CHAPTER - I

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India is a land of rivers having predominantly an agricultural based economy. Agriculture is the main supporter of the majority of the people in India and water is the most important input in crop production. The success of agriculture depends upon the adequacy and timely occurrence of rainfall. But the rainfall in India is often scanty, uneven and there is even total failure in some regions and during some periods. Rain is confined to a few months in a year and it varies from year to year and region-to-region which makes large parts of the country vulnerable to drought. Thus, natural distribution of water is deficient both spatially and temporally.

Therefore, to inject dynamism in India’s traditional agriculture, assured water supply is essential to inspire the farmers with hope in his farm business and to work with optimism. Assured supply of water remains one of the major means of achieving sustained agricultural production. Thus, irrigation has become a lifeline of progress and prosperity of agriculture. The protective function of irrigation is towards making agriculture relatively ‘drought-proof’ the productive functions are to ensure “sustained agricultural production”, at higher level of productivity to permit diversification of cropping pattern to extend agricultural production to more than one season (Reddy, S. 1997).

India, which has 16 per cent of the world’s population and 2.45 per cent of land resources, has roughly 4 per cent of the world’s fresh water resources. India is a home to more than billion of people, a figure i.e.
projected to increase to 1.7 billion by 2050, assuring a fertility rate of 2.1 per cent. (Ranjeet Kumar, et al. 2003). With the growth of population and consequent need for larger agricultural production, the requirement of irrigation has increased a great deal.

The statistics from GOI, 2000 show that, in 1999 agriculture consumed 85.3 percent of water, industry 1.2 per cent, energy sector 0.3 per cent and other sectors 6.4 per cent, whereas domestic consumption was 6.6 per cent. Gunnar Myrdal (1968) in his “Asian Drama” pointed out that, the annual rainfall of all over India amounts to more than 3000 million acre feet of water. Out of this amount, 1000 million acre feet are lost immediately due to evaporation and roughly 650 million acre feet seeps into soil, leaving 1350 million-acre feet to flow in to the river system. 1/3 of the river flow i.e. about 450 million-acre feet is considered utilizable for irrigation.

It is in this context that, irrigation becomes important to provide insurance against possible risks in rain fed farming; (Venkata Reddy, M. 1990). Hence irrigation is everything in India; it is the main input through which our farmers can successfully overcome from climatic vagaries. Not only this, introduction of irrigation has thoroughly changed the face of the country and life of the farmers. It has made effective application of new technology to farming (Satya Sundaram, I. 1997).

The irrigation network is an important indicator of the level of agriculture development of a region. This helps in improving the productivity of agriculture, intensification of land utilization, and higher employment opportunities with longer duration, which in turn will
improve rural income and reduce poverty. Thus irrigation totally changes the face of the land and life of the farmers (Gautam Purkayastha, 2004). Irrigation is the major use of water in the country and will continue to be so in the future. It is a chief natural resource, a basic human need and a prime national asset. The country has spent almost Rs.920 billion at historical prices for the development of irrigational potentiality since the First Five Year Plan in 1951-52 to 1996-97; (Gulati, et al. 2005).

The Green Revolution has made tremendous changes in agrarian social structure beyond expectation. Use of modern strategies brings about development in agriculture. Among the different strategies of agriculture development, the most important component is irrigation. Irrigation has always been a central pillar of the national agricultural development; (Bansil, 2004). It is proved that the development of agricultural sector and prosperity is possible only with the help of irrigation and water availability. The irrigation project plays an important role in improving the socio-economic conditions of the people living in the project area. Irrigation not only increases agriculture production but also serves as an impetus for establishment of industries, trade and business. Thus, the irrigation project contributes directly and indirectly in enhancing the quality of the life of rural people.

Hence the present study is undertaken to investigate the socio-economic changes among the rural farmers in the irrigation setup. It is an attempt to understand the life and problems of the rural farmers under the changing system brought by irrigation. It is not only an attempt to look in to the socio-economic and political changes in the life of the
farmers, but also an effort to understand the present status and problems of the farm families.

It is hoped that such a micro level study will not only help to evaluate the changes but will also help to know the problems and thereby to make appropriate recommendations to the planners, policy makers and extension workers who are engaged in the rural development activities.

**Indian Rural Scenario**

The world is predominantly rural especially the developing world, even at the dawn of 21st century. In spite of fast growing industrialization and urbanization a vast majority of people in the world depends on agriculture and other agriculture related activities for their livelihood. According to the world development report 2000-01 nearly 69 per cent of the people of the low-income countries live in rural areas. In South Asia the figure stands at 72 per cent (Lalitha, N.2004).

India is also a predominantly a rural society, it has a large number of villages. It is because of this that the country is proverbially called as ‘Land of Villages’. According to 2001 census, India has about 5,50,000 villages. In terms of population out of India’s total population 74.3 per cent of people are living in villages; (Doshi, et al. 1999). Hence the villages are considered to be the heart of India. Nehru once stated, ‘Our country is full of towns but essentially it is a country of villages’.

Villages are the reservoirs of the rich Indian culture and heritage, even in the fast changing conditions of the society. Mahatma Gandhiji described the nature and importance of villages in a very beautiful way.
According to him “Real India is a Rural India, if villages perish, India will perish too and it will be no more India” (Vatsayan, 1991).

According to Mahabharata, the village is rudimentary unit of administration; its leader was called as Gramini. Besides Mahabharata many other books of ancient literature have mentioned about villages. According to Manusmruti village is smallest unit of administration. The village had its own officials and its individual organization. In Manusmruti as in Mahabharatha, the leader of the village was called Gramini; (Madan, 1990). According to Rigveda the village is the unit of social and political organization of Indian social system (Vatsayana, 1991).

The development of India largely depends upon the development of rural societies. During the struggle for India’s independence Gandhiji repeatedly said that the development of the country and its prosperity depends on its villages. He advocated all through his life that all our efforts should be directed towards the development of our villages. It is in this context the constitution of India has made certain provisions to the villagers in the form of special development programs. The term village development includes the development of agriculture, health, education and all round social and economic development of the villages. Since, agriculture has been the backbone of rural society; Government of India has given top priority to the development of agriculture through the provision of irrigation and other facilities.

Today rural societies are no more static. During last several decades, anthropologists and sociologists from east and west have shown
that, Indian villages too are changing steadily due to modernization, industrialization, westernization and globalization. The changes have been more rapid during the last four decades. These changes are very much noticed in the field of agriculture, which involves the use of irrigation facilities and also improved technology. These in turn have brought about socio-economic changes in the rural society.

In India Agriculture is not merely an occupation but a way of life for rural folks. It being the largest sector forms the backbone of Indian economy. As a producer of food, as an employer of labour force and as a source of purchasing power for much of the non-agricultural consumer goods and services, agriculture continues to be a vital sector for country’s economic development. Agriculture is now rightly accorded a very high priority in India’s National Planning and ranks next only to defense; (Jain, J.D. 1967). In India millions of people who reside in rural communities mainly depend on agriculture, which is most important of all other sources of livelihood.

Rapid agricultural growth is essential for poverty alleviation and overall economic development. Agriculture alone contributes about 1/4th of GDP (Gross Domestic Product). There is no doubt that green revolution transformed the country from ‘food deficient’ to ‘self-sufficient’. Agriculture has been market driven which decides the cropping pattern and land use with higher inputs for higher production; (Ponnusamy, 2004).

The total geographical area of the country is 329 million hectares, out of which 141 million hectares is net sown area. About 42 million
hectares has assured irrigation. Rain-fed area accounts for 70 per cent of the net sown area in the country. Out of the total rain-fed area, 68 per cent falls in the low to medium region and remaining 32 per cent is in the higher rainfall zone, receiving more than 1125 mm. rainfall; (Manjunath, 2000).

It is rightly said that nothing moves in the Indian economy unless agriculture moves. The total development of Indian society mainly depends on the agriculture of the nation. Agriculture is the basic industry of our country. It supplies food for people and various raw materials for its industries. Speedy agriculture development helps the process of economic growth in backward areas in many respects. By modernizing agriculture, the output, income, and standard of living of the farmers go up and a country can establish new industries and provide employment opportunities, produce nutritious food crops, earn more foreign exchange and develop all sectors in the country.

Agriculture development does not start in vacuum, this is already in operation through ages but it is in a traditional way. The Indian agriculture scenario has greatly changed from an overwhelming rain-fed agriculture to a largely irrigated agriculture. Some signs of achievements in agriculture production can be noticed in the last four decades. Under planning, agriculture production has definitely improved, eliminating India’s dependence on food grains. The situation changed fast after 1947, particularly since the mid 1960’s. The budgeted allocation for agriculture and irrigation was the largest head i.e. 25-30 per cent of the outlay in all the plans. With the launching of the HYVs program, the Intensive Agricultural District Program and land reforms along with a considerable
expansion in irrigated area largely helped in the development of agriculture. It also created awareness among the Indian farmers.

Agriculture development mainly depends on two basic prerequisites i.e. soil and water. The natural source of water for agriculture is the rain. Indian agriculture depends largely on scarcity of monsoon. In scanty rainfall areas however there is an acute shortage of water for agriculture. Water shortage for agriculture is also the main cause of rural poverty. The planning commission has therefore attached a marked significance to the problem of irrigation right from planning era; (Acharya, V.V. 1999). Mr. Murarji Desai as the Chief Minister of Bombay State, emphasized the point in a radio talk on Jan. 14th, 1953, he said “I have no doubt the Planning Commission has indicated a right order of priorities by emphasizing the development of agriculture, particularly irrigation with securing self sufficiency in food and development of power and certain basic industries” (GOB, 1955-56).

Thus irrigation is not only important for stabilization of agriculture but is sin-qua-non for all round development. Therefore, the union and all the state governments are attempting to make optimum use of irrigation potential and sources of irrigation. Regarding India’s position in the world agriculture during the year 1999 is seventh after Russia, Canada, China, USA, Brazil and Australia. The India’s share of land area in the world is 2.3 per cent. However India’s rank is second after USA in the total arable land in the world. It has the largest irrigated area in the world i.e., about 22 per cent (Sidhu, et al. 2004). The main aim of irrigation in India is not only to provide water to the land and control flood situation but it also increase intensity of cropping, by use of
agricultural inputs like seeds, fertilizers, pesticides and credit facilities etc.

In this connection something has to be said about Indian farmers. Indian farmers are the hope and pride of the nation. Agriculture occupies a pride of place in the country’s economy, contributing a little less than 1/3 of national income it being 32.31 per cent in 1992-1993 censuses. (Mamoria, et al. 1998). Indian farmer is known to the world because of his own peculiar characteristics. The peasants of India are more hard working, tolerant, submissive, frank and open hearted. He being a Fatalist believes more and more in the supreme power of God. His agricultural activities start with the worship of God and end with the worship of God. Therefore, he has been generally known as higher religious and all of his activities are centered on God and religion. It is said that, farmer is ‘salt’ of the earth. Agriculture in India has never been smooth sailing. It is always confronted with one or other problems and it is determined by several socio-economic and environmental factors (Patil, 1992). It is often said that Indian agriculture is gamble in monsoon. It is so because rainfall is irregular, scanty and uneven. Moreover most of the Indian farmers are ignorant, illiterate, poor and debt-ridden. That is why it is said that Indian farmers are born in debt, live in debt and die in debt.

Indian farmers are conservative and orthodox and they are not readily willing to give up their age old methods of cultivation, which are out dated. His unprogressive outlook has become the greatest hurdle in the way of improvement in agriculture. The other problems like exploitation by merchants, middlemen, moneylenders, natural calamities, lack of irrigation facilities, costly agricultural inputs and fluctuating and
un-remunerative agricultural prices, inefficient implementation of the
government policies and programs, have deepened the miseries of the
peasants. Small holding, low yield from land, lack of financial facilities
and natural calamities cause great loss to fully-grown crops. Thus there
may be some times total failure of crops and this will cause for farmers’
suicide. Thus, the life of the farmers is miserable.

Majority of the Indian farmers are doomed in the darkness of
illiteracy. In spite of various educational facilities and encouragement
given by the government. Indian peasants have not come forward to
receive education owing to their lethargic attitudes towards education on
the one hand and lack of awareness regarding the importance of modern
education on the other.

From economic point of view too Indian peasants are not much
advanced. Even today the farmers in India are able to obtain only 15 per
cent of their requirement of agricultural credits from banks. The various
states and Seed Corporations are able to produce only 10 per cent of seeds
required by our farmers. At present only 23-30 per cent of farmers are
able to derive benefits of the extension services provided by various
government agencies. Every year about 20 per cent of the crop is lost due
to mishandling, spillage, floods, droughts and pests, diseases and lack of
farm knowledge and agricultural education. Because of this they have
been put to heavy losses. Moneylenders who provide finance at an
exorbitant rate of interest are still exploiting the farmers. According to
RBI Annual Report 2000-01, low and variable growth of output, poor and
decreasing yields, inadequacy of capital formation, lack of infrastructure
facilities and degradation of natural resources due to inefficient cropping
pattern have emerged as the major obstacles for rapid and sustainable agricultural growth (Singhal, 2003).

The last three years saw severe drought conditions in the country, especially in some parts of Karnataka. Owing to this a number of farmers committed suicides. Hence, there is a need to recognize and solve the technological and social problems of the farmers in a scientific way.

In this connection, to solve the various problems of the farmers both the central and state governments have initiated a number of measures for agricultural development since independence. They are; Intensive Agricultural Area Development Program (IAAP), Projects for Intensive and Integrated Agricultural Development (IIADP), Intensive Agricultural District Program (IADP), High Yielding Varieties Program (HYVP), Drought-Prone Area Program (DPAP), Command Area Development Authority (CADA), Small and Marginal Farmers Agricultural Development Program (SMFADP) etc. In spite of a lot of changes during these more than five decades of independence, still agriculture in India has been backward. Agriculture in India is not yet being considered an industry.

From temperamental point of view the Indian farmer is God fearing and goes by his customs and traditions. Therefore, it has been aptly said that custom is the king and tradition is God for the peasants in the village India. As far the agencies of social control, the role of customs, traditions, religious rites and beliefs etc., are of greater importance than formal agencies like laws, rules and regulations. In spite of the sheer exploitation and helpless conditions, agitations and movement are rare phenomena.
among the Indian farmers. It is how farmers in India have remained the most backward and poorest peasants in the world. Thus, Indian farmer has become rare example in the world with his peculiar nature.

However this does not mean that villages and rural farmers are not experiencing any change. A slow and steady change is taking place among the peasants in the villages. The isolated villagers and farmers are brought in touch with cities and towns and outside world through a network of transport and communication system. The agriculture has been commercialized and markets are widened. The socio-economic conditions of the farmers are fast improving. The education is spreading and social values are steadily changing (Patil, 1990). Owing to a lot of political consciousness, the agriculturists of India nowadays are fighting for their rights.

But even then the Indian farmers are facing lack of initiatives. They require proper guidance, better irrigation facilities, better seeds, fertilizers, machines, technical education, knowledge about farming and introduction of scientific methods etc. These facilities will certainly revolutionize the Indian agriculture and bring changes in farmers’ lives.

**Irrigation – Meaning and Significance**

Water is called the world’s all time essential resource. It is most vital for life without which no living body can survive. It is indispensable for economic prosperity and overall development of the nation. Therefore, water is considered a prime natural resource, an essential ingredient, a basic need and valuable national asset. The rise and growth of civilization is possible only where the water is available and the decay
of society sure where water is in short supply. Thus, water saves and glorifies our life, if it is abundant and leads to decadence if it is in short supply. In this way water has power to save life and takes away life.

It is estimated that about 71 per cent of the earth's surface is covered with water and remaining 29 per cent is land area. Of the water portion 94 per cent consists of salt water and remaining 6 percent fresh water that lies in the form of glaciers under polar ice caps or buried under ground.

Nature has its own irrigation system, which keeps vegetation and animal life alive. It is also true that irrigation through human efforts is essential for plant life. From very ancient times, man has been using water from natural resources or collected rainwater for irrigating agricultural crops. With the advancement of civilization and the development of science and technology, bigger water reservoirs and canal irrigation systems came into existence. They enable large tracts of land to be irrigated so as to produce more food grains and other crops; (Gurjar, R. 1990). Hence regulated water has become a basic requisite for the progress and prosperity of agriculture.

Water has the magical properties of turning desert into smiling fields. Irrigation deserves top most priority in achieving agricultural development in any region or locality. It is needless to stress that irrigation is the most powerful source of generating employment in the rural areas and was taken up as a measure of protection against famine and drought. Therefore it may be said that, what education is for man irrigation is for land and agricultural development; (Narayan, 1984).
Without assured irrigation in right quantities at right time, crops cannot
flourish and multiple cropping is hardly possible.

Irrigation is as old as civilization and many of world’s great
civilizations flourished due to irrigation. Irrigation in the modern world is
also said to be science of survival. At present the world’s population is
increasing day by day. The pressure of survival and the need of
additional food supplies are clearly indicating the desired rapid
expansion of irrigation throughout the world; (Ohri, M.Lal. 1990).

In countries as diverse as China, Egypt, Indonesia, Mexico,
Philippines, Sudan, Thailand, irrigation is a major part of rural national
economy. In fact, in many of these countries development of extensive
irrigation networks has been considered as a main thrust of poverty
eradication programs. The growth of irrigation in some of the countries
has been phenomenal. For instance cent percent agricultural land in
Egypt, 77 per cent in Pakistan and 63 per cent in Japan is irrigated. The
five countries having the most irrigated land in the world are China,
India, USA, Pakistan and Soviet Union collectively; these countries had
about 3/4 per cent of world’s total irrigated land; (Chambers, 1988,
Pawar, 1989 and Bahuguna, 1994).

“Irrigation is a system providing water through artificial means to
meet crop water needs in the absence of adequate and timely rainfall”

In simple words irrigation means an artificial application of water
to the soils to assist the growth of crops. It implies a deliberate human
effort to carry the water to the crops in fields.
Naugtern, J. (1970) has defined irrigation "as the provision measures and availability of temporary as well as permanent nature aiming at supply of water, in some cases together with other to the soil, respectively to the plants in order to maintain or promote the growth of crops".

Hansen, (1979) defines Irrigation as "the application of water to the soil for any of the following purposes to supply the moisture essential for plant growth, for crop insurance against short duration droughts, to cool soil and atmosphere thereby making favorable environment for plant growth, reduce the hazards of soil piping, soften tillage pans and clods and delays bud formation by evaporation cooling".

The definition given by Colin Clark (1970) is believed to be more scientific He says "Irrigation is the application of water by human agency to assist the growth of crops or grasses".

According to Jain, S.K. (1992) "it is the application of water to the soil for the purpose of supplying the moisture which is essential for plant growth".

Thus, irrigation is a tool by which land is made useful in drought-prone areas by providing water for land. It is a technical and institutional innovation, which permits cultivation of lands otherwise ill suited for agriculture. The idea behind this is give water to the farmers as far as possible to save their crops when the rains fail.

Irrigation also has been, a technical enterprise aiming at construction of structures like dams, reservoirs, weirs, barrages, canals etc.
Significance of Irrigation

The need for irrigation has been recognized in India since time immemorial. Artificial irrigation was practiced as far back as the 4th millennium B.C. Early irrigation works were undertaken for domestic and agricultural needs. They included wells, tanks and reservoirs for storage of rainwater. South India was known for irrigation network. Even flood irrigation was practiced through inundation canals in the plains of Northern India and deltaic areas of Central and South India (Savant, 1991). According to Hindu mythology the whole universe is made up of five elements. They are Vayu (Air), Jal (Water), Bhoomi (Earth), Agni (Fire) and Akash (Sky). These elements are to be duly respected and considered in planning for the progress of any country and to avoid disasters (Ravindar, 2004).

As early as 1815 Lord Hastings recognized the value of irrigation works in Indian society. In 1815 Dalhousie wrote in a minute, “Everywhere I found lands of vast extent, fertile properties now lie comparatively waste but wanting only water to convert them to plains of the richest cultivation” (quoted in Bhattacharya, 1971).

Indian agriculture is characterized by instability. The instability of agriculture is caused by the vagaries of monsoon, rains may be too early or too late, they may be too much or too little. In these cases crop prospects are adversely affected. Excessive rains cause floods, which destroy crops and cause soil erosion. Deficient rains cause droughts, famine and pestilence. Both floods and droughts cause a fall in agricultural output and agricultural exports causes’ disequilibrium.
It is rightly said that nothing moves in the Indian economy unless agriculture moves. And it is truism to state that agriculture cannot move unless water moves into agriculture (Agrawal, et al.1990).

Sir Charles Trivelyan (quoted in Narasimhula, K. et al. 1988) says "irrigation is everything in India water is even more valuable than land because when water is applied to land it renders a great extent of land productive", these remarks bring out the importance of irrigation in the country. Our late Prime Minister Jawaharlal Nehru said, “Dams are the temples of modern India” (quoted in Rudra Datt and K.P.M. Sundharam, 2004).

The extension of irrigation has always been considered as an essential ingredient of any strategy for increasing agricultural production. It is supplementary and becomes an absolute necessity where the rainfall is not in time or sufficient (Dewett, et al. 2000). Application of irrigation water helps in stabilizing production under abnormal conditions. As a consequence it has potentiality to bring transformation in land use, cropping pattern, techniques of production and productivity and also in occupational structure (Neelamani, 1993).

Irrigation enhances agricultural production as well as productivity. Every extension of irrigation increases the security of the food supply of the country in years of droughts. Irrigation raises the income content of land; it is likely to transfer even the average unit of cultivation in a feasible unit. Irrigation is necessary for diversification of agriculture; irrigation raises crop intensity helps multiple cropping and increases
employment and the duration of works on farms. Adequate and dependable supplies of water prevent crop failure. That is why it is often said that Irrigation is an Insurance against Drought. More irrigation means less risk. Thus irrigation is a key element in the new agriculture technology (Prasad, 1991).

Irrigation is needed especially in arid and semi arid areas and it has been used to establish firm agricultural economics in otherwise climatically hostile environment. Irrigation offers the best alternative and reliable technology for the cultivation of food and other crops. Irrigation also mitigates the impact of irregular, uneven and inadequate rainfall with wide fluctuations from year to year. This additional supply of water through, irrigation makes harvesting possible more than one time. It has been undoubtedly recognized that irrigation produces higher yield. Successful cultivation is not possible in large part of our country, without irrigation in one form or other. In the absence of irrigation facilities there are large areas in the country, which often produce only one crop. The irrigation facilities help to shift from traditional cropping pattern to the most advantageous cropping pattern (Patil, et al. 1978).

According to World Bank Study, even one per cent increase in irrigation will definitely enhance crop production by 1.6 per cent. Authoritative data reveal that production on irrigated lands is 3 to 5 times more than the output of non-irrigated lands. Irrigation is sine-qua-non for increased agricultural productivity (Satya Sundaram, 1997). Some economists give top priority to irrigation among all the agricultural inputs.
India has a large population, which is growing at a high rate of 2.1 per cent. According to 2001 census, India’s population has crossed the figure of 1000 million (1,033 million) and it is projected that it may be more than double (2375 million) in the year 2031. This rapid growth of population implies more burdens on agriculture sector. And this agricultural sector depends on the need of irrigation facility to mitigate the problem of food. Thus, it helps progress in socio-economic conditions of the farmers and eradicate inequality and illiteracy problem in the rural communities. Thus, irrigation plays a vital role in the all round development of the society.

Case studies have revealed certain beneficial effects of implementation of irrigation project. These include diversification in the cropping pattern, commercial cropping, and stable crop production; bring waste land under cultivation, good farm husbandry and crop yield etc. It also increases employment opportunities, increase in consumption and change in consumption pattern, asset formation and increase in income as a result of irrigation. It also indirectly provides a base for the establishment of agro based industries, servicing and repair centers and other business centers (Dhavan, 1988).

It is said that irrigation is not simply an exercise in machines. It is a human activity. Due attention to the socio-economic aspects of irrigation is of vital importance to the all round development of agriculture. Irrigation has a significant role in the water management in irrigated areas. If a farmer is socio-economically strong, he irrigates more lands with less water with new technology, but the same is not the case, if he is poor and backward. Agricultural scientists are of the opinion that land
and water resources of our country are adequate to feed even twice the size of our existing population. However most of our land remains under utilized mainly due to lack of irrigation. India today has more unharnessed water resources than most countries in the world (Choudhary, et al. 1994).

With the help of the irrigation all aspects of human development will be possible. Thus, by now it is acutely realized that water resources constitute an indispensable support system for human development in India (Salunke, 2000). Thus, water is precious commodity anywhere; it is more so in India. Our scriptures say that water is one of manifestations of God, it is essential for life and more so far agriculture. Irrigation is necessary for those states that are frequently affected by drought such as Rajasthan, Gujarat, Andhra Pradesh, Karnataka and Tamil Nadu etc, Hence the use of water for irrigation has to be done very carefully (Shivappan, et al. 1987). The importance of irrigation has been well documented by Gulati who writes “Irrigation is an old art in many countries, but for the whole world it is a modern science i.e. the science of survival” (quoted in Govindaiha, T. 1989). In fact it acts as a harbinger of change and brings far-reaching changes in the cropping pattern, input absorption capacity, influences production and productivity and investment pattern (Khan Mohd, Azimuddin. 1992).

In the light of the benefits, considerable importance has been given for the development of irrigation particularly in the planning era of the country. During the pre-plan period to plan period i.e. up to 1997 about 158 major and 768 medium projects were taken up and completed up to 1997. In addition 119 major and 176 medium projects, which were taken
up during this period are at the different stages of completion (GOI, 1997). Because of these developments in the irrigation field, the total irrigated land has increased from 22.6 million hectares at the time of independence to 89.5 million hectares at the end of 1996-1997. This represents around 79 percent of ultimate irrigation potential of the country, which is estimated to be 113.5 million hectares. In final terms it is estimated that nearly Rs. 860 crores has been invested on irrigation during 8th five year plan i.e.1992-1997; (GOI, 1997). Thus, irrigation is an important input for agricultural development. If it is not put to its best use, it means not only wastage of money sunk in its provision but also wastage of human resources, which leads to the backwardness of the area.

Scope of the Study

In the present day context, irrigation projects and water are recognized as an important factor for increasing agricultural production and achieving rural development. Irrigation development continues to be given high priority all over the region and at all times. Generally irrigation is the artificial application of water to the soil for crop production. It encourages the farmers to adopt scientific techniques and go in for more beneficial crops and thereby help development in agricultural sector.

Assured water supply is essential to inspire the farmers with hope in his farm business and work at his optimum level. Water has a magical power of turning the desert into smiling fields. Thus irrigation deserves top most priority in achieving agricultural development in any region.
The study of agriculture, farmers and irrigation in rural setting is very important because whatever the important changes taking place in the agrarian communities are mainly due to agriculture and inputs used for it.

Agricultural operations in Karnataka as of the whole of India are subject to vagaries of rainfall. The state falls in the category of high degree of drought and famine. In this situation the development of the river valley projects has become a life-line of progress and prosperity. Malaprabha project is one of such a irrigation projects in the state which is ambitious project under taken by Government of Karnataka to provide benefit of irrigation to about 2,13,206 hectares in the total Malaprabha command area of northern Karnataka. The Malaprabha command region covers the districts of Belgaum, Dharwad, Gadag and Bagalkot. The present study concentrates on Nargund Taluk of Gadag District.

The irrigation was introduced in Nargund Taluk 32 years back, and now the area has become a fully developed agricultural region. From the date of advent of irrigation in 1973-74 till today, the pattern of agriculture in particular and society in general has been in a state of change.

Nargund taluk was chosen an in-depth study mainly for two reasons.

One, Naragund taluk, which suffered from shortage of rainfall, is now supplied with irrigation water. Twc, Naragund is the only taluk in Malaprabha Command Area where all the villages of agricultural lands are irrigated.
The present study is confined to the four villages of Naragund Taluk viz., Jagapur, Banahatti, Chikkanaragund and Konnur, which are fed by Malaprabha Irrigation Project. These four villages have been selected mainly because, the climatic conditions, nature of soil, extent of irrigation, infrastructure facilities and socio-economic conditions of the farmers are by and large, similar if not identical. The scope of research study includes the direct and indirect impact of irrigation on the life of the farmers in particular and the four villages in general.

It also aims at studying the problems of farmers and their life in the changing situation. It is hoped that the findings of the study may be useful for preparing plans for economic and social development of the farmers and the agriculture and also to evolve proper irrigation and water distribution systems.

The present work is intended to analyze the socio-economic impact of irrigation on different categories of farmers such as small, medium and large farmers. It includes changes in social and economic structures like family, marriage, income, standard of living, educational and political participation, health facilities, purchasing power, household gadgets, life styles, mechanization of agriculture and cropping system etc. Further the changes in the life of the farmers are analyzed by comparing their present situation, with the situation before the advent of irrigation.

The study also tries to examine the socio-economic problems arising out of irrigation, such as the land degradation, litigation with neighboring farmers and authorities, problem of health, extravagancy, problem of dowry, alcoholism, gambling, and problem of debt etc.
Finally, since so far no attempts have been made to evaluate the positive and negative impact of irrigation from a sociological viewpoint, the present study is a modest endeavor to examine empirically the positive and negative impact of irrigation on rural society.

**Theoretical Support**

Change is ever present in the society; it is the law of nature. The social structure is subject to incessant change. Similarly rural society is not static, it has been changing. The changes have been more rapid during the last five decades and much amount has been spent on rural development, particularly after independence. It has been stressed by economists and sociologists that, the key to our development lies with development of rural people. Government has spent crores of rupees in the development of villages. Stressing the need for studying the village society without a socio-historical bias, Chitra Shivakumar and S.S.Shivkumar rightly observe; rural social change has been among the most important subjects of the study, because major national efforts have been directed towards economic development and such efforts have been predominantly located in agrarian social setting. The entire future of development and its efforts rest on what happens in rural communities (quoted in Doshi et al, 1999).

Hence social change refers to changes in structure and functions of the society and its relations. It should be noted that social change is complex and multifaceted phenomenon and it is the product of multiple factors. No factor is solely responsible for the occurrence of social change.
After 1951 profound change took place in the rural societies. It is not only in a particular field but it is in economic, social and political, educational etc. There are numerous theories developed by different disciplines to explain the direction and means, through which changes occur. In this connection, here an attempt is made to co-relate present study, with two theoretical supports namely ‘Economic Determinism Theory’ of Karl Marx and ‘Theory of Modernity’. Change in technology and economy affects on different spheres of life of the farmers and it consequently leads to changes in different fields and sections of the society.

Karl Marx’s Theory of Economic-Determinism

During the last five decades development theory has taken several sharp turns. In the first phase, development essentially meant economic development. In the second phase the relationship between economic development and social change was more keenly realized and consequently emphasized.

Some thinkers tried to establish a link between economic changes and social changes. The economic interpretation of social change is associated with Karl Marx. He asserts that economic forces form the foundation of society and changes in the economy lead to changes in other aspects. Social change is associated with stage of economic development. Marx and other later scholars emphasized the organization of production as the chief factor in economic development.

Karl Marx has enormously popularized the economic theory of change. The prime movers of change according to this view are changes
in the economic infrastructure bringing changes in the whole system of the society. Marx has best explained his theory of 'Materialistic Interpretation of History' in his book 'Critique of Political Economy' (1859). According to him economic changes brought about corresponding changes in the superstructure, consisting of social, political, judicial, educational, religious etc. Changes in the forces and relations of production are the motivating force for changes all around.

Although this theory did not consistently argue a crude economic determinism, it is considered that economy to be the foundation of the whole socio-cultural system. Throughout their study, Marx and Engel emphasized that, the primacy of economy in human relationship and the centrality of the economic dimension in social structure (Larson, C. J. 1973).

Economy is paramount and all other factors in the human experience of social relations were subservient and dependent upon the economic factor. This theory underlines that, the whole development, 'rests on the economy' but they all react upon one another and upon the economic situation, which is the sole active cause, and that everything else is nearly passive effect. There is rather reciprocity within a field of economic necessity, which in the last instant always asserts itself (Francis Abraham, et al. 1985).

This theory also argues that, human thoughts, human awareness and human consciousness, were not self-originating but were derivatives of economic principle. And it is in the arena of political economy that governments and religious institutions must be controlled and human
consciousness brought under dominance. Men must realize that the social environment is dependent upon the economy (Francis Abraham, et al. 1985).

The central theme of the theory is that; 'it is not the unfolding of ideas that explains the historical development of society but the development of social structure in response to changing material conditions that explains the emergence of new ideas'. The ideas belong to the realm of superstructure and are determined by the economic infrastructure. In other words ideas depend on the social positions, particularly on their class positions of the proponents. The most important characteristics of any society are its form of property, economic conditions that touch every aspects of people's life. Religious alienation as such occurs in the inner life of man. Economic alienation is that of real life it therefore affects both aspects i.e. mind and action.

Material forces are more important than other forces "matter is primary mind is secondary. 'World by nature is material', this theory believed that material forces mainly decide the cause of human activities. Therefore, matter rules the mind. Materialistic Interpretation of History, Marx would also call it the economic interpretation of history. The material conditions of life influence the social and political changes. Thus, economic forces determined social and human history.

Since economic production is the basic activity of human aggregate, the mode of production (productive forces and social relations of production) plays a determining role in shaping the social structure the psychology and the ideology of that human aggregate. Further the level
of production and the way in which the products are distributed among the different strata of a society, determine the level of material prosperity of the society as a whole and of the various socio-economic groups comprising it. They also, to a very large extent, mould the institutional setup of that society as well as the cultural life of its people (Desai, A. R. 1978).

Theory of Modernization

Modernization broadly refers to the use of modern science and technology and rationalistic attitudes towards the production process. While social modernization refers to the attitudes, the values and the political institutions. These two aspects are closely interrelated and in fact we can say that there is a reciprocal relationship between these two because the change in any one aspect can bring about change in other aspects too.

Modernization is a process denoting a movement from a traditional or quasi-traditional order to certain desired types of technology and associated forms of social structure, value orientations, motivations and norms (Dube, S. C. 1996).

Nash says "Modernity is the socio-psychological framework which facilitates the application of science to the process of production. And modernization is the process of making societies, cultures and individuals' receptive growth of tested knowledge and its employment in the ordinary business of daily living" (quoted in Verma, 1980).

Heilbroner (1963) refers to the economic development "as deepening flow of incomes and widening flow of production". He
emphasizes on the process of economy that would break the shackles of backwardness. The shackles of backwardness, according to him, can break by the process of economy in which income is more important and is ahead of production for profit. The modernization process occurs in all aspects of social life. Hence, Rationality, Individualism, Secularism, Equality and application of scientific principles for advancing technology as well as personal goals become basic criteria for understanding modernization.

In 21st century technological innovations in agriculture are going to be the most important determinant of the level of pace and sustainability of agricultural development (Singh Katar, 2001). The modern age is often called the technological age or the mechanical era. One of the most important and fast moving phenomenon of present times is; ‘technology’. In utilizing the products of technology man provokes social changes. Technology is playing an important role across the rural economy.

The word ‘technology’ is derived from the Greek term ‘tekhnologia’ (meaning systematic treatment). The literal meaning of technology is applied science or science dealing with industrial arts (Bharat, 2001). In the broader sense, technology is defined as the translation of scientific laws into machines, tools, mechanical devices, instruments, innovations, procedures and techniques to accomplish tangible ends, to attain specific needs and manipulates the environment of practical purpose.

Technological determinism, according to Rogers, is the degree to which, technology is the main cause of social change in the society. The adherents to this concept consider technology as a prime mover, which
help and shape a society. Technological determinism would be so strong a factor as a cause of social change (Gupta, V. S. 2001). Western economists consider the basic element of an economy to be land, labour, capital and entrepreneurship. Sociologists and anthropologists often consider technology as a fifth element (Turner, J. 1978).

The Human Development Report 2001 has introduced a new tool and technology for human development. Technological development and innovations are the part of our way of life. It is argued that all problems of humanity can be solved through technology. The newer technology the better it must be. (Chandra Datta, 2001). The technological order of change clearly falls in the realm of social change. Technological change and technological advance, according to some sociologists, provide the main explanation of social changes.

Schumacher, a German development economist and the author of the famous classic ‘Small Is Beautiful’ said that technology as motor of development and as an instrument of social change. To underline the crucial role of technology, Schumacher’s perspective points out that, sustainable development the crying need of the day, is the function of technology. The history of agriculture reveals a variety of implements, which have been employed by rural communities (Giri, D. K. 2001).

While talking of technology for rural poor, we are not dismissing the relevance of new technology in a particular context. All technologies are relevant and appropriate depending upon the context and their application. New technology replaces the indigenous one. More
technology leads to progress and it is panacea to the complex problems (Giri, D. K. 2001).

Agriculture is an integral part of the general development system; it helps the system as a whole and is being served by it. It in fact holds the key to sustainable development. Sustainable development and development of agriculture are interdependent and interrelated in more than one-way.

Agriculture today has become more complex in the wake of globalization and WTO regime. Machines govern the agriculture scenario. There is no exaggeration in saying that, the present self-sufficiency in food-grain production in the rural community could be achieved only through a strong network of extension in the country along with the great contribution made by the agricultural scientists in developing technologies and new crop varieties (Dayanandn, R. 2003). Indian agrarian society for longer periods of history cultivated its fields in a primitive way. It carried out its agricultural operations through indigenous breed of bullocks, indigenous seeds, manure and crude type of thrashing, primitive plough and leveler. Such a method of cultivation coupled with organic fertilizer, did not give any market surplus. Such a state of agriculture got a revolution by technological innovations. These innovations on the one hand saved much of manual labour and on the other increased the productivity. Technology thus, has proved as a multiplier effect on production.

The technological demands of new agriculture have produced new social conditions in the functioning of the family system. The younger
educated or semi-educated members in the households look after the most technical and managerial activities of farming, its credit and marketing side etc., where actual head of the household plays only a minor role. But in social matters such as, marriage ritual, distribution of goods and resources etc., the traditional head of the family continues to play his role (Yogendra Singh, 2000).

It is no doubt that, the rise and spread of new technologies brings about new forms of social relations and new cultural pattern. But the emergence and extension of technology is itself conditioned by a variety of complex social factors (Dube, 1996). The technological factors represent the conditions created by man, which have a profound influence on his life. The social effects of technology are far reaching. According to Karl Marx even the formation of social relation and mental conceptions and attitudes depend upon technology. Karl Marx, Veblen and few others have regarded technology as the sole explanation of social change. W.F.Ogburn says, technology changes society by changing our environment to which we in turn adopt. This change is usually in the material environment and the adjustment that we make with these changes often modifies customs and social institutions.

In attempt to satisfy his wants, fulfill his needs and to make his life more comfortable, man builds civilization. Technology is a product of civilization. When the scientific knowledge is applied to the problems of life, it becomes technology. Transfer of technology keeps the wheels of agriculture development moving. The success of agriculture and rural development strategy initiated, planned and developed by the policy makers, the planners and the scientists hinges on the effectiveness of the
extension machinery whose task is to transfer the technology from ‘lab to land’. Technology has brought about changes in the lives of people in the countryside and the farmers and others who have adopted the new technology and methods of cultivation (Desai, A. R. 1978).

The invention of power driven machinery in modern times resulted in the production of such amazing labour saving agricultural machines as tractors, thrashers, weed remover and crop cutter etc. These new agricultural techniques are used on a large scale. Hence, the volume of agricultural products has increased in proportion to the advance of agricultural techniques. The extent of the material wealth of rural society therefore, depends mainly on the technical basis of agriculture. Higher is the technique applied greater is productivity of agriculture (Desai, 1978).

The system of transfer of technology from research stations to the farming community has played a crucial role in modernizing agriculture. For last five decades of agricultural extension is continuously contributing in enhancing the food grain production and productivity. Adoptions of technology by the farmers are some of the factors that helped to achieve great stride in agricultural production (Intodia, S.L. 2002).

Abraham Lincoln speak on technology said “The dogmas of the quite past will not work in the turbulent future. As our cause is new, so we must think and act according to new knowledge and techniques and these can only help us to survive the future” (Das, J. N. 2001).

In India mechanization of land tillage during Green Revolution has led to the cultivation of more land and the production of more crops per
year. The investment made in agriculture during the 1950's brought about "green revolution" in agriculture during the late 1960's. This triggered new social, political and economic and cultural process in the community (Yogendra, Singh. 2000). The demand made upon transfer of technology for accelerating agricultural production is enormous.

Thus modernization refers to the process of directed change through which a community achieves economic growth, political development, autonomy and social reconstruction. Today, in Indian society, its educational pattern, bureaucratic structure, science and technology, policy of life styles are in dramatic change. The cumulative effect of all this is leading to a kind of universal strategy for the betterment of living conditions, through economic development, free from traditional bondage.

**Review of Literature**

Review of available literature on particular aspect helps to understand and identify the research gaps and also focus on dimensions of the problems. Examination of different issues studied by various scholars helps to provide valuable insights. In this section an attempt is made to review some important empirical works done by scholars on the various aspects of the irrigation.

There is a long tradition for irrigation literature and there is no dearth of literature about impact of irrigation. These studies are undertaken by scholars belong to various disciplines. Geographers, Economists, Engineers, Historians, Agronomists have studied the impact of irrigation from different angles. This section aims at two purposes,
firstly it reviews the literature and provides an appraisal and secondly it attempts to assess the impact of irrigation on the people with different socio-economic background. The studies on irrigation impact are basically of two types' viz., 'cross-sectional' and 'longitudinal'. Cross sectional study refers to a comparative study of two villages; one with irrigation and another without irrigation. Longitudinal study refers to the study of one single village at different two points of times namely before irrigation and after irrigation.

Several scholars, academicians and researchers have studied the impact of irrigation on different aspects like production, productivity, land use pattern, intensity of crops, man-day works, land degradation, mechanization of agriculture, transformation in agriculture, soil type, fertility, income, water management etc. These studies are carried out at the regional level and also in macro level and most of these studies are confined to economic and geographical aspects. The most important studies conducted hitherto are reviewed with a view to obtain the impact of irrigation on rural society.

Epstein (1961) conducted a study during 1954-55 in Mandya District of Karnataka. She made a comparative study of dry and wet villages and concluded that irrigation has considerably raised the farm productivity. This has also facilitated the growth of commercial crops as a result of it the prices of land have gone up by about 3.3 times. Introduction of canal irrigation has minimized instability of production as well. Irrigation thus has reduced the risks to farmers caused by the irregular and meager rainfall in the area. The wet village could develop into a kind of serving center for nearby villages and its economy has been diversified.
Singh and Singh (1962) have examined the effects of Bhakra Dam on socio-economic aspects of the neighbouring areas by selecting fifteen villages, eight irrigated villages and seven dry villages. It is concluded by the study that the patterns of cropping intensity have changed in the villages under the dam with more stable production conditions and with more returns. As a consequence the standard of living of the farmers has gone up. More and more priority is shown for cash crops such as cotton, sugar cane in the place of traditional crops such as Bajra.

Savale (1966) conducted a study on the role of irrigation in the development of the agriculture and cropping pattern in Nasik of Maharashtra state. The study was based on data collected in Farm Management, Scheme of Planning Commission Government of India. The benefits of dry and irrigated farms indicated that, the net returns from 10 and 20 acres of irrigated lands was Rs. 4,853 and Rs.10,363 respectively. While the net returns of dry farms of the same size were only Rs. 535 and Rs. 1159 respectively (according to money value of 1966). A net return per rupee of capital invested in different size of irrigated farm returns was 150 per cent to 200 per cent. The irrigated farms had employed almost 5½ times more human labour and 2½ times more bullock labour as compared to dry land.

Jha (1967) has made an in-depth analysis of direct and indirect impacts of irrigation, in the Champaran District of Bihar. This study has been considered special as the author makes a comparison between the project and the control area. In the project area, 96 per cent of land is irrigated while in the control area only 34 per cent irrigated. For analysis the variables chosen were land ownership, land use pattern, cropping
pattern, rural credit, borrowings, input output rates in the category of direct impact and farm labour, rural industries, rural transport and urban industry in the category of indirect effects. It has been concluded by the study that irrigation has definitely brought prosperity to the cultivators of the project area as compared with the cultivators of the control area.

Garg, J.S. and Singh, G.N. (1971) have studied income disparity of dry land and irrigated farms in Uttar Pradesh and come to the conclusion that the intensity of cropping varies positively with the farm size, as it was 150.64 per cent in the smallest size group and 158.53 per cent in the largest size group. Though there is variation in the intensity of cropping with the change in the size group, yet the variation is most highly significant. It is mainly because the level of irrigation on all size groups was more or less uniform. The net income per hectare on dry land farms worked out at Rs. 414 as against Rs.1971.17 on irrigated farms. They found that the input – output relationship was higher on irrigated farms as compared to dry land farms.

Whitcomb (1971) in her study of the United Provinces under British Raj (1860-1900) narrates how the development of canal irrigation leads to changes in cropping pattern and in food availability in the region, with land made an alienable individual property and land revenue to be paid in cash. How a credit network linked with commercial crops leads the petty peasants in to the trap of indebtedness.

Clay (1974) conducted a study related to Kosi region in Bihar, about equity and productivity effects of package of technical innovations and changes in social institutions. He underlined the effects of increased
tractorization, and extensive irrigation on employment. He also examines the impact on small cultivators who generally depend on bigger farmers.

Krishna, Bhardwaj (1974) used the farm management data of different states and studied the impact of irrigation and concluded that there is a general tendency for intensity of cropping and to increase the percentage of area irrigated. In order to see whether irrigation influences the relation between outputs and inputs per acre of land and size of holdings, she compared the results of irrigated and un-irrigated holdings in Punjab and particularly irrigated and dry holdings in Bombay. It did not give any consistent results, possibly because the partially irrigated holdings had poor quality and low level of irrigation. There is a positive although not systematic relation between percentage area irrigated and output per acre.

Many scholars have stressed the point that irrigation farming leads to transformation from a traditional system of farming to modern agricultural system of farming. In addition, the social and economic impact of irrigation on communities has also been discussed.

Gadgil (1978) evaluates economic effects of irrigation with reference to the Godavari and Pravara Canals. Much light is thrown by his study on many direct and indirect benefits of irrigation. Further, he presents the beneficial impact of irrigation in dry areas. It has been concluded by this study that the provision of irrigation facility to the people of Godavari and Pravara Canal command area has enabled them to have superior cropping pattern, higher productivity and gross farm increase. He explains the direct benefits to the people who have been involved in the
processing and transformation of enhanced agriculture production in the command area. There is an increase in the volume of trade on account of increased agriculture production and it has benefited railway traffic, road traffic and trading establishment in Ahmad Nagar district. Irrigation agriculture has increased the demands for labour, which in turn has raised the wage rate of the labourers. Economic conditions of the labourers also improved much by irrigated agriculture. The construction and maintenance of a project has great effects on the economic life of the community, living within the region and also to some extent on the neighboring communities too.

Kumar (1978) made an attempt to examine the impact of irrigation on cropping pattern, intensity of crops, farm inputs, income and elasticity of production of farm inputs in various farmers of the Hirakud canal system. Different methods were used by him like logarithmic way of arithmetical calculation, regression model with random coefficients, to express the relationships between the explanatory and dependent variables. He concluded that the field canals have led to an overall increase of 13 per cent in irrigated area and 9 per cent increase in cropping intensity.

Sagar (1978) conducted a study in Rajsthan and has pointed out that the contribution of irrigation to raise crop yield over the period of 1961-74 was 22 per cent in wheat, 34 per cent in millet, 41 per cent in rice and 32 per cent in oil seeds. As per his calculation irrigation accounted for 30 per cent of increase in the use of fertilizers and 15 per cent increase in high yielding variety of seeds and 18 per cent increase in total agricultural output.
Hansen, et al. (1979) in their study of irrigation principles and practices have examined the problem of irrigation, standards for irrigation, how to irrigate and how much water to be supplied for the crops etc.

Mishra and Vivekanand (1979) made a survey of Tungabhadra Command Area to assess the impact of canal irrigation in Bellary district. They observed that, the pattern of crop cultivation has undergone some basic changes after canal irrigation in the villages. Canal irrigation has induced the use of modern inputs and practices in framing and positively affected employment of labour to a given unit of area. The study has conclusively proved that the productivity and the net income to an acre are higher in the irrigated areas than in the dry areas although cost of farming has also gone up correspondingly in these areas. Further it is concluded by the authors that large farm holdings are much better-off than the others in the command area. Thus, it can be said that irrigation has brought up several positive economic effects on the areas covered.

Pandey’s (1979) study of Kiual- Badua-Chandan command area in Bihar state deals with impact of irrigation on rural development. The researcher selected 6 villages for his study, 3 each from wet and dry categories. The village samples are selected on the basis of purposive random sampling method. Out of the total 2033 households, a sample of 610 households is selected. These villages are examined with reference to the variables like population, occupation, market, communication, cropping pattern, income and indebtedness etc. The study concludes that the performance of wet village is far better than that of dry villages.
Robert, Chambers (1980) in his study ‘Managing Canal Irrigation’ emphasized the importance of main system of management in large and medium irrigation projects. He calls for a search analysis, understanding an idea with practical applications. Researcher has shown that irrigation has improved productivity, equity, stability and utility among beneficiaries. The welfare proposition rose by Chambers ‘who will gain and who will lose’ is an attempt to change the allocation of the resources and also underlines the importance of interdisciplinary approach for solving irrigation problems.

Alexander (1982) made a comparative study of both irrigated and non-irrigated parts of the Ganga Nagar District in Rajasthan. It is concluded from the study that irrigation facilitates intensification of agriculture activity through increased use of labour, fertilizers, insecticides and other inputs and enables farmers to use improved tools and machines. Irrigation further has also paved the way for modernization of occupational values and their specialization.

CPDS (1982) study conducted by Center for Planning and Development is based on farms of both ‘with and without irrigation’. The important results drawn from the studies are that growing of jawar, groundnut and cotton has made way to growing high yielding crops like paddy, chilies and cotton etc. The average net income of the farm per acre rose by 10 fold and the rate of per unit of input increased by more than 3.5 times and bullock labour utilization doubled.

Patel (1982) examined in his study that the success of irrigation depends on farm size, on the investment and utilization of farm
resources, the level of inputs used and output produced. Further he compared the existing levels of inputs and profitability of different crops with their corresponding levels at the least cost combinations. This study is based on 208 household samples including 106 irrigated and 102 un-irrigated farms spread over 21 villages of the Padra Taluk in Baroda district of Gujarat state.

Sengupta (1982) conducted the very interesting study on how the mismanagement of irrigation leads to drought prone situation. This study was conducted in Northern districts of Bihar. He concluded that the technical, social and economic aspects of irrigation, which had supported high population densities but have now fallen into disuse owing to negligence of maintenance and lack of official support. As a result the formerly productive and better-irrigated areas are today declared to be drought prone, the old irrigation system neither maintained nor replaced by new ones.

Adinarayan (1984) has examined the impact of irrigation in the formation of cropping pattern, farm productivity, capital assets, income and employment in Kakatiya canal of Shriramsagar project in Andhra pradesh. He made a comparative study of irrigated and un-irrigated villages. His findings show that assets formation was significantly increased by about 3 times on fixed assets, while it was less on working assets of the irrigated farms compared to un-irrigated farms. There was an increase in employment of human labour by more than 100 per cent, farm production of the irrigated farms increased by more than 200 per cent.
Charan (1984) observed the impact of irrigation on cropping pattern and income of sample household farmers of Narmada command area in Gujarat state. The study revealed that gross returns in different size groups were 2-3 times more on irrigated farms and also total man days of employment was more in the irrigated farms than in non irrigated farms.

Dhavan’s (1984) conducted a study on differential income impact of public canal irrigation in Maharastra State. He shows that there is a tremendous increase in farm output owing to canal irrigation, in Girana and Ghod commands. Researcher opines that introduction of irrigation, no doubt enhances farm income but it also increases the absolute income differential in the farm sector of two commands. He points out that the larger farmers have better chances of facilities, such as extension services, credit facilities, education, income benefits for per unit of irrigation, communication facilities, compared to small farmers.

Gadgil, D.R. (1984) conducted a cross sectional study covering two irrigated villages from the Godavari and Pravara canals and two un irrigated villages from the adjacent area. A systematic methodology is used to enquire into the direct and indirect benefits of irrigation. Irrigation returns have been classified into two categories viz. direct and indirect benefits. The direct benefits include cultivation of high yield crops leading to higher production, income and employment potential. On the other hand indirect benefits give rise to demand of labour, accessories, materials and techniques leading to economic activities relating to production, trading and transportation. Irrigation is expected to reduce income inequalities in the countryside. The study reveals that, the effect is almost nil in terms of the actual increase in production in the
areas at the tail end farmers of the canal. Employment has shown an increase in irrigated areas, migration of agricultural labourers during harvesting season has been significant feature of the region.

Jairath (1984) carried out a study on the role of irrigation on agricultural production in Punjab. The study is related to technological aspects of major sources of irrigation, utilization aspects of land growth and distribution of modes of irrigation and productivity and conjoint use of public and private irrigation. The study reveals the effect of irrigation in detail on agricultural production in Punjab and emphasizes its importance and deficiencies.

Gurjar (1987) recently made a study on Indira Gandhi Canal system of Rajasthan. He considers irrigation as an important infrastructure for modernization of agriculture. It is evident from his study that there are many visible impacts of Indira Gandhi canal on the agriculture system of Rajasthan especially in the arid parts of the state. He reveals through his finding that there is significant contribution from irrigation to agricultural modernization, productivity; cropped land use patterns and agricultural products. He has proved that the empirical knowledge helps in deciding the mode of allocation of resources, research priorities and other relevant policy measures for land and agriculture development.

According to Dhavan’s analysis, (1988) irrigation helped Agricultural transformation in many respects. As per his observation, even 1 per cent raise in irrigation quantum was accompanied by about 6-10 per cent rise in the intensity of cropping. The pure yield effect of irrigation was the single most important component accounting for 38 per
cent of total output raised because of irrigation. Irrigated land yield was highest in farms watered by private tube wells and lowest on those dependent on Tanks, Canal, irrigation falls between these two. Researcher concluded that Indian farmers continued to show remarkable preference for growing food grains under irrigated conditions.

Gopal Reddy (1988) made an effort to analyse the impact of assured irrigation in different regions and different farm sizes, on the cost of cultivation and returns from the crops and farm business by taking the period of irrigation as the basis. He has selected three irrigated blocks on Nagarjun Sagar Left Canal by taking the period of irrigation i.e. of 5 years, 3 years and 1 year respectively. It is found that both the costs of cultivation and returns are positively related to the period of irrigation. He also found a positive co-relation between the age of irrigation on the one side and gross return and farm business and income on the other.

Vasudev Rao (1988) analyzed the evaluation of the impact of irrigation on the socio-economic and agricultural practices of the people in command area in Karnataka State. The study aims at quantifying and linking the various facets of development with irrigation as the starting point for all-round development of rural areas.

The main objective of the book was to study in depth, how irrigation holds the key for agricultural development in particular and consequently rural development in general. At the micro level the cultivator households unit is taken for study to know the overall development. At the farmers level various aspects have been studied in the benefited villages and the controlled villages. In order to assess the
impact of irrigation on work participation of family, labour, females
school attendance, area under cash crops, optimum labour use, use of
inputs on time, insufficient qualities and proportion of expenditure on
non food items in the total expenditure, income, indebtedness, housing
conditions and availability of amenities with regard to poverty line have
been discussed.

Bowonder & Ravi (1989) studied water logging in irrigation
projects, which is an environmental hazard. The problems and intensity
of water logging in three major irrigation projects have been discussed.
According to the author, water logging means loss of an opportunity in
terms of production cost and ineffective use of irrigation facilities. It
causes loss of hope of the opportunities in terms of loss of fertile land and
also non-availability of water to tail-enders and results in lower output
per unit of investment and expenditure in agriculture.

Pawar (1989) made the study about the relationship between
irrigation and agriculture. He describes the spatio-physical environment,
which has shaped the agrarian economy of the region of the upper
Krishna basin of Maharashtra. An attempt is made by him to examine the
impact of irrigation on the use of mechanical and bio-chemical inputs,
land use in general and cropping pattern in particular. He analyzed the
relationship between the irrigation and changes in crop productivity;
intensity, crop combination, diversification and overall development of
agriculture along with land degradation, a problem of supreme
importance in the region.
Sharma, B.L. (1989) studied the Indira Gandhi command Canal area and opines that this is a unique command area in the country. It is unique because, before the introduction of Indira Gandhi canal, the region was entirely a desert, where even drinking water was not available and the population of region was very low. But after the advent of irrigation, water and the population is quite new to this area. Their proper mutual adjustment not only laid foundation for the future development of the area but also symbolised its progress. Whatever conclusions and experiences have been drawn so far; from research on irrigation in different parts of the country could not be applicable to this command area because the nature of those areas is much different from this Indira Gandhi canal area.

Indira Gandhi canal consists of a variety of soil and the different topography, which made problems more complicated. For example, the irrigation water supply to sandy soils and the soils with hard container created problems such as water logging, salinization and alkalization.

Therefore, it is very essential to identify the areas, which are suitable for irrigation, which would cause no negative effects. The second problem is to determine the period of irrigation days / watering days required for the crops is to be fixed. Time is also an important factor in the use of irrigation water. It has two aspects viz., when to irrigate? And also how much to irrigate? Researcher has also highlighted about irrigation-water used relationship; between irrigators and government officials connected with water distribution.
Bannerjee, et al. (1990) found that, irrigation brings changes in the micro climatic of southeastern parts of the states and in turn resulting in increase in the number of rainy days, rise in the percentage of humidity and lessen the number of dust storms. At the same time it has also reduced the amount of variation in the daily temperature. There are other important impacts of irrigation, which are pointed out by the researcher in his study.

Navalwala (1990) in his article, "Water Resources Development and Management", stated that irrigation is an effective vehicle in bringing out the green revolution. He has shown that the food crops due to irrigation increased from 115.58 million tonnes to 126.77 million tonnes during 1960 to 1990. The main reason for this is the irrigation and water management. In this essay he emphasized the importance of an economic use of water with the help of lining, reducing water losses providing drainage system etc.

Gurjar (1990) in his article, highlighted about the irrigation culture and its problems. Indira Gandhi canal area is unique in its character. In spite of a number of socio-economic problems, a peculiar social organization has developed i.e., irrigation culture. The impact of irrigation in this region is altogether different. In most of the command areas, elsewhere-existing population was already large and therefore not much change was observed in the social organization. But in case of Indira Gandhi canal, the picture was altogether different. Here the existing population was almost negligible because the area was considered to be unfit for human habitation.
After the construction of canal irrigation, people from various parts of the state and country at large were brought to settle here and started their living with their own different life styles (Food habits, Dress habits, Different languages, etc.). But after settling in the same habitat, they have exchanged their culture and thereby cultural assimilation process started. As a result of cultural assimilation a new society has come into being which is free from all sorts of isms leading to the feeling of unity in diversity.

Reddy, V. (1990) pointed out the problems of irrigation and water management. In his opinion problems are common to most if not all. According to him in major irrigation projects there are problems such as in adequacy of water availability and planning of the water management etc. Many a time, it becomes rather difficult to grasp the problems and reasons for such inadequacy in irrigation systems, which are believed to be due to unscientifically marked out plans and programmes.

An attempt has also been made by the author to examine some of the issues associated with water management in major irrigation projects of Ghataprabha command area in northern Karnataka. The study deals with the prospects and problems of irrigation development in the region such as irrigation management and their limitations at the field level, the status of water distribution, the effective cropping pattern etc.

Acharya, V.V. (1991) conducted a study to assess the lift irrigation and its impact on Mandaki Village in Maharashtra. This study was based on scenario before and after the advent of irrigation. The socio-economic condition of Mandaki village was one of those 'have not' villages
characterized by backward agriculture, poor productivity, subsistence economy, utter poverty, associated with economic inequality and lack of opportunities for educational development etc.,

But after the inception of irrigation its effect can be seen on the entire society. The economic changes have been significantly influenced by irrigation. The socio-cultural and educational activities of the people, transformation in agriculture i.e. new cash crops such as growing of sugar cane and cotton in their agricultural land. More importance is attached to commercial crops rather than food crops. There has been change in agricultural infrastructure such as leveling of land, use of pesticides and fertilizers, development and provision of short and long term loans, change in governmental policies regarding agriculture, water related matters, fluctuations in market prices, increase in production, development of animal husbandry and other livestock etc.

Panth (1992) in his study, “Trends in Indian Agriculture” observed the changes that took place after the arrival of pump-set irrigation. The change from food crops to cash crops has increased. Many farmers prefer ploughing of their lands by rented tractors rather than by bullocks. Most of the farmers, irrespective of their size of holdings, use mechanical thrashing rather than manual thrashing. The noticeable change is, decline in share cropping system, Jajmani system and absentee landlord system. Today these systems do not exists in this area. Thus these are the changes pointed out by the author, which are caused by irrigation.

Verma, Neelmani (1993) in his work “Irrigation in India - Themes on Development, Planning, Performance and Management”, covered the
direct and indirect contributions of irrigation and the factors governing these contributions. Although the study tries to discuss impact of irrigation during the post independence period, it has also analyzed the growth and management of irrigation during ancient India and onwards. It has also covered the impact of irrigation on mechanization, cropping pattern, production and productivity. Along with this, the author focuses on cost benefits from irrigation, irrigation management and policy implications.

Chamber, S.R. (1994) examined that irrigation not only increased the productive thinking of the farmers but also livelihood thinking. He also suggested certain policy implications in connection with, improvement of existing canal irrigation, improvements and expansion of small-scale irrigation. According to him the livelihood potential is vast, the impact of irrigation in any one place can dramatically greater influences on the other. On part of Bheema Project, the total income from the sale of Agricultural Produce was three times higher after three years of irrigation.

He concluded that, irrigation has been acted as a measure against poverty, in the areas where it is used feasibly and economically. Well-implemented irrigation development is probably the single most promising direct means of reducing rural deprivation.

Paul, P.P. et al. (1994) in their article entitled “Socio-Economic Dimensions of Irrigation”, observed that availability of irrigation is a significant technology which decides the cropping patterns i.e. change from traditional cropping to commercial cropping system for instance
paddy is replaced by sugar cane. This study is based on "with and without irrigation" it is done by selecting three categories of farmers, viz., small farmers, marginal farmers and large farmers.

With the advent of irrigation facility, the cropping intensity is also increased, farmers are able to grow more than one crop and they need not migrate to other places in search of work. Thus, family disturbances were controlled with the help of provision of irrigation. In their study, it is noticed that productivity of paddy has increased significantly. Similarly the production of sugar cane, wheat, cotton and potato has also registered increase. They have also shown close relationship between irrigation development and employment opportunities. It helps the farmers to earn sufficient income thereby making it possible to improve the quality of life. Apart from this, the researchers have also pointed out the adverse impact of irrigation such as soil erosion, air pollution and health hazard problems. Moreover the small and marginal farmers face the problems like credit facilities, quality of seeds and farm inputs etc.

Chatarjee (1995) examined the relationship between irrigation and nature of soil. Irrigation has impact on cropping pattern, agricultural efficiency and use of HYV’s, spatial distribution, fertilizer consumption and crop yield in different zones.

It is also observed that irrigation increases ecological problems and socio-economic disturbances like uneconomic nature of land holdings, unscientific use of water resources, and lack of social awareness such as excess use of irrigation water, resulting in shortage of drinking water.
Irrigation has also caused technological problems such as disappearance of traditional technology, bad canal system improper land leveling etc.

Sanjeev Reddy, P. (1997) studied the performance of socio-economic and agro-conditions under different means of irrigation. The basic historical, social and economic factors of the sample study have been analyzed with crop wise and season wise and observed problems with regard to cropping system and productivity.

Author also underlined that irrigation is one of the important major infrastructure inputs, which influences agriculture to a great extent. Even then the Indian agriculture is facing a lot of problems such as regional disparities, crop imbalances and gaps in green revolution etc. He suggested the appropriate and well-designed irrigation system to eliminate the problems. It can help increasing agricultural output and ultimately influence the income and employment generation of the agrarian community.

Reddy, V. (1998) conducted a modest study to examine some of the issues and problems related to irrigation. He opines that irrigation gained much importance in the post independence period, and that it has been one of the critical factors in the growth of agricultural production. However he observed that though huge investment was made, the benefits were not commensurate with the investment.

The argument is that in the absence of proper understanding of complex process and scientific application of irrigation system, design, construction, operation and maintenance, utility and effectiveness of irrigation have not been appreciated properly. This has led to the
emergence of anti-major irrigation lobbies. Major complaints have been made regarding the Command Area Development Authority (CADA) drawbacks, that there is no co-relation between Agriculture Department and Irrigation Department. They blame each other, for the failures, CADAs are expected to co-ordinate to supply the necessary inputs besides irrigation water. Agricultural extension is yet another input for CADA to co-ordinate. It is also pointed out that, the failure of work of administrative machinery is due to the administrators who were transferred very frequently because they have been drawn from various departments on deputation basis.

Chandrashekhar (1999) in his article, “Irrigation-Literacy-Development” pointed out that most of the people have an ostensive feeling about irrigation. Irrigation is a sign of prosperity; it opens doors fortune of the people and society. Irrigation is a panacea, which is a means to eliminate the poverty, starvation and unemployment. These are the general feelings of the masses. In spite of all these, there is also a feeling, that irrigation has been more a curse than a blessing.

Author has made a comparative study of seven districts in Karnataka and seven Taluks of Raichur District, which are having more irrigation facilities and also less irrigation regions. He made a comparison between more irrigated and less irrigated regions and has concluded that, where there is more irrigation the rate of literacy is low and where irrigation facility is less the literacy rate is high. This clearly indicates that the irrigation does not increase the rate of literacy. He also pointed out the position of minority groups such as SC, ST, OBC, Women folk and economically backward class has not improved. Again he added that with
the advent of irrigation, the per capita income and literacy rate of only landlords has increased.

Gawati, S. S. (2000) carried out a study on impact of economic development on political participation during 1986-91, in Hukkeri taluk of Belgaum district, Karnataka. He made a comparative study of dry and wet villages, which, fall under the Hidkal Dam of Ghatprabha Valley Project. This comparative study is an empirical study and data were collected through sample survey of 20 villages i.e. 10 villages from wet and 10 from dry areas by using lottery-sampling method.

In his study it is proved that improvement in the economic conditions of the people through irrigation and industrial infrastructure has led to wider and effective participation in political process. The political participation of people as members in co-operative banks, APMC in youth clubs, mahila mandal, dairy co-operatives, peasant organizations, sugar factory, co-operative mills, and educational institutions has increased.

The study also deals with relationship between economic development and political participation and also co-relation with income, size of land holding, level of literacy, caste occupation and their impact on political participation of the people.

Folke, Steen (2001) focuses on water related conflicts and resolutions. The paper highlighted climatic change and its implications for India’s water resources development, keeping in view the impact of climatic change to meet out the foreseeable demand in India. Researcher examined several conflicts over canal irrigation in Mandya District of
Karnataka, in the command area of Krishnaraj Sagar Dam. The reservoir has brought not only relative prosperity in the district but also created conflicts between those who are favoured by the land ownership, caste and political backing and those who are not.

A study by Sarkar, A.N. (2001) deals with a detailed impact of ‘Indo-German’ - Watershed Development Program (IGWDP) in Dongaon of Nanded District of Maharashtra. The study is based on the primary and secondary data collected from the project area to analyze the impact. In watershed development project, the impact is seen in spheres such as expansion in irrigated area, change in cropping pattern, change in productivity, livestock development, creation of family assets and common property resources, employment generation and ensuring social equality.

Tewari (2001), conducted a study about the contribution of irrigation for agricultural production, renovation of irrigation capacity and causes for land degradation. Since independence, the government has given top priority to irrigation. After partition, irrigated land in India has raised from 22.60 m.ha to 80.76 m.ha. He has also thrown a light on the efforts made by the government to improve water use efficiency such as raising the water rates, farmer’s involvement in management and greater flow of institutional finance etc.

It also identified that the major cause for land degradation due to water logging and salinity. It may be natural or man made, like poor natural drainage caused for sub soil condition, spilling excessive infiltration in higher table etc., Man made causes are seepage from canals,
supply and application of irrigation water to crops beyond the exhalation, lack of motivation for night irrigation, inadequate drainage, use of sodic water for irrigation.

Rajendra, Singh (2002) conducted study in a village of U.P. and examined how the villagers mobilized themselves for improving their quality of life by contributing in building ‘Johads’ (Ponds). The participation of the people promoted community to become self-reliant. He also examined that the economic production raises four times, villagers are mobilized to improve their quality of life. It is also pointed out that due to economic prosperity the rate of crime has declined. There is improvement in educational level; health consciousness etc., thus, the overall quality of life of the people has improved a lot in the entire region, owing to construction of irrigation tank.

Sheshagiri, et al. (2002) article outlines the successful implementation of lift irrigation project in tribal dominated village in Surat District of Gujarat. The findings indicate that the project plays a successful role in improvement of the quality of life and economic status of the people in the area, besides equipping them with a feeling of social empowerment and self-esteem. This co-operative project offers ideal solution for complex problem of distribution of irrigation water on the basis of equity. This article also pointed out some of the problems like conflict among the farmers, politicization of co-operative societies, non-availability of credit and lack of extension facilities etc.

Swain, Mamata (2002) examined the importance of WUA’s in terms of adequacy, timeliness and equity of water etc. The farmers should know
the cropping pattern and water supply. While making discussions regarding process of irrigation development, the farmers should be consulted in planning, design, construction, operation and maintenance system. Farmers should have sufficient and accurate knowledge about their local resources like land and water.

She pointed out some of the benefits of WUA’s; it will help for optimal use of water and help to settle disputes concerning to water distribution. Water Users Association encourages community responsibility; better collection of irrigation fees and controls water logging and finally it creates mutual understanding between farmers and officers. It also helps for enhanced income through the sale of water maintenance and contract. This Association also helps for smooth running of the scheme.

Reddy, V. (2002), carried out a study and observed that, at present the average yield per hectare for irrigated land is two to three tones as against expected yield of five to six tones. Though there is increase in irrigation potentiality there is less production. Further he added that, building a dam, constructing the canals and releasing of water is not an end of irrigation development, it is only the beginning.

He argued that irrigation means not only construction of dams, canals and releasing water but also a dynamic social system. A holistic approach including social phenomena such as social structure, cultural system, agricultural system and social history is essential to achieve an efficient and effective strategy for irrigation water management. He suggested two levels of water control. Delivery and Distributor System; it
is at the Farm level; water should be demand based rather than supply based. In order to make farmers more responsible and accountable, the existing policies regarding water charges need to be revised thoroughly. And also, the delegation of powers between the agency and beneficiaries should be done to collect and to utilize irrigation fees particularly.

Saxena (2003), in his essay "Initiatives in promoting water resources in India", highlighted the importance of irrigation. He stressed how irrigation plays a vital role in increasing the agricultural production and maximizes the benefit from this sector. He has cautioned that water should be used efficiently and carefully and it should be the primary duty to educate and re-educate the farmers about sensible and cautious use of irrigation water.

The researcher suggested some prerequisite conditions to tackle the problems of irrigation. These include careful crop planning, less water consuming and short duration crops, control water logging, introduction of appropriate techniques and discouraging flood irrigation.