is presented in the Chapter I. Chapter II provide a review of the past studies on farmers' participation in water management made so far in different countries and different states of India. Agro-economic sufferings of the study area and socio-economic profile of sample households is presented in Chapter III. Status of reforms in irrigation policies are analysed in Chapter IV. Impact of WUAs on farm economy is analyzed in Chapter V. Impact of WUAs on water use efficiency and equity in water distribution is discussed in VI. The performance and sustainability of WUAs is presented in Chapter VII and lastly summary and conclusions of the study is presented in the last chapter.

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