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CHAPTER - I

INTRODUCTION

1.1 BACKGROUND OF LOW AGRICULTURAL PRODUCTIVITY IN INDIA:

The general background of low agricultural productivity in India has been discussed in this Chapter. The aim is to understand factors responsible for low agricultural productivity and to select an important key factor for research study.

Agriculture is the backbone of our Indian Economy. Inspite of various efforts taken at Central and State levels, the result is low agricultural productivity. The analysis of pros and cons of the low productivity differs from state to state, district to district, taluka to taluka, village to village and even farm to farm.

Over a period of time, the measures taken to improve upon the productivity at a particular point of time become obsolete and unless suitable immediate changes are made from time to time, the effect of measures taken not only vanishes but results into deterioration of productivity. It has thus become a very serious issue. The time has come to analyse each and every factor contributing to low agricultural productivity and take short term and
In order to understand agricultural productivity and its effects on Indian economy, it is essential to examine the agricultural scenes in pre and post independent periods.

1.1.1 Agricultural scene during pre-independence period:

* A] The report of Royal Commission on Agriculture in India 1928

The Report of Royal Commission of Agriculture in India 1928, is the basic document for all agricultural related studies in the country. This document has given a vivid picture of important landmarks of British efforts in the agricultural and rural developments in India. The report covers following areas.

a] Status of Indian agriculture in early Nineteen Century.

b] The immediate steps taken by Britishers to change adverse situation.

* Source-The report of Royal Commission on Agriculture in India 1928 - This was presented to King George Fifth of U.K. by Mr. W. Joynson and Mr. Hicks.
c] Recommendations of commission for agricultural development by certain direct remedial measures.

d] Recommendations of commission for agricultural development by certain indirect remedial measures.

e] Concluding remarks on Indian farmers with respect to agricultural prosperity.

a] Status of Indian agriculture in early Nineteen Century.

As per the report, Indian agriculture was in a very bad shape because of various adverse conditions prevailing at that time. The details were as follows:

i] As per the Census of 1921, about 73.9% population was directly engaged in or dependent on agriculture.

ii] There were lack of communication facilities and also organised trading and commerce which restricted farmers to produce more than their own consumption.

iii] There was lack of internal security to farmers in case they produced more. The local
authorities under the rural used to demand high shares of their agricultural production.

iv] There were more frequent and often wide spread famines and droughts.

v] Irrigation facilities, improved methods of cultivation, use of high yielding varieties of crops, fertilisers, insecticides, pesticides were totally lacking.

vi] There was no scope for large scale farming due to vast population of small cultivators and also continuous fragmentation of lands.

b) Immediate steps taken by Britishers in order to change the adverse situation.

Britishers had studied the above conditions prevailing in India and had taken remedial measures which created a little conducive atmosphere for agricultural development. The details were as under:

i] The establishment of internal security was the first step taken by Britishers and built confidence in farmers for protection against forcible acts of local authorities.
i) They also evolved a system of land revenue for helping farmers in the needy periods of agricultural activities.

iii) Improvement and development of communication facilities were established. This facilitated good distribution of increased production which in turn encouraged farmers to produce more.

iv) The old self sufficing type agriculture was replaced by a more commercialised system. It thus resulted in cultivation of money crops intended entirely for sale such as cotton, jute, oilseeds. The farmers had begun to look beyond the existing needs of their families and started venturing agricultural production as per the demands of markets.

v) The improved communications also stimulated growth in organised trading and commerce.

vi) The provision of irrigation facilities was however difficult due to capital investment. The Britishers decided to develop overseas communications and exports. By 1927, exports exceeded Rs.350 crores out of which major share was from agricultural products such as tea, cotton, jute and oilseeds.
The overall effect of all this was a substantial increase in agricultural production. This increase although was seen due to irrigation expansion in some parts and due to spread of cultivation. Only small proportion however was due to High Yielding Varieties of crops. But there was no effect of increase yields due to application of better methods of cultivation or use of manures.

After the report of "Famine Commission" of 1880 agricultural policy for 1881 to 1905 was drawn for improvement of agriculture on provincial basis by establishing new Secretariate. Thus the main responsibilities of agricultural research fell on the provincial governments.

There were specific changes recommended in organisational structures for agricultural research. They were as follows:
- For advancement of agricultural research PUSA was to be brought in closer touch with provincial agricultural departments and
- Constitution of crop committees and Imperial Council of Agricultural Research were suggested.
c] **Recommendations of commission for agricultural development by certain direct remedial measures.**

The commission report had suggested various remedial measures directly related to agricultural development. The important heads were as follows:

i] Research soil, soil conditions, soil erosion.

ii] Manurial experiments on crop yields.

iii] Introduction of improved varieties of crops.

iv] Introduction of new crops.

v] Organisation of agricultural engineering research.

vi] Research of Agricultural implements and machinery.

vii] Possibilities of power machinery.

viii] Crop protection against pests and diseases.

ix] Problems of cultivation in dry and precarious tracts.

x] Rebate on import duties on iron and steel used in agricultural implements and machinery.

d] **Recommendations of commission for agricultural development by certain indirect remedial measures.**

Along with the recommendations on direct measures, Britishers had also given their views on agricultural development with indirect measures.
Demonstration and propaganda.

Animal husbandry.

Forest.

Diseases of live-stock and their control.

Irrigation.

Communication and marketing

Agricultural finance.

Co-operative structure.

Village.

Education.

Rural industries and labour.

Horticulture and plantation.

Statistics.

Agricultural services.

e] Concluding remarks on Indian farmers with respect to agricultural prosperity.

This report had made certain specific concluding remarks on Indian farmers w.r.t. the agricultural prosperity in India. They were as follows:

i] No substantial agricultural improvement was possible unless farmer had will to achieve better standards of living and the capacity in terms of mental and physical health. This would help farmer to take advantage of the opportunities of which science, wise-laws and good administration might have taken place at
his disposal. Thus outlook of farmer was most important for the prosperous agriculture.

ii] Success of advancement of agriculture depended on farmer's environment. For this improvement of village life in all directions assumed all importance.

iii] The co-ordinated efforts for rural upliftment programmes, rural welfare programmes, understanding of psychology of farmers had to play very important role in raising living standard of a farmer and this was the responsibility of the Govt. and Govt. only.

Thus this report had given the detailed idea about agriculture in India prior to year 1928 and also recommendations for improvement in agriculture with specific remedial measures.

B) Actual situation during British Regime.

Although the commission report had presented the status of agriculture prior and after Britisher's intervention in agricultural development and also future recommendations, the actual situation was somewhat different.

During pre-independence, Britishers gave
unprecedented position and authority to landlords through permanent settlement system. Ownership and control of lands therefore steadily fell into the hands of landlords and intermediaries. Thus it broke down the process of co-operative village structure which was existing earlier.

The controlling group of landlords had their main interest in extracting maximum rents from tenants in cash or kind. In doing so they also started diversion of their capital from rural to urban areas and sublet their lands in small plots to agricultural labourers and increased number of smaller land holdings.

The motivation to these agricultural labourers for increased production was totally lacking. Also cultivators had to pay high rents to landlords and had absolutely no surplus to invest anything in the farm improvements. Thus the economic motivation resulted into exploitation rather than investments and improvements in agriculture.

1.1.2 Agricultural scene during post-independence period:

After independence, zamindari abolition programmes were undertaken by Government but could not create conducive environment to agricultural growth. Due to absence of landlordism and disguise tenurial
arrangements continued to dampen the enthusiasm of the cultivators for productive cultivation.

The poor management, lack of adequate irrigation and drainage facilities, poor research and extension programmes, inadequate power, transport and marketing arrangements gave a little scope and incentives for intensifying production through improved methods.

Also due to absence of progressive lobby, action programmes became inflexible and gave no recognition to felt-needs and aspirations of farmers.

1.1.3 New strategy for agricultural growth/development:

During first and second five year plans due to concentration on industrialisation there were foodgrains and foreign exchange crises. During second five year plan, Government had to import foodgrains under PL480 arrangements from USA due to severe food grain shortage in the country. In order to bring sharp focus on lack of modern infrastructure for agriculture in mid-nineteen sixty new strategy for agricultural development was designed, announced and introduced.

The critical elements of new strategy were -

a. Use of High Yielding Varieties [HYV] of seeds and
fertilisers.

b. Adequate and controlled supply of water.

Thus a deliberate policy of combining of these two aspects with a package of complimentary inputs was introduced in selected water-assured areas of the country.

The Government machinery along with banking system could not cope-up with the task of providing adequate inputs needed by farmers to adopt new technology and hence amongst the resource-poor farmers, the traditional/conventional farming methods continued to dominate the scene.

Although the large farmers and landlords were in a position to adopt new technology, they did not show interest. This is mainly because they could not get enough incomes from this new technology than the traditional techniques by using cheap labour.

Thus the success of new strategy based on adoption of advanced techniques of science-based and industry-linked farming coupled with sufficient development of agricultural infrastructure. During third five year plan, from mid-nineteen sixty various studies were conducted to assess the impact of new strategy with reference to various factors and their trends both at Macro [National] level and
Micro [State] level on the agricultural productivity. For all future analysis of trends of agricultural productivity due to effect of new strategy, year of 1960 was taken as a base year.

The important factors such as cropping intensity, foodgrains, inputs, credits etc. are studied to understand their effects on the agricultural productivity.

1.1.4 TRENDS:

With 1960 as the base year, various studies have been conducted to assess the impacts of new technology with reference to various factors governing agricultural productivity and their trends both at National [Macro] level and State [Micro] level.

A) Cropping intensity:

As bringing more area under cultivation was practically exhausted, efforts were taken to intensify the land use through double and multiple cropping system. This can be seen from net sown area trends as well as gross sown area trends. The trends of

i) cropping intensity, it is dependent on water
availability. the more the water availability the
more is the cropping intensity.

ii) percentage of gross sown area to be irrigated area,

are indicators of acceleration or deceleration of
agricultural growth.

In Maharashtra cropping intensity is ranging from
125% to 200% and thus depending upon its percentage
increase or decrease the percentage of gross sown
area to irrigated area increases or decreases
respectively.

B) Food grains:

The following trends related to foodgrains can be
the indicators of the agricultural growth in the
country.

i) Production trends in metric tonnes of
food grains such as -

a) rice, wheat, jowar and other cereals
b) pulses, oil seeds, sugarcane and cotton
c) fruits and vegetables

ii) Production trends in value of output in Rs. per ha
of net sown area.
iii] Production trends of value of output in Rs. per ha of gross sown area.

iv] Production trends of value of output in Rs. per agricultural worker.

v] Percentage of the cropped area to total gross area.

A graph is enclosed for showing trends of total foodgrains production, average yield per ha and total area in Chapter No. IV on Annexure No. IV-C. This graph can give idea of trends of related foodgrains for Maharashtra since 1960 a base year.

C] Inputs:

The trends of use of inputs and their effects on increase or decrease of agricultural production can be the indicators. Thus following inputs can give various trends.

i] High yielding varieties of seeds and its effect on agricultural production.

ii] Fertilizers consumption per unit of gross cropped area in kg. per ha and their effects on agricultural production.

iii] Expansion of irrigation and promotional
activities are the indicators of infrastructure to absorb new technology.

iv] Trends of achievements in irrigation potential, items of irrigation such as number of dugwells, shallow tubewells, electric pumpsets, diesel pumpsets can become the economic indicators.

The trends of minor irrigation progress is given in Chapter-I Point no. 1.3.2.

D] Credit:

i] The trends related to credits can also throw light on the effects of efforts taken for agricultural growth. Thus under the institutional credits, the trends of major two areas
a] Expansion of credits
b] Recoveries of overdues
can decide improvement in productivity. Any failures in recoveries of overdues used to have consequent repercussions on efficient supply and use of inputs and thereby adversely affecting the productivity.

iii] The trends of short-term credits used to purchase of inputs and meeting other crop production expenses is provided by primary agricultural credit societies, commercial banks, regional rural banks, land development banks.
iv] The trends of medium and longterm credits are provided for construction of dugwells, sinking of tube-wells, purchase of pumpsets and other farm machinery, investment in plantation and horticulture, animal husbandary programmes.

v] The trends of primary agricultural credit societies, land development banks, regional rural banks and commercial banks for loan disbursement can show effect of credit on agricultural productivity.

vi] The trends of deposits mobilisation can also indicate agricultural productivity behaviour.

The trends of total refinance and also agency wise refinance from NABARD to state of Maharashtra for past three years have been given in Chapter No.IV, in Point No. 4.4.5 [c].

1.2 FACTORS RESPONSIBLE FOR LOW AGRICULTURAL PRODUCTIVITY IN INDIA

It has been distinctly indentified the various factors responsible for low agricultural productivity. These factors have been affecting the agricultural productivity of the country.

They can be classified into following factors:
1.2.1 Geographical factors

1.2.2 Agricultural management factors

In order to understand effect of each of the above factor, further classification has been done in more details. The details are as under:

1.2.1 Geographical factors

A] Higher population density:

The higher number of agricultural workers per hundred ha of net sown area in a state is the indicator of low agricultural productivity. Also the total population and total geographical area can determine low agricultural productivity. Higher the total population with respective total geographical area the lower is the agricultural productivity.

* Eastern region of India covering the states of West Bengal, Bihar, Eastern UP and Orissa has got the highest population density after Kerala. It covers 0.5 lakh sqm, with a population of 192 million. Thus it occupies 15% of geographical area and 28% of total population of the country. The effect of such situation is the low agricultural productivity. Any efforts taken in improvement is going to worsen the situation unless population control measures are taken.
Eastern India has the highest i.e. 160 nos. of agricultural workers per hundred ha of net sown area as against 105 numbers of all India, resulting into low agricultural productivity.

B) Extreme Climates

Climate plays very vital role in crop pattern depending upon its nature such as tropical, hot, cold, humid and temperature ranges i.e. Physiography.

There are temperature variations from minimum below 0 degree in Sub-Himalayan areas to maximum 48 degrees centigrates temperatures in deserts of Rajastan. This temperature and humidity factors have direct controls on the suitability and growth of various crops. Any change in matching of crop pattern with respective climatic conditions lowers the output of agricultural produce and also productivity. In Chapter-IV, Annexure-IV-A physiography of Maharashtra has been shown. Thus the climate is very a crucial factor in the agricultural growth of the country and makes agricultural planning very difficult.

* Source - Report of the Committee on Agricultural productivity in Eastern India, by Reserve Bank of India 1984 Chairman Mr. S.R. Sen.
C) Erratic rainfall:

The annual average rainfall of the country varies between 1300 mm to 1700 mm. There are however, considerable inter-districts variations in the quantum of rainfall. There is also a large variation within the season and from year to year which causes considerable instability in agricultural production. Even in the years the when the rainfall is normal long drought spells and inadequate rainfall in crucial months of sowing, transplantation or growth of plants adversely affect agricultural production.

There are specific rainfall zones all over the country. Also in each state rainfall zones show the average rainfall and area in sqm. The normal, excessive and scanty rainfalls can become the indicators of the water availability in the zone which affects the agricultural production.

The details of rainfall zones & districtwise average rainfalls have been shown in Chapter-IV, Annexure-IV-B.

D) Infertile Soils

Soil also plays very important role in deciding crop pattern depending upon nature of soil and its
condition such as coarse, shallow, medium black, deep black, reddish brown, hills, slopes, coastal alluvium, yellowish brown on high levels, yellowish brown soil on plains, laterite and tatenic and coastal saline, etc. Salt affected saline and alkali soils can contribute to the large extent to the low agricultural productivity.

In Chapter-IV, Annexure-IV-A, the details of types of soils have been shown for the state of Maharashtra.

Also the fertility index of soil interms of Nitrogen, Phosphorus, and Potasium decides input of fertilizer doses for raising quality of land. The higher the dose the higher the yields, but adds to the cultivation costs and results into low agricultural productivity.

Thus the fertility of soils is very important factor affecting total economics of individual farmer interms of income, expenses, and ultimately agricultural productivity.

E) Susceptible Agro-climatic zones:

Such zones of soils are divided on the basis of rainfall, temperature, humidity, altitude, ground water status and other common characteristic
features. Any planning without consideration of agro-climatic zones does not give expected results.

There are 115 agro-climatic zones in the country. Each zone depicts the rainfall pattern, soil type and area covered under the zone. The agro-climatic zone thus becomes the deciding factor for all future agricultural growth in terms of agricultural production, minor irrigation potential, investments etc.

In the present 8th plan, as discussed in Chapter-I, point no. 1.4.4 planning process is done for the first time on the basis of agro-climatic zones for all future projections related to minor irrigation and agricultural programmes in the country for effective use of funds and result oriented activities.

The maps showing agro-climatic zones of Maharashtra State enclosed in Chapter-IV, Annexure-IV-A & B in terms of physiography, soils, rainfall zones.

F] Improper Land use pattern:

The land used pattern of the state or the country can be decided on the basis of following:

i] percentage of net sown area to reporting area,

ii] percentage of net sown area to culturable area.
An increase in percentage is the indicator of higher agricultural productivity.

The efforts to increase the percentage of these indicators have to be well thought of by giving utmost attention to financial aspects, otherwise overall effects result into low agricultural productivity. e.g. Chapter-IV in point no. 4.2.4 land use pattern of Maharashtra has been shown which can give an idea of percentage of net sown area to reporting area % of forest area to reporting area etc.

G] Non-viable Agrarian structure:

An average size of operational land holding is very small. The proportion of small and marginal farmers is deciding factor. Land size groups can be categorised in four groups incorporating landholdings in ha.

a) 0 to 1 ha
b) 1 to 2 ha
c) 2 to 10 ha
d) Above 10 ha

Thus if the proportion of small and marginal farmers below two ha is more then there is adverse effect on agricultural production. This is basically due to
poor resources and no risk bearing and trend setting capacity of the farmers.

This is further elaborated in Agricultural Management in Chapter-I, Point No. 1.2.2.

H] Acute Fragmentation of land of land-holdings:

Acute fragmentation of land-holdings and moreover if they are wide-spread then it has direct impact on the agricultural productivity. The consolidation of land in such situations becomes very necessary. This has been discussed in details in point no. 1.1.1 [a] of this Chapter about Report of Royal Commission of Agriculture in India.

I] Absence of Records of Share cropping:

Share cropping is widely prevalent in India. This definitely affects the total agricultural production in the country. Attempts to record share croppers have been made in some states but process in not still complete. However, in some states process has not been taken up or also yet started.

This has been therefore, causing serious damage to agricultural productivity. Therefore the Govt. should take suitable measures in order to update the records of sharecroppers in the country.
Inadequate irrigation facilities:

The detailed study of network of rivers, canals, lakes, etc. is required. This is basically to increase ground water and surface irrigation potential in mha i.e. total minor irrigation in mha in the country. This is discussed in details in point no. 1.3.2 of this Chapter.

Also higher or lower percentage of cropped area irrigated to area irrigated, percentage of potential utilised are the indicators of higher or lower productivity respectively. The exploitation of ground water resources is therefore very important alongwith development of command areas for surface irrigation and general surface irrigation facilities in the country.

Frequent Water-logging:

This phenomenon is due to physiographic situation causing problems to kharip crops. This is seen in command area of dams and also in catchment areas due to heavy rains with denudation of forests resulting into floods. Water logging problem has been the factor of low agricultural productivity in many parts of the country. This can be avoided by effective drainage systems.
Construction of network of field drains, intermediate and bigger drainage channels is necessary to avoid loss of crops and property and also hazards to human-beings and cattles. In absence of drainage arrangements due to water-logging problems, soils get damaged due to deposition of sands and affect adversely the agricultural production. Thus, water-logging and drainage are supplementary to each other to improve or affect agricultural productivity.

1.2.2 Agricultural Management Factors

Broadly speaking, modernisation of agriculture in a state becomes feasible and farmers are capable of maximising production per unit of land and also per capita. This is possible when they have adequate control over the factors of production. Farmer's choice and decision making in production process are greatly constrained by factors which are beyond their control. The agricultural management factors play very significant role in lowering agricultural productivity in India. These factors are classified into following three categories.

A] Social and Structural Factors.
B] Technological Factors
C] Organisational Factors.
A) Social and structural constraints:

a) Agrarian structure:

The average land holding size has reached to such a level as to make the farm size an uneconomical unit under traditional farming technology. This is basically because of impoverishment of peasantry under zamindary system coupled with growing pressure of population on land. This has eroded the operating base of the most of the farmers. Moreover, the land is divided into many small fragments. Thus these two factors affected farm income adversely. Also farmers who possess knowledge of farming have no resources for technological improvements.

The heirs of farmers divide the property in order to extract maximum wealth from land which they can separately claim as their own. The law of succession is contributing to continuous sub-division and fragmentation of holdings.

Though land-reform laws have conferred ownership rights on tenants, concealed tenancy is wide-spread with inadequate legal protection. Unless ownership and tenancy arrangements are properly defined, assignment of water rights, management of tube-wells, obtaining loans from
banks, etc. become difficult. Registration of share cropper is very essential. If leasing in and out of lands of small and marginal farmers are permitted small holdings could be made economical for farming operations. Expansion of non-agricultural economy in the country-side is not enough to induce significant absorption of surplus labour from agricultural sector into other occupations.

This fact together with social and economic conditions obtaining would now tend to increase small farms. The existence of large number of share croppers and reluctance of cultivators to exchange land due to sentimental or security considerations are hampering consolidation work. Also, under traditional technology, consolidation provides much less economy in crops like rice, bajra etc.

b) Soil management:

Although soil is a geographical factor already discussed Chapter-I in point 1.2.1-D, without proper soil management agricultural productivity cannot be achieved. The heavy erratic and uneven seasonal patterns of rainfall create serious soil erosion problems particularly in hilly areas, constraining
agricultural development. Coastal areas face problems of salinity. The large number of rivers and rivulets get silted-up making vast areas prone to floods. Areas of either sides of river belts become increasingly unfit for kharip cultivation. Due to natural topography, poor drainage and water logging become acute problems. For soil erosion Government has to adopt afforestation and agro-forestry programmes. Also reclamation of salt affected lands, ravine lands for bringing more land under agriculture can be considered.

Thus alongwith facility of soils, the phenomena of soil erosion, salt-affected land, ravine-lands play very adverse effect on agricultural productivity and thus soil management becomes very crucial factor.

c] Erratic rainfall:

The rainfall factor is a geographical factor already discussed in Chapter-IV. Annexure-IV-B and also in point no. 1.2.1[c] of this Chapter. However planning of agricultural and irrigation resources in most effective and result oriented manner will not be possible without systematic management of erratic rainfall behaviours.
The pattern of rainfall provides very little choice to farmers during kharip season. Droughts, cyclones and floods ruin the crops which are beyond control of farmers.

B) Technological Factors:

a) Poor Water management:

Infrastructure for irrigation and drainage can overcome the physical constraints. From available surface and ground water resources gross crop areas under irrigation is to be increased by exploitation of water resources & using efficient items of irrigation. Untimely and uncertain release of water is to be avoided. The improper maintenance of canal systems, inadequate and erratic power supply and improper maintenance of state tube-wells also affect the water management. Proper irrigation and drainage have to support modern agriculture. Onfarm development works are essential.

b) Inadequate Research:

Incidence of pastes, diseases and deficiency of micronutrients are also important constraints which can be avoided by research. Also research efforts to develop crop technology appropriate to
different physical environments and in various agro-climatic zones is required. High yielding varieties to suit any agro-climatic conditions are to be developed.

c) Traditional Farm machinery:

Farm machinery and its use for improved tools implements such as seed cum fertilizers, drills, sprayers, tillers, tractors, threshers, modern ploughs, diesel engines/ D.P.sets, combine harvesters, etc. is to be considered. Inadequate bullock power with small and marginal farmers with traditional farm machinery should be met with improved tools and implements.

In Report of Royal Commission on Agriculture Britishers had given emphasis on power machinery for agricultural growth in the country. The conditions of agricultural in the present context also demand an ideal farm machinery.

C) Organisational Factors:

a) Non-availability of timely and continuous supply of inputs.

Use of high yielding varieties of seeds, fertilizers need continuity in supply. The
A substandard variety or poor input delivery system can affect productivity adversely. Also lack of suitable fertilizer or pesticide or their application can deteriorate the process.

b] Inadequate and Erratic Electric power & diesel.

Inadequate and erratic power supply can discourage the farmers going for investment in electric motor pumpsets or tube-wells, etc. Also petroleum production such as diesel, lubricating oil should be available in continuous without adulteration & in abundant manner to run DP sets, power tillers, tractors etc.

c] Lack of Extension and transfer of technology :

To adopt modern agronomic practices, motivation to farmers proper extension and transfer of technology services are essential to change traditional attitudes of small farmers who are reluctant to take risks. TV, radio, other publicity media and extension work by village level workers is required to percolate knowledge down to villages.

d] Inadequate Credit Flow :

Flow of institutional credit for use of inputs
Overdues can restrict the capacities of co-operative sectors. Also managerial and financial weaknesses can become handicaps for co-operative sectors. Inadequate supervision over endusers of credit, slackness in follow-up actions in recovery and lack of effective co-ordination between lending activities of institutional agency can become constraints in flow of credits and developmental programmes.

e) In-effective Marketing infrastructure:

The essential factors for effective marketing infrastructure are roads, transportation, marketing, cold storage facilities, rural godowns, processing facilities, fluctuation in prices of food grains and non-food grains by Government agencies like Food Corporation of India. State level procurement agencies can stabilize procurement prices. Also marketing arrangements can be well organised by them. Demand can also be adverse factor affecting agricultural growth.

g) Inefficient Administration:

Absence of effective agricultural lobby without flexibility and bureaucratic framework to attend
farmer's need can be a constraint. Also ineffective inter-departmental co-ordination both at state and field level, ineffective monitoring of developmental efforts will deteriorate the process of good administration. Administration efficiency should also reach to the resource-poor farmers otherwise such farmers will be deprived of all benefits of marketing infrastructure.

1.2.3 Special agencies:

Special agencies were established in order to cater to specific needs of weaker sections by setting

a) Regional Rural Bank in 1975 [RRB]

b) Tribal Development Corporation (TDC)

c) National Bank for Agricultural and Rural Development established in 1982 [NABARD] to refinance member banks.

These agencies have been engaged all the time to improve the conditions of farmers related to agriculture in the country.

1.2.4 Special development programmes:

Government of India had undertaken various programmes for agricultural development in the country -

a) Command Area Development Programmes [CADP].
b] Tribal Development programmes.


d] Integrated Rural Development Programmes [IRDP]

e] Special programmes for small and marginal farmers.

f] Special Component Scheme for Schedule Casts & Tribes.

g] Drought-Prone Area Programmes [DPAP]

h] Desert Development Programme [DDP]


j] Installation of windmills & solar pumps.

k] Sprinklers, drip irrigation & water turbine.

l] Other State Government Programmes.

1.3 A KEY FACTOR OF LOW AGRICULTURAL PRODUCTIVITY - WATER MANAGEMENT:

The critical element of New agricultural strategy has been an adequate and controlled water supply to boost up agricultural production in the country. Also in the agricultural growth, while considering agricultural management of technological factors, the importance of water management has been seen and its advance & effective on agricultural productivity is well understood.

Thus although the agricultural productivity is
dependant upon various factors however if water resources are not tapped properly for effective utilisation, any efforts in implementation of new agricultural strategy will be futile. The advance water management techniques therefore can improve in the total agricultural scenario of the country.

1.3.1 Scope and perview of minor irrigation:

For the effective water management in the country, Govt of India under the minor irrigation programmes have been covering various schemes related to


B] Surface water Irrigation Schemes.

The Minor irrigation schemes, by their very nature, are quick maturing and labour intensive. The future of agricultural prosperity of the country is based on the success of these two schemes of minor irrigation.

A] Ground Water Irrigation Schemes:

The private ground water schemes which are constructed, owned and operated by the farmers themselves mostly comprise of -

a] Dugwells

b] Dug cum borewells
Borewells

Filter-points

Shallow tube-wells

Individual borings with command areas varying from 1 to 4 ha average.

State level assistance is confined to -

- Technical guidance
- Custom service for boring
- Subsidies
- Arrangements of credits at reasonable rate of interest.

These schemes contribute more than 86.7% potential for ground water development and more than 65.6% whole of minor irrigation programmes.

Construction, operation and maintenance of deep public tubewells with command areas ranging from 40 to 100 ha is handled by state department of irrigation or minor irrigation or tube-wells corporation of state Government. Augmentation of tube-wells which are meant for increasing the supply in canal systems are also included under minor irrigation schemes.

B) Surface Water irrigation schemes:

Surface Water schemes comprise of -
a] Pumpsets installed by individuals and groups of farmers on surface water sources like tanks, small streams and rivers. These are termed as small lift irrigation schemes with command areas of 2 to 20 ha average.

b] Larger lift irrigation schemes with command areas from 20 to 200 ha constructed by State Govt. minor irrigation department, under the State Governments.

c] Small storage tanks generally called bundies owned by individual or group of farmers. These have command areas upto 20 ha only.

d] Larger storage tanks with command areas varying from 20 to 2000 ha contributed by state irrigation departments along with their distribution systems. These contribute the biggest items under minor irrigation surface water schemes.

e] Percolation tanks for the purpose of recharging ground water table.

f] Small diversion channels to divert the running water of streams, rivers mostly in hilly areas. Check dams and anicuts are also included under these schemes.

1.3.2 Perspectives and achievements of minor irrigation:

The ultimate potential for minor irrigation in the country is estimated as 97 mha of gross cropped area which comprises of 80 mha from ground water sources
and 17 mha from surface water sources. Against this, development envisaged upto year 2010 has been 115 mha from ground water and 23 mha from surface water making total development of 138 mha.

A. The progressive growth and projections of irrigation potential

The progressive growth upto VII plan and projections for VIII plan and beyond upto year 2010 of irrigation potential in the country is as follows:

Table No.I-1A

<table>
<thead>
<tr>
<th>Irrigation potential [in mha]</th>
</tr>
</thead>
</table>

Achievements:

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Period</th>
<th>Surface</th>
<th>Ground</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>01]</td>
<td>1950-51</td>
<td>6.40</td>
<td>6.50</td>
<td>12.90</td>
</tr>
<tr>
<td>02]</td>
<td>1960-61</td>
<td>6.45</td>
<td>8.30</td>
<td>14.75</td>
</tr>
<tr>
<td>03]</td>
<td>1968-69</td>
<td>6.50</td>
<td>12.50</td>
<td>19.00</td>
</tr>
<tr>
<td>04]</td>
<td>1973-74</td>
<td>7.00</td>
<td>16.50</td>
<td>23.50</td>
</tr>
<tr>
<td>05]</td>
<td>1977-78</td>
<td>7.50</td>
<td>19.80</td>
<td>27.30</td>
</tr>
<tr>
<td>06]</td>
<td>1979-80</td>
<td>8.00</td>
<td>20.00</td>
<td>30.00</td>
</tr>
<tr>
<td>07]</td>
<td>1989-90</td>
<td>15.00</td>
<td>40.00</td>
<td>55.00</td>
</tr>
</tbody>
</table>

[targetted] [likely] [11.15] [34.78] [45.93]
**Project 1**: 1990-1995 17.00 80.00 97.00

1995-2000 19.00 91.00 110.00

2000-2005 21.00 103.00 124.00

2005-2010 23.00 115.00 138.00

B] **Progressive Physical growth of items of irrigation and projections of VIII Plan.**

The progressive physical growth of items of irrigation is showing constant rising trend since 1950. The projected ultimate feasible potential is very ambitious and the details are as follows, incorporating the items of irrigation, e.g. Dugwell, Private tubewells, Public tubewells, Electric pumpsets, Diesel pumpsets from the 1st five year plan period.

**Table No.1-2**

<table>
<thead>
<tr>
<th>Year</th>
<th>Dugwells</th>
<th>Pvt. Tubwells</th>
<th>Public Tubewells</th>
<th>Electric Pumpsets</th>
<th>Diesel Pumpsets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-51</td>
<td>38.60</td>
<td>0.30</td>
<td>0.24</td>
<td>0.21</td>
<td>0.66</td>
</tr>
<tr>
<td>1960-61</td>
<td>45.40</td>
<td>2.20</td>
<td>0.89</td>
<td>2.00</td>
<td>2.30</td>
</tr>
</tbody>
</table>

**Achievements & Projections of items of Irrigation.**
The outlays for the minor irrigation programmes are being mainly derived from two sources -

i] Public sector funds as part of the state plan outlays

ii] Institutional sources such as land development banks, co-operative banks, rural banks, commercial banks with refinance facilities from the NABARD.

World bank has also made available substantial amount particularly for ground water development.

Under the plan outlays, funds from the central sector are also available in the shape of centrally
sponsored schemes on matching basis. These schemes are -

a] Integrated Rural Development Programme [IRDP]
b] Scheme for assistance to small and marginal farmers
c] Tribal development and special component plan, etc.

In addition to these schemes, there are centrally sponsored schemes of the Ministry of Irrigation for giving subsidies for solar pumps, windmills, sprinklers, etc. and strengthening the state ground water and surface water minor irrigation organisations in respect of equipment.

Surface water flow irrigation schemes are mostly financed from public sector funds. Only in case of surface water lift irrigation schemes being constructed by state corporations, the financing is from institutional sources. The utilisation of public sector funds in the field of ground water development is confined to items like purchase of drilling equipment, cost of stall, ground water surveys, contribution to share capital and advances to the tube-wells corporations and subsidies that are made available to small and marginal farmers or the tube-wells corporations due to water rates released being lower than the economical rates. The borrowed funds for private wells, tube-wells,
pumpsets, etc. are mobilised exclusively from institutional sources. In addition to the above, there are also sizeable investments made by cultivators from their own resources in the field of minor irrigation.

D] Financial progress in Minor Irrigation:

a) Progressive Investments in Minor Irrigation & Projections for Eighth Plan:

There has been sustained growth in the investments of minor irrigation programmes in the country. Since first five year plan, the constant rising trend on investment can indicate the need and also the efforts taken by Government of India in increasing minor irrigation potential in the country.

The details of Achievements & Projections of investments are given in the Table No. I-3A from the 1st five year plan.

Table No. I-3A
Achievements & Projections of Investments.

[Rs.in Crores]

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Plan</th>
<th>Plan Insti-</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>outlays</td>
<td>tutional</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>First</td>
<td>66</td>
<td>-</td>
</tr>
<tr>
<td>02</td>
<td>Second</td>
<td>142</td>
<td>19</td>
</tr>
<tr>
<td>Sr No</td>
<td>Plan</td>
<td>Plan outlays</td>
<td>Institutional</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>--------------</td>
<td>---------------</td>
</tr>
<tr>
<td>03</td>
<td>Third</td>
<td>328</td>
<td>115</td>
</tr>
<tr>
<td>04</td>
<td>Fourth</td>
<td>513</td>
<td>661</td>
</tr>
<tr>
<td>05</td>
<td>Fifth</td>
<td>631</td>
<td>780</td>
</tr>
<tr>
<td>06</td>
<td>Sixth</td>
<td>1811</td>
<td>1700</td>
</tr>
<tr>
<td>07</td>
<td>Seventh</td>
<td>2805</td>
<td>3513</td>
</tr>
<tr>
<td>08</td>
<td>Eighth</td>
<td>7513</td>
<td>5119</td>
</tr>
</tbody>
</table>

The further investments in minor irrigation beyond eight plan have been projected upto year 2010. This can show the urgency and also the anxiety of the Government to make water available in abundant quantity to meet the foodgrains demand in the country. The details are given in Table No.I-3B on page no.46 incorporating investments in both ground water and surface water schemes.

b) Future Investments in Minor irrigation in ground water and surface water schemes.

The projections from 8th Plan onwards upto year 2010 have been shown as follows:
Table No.1-3B.

Projections of future investments in M.I. (Rs. in Crores)

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Year</th>
<th>Ground Water</th>
<th>Surface Water</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>1990-95</td>
<td>9595</td>
<td>4550</td>
<td>14145</td>
</tr>
<tr>
<td>02</td>
<td>1995-2000</td>
<td>13200</td>
<td>7000</td>
<td>20200</td>
</tr>
<tr>
<td>03</td>
<td>2000-2005</td>
<td>18000</td>
<td>8000</td>
<td>26000</td>
</tr>
<tr>
<td>04</td>
<td>2005-2010</td>
<td>21600</td>
<td>9400</td>
<td>31000</td>
</tr>
</tbody>
</table>

1.4 HIGHLIGHTS OF VIII PLAN ON MINOR IRRIGATION & AGRICULTURE

1.4.1 Physical Targets:

a] M.I. programme has been given a great thrust for ground water and also for surface irrigation. This can be seen from high jumps in irrigation development potential in mha and also planned investment from VII to VIII plan, the irrigation potential is targetted at 55 mha in VIII plan from 30 mha in VII plan and also investment to in

Rs.12632 Crores in VIII Plan from Rs.6318 Crores in VII Plan.

b] In ground water schemes thrust has been given through dugwells in hard rock areas and shallow tubewells in alluvium areas. Programmes for freeboring [shallow tubewells/borewells] & dugwells have already been launched under Special Food-grains Production Programmes [SFPP] in 134 selected districts of 12 States. This can be seen from increased population of 106.67 lacs and 64.40 lacs for dugwells and shallow tube wells respectively from 94.87 lacs and 47.54 lacs respectively in VII plan. This will help in achieving ground water minor irrigation potential cumulative achievement of 80 mha by 1995.

c] A target of 1.5 million free borings has been proposed by Ministry of Agriculture. In rural development department one million free wells are to be constructed for small & marginal farmers belonging to schedule castes/tribes. This is specifically unique effort on the part of Govt. of India to boost up agricultural production in the country by encouraging small and marginal farmers belonging to schedule castes and schedule tribes who were neglected from this aid.

d] A target of 17.11 lacs dugwells is provided
considering likely achievement of 7.45 lacs against the target of 12.5 lacs for VIII plan in order to achieve higher irrigation potential of 10 mha. They will be backed up by specific ground water surveys and investigations by S.G.W.O.

e) Similarly a target of 16.89 lacs shallow tubewell/borewell against likely achievement of 13.95 lacs during seventh plan.

f) In respect of public tubewells target is reduced to 11000 nos due to performance of tubewell is going down year by year. Greater stress is given on private shallow tubewells.

g) In respect of surface water renovation of old and construction of new tanks has been given importance. Massive programme has been undertaken through Jawahar Rozagar Yojana. Thus, high irrigation potential of 2 mha has been proposed against the target of 1.5 mha during seventh plan.

h) There is a big jump in the projection of electric motor pumpset from cumulative figure 82.26 lacs by VII plan to 112.26 by VIII Plan and 43.5 lacs by VII Plan to 49.77 by VIII plan for diesel pumpsets.
1] Rectification of Diesel pumpset programmes in 7th plan have given very encouraging results. This will be taken on massive scales in the VIII plan. The modalities of sharing cost between various agencies shall be worked out. It is proposed that out of 35.5 lacs of pumpsets operating upto VIII plan atleast one lac DP sets are proposed to be rectified in VIII plan costing Rs.10 Crores. The saving in diesel will be of the order of Rs.12.00 Crores annually. Projections of rectification of D.P. Sets is as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>DP Sets to be rectified (nos.)</th>
<th>Grant Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-91</td>
<td>50000</td>
<td>Rs.5.00 Crores</td>
</tr>
<tr>
<td>1991-92</td>
<td>50000</td>
<td>Rs.5.00 Crores</td>
</tr>
</tbody>
</table>

1.4.2 Financial Requirements :

The distribution costs for minor irrigation items for 8th plan have been worked out in a very systematic manner. The details are as follows:

Costs of minor irrigation schemes for dugwells, private tubewells, electric pumpsets, public tubewells, tubewells and other structures like boring, deepening of failed dugwells have been worked out by Ministry of Irrigation. The details of these costs are as under:
* Table No.1-4

Cost of M.I. Structures for VIII Plan

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Item Description</th>
<th>Target Cost [Rs. Crores]</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Dugwells [without pumpsets]</td>
<td>17.11</td>
<td>3010</td>
</tr>
<tr>
<td>02</td>
<td>Private tubewells [without Pumpsets]</td>
<td>16.89</td>
<td>1084</td>
</tr>
<tr>
<td>03</td>
<td>Electric Pumpsets</td>
<td>30.00</td>
<td>2401</td>
</tr>
<tr>
<td>04</td>
<td>Diesel Pumpsets</td>
<td>6.22</td>
<td>505</td>
</tr>
<tr>
<td>05</td>
<td>Public tubewells</td>
<td>0.11</td>
<td>659</td>
</tr>
<tr>
<td>06</td>
<td>Other Structures like boring, deepening of</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>failed dugwells</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8659</td>
</tr>
</tbody>
</table>
a] This investment will be met partly by farmers from their own sources, partly from subsidies given to weaker section of farmers and partly from institutional investment.

b] The costs of surface water irrigation schemes are about Rs. 22000 per ha for normal programme & Rs. 30000 per ha under aided projects. Modernisation of tanks is costing about Rs. 25000/- per ha. Based on these considerations amounts under plan layouts have been estimated.

c] Institutional investments have been very significant in M.I. programmes and VII plan likely achievements will be Rs. 3311.91 Crores and envisaged 5119.00 Crores during eighth plan, i.e. about 144% increase.

d] Major constraints in accelerating flow of loan for M.I. schemes have been highlighted such as

i] delay in preparation of Banking Plan and a shell of schemes,

ii] Delay in preparation of schemes and sanction of applications/simplification of procedures for grant of loan and strengthening of machinery involved.
lack of technical guidance to farmers for site location and subsequent construction work.

Inadequate custom service for boring, blasting, installation of pumpsets etc. and construction of wells, tubewells, liftschemes on turnkey basis.

Unsatisfactory recovery position resulting reduced lending eligibility of the banks.

Problems of failed wells in hard rocks areas.

lack of location specific surveys by SGWO/CGWB for giving technical feasibility for individual work sites in hard rock areas, saline zones

Non-availability of data on loaning and completed works specially from commercial banks.

lack of coordination among different departments and agencies connected with the programme.

The above constraints affect the fulfilment of physical targets especially under ground water development. The necessary measures for
improvement must be taken to achieve the ambitious targets.

1.4.3 'Strategy and thrust areas of VIII Plan.

The Govt. of India has decided specific strategy and thrust areas to meet the challenges of foodgrains demands of year 2000.

a] To achieve the target of creation of 10 mha of irrigation potential from installation of ground water structures.

b] To achieve target of creation of additional irrigation potential of 2 mha from surface water minor irrigation schemes.

c] Restoration and modernisation of existing tanks.

d] Accelerated developments of M.I. in tribal areas.

e] Technology and technology inputs in M.I. projects.

f] Conservation of water & improved irrigation management and utilisation of irrigation potential.

g] Close monitoring of programme, improvement in
organisational structures at Centre and State level and imparting training at all levels.

h] Extending the benefits of M.I. programme to weaken sections of farmers.

i] Encouraging farmer’s participation & construction of irrigation Cooperatives/Water users association.

j] Use of ground water should be on scientific basis and regulated,

k] Increased use of water lifting devices using non-conventional energy sources.

l] Accelerated development of minor irrigation in drought prone and other difficult areas.

m] Improving the performance of public tubewells to achieve unutilised potential of 2 mha.

n] Restructuring and strengthening Central and State level M.I. organisations and meeting training needs.

On above listed strategic areas, specific thrust areas have been also listed statewise in details to achieve the physical targets for the eighth plan.
A) Agroclimatic Zone Planning for effective agricultural and irrigation growth.

a] For the purpose of agroclimatic regional planning country has been divided into 115 agroclimatic zones. Each zone is further subdivided into division and subdivisions.

b] The pattern of existing M.I. Schemes the water resources available and planning of new schemes for eighth plan vary from zone to zone.

c] This would overcome the limitation of over generalisation and lack of location specific issues and problems.

d] It is a strategic planning concerned with resource use particularly land, water and at a later stage integration of these plans with track of other regional plans will complete the process.

e] Thus this will help in boosting up irrigation potential and also effective growth of irrigation items to bring more land under irrigation and ultimately increase foodgrains production in the country.
a) Provision of Funds:

The declared policy of the Government is to channelise half of the investible funds to the rural sector. The planning commission has taken necessary steps and had issued guidelines for stepping up outlays on agriculture and allied sectors. The union budget for 1990-91 has provided for this. Other budgetory measures to help the rural sector include allocation of Rs.4000 Crores towards fertilizer subsidy, concessional import duty on specified pesticides, removal of excise duty on refined rape seed/mustered seed oil. Rs. 1000 Crores for implementing debt relief scheme for small farmers.

b) Debt Relief Scheme -

The framework of the debt relief scheme has been announced. The farmers who had taken loans for

* Source - Directorate of Advertising and Visual Publicity Ministry of Information and Broadcasting, Govt. of India, New Delhi, publication of June 1990.
agriculture and related activities will be covered under this scheme. The relief would cover all overdues on short term and other term loans advanced by public sector banks, regional rural banks, as on 2nd October 1989. Once the eligibility of the borrower is established the waiver of the principal and interest amounts would be allowed upto Rs.1000 Crores. The measure is likely to cost the Centre and States about Rs.3000 Crores.

c) National Agricultural Policy:

The importance given to agriculture will be effected in a national agriculture policy to be formulated. Meanwhile a high powered committee has been constituted to look into agricultural policies and programmes so as to fully realise the vast and untapped potential of Indian agriculture. The government will also have the advice of farmers' representative in formulating effective agricultural policies and programmes. A review committee was appointed on the basis of their interim report.

The support prices have been increased by Government. Thus procurement prices of Wheat for instance has been raised from Rs.183 to Rs.215 per quintle.

d) Land Reforms in the 9th Schedule:
Land Reform Laws passed by various states after 1984 have been included in the 9th schedule of the Constitution. A bill to this effect has been passed in parliament during the budget session. After inclusion in the 9th Schedule these laws cannot be challenged on the grounds of infringement of fundamental rights guaranteed in the constitution. Other measures to bring improvement on the farm front include:

i] A new commission for streamlining land revenue administration proposed.

ii] A corporation on the lines of NABARD for the construction of Minor Irrigation Projects.

iii] Improvement and expansion of the crop insurance scheme.

iv] Greater attention to oil seeds production and dairy development.

e] More incentives for small scale & agro industries:

More incentives for small scale & agro industries have been planned. The details are as follows:

i] Greater promotion of small scales and agro based industries and simplifying of procedure of industrial approval.

ii] High priority to agro processing industry in credit allocation from financial institutions.
CONCLUSIONS

1.5.1 The various factors of low agricultural productivity on one hand and very ambitious programmes of VIII plan related to minor irrigation and agriculture on the other hand can indicate the confused state of affairs in the country.

1.5.2 It is well understood that VIII plan will not yield expected results unless detailed studies both at MACRO and MICRO levels are undertaken to investigate each and every factor especially factor related to agricultural management as discussed in point no. 1.2.2.

1.5.3 As the water management has been the key factor of low agricultural productivity, it needs detailed investigations and research study.

1.5.4 An attempt has therefore been made to undertake the research work related to water management problems due to diesel engines, a vital tool of water management. In the next chapter, a detailed review has been taken to highlight the status of low agricultural productivity with respect to diesel engines in India at MACRO level.