Chapter-II

DESIGN OF STUDY-ROLE OF IRRIGATION IN AGRICULTURE
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In this chapter an attempt is made to design the study and to explain the role of irrigation system, macro level data is collected with regard to Karnataka and Agriculture Development. In this background of minor irrigation however primary data is collected through survey to establish the fact that minor irrigation and agriculture development go hand to hand.

The entire thesis is presented in seven chapters which will start from the introduction, leading to role of irrigation and economic development. A Special study is made in Tumkur District, in all the Taluks choosing fifteen farmers in each village. Finally conclusion and suggestions are drawn.

Firstly Bio-fertilizers can be used as low cost inputs to increase crop production.

Bio-fertilizers:

“Agriculture is one of the most important sector of the Indian Economy. More than 70% of the total active population relies on Agriculture and this sector represents 7% of the Gross Domestic Product (GDP). The Rice and Wheat are the most profitable crops in irrigated lands while millets, pulses and oil seeds are most profitable
option in dry land areas. Farmers devote their land to agricultural production that has made India self sufficient in food production.”

Bio-fertilizers can also play a pivotal in sustainable agriculture, because of consumption of chemical fertilizes was 1431 million tonnes during 1996-97. India has to go along way to increase the fertilizer consumption to produce sufficient food grains to meet the food security and nutritional needs of the growing population. Bio-fertilizers include Nitrogen fixing micro-organisms; viz, Rizobiam spp. Azospirillum spp. Bradyrhizobium spp, Azotobacter spp. Frankia; Phospho micro organism viz., phosphate solubilizing bacteria, glomas spp, phosphate solubilizing fungi; compost in inoculant viz., cellutic or lingno lytioc fungi; etc. These bio-fertilizers are cheaper when compared with chemical fertilizers and help in reducing the consumption of chemical fertilizers. They reclaim potentiality of the soil and provide good soil-health. Bio fertilizers are non-polluting eco-friendly and provide better crop yields and uptake of plant nutrients.

Bio-fertilizers may be applied by different methods, viz., seed treatment, seeding treatment, tuber/sets treatment and oil-treatment. The seed treatment showed that 483 of carrier based culture is sufficient to inoculate 10-12 kg, medium sized seeds required for 1 hectare of land.

The quantity of culture depends upon the size of seed as it is directly proportioned to seeds. In seeding treatment a suspension of 1-2 kg of bio-fertilizers in 5-10 litre of water in a shallow container is

prepared. The roots of the seedlings to be planted in 0.4140 hectares of land.

In Tubers/sets, a slurry is prepared containing 2-4 kg of bio-fertilizers in 40-80 litres of water. The tubers or sets are dipped for 10-15 minutes before sowing in the field. The soil treatment is practiced in standing or plantation crops.

During this millennium when population has crossed 1. billion, it is necessary to promote bio-fertilizers. Through training programmes, dissemination of information pertaining to bio-fertilizers and their use in agriculture and related field for the benefit of the farmers etc. In 1983, ministry of agriculture launched National project on "The Development and use of Bio-fertilizers to produce, distribute and promote the good, " under United Nations Development Programme, a National Bio-fertilizer Development Centre was established at Bangalore (Karnataka) Bhubaneshwar (Orissa) Hissar (Haryana), Imphal (Manipur), Jabalpur (Madhya Pradesh) and Nagpur (Maharashtra) and those started functioning in 1991-92.

Thus to improve agricultural productivity and increase farm income (due to low investment on bio-fertilizers), there is need to use bio-fertilizers. It production done at large scale the marketing cost may be reduced by greater liberalization of the input markets. This would bring higher productivity when compared with chemical fertilizers.

If bio-fertilizers supplied through National Demonstration projects and operational Research Projects in rural and remote villages, it would bring the Re-green revolution through bumper crop production.
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**Pulses and Agriculture Development:**

Pulses are the main sources of protein for populations of our country.

Importance of pulses is providing environment security arc as follows. Pulses are equally important for maintaining soil health and sustainability of different cropping systems. By virtue of being a restore of soil fertility, pulses have a unique position in cropping systems and dry land or rainfed agriculture. Due to tap root system, these crops opened up soil by which soil accretion, improves.

The heavy passes can fix large amount of nitrogen through symbiosis and thus minimize dependency on chemical fertilizers, which leads to environment pollution. Hence, pulses have a vital role in improving soil health and ensuring environmental security.

In discussions on the performance of Indian Agriculture since independence, it has now become customary to divide the reference period into two main parts, the dividing line usually being the two years in the middle of the 1960. i.e., the years 1965 and 1966.

From the integrated rural development approach to a technology oriented agricultural production approach. The new strategy emphasized the application of modern science and technology to agriculture supported by substantial investment in modern inputs, and price incentives for farmers to adopt them. 2Thus the main strand of the strategy of agricultural development in India since the mid-1960's

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is a superior agricultural technology based on modern scientific research.

The New Technology, which was introduced in Indian Agriculture in the late 1960's as a part of the new strategy of Agricultural development, it based on some newly developed crop varieties generally know as the high yielding varieties (HYV). As their name suggests, there new varieties are capable of giving yields much higher than those of the traditional varieties especially when they are used in combination with a number of complimentary inputs, such as fertilizers and water.

These high yielding varieties (referred hence fourth HYVs) posses certain distinctive physiological attributes which are of significant implications.

The new Technology in the form of HYV fertilizers water package also calls for careful and intensive intercultural operations. First, the plants require the fertilizer water input at particular stages of growth. Secondly, as fertilizer can be observed by weeds as well as by plants, effective weeding is required to prevent waste of expensive fertilizers. Thirdly, while H.Y.V. seeds give higher yields, they are more prone to damage from excessive watering. For example shorter stemmed dwarf varieties are more liable to be flooded.

They thus require more effective water control and better drainage. Fourthly being relatively new and non acclimatized strains, they are more prone to local pests and diseases than established indigenous varieties and therefore to be protected by pesticides and germicides.
In raising crop-yields per unit of land, and in making it possible to raise cropping intensity of land, HYV seed fertilizer, water package has the same effect on agricultural production as that of an increase in the total land resources. This land augmenting character of the new technology makes it very appropriate for Indian conditions, where cultivatable land is becoming increasingly scare with the continued rapid population growth.

**Measures Taken to Promote Adoption of New Technology:**

Technical appropriateness of the HYV seed chemical fertilizer and water package is one thing while effective implementation of the new technology in the farmers fields is quite another. Adoption of the new technology package of farmers would require along with other things.

A) Irrigation facilities to ensure controlled supply of water for crops.

B) Effective extension service to help farmers in adoption of new practices.

C) Adequate supply of such inputs as HYV seeds fertilizers pesticides etc. in appropriate time and at prices affordable to the farmers.

D) Provision of credit to much requirements of increased farm investment on purchase of inputs of new technology, installation of pumpsets and such other things.

E) Facilities for marketing the increased volume of farm products at remunerative prices.
In trying to assess the performance of the new agriculture strategy, the first thing one tends to consider is its contribution to agricultural growth. It is, therefore, questioned whether introduction of the new technology and led to any enhancement in the pace of agricultural growth in the country. To answer this question it is necessary to compare the growth experiences of Indian agriculture since the later 1960's with those of the 1950s and early 1960's.

Tracts of any possible declaration in the growth of Agricultural production since the late 1960's do not come up with any significant positive evidence in support of the decelerations hypothesis.

The impact the strategy was however less spectacular on the production of rice-India's number one food crop.

India ranks seventh in the world in items of Area, but its population of 1020 million (2001) makes it the second most heavily populated country in world. Agriculture is the main stay of Indian Economy and over 70 percent of the population depend on it for their livelihood. The output from agriculture being dependent on timely onset of monsoons and its proper distribution over the crop period. The annual, output of food grains has been unsteady. This has resulted in frequent shortages of food requirements should have no occasion to import food grains.

**Scope for Irrigation Development and Progress:**

As already mentioned, the success of agriculture is dependent upon adequacy and timely occurrence of rainfall during the crop

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period. But the characteristic feature of rainfall in India is its liability to serious deficiency or even total failure in critical periods.

Nearly 70 percent of the cultivated area in the country lies in regions of medium to low rainfall. Where water deficiencies lead to drought conditions. Provisions of irrigation facilities is thus a necessity both as a measure against drought and for increasing agricultural produce.

The estimated total usable water resources of the country available for irrigation will not be adequate to cover more than about 50-60 percent of the cropped area. Further, the distribution of irrigation facilities will not be uniform from region to region and state to state. In most areas where water resources are insufficient in relation to the requirements of cultivated area, the aim will be to secure the maximum crop production per unit of water. In the case of low rainfall areas, if water can be made available, either from local source or by transfer from a neighbouring basin, it will benefit a large section of the community, which has no alternative of economic betterment. While considering future policies, it is necessary to keep in view that in developed countries like the United States, Australia, Japan, etc. the number of people depending on agriculture is very large and their land holding are very small. Creation of facilities of multiple cropping and provision of necessary inputs for increasing the yields hold the key for improving the economic conditions of the large population engaged on agriculture.

On present estimates 107 million hectares of land can be ultimately irrigated both from surface and ground water resources.
Their breakup being 72 and 35 million hectares respectively. Irrigation projects are classified into three categories, viz., minor, medium and major for administrative convenience. Projects costing up to Rs.25 lakhs (Rs.30 lakhs in hill areas) are classified as minor and are dealt with in the Agriculture sector. Those costing above Rs.25 lakhs and up to Rs.5 crores are classified as medium and those costing above 5 crore are major and dealt with in the irrigation sector. It has been estimated that the ultimate irrigation potential would be about 50 million hectares from minor schemes and about 57 million hectares from major and medium irrigation schemes.

Efficient use of Irrigation Facilities:

The concept of proper or efficient use of irrigation facilities created has two distinct phases. The first one refers to the physical use of irrigation facilities or potential created by the completion of all engineering works up to the last point in the water delivery system for which the government is responsible and this includes the making of necessary administrative arrangements for ensuring that water is made available to the farmers at the desired time and location in adequate quantities. The second phase refers to the efficient on farm use of the irrigation facilities by the farmers, to achieve optimum agricultural production and the creation of necessary facilities to achieve this object.

In the case of irrigation systems already under operation in the country, where the irrigation potential created is already being used up in the quantitative sense, there is great scope for introducing steps relating to the second phase. But in the case of new projects, where
irrigation is yet adopting, activities relating both the phases can be planned simultaneously. The irrigation commission (1970-71) and National Commission on Agriculture (1973) which have examined the requirements of both the phases, have highlighted certain deficiencies being experienced for efficient use of irrigation facilities and have suggested specific measure for ensuring efficient use.

**Integrated command area approach :**

The various steps which have been considered necessary for prompt utilization of irrigation potential created and its efficient use of field encompass the activities of a individual government departments like irrigation, agriculture, revenue and co-operation and no single department would be in a position to provide all the requisite arrangements.

It is only by a close inter disciplinary and inter departmental approach that the measures required for prompt and efficient use of irrigation facilities can be ensured. Such an approach, known as command area approach has been introduced recently in some major irrigation projects, by constituting special administrative agencies for this purpose.

In the mitigating drought, village ponds and farm ponds have to play an important role. The village ponds can be used for livestock and to meet daily needs of villagers. Of course, the extent of help depends on catchments characteristics, runoff volume and its utilizations. The natural farm ponds are for pre-sowing, protective irrigation an livestock consumptions.

The following Table-2.1 provides an insight in to the zone wise irrigated area in India and Fig.2.1 shows in the form of graph.
### Table-2.1

**Agriculture zone wise total geographical area and Gross Irrigated area in Karnataka**

(Unit : Area in Hectares)

<table>
<thead>
<tr>
<th>Zone No. &amp; Name</th>
<th>Total Geographic Area</th>
<th>Gross Irrigated Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. North Eastern Transition Zone</td>
<td>871036</td>
<td>50814</td>
</tr>
<tr>
<td>2. North Eastern Dry zone</td>
<td>1762604</td>
<td>259845</td>
</tr>
<tr>
<td>3. Northern Dry zone</td>
<td>4783642</td>
<td>1137872</td>
</tr>
<tr>
<td>4. Central Dry zone</td>
<td>1943830</td>
<td>251270</td>
</tr>
<tr>
<td>5. Eastern Dry zone</td>
<td>1808217</td>
<td>225665</td>
</tr>
<tr>
<td>6. Southern Dry zone</td>
<td>1739430</td>
<td>322589</td>
</tr>
<tr>
<td>7. Southern Transition zone</td>
<td>1218029</td>
<td>229262</td>
</tr>
<tr>
<td>8. Northern Transition zone</td>
<td>1994941</td>
<td>154613</td>
</tr>
<tr>
<td>9. Hilly zone</td>
<td>2560727</td>
<td>135681</td>
</tr>
<tr>
<td>10. Central zone</td>
<td>1167380</td>
<td>113315</td>
</tr>
<tr>
<td>State Total</td>
<td>19049836</td>
<td>2880926</td>
</tr>
</tbody>
</table>

**Source**: Annual and Season Crop Report – 1996-97, DE&S.

After discussing the design of the study, in this chapter, agriculture transformation through irrigation and economic development is discussed in the next chapter.
Fig. 2.1: Graph showing Agriculture zone wise total geographical area and Gross Irrigated area in Karnataka.