CHAPTER II

REVIEW OF LITERATURE

Minor irrigation and agriculture development is an important subject particularly in LDCs (Less Developed Countries). Where the economy is mainly influenced by Agriculture sector. Hence to understand the significance of minor irrigation on agriculture development and to have knowledge of various approaches and concept by different authors of National and International, an elaborate review of literature is conducted pertaining to the study.

I. The book entitled as studies in minor irrigation with special reference to ground water written by B.D.Dhawan.

This book contain 12 chapters, the first chapter of the book is an introduction which deals with irrigation and type of irrigation practiced in India. This chapter contains information mainly on minor irrigation right from 1st five year plan till eighth plan periods particularly the ground water potential in India. The 2nd chapter of the book deals with India’s ground water resources which is a elaborative study infers information, the distribution of ground water in different parts of India depending on the rock structure and aquifer. Apart from this, two central points have been stressed in this chapter firstly the need for keeping (distribution) between stock and flow dimensions of ground water resource. It has been stressed the need for groundwater planing according to that utilization and annual replenishment. Secondly a substantial component of ground water re-chage from surface irrigation. The author also has stressed that the ground water potential in not fixed by nature but grows in volume due to man made efforts in
the shape of incidental re-charge from canals and irrigation works as well as artificial re-charge, from canals and irrigation works.

The 3rd chapter of the book contains ground water estimates of India. The apex ground water body namely the central ground water board has revised the estimation of different states.

The 4th chapter explains the impact of excessive exploitation of ground water the author has attempted to warn against more exploitation of ground water. He has suggested various regulation and enactment to prevent such over use of groundwater. In the 5th chapter of the book the use of tube well technology is dealt. It is proved that tube well irrigation is most economical one. This chapter is entitled as economics of tube well irrigation with special reference to India where in the external economy from tube well irrigation is also dealt. Similarly in the 6th chapter of the book the detailed empirical evidence with regard to tubewell operation is discussed with cost and benefit of it.

In the 7th chapter of the book the author has made an attempt to estimate the economics of ground water utilization. In this chapter the depth of water table, traditional technology, modern technology, low operational cost, high capital needs, size and fragmentation disabilities, methods of financial appraisals, the externalities due to ground water utilization in both long term as well as short term are discussed.

In the 8th chapter of this book the exploitation of ground water, in India is discussed. This chapter gives the information on internal and external economics from ground water. The traditional well and their contribution in exploiting the ground water, the modern ground water technology also discussed. While explaining the external dis-economies the author has stated, "a farmer alone is legally entitled
to put up a ground water tapping device on his farm but he is not the exclusive owner of groundwater underneath his farm. So far all practical purposes ground water becomes a common property resource whose exploitation by one farmer may impose external dis-economics on his neighbour who utilising the same source of water".1

The 9th chapter is sub titled as extend abilities of new ground water technology on small farmers. The advantages of new technology for lifting ground water by small farmers is discussed. The subsequent chapters explained about under utilization of ground water resources in India.

The 11th chapter of the book is on demand for Irrigation (A case study of government tube wells in Uttar Pradesh). The demand for irrigation is discussed on the basis of four variable such as 1) price of farm output 2) price of irrigation water 3) normal rainfall and 4) deviation from normal rainfall.

Thus the book is most informative and valuable for the study purpose. Elaborative information given on ground water and its exploitation by modern technology.


The author has made an attempt to conduct a micro level study of the area. The author has given emphasis for preparing a model project

at micro level for evaluation of the existing irrigation utilization, identifying key constraints and suggesting remedial measures.

The book contains eight chapters. The 1st chapter of the book is an introduction about Sharadh Saharyak irrigation system. The study area and the information on socio-economic features. The Sharada canal was commissioned in 1928 to provide protected irrigation for the area lying in Ganga Ghgra doab in central Uttarpradesh by diverting the waters of river Sharda at Banbusn in Nainitail district near Himalyan foot hills. It also gives information on irrigation potential increase from 1961 to 1987. Though the book namely deals with major irrigation i.e. canal irrigation the explanation and analysis will be useful to understand the impact of irrigation on agriculture development. The 2nd chapter of the book deals with agricultural practices and production mainly focusing on agricultural implements and consolidation of holdings, cropping pattern and productivity. In this chapter the researcher has collected information on the aspects of before and after irrigation. Though the irrigation was provided in this area through minor irrigation after linking the feeder channel of Sharda Sahayak in 1978. The discharge of water increased as a result it has lead to agricultural practice in this region.

After the Sharda Sahayak project in this area a sea change has taken place in cropping pattern and productivity. This can be seen by the statement made by the author. "In the present Sahayak area there is a vast change. Paddy which used to constitute just 2% of the cropped area is now grown in about 76% of the cropped area".²

The 3rd chapter of this book is mainly on irrigation and irrigation practice in the area of Utter Pradesh. In the study it is identified that the adequacy and regularity of canal water and irregularity and inadequacy. It is mainly due to lack of machinery to regulate the water supply in the entire area.

The 4th chapter of the book deals with farm development works. Under this subtitle the author has made on attempt to find out the main aspects of farm development such as topographical survey, planning and designing micro irrigation works construction of field channels field drains from roads, land leveling, shaping and banding. This depict the externalities of irrigation in the field of agriculture. The 5th chapter explains the impact of irrigation credit and agriculture extension in the region. The impact has been assessed by the author by collecting the data through sample survey.

The 6th chapter of the book is an evaluation and constraining in the region after sada channel in the region. In the study it is identified that the tail reach farmers are the worst forever of both inadequacy and irregular supply of water. It is also identified by the researcher that the level of production also lower among the farmers tail reach than the head and middle reach farmers.

Thus the book is a case study of an irrigation region. Hence the information given in the book is most vital for the study related to Tumkur district.
III Minor irrigation development administration written by B.S. Bhargava published in 1980 by Ashish publishing house New Delhi.

The book has 5 chapters the first chapter of the book is on introduction, the second chapter deals with minor irrigation development, 3rd chapter is the organisation. The 4th chapter explains excessively three minor irrigation projects, a detailed story and the 5th chapter confined to findings and suggestions.

The author has tried to explain the administrative system in the maintenance of minor irrigation in Karnataka. Though the 1st chapter deals about development administration, the second chapter mainly focussed on minor irrigation particularly with reference to Karnataka.

The 3rd chapter of the book mainly related to the organization of administration in planning and minor irrigation in Karnataka state. The author has mainly dealt with hierarchy of administration, the functionality and technicality etc. The 4th chapter of the book is a detailed study of three major tank in Bangalore district of Karnataka state. The major three tanks are 1) Obichoodanahalli Tank Scheme, 2) Maralavadi Tank and 3) Moragondonahalli Tank (Which are in the urban sprawl now). The author has given the detailed picture of these tanks comprising information about the width, the water level, the extent of area irrigated by these links etc.

The last chapter of the book is an findings and suggestions by the author. To define minor irrigation he has given explanation in his own words as follows. "Minor irrigation programmes include a large variety of schemes which differ widely in their technical features and scope. Some require specialised knowledge while others may just depend on
local skill and talent for satisfactory completion. The schemes also vastly in that some of them are private owned others by community and some state occurred and managed. Several of the schemes are amenable to public participation in the form of individual enterprise cooperative venture or public contribution. However minor irrigation works mainly comprise of (a) New work such as lift irrigation (b) construction of new tanks, increasing percolation of tanks (c) pick-ups or Bhandaras across small streams (d) repairs and improvements of existing tanks (e) desilting of tanks and (f) modernization of tanks and irrigation".3

His findings mainly related to administrative hardels in the maintenance of minor irrigation siltation misuse of water etc. similarly his suggestions are also most valuable to the current study in Tumkur district.


This book is most important literature to the present study because it contains information mainly with reference to impact of irrigation on agriculture. The book contains 10 chapter every chapter of the book deals with Irrigation and Agriculture Development in India.

The first chapter of the book is an introduction which gives bird eye view of Indian agriculture and irrigation emphasis the need for irrigation, adequacy of water resource, achievement of a critical perspective, the scope and limitations of the book and an over view of main findings in general. The introduction chapter gives the scenario of

Indian irrigation and its impact on agriculture. The second chapter of the book is on irrigation impact perception and misconceptions. The main aspects of this chapter are concept of irrigation, external effects of irrigation, intensity of cropping effects, yield impact of irrigation, area and output impact of irrigation, impact on crop pattern stabilization with irrigation and case study of problem of output are dealt.

To write the introductory chapter of the thesis, this chapter of the book has been very handy and useful, particularly the aspect of external effects of irrigation is referred to analyse the impact of minor irrigation on agriculture in the study area. To compare the irrigated agriculture and dry agriculture the author has given examples of scarlet Epstein studies conducted in South Karnataka in 1962.

"The socio-economic changes in two (adjustment) villages in Southern Karnataka one receiving canal water and other carrying on traditional, dry farming since the farmers in the irrigated village took to sugarcane cultivation in big way the demand for male labour needed for this purpose increased. This increased demand was met mainly from the dry village as many of the male inhabitants including farmers found year round employment on sugarcane farms as an attractive proposition in comparison taking out a (precessions) living out of dry farming in very uncertain rainfall conditions with this new employment opportunity these dry village farmers own dry cultivation received lesser attention (on) as it become increasingly dependent on female labour. This shift from male to female labour proved deleterious on female labour to land productivity in the dry village".

The aspect of impact on crop pattern also gives the clue to understand that the commercial crops are emerged by irrigation. The 3rd chapter of the book on methodology for assessing irrigation impact. Infact it is a most vital chapter in the thesis where the collected data analysed. With the help of this chapter several models have been adopted to assess the irrigation impact of them one is estimating productivity by source of irrigation by a formula of 
\[ y=b_1 \text{ CANAL}+b_2 \text{ TANK}+b_3 \text{ WELL}+b_4 \text{ VIA} \]
where \( y \) stands for aggregate, \( \text{TANK} \) stands for the area under tank irrigation, \( \text{WELL} \) stand for the area under Well irrigation, \( \text{VIA} \) is the unirrigated area, \( b_1 \), \( b_2 \) and \( b_3 \) are source wise overall crop yields per irrigated area under canal, tank and well irrigation respectively and \( b_4 \) stands for overall crop yield per irrigated. Thus the author has given several models to assess the impact of irrigation which has been very useful to the current study. The 4th chapter of the book deals on productivity of Indian irrigation. In this chapter the author has taken the data collected from the specific areas and tested with certain parameters such as irrigated versus unirrigated, land productivity, spatial variation, state wise up trends 1972-83, state wise comparisons, impact of irrigation on production productivity of irrigation per hectare cubic meter water etc.

This parameters are most suitable to present study, particularly to assess the impact of irrigation on agriculture. The 5th chapter deals with inter source differences in productivity of irrigated agriculture. Here the author has discussed about various source of irrigation in different states of India. The amount of water required by different crops in different states also delt.

5. Ibid
Chapter VI of the book deals on Income generation through irrigation to determine the income generation out of irrigation.

The author has taken several variables such as

a) Total income from agriculture  
b) GIA is gross irrigated area  
c) UIA is unirrigated area  
d) Rain denotes rainfall  
e) Time.

Taking the above variables he has assessed the income in different regions like Indus basin, Southern India, Ganges basin, the ocean plateaus, and he has found out the inter-regional differences.

The 7th chapter of the book is related to the role of irrigation in stabilizing farm output. To find out the stabilization of farm output due to irrigation empirical evidences of different states are taken into consideration study like Andhra Pradesh, Tamil Nadu, Haryana, Punjab, Gujrat, Rajasthan, Maharashtra, Karnataka, Uttar Pradesh, Madhya Pradesh and Bihar are chosen.

As the author has pointed out, the stability gain due to irrigation is much higher. More specifically, irrigation has lowered the coefficient of variation from 11.4 to 5.4 per cent in the case of output of all crops, from 11.4 to 6.4 per cent in the case of food grain output, from 9.3 to 4.3 percent, in respect of over all crop yield and from 2.9 to 1.9 percent in respect of crop acreage. Not unexpectedly, the stability gain in yield due to irrigation is much more than the corresponding stability gain in crop acreage.

6. Ibid.
The 8th chapter of the book deals protective performance of Indian Irrigation. This chapter mainly explains how irrigation protects Indian agriculture from frequent drought caused by monsoon climate. The author emphasized that among the various minor irrigation tube-well and deep well perform better. He has studied the impact of drought and normal output in agriculture state wise and stressed the need for going to minor irrigation particularly in the states like Rajasthan and Gujrat in India.

The 9th chapter of the book is on equity in sharing gains from irrigation. In this chapter the author intended to reanalyse the data to arrive at reliable estimation of incremental income due to the application of irrigation water to a hectare of a crop area. The case studies of Maharashtra, Tamilnadu, Punjab, Uttar Pradesh are taken for analysis.

The last chapter of the book is on agricultural transformation through irrigation. In this chapter the attempt has been made to discuss the policies for the development of both surface and ground water irrigation as well as the identification of a desirable crop pattern under irrigation conditions. As author has pointed out "Irrigation has performed reasonably well in India, on both production and stability counts. This is especially true for states where water or resource because of unfavourable rainfall conditions." In this chapter the crop pattern changed by irrigation application in different parts of country is discussed. Thus the whole book contains information on irrigation and agriculture particularly with refers to India.

7. Ibid.

It contains most valuable information regarding Indian agriculture. This book containing 36 chapters. The various chapter of this book deals with different aspect of Indian agriculture problems, prospects and remedies. The first chapter of the book deals about present agricultural situation in India. All the 36 chapters are in the form of research papers. In the 1st chapter the author has explained the present agriculture conditions in India with population projection and area sown. He also has estimated the required food grains in India by growing population.

The 2nd chapter of the book deals with food needs, supply possibilities and production technologies in AD 2000. In this chapter the author has emphasized the need for food supply and required technology to active the target of adequately food to India by 2000 AD. He has given the examples of development countries like Australia, Japan, U.K. as per the protein and colories in take in such countries compared with India.

The 3rd chapter entitled as agriculture challenges of the 1980 mainly deals with the strategies for becoming self sufficient in food production. Thus several chapters mainly focussed on Indian agriculture and agriculture production.

Particularly chapter 12 13 14 15 16 and 17 mainly deals with irrigation aspect with sub titles as water management for different irrigation, lift irrigation and development of ground waster resources, water management in rain fed agriculture drought prone areas, soils and moisture conservation a programme and watershed management
for the Southern region are most relevant to the present study. Chapter 12 of the book subtitled as water management for efficient irrigation clearly explains the amount of water used to grow different crops like rice, wheat, sugarcane etc. An estimation is also given by the author. It is also pointed out that the water is misused on several occasions. This can be reflected from the statement made by author. For instance in heavy rainfall area the natural water course are deep and it is therefore possible to build suitable structures and hold the water through out the end of the season and make it available for growing some crop after (wheat) the main crop is harvested. Similarly holding in the form ponds will make it possible to give life saving irrigation at critical times are even to take up to double cropping. "It is not uncommon to see rice crop suffering due to prolonged breaks. During such periods there is usually a good underground water source which can be tapped, lifted and used for irrigation to stabilize the production of rice. More attention is required to be paid to such measures of harnessing unused reorsce. If these resource are fully tapped it will be possible to stabilize the production of a "crops."  

Thus the author has given several valuable suggestions which will be taken up for the current study. Similarly chapter No 13 titled as lift irrigation and development of ground water resource is another important chapter to understand the technology of lift irrigation. The uneven distribution of rainfall in a given region is discussed in this chapter and the exploitation of ground water from the water table also

Another important chapter of the book is (14) water management in rainfed agriculture. The author has made an analytical study of rainfall distribution in India and the wastage of rainfall water without proper plan also dealt. To explain with example Karnataka state is taken as case study where 26 different rainfall zone found. According to rainfall in each region the possible crop cultivation such as paddy, jower, maize, etc. are suggested by the author. Chapter of 15 of the book is on drought prone areas where different type of droughts are discussed. As author has stated. "Drought prone areas is the uncertaining of rains. Once does not know when there will be rain and of what magnitude". He has suggested various possible method through Drought Prone Area Programme (DPAP) to improve the agriculture in such region.

The 17th chapter of the book deals on Watershed Management for the Southern region. The amount of rainfall occurs in different states of Southern regions are taken into consideration to analysis the watershed management. Author also stressed the need for consolidating the holdings for better water management. He has divided the southern region in-to three subdivision such as west coast, the hilly area, and the plains where amount of rainfall varies in these three different zones. He has also suggested various remedies to manage water in the southern region. Thus the book is most useful to understand the agriculture and irrigation practice in India.

9. Ibid.

This book is a latest addition to the field of irrigation. It contains 35 chapters all the chapters are dealing with irrigation system and practice in India. The chapter listed are water resources, soils and crops water relations, Plant water relationships, Air transpiration, Water equipment of crops, Measurement of irrigation water, Scheduling irrigation, Surface methods of irrigation, Sprinkler, Surface methods of drip irrigation, Irrigation efficiencies and water efficiency.

Irrigation of principal crops, Suitability of irrigation water, Drainage, Irrigation systems, Minor irrigation localization, Land development for irrigation, Cropping pattern in command areas, of use ground water, on form development. Aggregate crop water demand in irrigation projects, Optimum utilization of irrigation water, Preparation of operation plan for canal irrigation system. Command of area development programme. Farmers participation in irrigation water management, Modernization of irrigation systems, Production functions of irrigation, Water irrigation management information systems, Processing of irrigation water, Water laws and irrigation acts etc. Right from 1st chapter to the last chapters are relevant to the present study. All chapter deals with irrigation aspect only.

The first chapter of the book contains information on water resources in general giving the world scenario of water resource. The area under irrigation in different countries of the world also is given. Apart from containing information on Indian irrigation. Chapter eight is a scheduling of irrigation. This chapter explains the budgeting of water to different crops with the help of formulas.
Similarly ninth chapter of the book deals with surface methods of irrigation where different methods like border strip method, furrow irrigation, surge irrigation and subsurface irrigation are discussed.

Chapter ten and eleven discusses about sprinkler irrigation and drip irrigation. Chapter No.25 explains about optimum utilization of irrigation water since water is a scarce and expensive resource the author has made an attempt to explain how water should be utilized for irrigation purpose. Thus each chapter have become useful to pursue the research on the selected topic.


This is a study made by three authors which was sponsored by advisory board of energy government of India. The study is in the form of project which deals with scope and limits, methodology, the present serious and future demand of energy for agriculture in India.

The book contains four chapter the first chapter of the book is on Introduction which contains scope and objectives of the study. Basically India is an agriculture country where agriculture depends on rainfall. In order to provide irrigation to agriculture land particularly for minor irrigation energy is required. In this chapter the authors have emphasized the need for energy to extend irrigation. The parameters set by the author are.

1) Energy demand the estimated and projected in relation to only the commercial or conventional form of energy (i.e. fossil-fuel based). That is electricity and petroleum product.
2) Demand estimations and projections are restricted to six major crops such as paddy, wheat, sugarcane, cotton, oil seeds and pulses.

3) In order to represent different agriculture climatic zones and prevailing levels of agricultural development, the demand estimations and projection each of the six crop to be worked and for each crop in each major states in India.

4) Energy demand estimations for each of the six crops in each state are to be made in relation to crop production, harvesting and threshing only. In other words energy demand estimation would exclude the operation beyond threshing. Given the above parameters energy demand model report have the following objectives.

1) "To estimate and project energy demand for each crop in each state operation for covering both direct and indirect energy inputs.

2) To estimate and project energy elasticity of production and energy intensities for each crop in each state.

3) To estimate and project above energy demand data in relation to farmers categorize according to levels of technology used.

4) To present the above results in relation to 1989-90-1994-95 and 1999-2000".10

The 2nd chapter of the book contain assumptions and methodology. In this chapter six aspects are taken they are

a) Categorization of area under different levels of technology.
b) Fertilizer consumption under different levels of technology.
c) Energy input from pumping irrigation.
d) Energy input from tractor operations.
e) Energy inputs from threshing
f) Distribution of Energy Input over Areas under different Technology levels.

Here modern, transitional and traditional methods are being discussed. The 3rd chapter of the book is one energy scenario for the base year 1981-82. The energy scenario is examined on the basis of three dimensions.

1) Source-wise energy input
2) Energy intensities for crop production
3) Energy elasticity to crop output-state wise data of India is taken for analysis.

The 4th Chapter of the book deals about forecast of Energy demand. Taking the major six crops grown in different states into consideration the forecast has been made by the authors. The energy projection for 1981-82 to 1999-2000 has been made with related to six major crops like paddy, wheat, oil seeds, pulses, cotton and sugarcane. The empirical data clearly shown in bar-graphs as well as wheel graph both crop wise and state wise. Thus this book is a good reference for analysing the energy required in agriculture.

It has been published in the book form which contains 4 parts of 17 papers presented by different eminence in the field of agriculture and irrigation.

The first part of the book deals mainly on utilization of existing irrigation facilities. On this aspect seven authors have written the papers the first paper is related to concept of irrigation and problems of Measurement by J.S. Sarma. In his paper the author has stressed the need for maintaining separate statistics for unirrigated and irrigated areas by sources and crops and scoring uniformity in the concepts and definition used in irrigation statistics similarly the 2nd paper presented by Gopinath who concedes the practical difficulty in evaluation of irrigation efficiency. Another two authors Y.K. Murthy. R. Ghosh have dealt on utilisation of irrigation facilities and its potentiality.

The 5th paper of the first part deals mainly on A dynamic approach to irrigation development and irrigation utilisation by P.R. Michael. The author has narrated the irrigation progress after independence in India. He has pointed out some aspects like changed role of irrigation in Agricultural Development, Limited of Surface irrigation in the changed context, lack of management during seasonal supplies. Ground water works, need for ground water legislation etc.

The 6th paper deals with water co-operatives for utilisation of Irrigation potential in Gujarat, which is a joint work by V.N. Asapa and B.L. Tripathi. The authors have discussed the problems and prospects of
co-operative organisation in the use of irrigation water for agriculture. The authors have taken Gujarat State as case study.

As authors have stated, "water co-operatives could serve as the organisational and operational mechanisms by which farmers could participate in the decision making processes relating to water scheduling, rotation periods and other aspects of water management"\(^{11}\). While stressing the need for water cooperatives they explained the modality of water cooperation. By studying this kind of literature the mechanism of water management in the study area may be suggested.

The 2nd part of the book mainly focussed on Investment in irrigation and returns on investment irrigation. This part contains 4 papers which deals with input-output aspect of irrigation. The four important papers are 1) Economic yardsticks for irrigation projects: Review and perspectives by N.V.Sovani, 2) Input of different sources of irrigation on input output Relationship, cropping pattern and farm practices by T.V. Moorti. 3) Return from investment: An area of increasing concern by V.K.Srinivasan. 4) The current method of choosing irrigation projects in India: A Review by NILAKANTHA RATH are the best articles to understand the impact of irrigation on agriculture.

The 3rd part of the book contains information on National Policy on underground/surface water use. There are six articles written by different eminent authors. The 1st paper is on new challenges before Indian agriculture by V.K.R.V.Rao, a famous economist. Second paper written by B.B.Vohra on a policy for water.

\(^{11}\)V.N.Asopa, B.L.Tripathi, Role of irrigation in the Development of Indian Agriculture, 1976.
Similarly 3rd paper deals with growth of irrigation in India. An outline of performance and prospects by C.H.Hanumanth Rao. The 4th paper is on role of irrigation in Integrated Area Development planning by Lalit.K.Sen. Where as the fifth paper of this part discuss on integrated approach to utilization of surface and underground water. And the last paper of this part deals on Ghataprabha and Malaprabha Irrigation Projects: A case study in command Area Developments by P.R.Dubaashi. Thus the 3rd part of the book is more informative for irrigation.

The 4th part of the book contains proceedings of the seminar particularly report on session IV which is a policy recommendations is more relevant information. It is a sum up of all the papers. One of the recommendations is the National Policy of water. Thus, this book is a good literature for the study of Minor irrigation and its impact on Agriculture Development.

WATER MANAGEMENT IN INDIA, CHINA AND JAPAN

IX Water Resource Management: Institutions and Irrigation Development in India by A Vaidagration, Oxford University Press, New Delhi, 1999:

The book is not mainly about India nearly half the book irrigation management in China and Japan. The book comints of four chapters. The first and fourth chapters are based on author's research as a visiting research fellow at the Institute of Developing Economics, Tokyo in 1982. While the first chapter deals with irrigation institution in China, Japan and India, the second and third chapter in India and the fourth chapters deals with the China in a more comprehensive.
The first chapter covers relations between water control and agricultural production, lot of irrigation institution in acquisition, conveyance and distribution of water, including system maintenance and its sustainability. Since these chapter is based on earlier research in Japan, China and India, the comparative illustration are drawn from these countries.

The central argument of this chapter is that a proper understanding of the form and effectiveness of irrigation organisation requires that their structures and functioning be viewed in the content of agro-climatic, technological and socio-economic environment in which they operate.

The second chapter reviews the salient features of India's Irrigation development during 1950-90, the problem that have emerged, the responses such problems have evoked and the reasons for failure to eliminate these problems. The author is of the view that Indian plan have accorded high priorities to irrigation sector and consequently investments have been made in this sector. As a result irrigation facilities have made a major contribution to sustaining agricultural growth during the past five decades. At the same time the performance of irrigation sectors, particularly that of public sector, has not matched the expectation both in terms of pace of development and use of facilities and their impact on productivity of land. He lists a number of problem which have during 1950-90. The ones highlighted by are inordinate delays in completion and escalation of large surface projects, under utilisation of their irrigation potential, unsatisfactory of quality of irrigation, low cost recovery and sustainability of such projects. In addition, the problem which have led to ecological and environmental degradation on account of water logging caused by major and media in
the surface projects and problem of salinity and groundwater saturation on account of its excessive extractions.

The third chapter entitled 'Aspects of Institutional Reform in Irrigation' focuses on institutional features. The author's explain on institution is due to his contention that institutional deficiencies are the root causes of many of the problem and that restructuring the management structure is a sine quanon for tackling such problems. He spell out the directions of reforms in these key area: a) Planning and operation of large surface systems b) Rehabilitation and expansion of local irrigation works to benefit rain-fed agriculture through integrated watershed development and regulation of groundwater.

The 3rd area of reform dealt with in the chapter relates to irrigation of groundwater sustainability is more relevant to present work. On account of historical antecedents, comparatively smaller investment requirements, easy manageability and Government encouragement and support to the farmers, groundwater development witnessed a phenomenal including in all parts of India.

This has led to twin problem of salinity and groundwater saturation. In the midst of such a scenario, two opposite view have emerged. On the one hand, there are the water market proponents who argue in favour of its feels uses. On the other, there are regulation proponents who asks for strict control and enforcement of a legislation in this respect. The author suggests a number of steps to be taken by the Government to regulate the excessive extraction of groundwater. While some of these delete to measures, restricting government encouragement and subsidies to farmers, the others relate to regulating mechanisms. The author lays special emphasis on forcefully and continuous by publicizing emerging trends and their consequences in
specific endangered areas by dramatizing potential dangers in such areas.

The fourth and the last chapter examine the organisation and management of water control in China in a historical perspective. A postscript on post 1979 reforms has been added to the chapter based on paper presented in an international conference on irrigation managerial transfer held at China September 1994.


In India, about three-fourths of the population are dependent on agriculture for their livelihood and more than 30 percent of the gross cropped area is under irrigation and the remaining area is still dependent on the vagaries of rainfall. That productivity of irrigated land is considerably more than that of unirrigated one is an accepted fact--under Indian climatic conditions, the productivity of irrigated land can be increased from four to six times than that of unirrigated land. Despite the green revolution the per hectare yield of (irrigated) rice in India (1.8 tonnes) is much less than that of China (3.7 tonnes) and Japan (5.5 tonnes). However, the production of foodgrains in India increased from 60 million tonnes during the mid-1995. This increase in output has been possible primarily due to increasing irrigation facilities. Though major and medium irrigation projects serve more area under cultivation, the smaller irrigation projects such as tanks and wells also serve a considerable extent of cultivated area. In fact, there has been considerable difference in output per hectare of land under different sources of irrigation such as canals, tanks and wells. This is the
aspects elaborated in the book under review in the context of the Telangana region in Andra Pradesh.

The book under review, is based on the author's Ph.D work. In the introductory chapter, using available surveys the author has brought out an important fact that in Indian agriculture there is little scope for increasing productivity by new agricultural technology and the only alternative strategy for increasing the total output is expanding the proportion of irrigable area in the total cropped area. While describing the relative position of different sources of irrigation the author's contention is that major and medium irrigation projects (such as canals) have better prosperity compared to smaller (tank) irrigation projects. This is because of state intervention and the government's policy to provide irrigation facilities to larger cropped area with subsidized irrigation charges. In the major and medium irrigation projects the modernization process of the canal system by the government helps the farmers to benefit more without spending money or more efforts., which certainly created regional imbalance in agricultural sector especially when compared with the farmers who use other form of irrigation such as tanks and wells. At the same time, the vagaries of monsoon, poor maintenance of irrigation structures and meager allocation of funds to tanks have reduced the tank irrigation's share in the total irrigated area. In both canal and tank irrigation the investment made on the beneficiary farmers is very limited. However, in well irrigation the entire cost of wells in borne by the individual farmers. The author stress the fact that as each source has its own advantages and disadvantages only the conjecture use of surface and subsurface water can make a sustainable pattern of water use in agriculture.
In chapter two, a detailed analysis of investment made in the major, medium and minor irrigation projects in India over a period of four decades is presented. This is followed by the relative position of irrigation in terms of ultimate irrigation potential, potential created and potential utilised among different sources of irrigation in the states of India has been discussed in greater detail. After independence India's agriculture has developed considerably facilitating self reliance in foodgrains production especially after the mid-1960s. The overall analysis indicates that major and medium irrigation sources have been receiving a better share of investment than the minor irrigation sources in almost all the plan periods including the eight plan (more than 5 percent of the total plan outlays or Rs. 22,400 crore). Minor irrigation accounts for a small share of only 1.38 percent or Rs. 5,977 crore of the total eight plan outlay. However, the total irrigation potential created in the major and medium irrigation sources was only 37.9 million hectares but for minor irrigation it was 61 million hectares. Moreover, 56 percent of the ultimate irrigation potential under major and medium irrigation projects have been tapped (up to 1991-92) but for minor irrigation the percentage shall being 91.4. On the basis of the above data the author has observed that minor irrigation sources have been more efficiently utilised than major and medium irrigation sources.

The findings of the analysis of investment on irrigation as well as the potential created and utilised for major, medium and minor irrigation projects at the all India level is confined Andra Pradesh. In chapter three, the methodology adopted for estimation of productivity and efficiency of crop enterprise under different sources of irrigation is discussed. The study is strengthened by both the secondary and primary sources of data. The 225 households (each 75 from canal,
tank and well irrigation sources) selected for primary sources was filtered from districts to mandals to villages to households.

In chapter four, to cross-check the hypotheses formulated in chapter one of the study, the author has examined some aspects of social and agro-economic condition of the selected sample households. Analysis of socio-economic data covering population levels of literacy, economic states of farmer and occupational structure of workers under the sample households reveal some interesting results, canal irrigation, considered as an assured sources of irrigation appears to limit family size, the percentage of literacy level is decreasing from canal to tank and further to well irrigation the higher educated persons are found more in canal irrigation areas and large farmer category under different sources of irrigation. It is also inferred that the canal irrigation reduces the dependency ratio of males and increases the female ratio. The result also shows that the percentage of females agricultural workers more than of males in all the three sources of irrigation.

Regarding the distribution of different sources of irrigated area the author has observed that the average irrigated area performance is found to be increasing with the size of operational holdings. The discussion on cropping pattern portions to only on major crops such as paddy, groundnut, sugarcane, cotton and chillies. Paddy is the predominant crop on both the Rabi and Kharif seasons followed by groundnut in canal irrigated areas and cotton in tank and well irrigated areas. Irrigation intensity is the highest in canal areas followed by well and tank irrigated areas. However the difference in irrigation intensity is negligible in later category of sources.

The main purpose of providing irrigation is to acquire more profits by achieving maximum productivity. Since the quantum of supply
available to farmers differs considerably from source to source. The productivity of land profits accrued from them also vary significantly. Apart from different sources of irrigation, the type of inputs used by different categories of farmers (large, medium and small) is also a major factor which affects the productivity and profitability substantially.

This core aspect is dealt in chapter five. The overall analysis indicator that farm size and productivity are positively related in canal and tank irrigated areas, where an medium six farmers category is the highest producing category in well irrigation. Regarding cropwise analysis it is found that groundnut crop is more profitable than paddy under different sources of irrigation. The author observation on the benefits accused by large farmers is notable: "due to higher investment in the form of valid been an labour, fertilizer, tractorisation, etc., the larger farmers category is getting higher returns per acre than other categories in canal and well irrigated areas. This complication also holds goods for marginal category in tank irrigation".\(^\text{12}\)

In chapter six, the author has estimated the efficiency of farm economy through per area input costs for paddy, groundnut and all the five selected crop put together separately. The analysis reveals that when compared with tank and well irrigation, canal irrigation is the most efficient and that the intra-size comparison shown that efficiency is inversely related to farm-size in all the three sources of irrigation.

To evaluates the economic efficiency of farmers to achieve maximum productivity by using their resources under different sources of irrigation the author has used the cobb-douglas production functions analysis for selected crops (paddy and groundnut) and found some

\(^{12}\)Sanjeev Reddy; Different Sources of Irrigation A case study of the Telangana Region, Manak Publications, New Delhi, 1997.
interesting results. The results of the sources efficiency ratios of marginal value productivity to marginal cost show that utilisation of fertiliser in tank irrigation and irrigation charges under all the three sources of irrigation has been less than optimal level and hence there is possibility for increasing their inputs to get more income. The author's analysis and the results for the use of organic manure and pesticides application does not conform to general expectations. For intense, under, tank irrigation farmers apply more organic manure and also relatively spend more money for pesticides application. But farmers under canal and well irrigated areas use manure and apply the pesticides.

ARTICLES:


In this article the author says that only in integrated intensive farming system noted in the principles of ecology, economics, equity and employment generation will helps us to meet the challenge of population explosion. He has emphasized the system approach and a high degree of vertical and horizontal integration of programme will ensure success in various fields. The author has made a comparison between India and China interns of food security and population growth. He also explained the Gandhi Vision on a hunger free India. In the article definite measures are suggested by the author to have sustainable food security.

In this article the author has mainly discussed about green revolution in India. The various aspects like green revolution and food security, consumption pattern, national agriculture research system, research and production advances are discussed as "Tracing the transformations of India from an importer of food grains into an exporter in the post independent era, the author says that we would be able to usher in a second green revolution only by increasing the productivity of the land rapidly making the dryland more productive through hybrids, watershed approach and farm mechanism. Paying Kudos to our agricultural scientist for the spectacular performance on the food front, he underscore the need to redefine our priorities and plan of future strategies to evolve a more efficient and sustainable food security system. Only through judicious use of land, water biological resources and technology the challenge of growing domestic and export needs can be effectively met and sustainable agriculture growth insured.\(^\text{13}\)


While discussing the importance of agriculture in India the author has dealt with population, land and work force. However he has mainly focussed on agriculture. He has stressed the emphasis of agriculture sector in 9th plan period. He has stated that in working out

\(^{13}\) Indian Agriculture: A Saga of success and challenges ahead by H.S Paroda, Kurukshetra, August 1999.
the production potentials in the agriculture sector, the approach of agro-climatic planning is to be vigorously pursued.


The author has assessed the 50 years performance of Indian agriculture. He has discussed the recent performance of agriculture sector and listed out various strategies during 9th plan period. To mention a few, North Western high production region, eastern region with abundant water, water scarce region Irrigation fertilizer seeds credit etc. Apart from agriculture he stressed the need for strengthening the allied sectors like horticulture, plantation, fisheries Animal Husbandry, etc.


In this article the author has stressed the need for globalizing Indian Agriculture from the export point of view. In his paper he has discussed the significance of Horticulture crops, dry land farming and biological software library, water as a national asset. Stressing the need for dry land farming he has stated that there is a need for flow of investment in dryland agriculture, which is insignificant at present. It can be suggested that if a part of the huge funds allotted in the 9th plan for famine relief in the event of drought could be spent for proper nutrition of poor dry land soils and crops, the recurring problem of famine could be solved to a great extent.14 Explaining about water as an

asset he has called selective and systematic approach to judicious use of water at micro and macro levels.


B.D.Dawan being an irrigation expert has examined the productivity of land under irrigation and different type of irrigation. He has stated that ground water irrigation is much more production augmenting than canal irrigation. So emphasis should be given for ground water irrigation rather than major irrigation project.

He also has suggested the need for changing cropping pattern in order to enhance the productivity of irrigation. The income gained from irrigation between small and large farms are also discussed. The author has stressed the policy implication for implementing ground water irrigation.


The author discussed the importance of watershed development particularly in dry land. The article has 4 phases such as watershed: A drought proofing mechanism, Theoretical under piononaning of sustainability and participation. Farmers participation in watershed regions and sustainability in watershed. In his article the author has pointed out the significance of using local resonance for watershed development and participation people in this programme.

The authors have discussed the rainfed agriculture typology for the dry land arid and semi arid tropics of India by using the predominant crops in the districts as a key integrator variables.

They have selected the variable like dry land semi Arid Tropics of India’s District level data and clustering district to suggested the crops to be grown in different region having rainfalls and climatic conditions. They have divided the entire India into 23 crop zones selecting few districts from each zone to analysis the type of crop to be grown.


This article shows the result of an analysis of state level data on area and output of 43 crops for the 30 years from 1962-65 to 1992-95. It reveals that there was a marked acceleration in the growth rate of agricultural output in India during 1980-83 to 1992-95 as compared with earlier period.

Further more agricultural growth had become regionally much more diversified. The authors have discussed the levels and growth of gross cropped Area with 43 crops and net sown area taking Haryana, Himachal Pradesh, T&K. Punjab, U.P. North West Region, Assam, Bihar, Orissa, W.B, Gujarat, M.P, Rajasthan, Karnataka, Kerala, A.P. and T.N. The cropping pattern changes during the 1980s also discussed.

The authors have studied the data base from Karnataka state. As the authors stated the state had about 50% each of the irrigation dug wells and bore wells owned by small and marginal farmers. To study the equity they have taken the well failures of different farmers. Equity in access to ground water is of concern as ground water offers considerable potential to enhance land productivity. In addition to the existing inequity in land holdings the inequity in access to ground water further widens the skewness in asset and income distribution.


The author has explained the advantages of drip irrigation, the cost benefit the source of loan and the government policies for drip irrigation. It is estimated that cost of drip irrigation varies from 5000 to 15000 per acre depending on crop. As the author has pointed out in India about 20,000 hectares of land under drip irrigation.


In the introduction the authors have discussed the significance of ground water in Indian Agriculture. As they pointed out, in India about 33% of the net sown area is under irrigation where ground water and surface water have equal share in the gross irrigation. They have
discussed the cropping intensity, investment particulars, irrigation cost. They have also analysed the gross and net returns, feasibility of investment in ground water irrigation.


The author has explained the present system of operation, management and distribution of water in surface irrigation in India and water control institutions in Japan and makes out a case for the relevance of it in India. Author was given a brief introductions about irrigation system in India. He has explained the irrigation pattern in South India and North India. His analysis mainly based on canal irrigation. He has structured more an (CADA) Command Area Development Authority.

In the second part of the article the author has narrated water management system in Japan. The irrigation system in Japan is comprehensive package programme called Land Improvement. This programme includes irrigation development water use, drainage and flood control and consolidation of land holdings. This project is exempted by the Land improvement Districts. It is a kind of co-operative organisation established wherever farmers want improve their farm lands. The land improvements districts have the membership of actual farmers. The LIDs have agricultural water use organisation as its substructure.

Thus the LID in Japan has been doing good work as per as irrigation system is concerned. Infact as author has stated in Japan there are about 8,776 such LIDs which covers 3.4 million hectares of
land with 4.8 million members. And it covers nearly 70% of agricultural
land. The other functions of LID is operation and maintenance of
irrigation. Thus the author has made a comparison of irrigation
maintenance system in Japan and India.
KARNATAKA
STUDY AREA
TUMKUR DISTRICT