### CONTENTS

| A) Waterlogging                  | 252 |
| B) Drainage Schemes              | 257 |
| C) Transit Losses                | 264 |
| D) Field Losses                  | 269 |
| E) Costs of Irrigation Benefits Lost | 272-279 |
Introduction

It has been observed that canal water is not being properly utilized in Maharashtra State. The canal water is lost due to number of factors, e.g. application of excess water to sugarcane cultivated in canal irrigated areas resulting in waterlogging, seepage, percolation absorption and other losses. The bad effects of these losses get more magnified specially when the large areas of lands can not be put to proper use on account of shortage of water. A seriousness of this problem increases because the water resources are limited in the State restricts the scope of development of irrigation in the State.

It is, therefore, necessary to assess the loss that is resulting due to the benefits of irrigation thus lost. An attempt has been made to ascertain these losses in terms of money. Of course, the discussion centres round the problems created due to waterlogging and transit losses.

A. Waterlogging

Meaning of the Term Waterlogged Land

An agricultural land may be termed as waterlogged land when the water table is permanently located at the ground level or when the soil pores in crop root zone get saturated with water.
Nature of the Problem

The following points need to be properly attended in order to know the nature of this problem.

i) **No Waterlogging Due to Wells**

Wells do not develop any kind of damage to soils. And, hence, the area that receives water from wells is completely free from waterlogging.

ii) **No Appreciable Damage by Minor Irrigation Works**

It has been observed that the minor irrigation works like tanks and bandharas remain in operation only for two seasons in a year. So far no waterlogging has taken place on any appreciable scale due to these works.

iii) **Waterlogged Land in Command Areas of Medium and Major Projects**

It has been observed that waterlogged area has been concentrated in the command areas of medium and major projects. Within a period of 2 to 3 years from the commencement of the canal irrigation damage to soil develops.

The Water Account

The following table gives a water account. It shows the distribution of water from the storage tank to successive stages.
Table No. 1 : Distribution of Water.

<table>
<thead>
<tr>
<th>Particular</th>
<th>Water in M.Cft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water stored in the lake.</td>
<td>1.00</td>
</tr>
<tr>
<td>At the canal Head - Exclusive of transit losses from storage to pick-up weir.</td>
<td>0.85</td>
</tr>
<tr>
<td>At Distributary Head.</td>
<td>0.60</td>
</tr>
<tr>
<td>At the Outlet Head.</td>
<td>0.54</td>
</tr>
<tr>
<td>At the Field Channel.</td>
<td>0.49</td>
</tr>
<tr>
<td>At the Field - Site.</td>
<td>0.45</td>
</tr>
<tr>
<td>Water transpired from an acre of Sugarcane.</td>
<td>0.15</td>
</tr>
<tr>
<td>Water evaporated from soil per acre under cane.</td>
<td>0.08</td>
</tr>
<tr>
<td>Water left in the soil.</td>
<td>0.22</td>
</tr>
</tbody>
</table>


0.22 M.Cft. Water is Added to Sub-soil

According to Table No.1, out of 1 M.Cft. water stored 0.22 M.Cft. water is left in the soil. That means about 1/5th of the total stored water is absorbed in the cane field. This raises the level of sub-soil water and unless it is lowered by some means or other that would cause a damage to the land.

Special Causes Responsible for Land Damages in the State

1) Heavy seepage from unlined canals.
2) In early days pre-irrigation soil survey was neglected. Situation has improved a lot after an
establishment of the Directorate of Irrigation Research and Development.

iii) Adoption of Wasteful irrigation practices specially in sugarcane fields. It is estimated that on an average at least 25 per cent more water than is required, is applied to sugarcane.

Water Table Position in Maharashtra

It was observed in the command area of the Nira Right Bank canals, the water table has risen in general. It was 40 ft. before the introduction of canal system. It raised to 25 ft. within a short period after its operation. The following table shows a water table position in command areas of major irrigation systems in the State. The area with 10 ft. hydro Iso-bath level is covered in this table.

Table No.2: Water Level Position in Maharashtra. (Area in Acres)

| Canal System               | Culturable Area in feet | 10 feet Hydro Isobath | Percentage of Area | 3 to 2
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Perennial section</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wira Left Bank Canal</td>
<td>1,02,251</td>
<td>63,327</td>
<td>61.9</td>
<td></td>
</tr>
<tr>
<td>Wira Right Bank Canal</td>
<td>99,216</td>
<td>47,759</td>
<td>48.1</td>
<td></td>
</tr>
<tr>
<td>Godavari Left Bank Canal</td>
<td>55,974</td>
<td>27,736</td>
<td>49.5</td>
<td></td>
</tr>
<tr>
<td>Godavari Right Bank Canal</td>
<td>93,216</td>
<td>57,987</td>
<td>62.2</td>
<td></td>
</tr>
<tr>
<td>Pravara Left Bank Canal</td>
<td>84,045</td>
<td>47,492</td>
<td>58.4</td>
<td></td>
</tr>
<tr>
<td>Pravara Right Bank Canal</td>
<td>41,306</td>
<td>24,400</td>
<td>58.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4,76,008</td>
<td>2,68,701</td>
<td>56.3</td>
<td></td>
</tr>
</tbody>
</table>

Table shows that 56.3 per cent of the areas under main canal systems have a water table 10 ft. just below the surface level and, hence, indicates a danger to land.

**Kinds of Damages**

The rise of water table creates two types of damages; viz., (i) Waterlogging in areas of comparatively shallow soils, and (ii) Salt efflorescence in deep or fairly deep soils. The following table shows kinds of damages created in the State in the command areas of major canal irrigation systems.

**Table No.3 : Kinds of Damages Created in Maharashtra State.**

<table>
<thead>
<tr>
<th>Areas in Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Waterlogged:</td>
</tr>
<tr>
<td>Salt Affected</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Nira Canals</td>
</tr>
<tr>
<td>Godavari Canals</td>
</tr>
<tr>
<td>Pravara Canals</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

**Source:** Problems of Irrigated Agriculture - April, 1970, p.25, by Dr. D.G. Kulkarni. Orient Longman Publication.

The table leads to a very important observation that out of the total damaged area 75 per cent is salt affected. The entire damaged area is unfit for any kind of cultivation.
B) Drainage Schemes - A curative Measure to Reclaim Waterlogged Areas

Drainages as a measure to reclaim the waterlogged lands are effective and deeper drains upon a permeable strata are usually successful. Drainages lower the level of water table which helps the damaged lands to get dried up. In due course of time, the lands can be brought back to cultivation.

The construction of drains is the long term solution to reclaim the damaged lands. Its construction prevents further spread of this menace. Drains remove both excessive water and salt from soil. And, hence, an efficient drainage system is essential. The progress of development of drainage schemes in Maharashtra, and difficulties in it have, therefore, been narrated in the following pages.

Construction of Drainage Schemes in Maharashtra State

It was Sir C.C. Inglis who initiated land drainage schemes in Maharashtra as early as 1916. Now the technique of construction of drainages has almost been standardized. It had been fully developed by Mr. W.A. Evershed, the then Executive Engineer, Irrigation Research Division, Poona, in the year 1937. The technique is fully elaborated in the Technical Paper No.56 published by the Public Works Department. The same technique is adopted, since then,
for the construction and design of drainage schemes in Maharashtra State.

While constructing a drainage scheme following three elements are duly considered - the slope of the soil. Permeability of the profile and, presence or absence of a permanent water table. A relative importance of these factors decide the need of drainage schemes in a particular area.

Achievements: Drainage Schemes

The following table shows number of schemes completed and the cost incurred up to 1963:

Table No. 4: Drainage Schemes Completed and Cost incurred and Area Reclaimed up to 1963.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Number of Schemes</th>
<th>Damaged Area in Acres</th>
<th>Area Improved in Acres</th>
<th>Cost in Rs. Lakhs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed Schemes</td>
<td>45</td>
<td>35,260</td>
<td>22,020</td>
<td>56.05</td>
</tr>
<tr>
<td>Additional Schemes in III Plan Period</td>
<td>69</td>
<td>34,350</td>
<td>23,000</td>
<td>88.70</td>
</tr>
<tr>
<td>Schemes in Sugar Factory Areas</td>
<td>13</td>
<td>16,640</td>
<td>11,000</td>
<td>41.57</td>
</tr>
</tbody>
</table>


The cost of the scheme varies between Rs.250 to Rs.275 on the basis of the land improved. It is expected
that due to price rise, even at present, the cost would not be more than Rs.400 per acre improved.

Upto 1970, 73 new drainage schemes have been completed at the cost of Rs.83.51 lakhs with the total length of about 500 kilometers.

During 1971-72, 54 land drainage schemes were at hand with the total length of 403.65 kilometers to improve 37.515 acres (or 15,006 hectares) of land. And, the total estimated cost was Rs.98.80 lakhs. But the Government of Maharashtra provided only Rs.45.38 lakhs for the same period in the budget.*

**Economic Yard Sticks**

The Government of Maharashtra has laid down the following economic yard sticks to decide the financial feasibility of the project, viz., (i) Total cost should not exceed Rs.500/- per hectare of total area damaged in the catchment of the project, and (ii) Total cost should not exceed Rs.250/- per hectare of the area protected.

**Agency for the Construction of Drainage Schemes in Maharashtra State**

Execution of these projects is the major responsibility of the Director, Irrigation Research and

* Performance Budget, 1971-72, the Department of Irrigation and Power, the Government of Maharashtra.
Development, Poona. He has under his control three-divisions, each under an Executive Engineer, located at Poona, Nasik and Aurangabad.

Special Problems Connected with the Development of Drainage Schemes in Maharashtra

i) Drainages are designed to carry small flows. But this design creates a problem whenever there is a heavy rain. These drains get flooded. These are susceptible to erosion and silting up and get out of use.

ii) Usually, the drains run with low velocity and, hence, suffer from weed growth.

iii) The drainages are located far away from roads and other means of communication, consequently, repairs and maintenance become difficult. Again, the work has to be carried out under wet conditions. Thus, repairs and maintenance become difficult.

iv) Complaints about drainage come from farmers and then only these are attended to. It has been found that area damaged is increasing in the State. Inadequate and improper maintenance are the chief causes responsible for such increase.

v) The designs of drainages are prepared to achieve an economy in their construction.
vi) Many times farmers put cross bunds in drains to divert or pump out water for irrigation. But these bunds are not removed which stops normal functioning of drains.

Suggestions to Improve Functioning of Drainage Schemes

1) Treating as Part of Irrigation Projects

It has been proved that the drainage schemes are necessary to control the damages caused to the lands in the command areas of the irrigation projects. And, hence, it would be adviseable to include these schemes as a part and parcel of the irrigation projects to be constructed.

2) Improving Existing Drainage Schemes

It is essential to improve schemes already constructed both by excavating new drains if necessary and remodelling of existing drains. These measures would increase the capacity and efficiency of drainage schemes. In this connection the example set by the Government of Uttar Pradesh is worth following. It has prepared a Master Plan containing both excavation of new canals and remodelling of existing drains running over 6,000 km.

3) Ensuring Strict Vigilance

Many times unauthorised obstructions are created in the form of cross bunds. It disturbs normal functioning of drains. It is, therefore, necessary to ensure strict vigilance over the drains and persons creating unauthorised
obstructions be detected and punished. If necessary, some legal provision be made to empower Government Officers to take disciplinary action.

iv) **More Inspection Facilities**

While constructing drainages, it should be observed that more inspection facilities be created and service roads and inspection paths be provided.

v) **Sufficient Funds for Maintenance**

In order to improve the standard of maintenance of drainage schemes, sufficient funds should be made available. Usually, separate funds are not allocated for this purpose. It would be, therefore, advisable to provide separate funds sufficient for maintenance of schemes.

vi) **Levying Drainage Cess**

It would be appropriate to levy and collect the Drainage Cess from those who are benefited by the scheme. The funds, raised can be applied towards the maintenance of the schemes. Such cess is collected in Andhra Pradesh under the Andhra Pradesh Drainage Cess Act, 1968.

vii) **Change in Policy**

Economic yardsticks laid down by the Government of Maharashtra for the construction of drainage schemes indirectly suggest that the Irrigation Research Division
should wait till the damage increases to such a proportion so that the scheme would be economically feasible.

And, hence, a change in this policy is essential. The authorities must be empowered to undertake the construction of drainage schemes in those areas where the chances of damages are visible. It would protect the command areas and by preventing damages it would achieve an increase in both the area under irrigation and the use of available water resources.

viii) Use of Drainage Water for Irrigation

The drainage scheme consists of a net works of open drains and pipe lines laid underground for collecting the percolated water and carrying it to natural drainage line. If the salt contains in this drainage water are less and if the water is not harmful for crops, it should be utilized for irrigating the lands beyond the damaged area or the damaged area after its reclamation.

ix) Establishing a Separate Section for Maintenance and Management of Drainages

At present, the completed drainage schemes are handed over to the concerned management division of the Irrigation and Power Department for maintenance and management. Since, the division is primarily concerned with the problems connected with the canal system, it can not pay proper and adequate attention to drainages. It
is, therefore, advisable to establish a separate field unit to look after management and maintenance of drainages.

C. Transit Losses

In order to know the nature of transit losses, the following terminology would be useful.

i) Absorption Losses

These losses are caused due to capillary action. In this case the pressure of water is less than the atmospheric pressure.

ii) Evaporation Losses

These losses are developed due to vaporization of water. The process comes under the influence of different climatic conditions.

iii) Percolation Losses

In the first instance water in tanks or canals find its way into the pore space of the sub-soil strata under gravity and then it flows out into a depression after filling the pores. The water lost in this way is called the percolation loss.

Magnitude of the Problem

Evaporation Losses

It should be noted that the evaporation losses are negligible if compared with absorption and percolation
losses. Again, very little can be done to eliminate these losses.

But it is equally true that the problem of evaporation has become quite serious in case of shallow irrigation tanks with open water surface. It has been found the "Cetyl Alcohol" and its modifications like OED-70 offer effective means to reduce evaporation.

Its utility and effectiveness are yet to be tested under the peculiar climatic conditions existing in Maharashtra State. An effective research on this issue is necessary to find out suitable solution.

Absorption and Percolation Losses

These are the main losses. These depend upon the permeability of the bed and bank material of the channel. It is held that the seepage action in the process of percolation depends upon the depth of the water in the channel and its temperature. But it has been experienced that these factors exert little pressure on the process of percolation.

Transit Losses in General

The generally accepted figures for transit losses in "alluvial" plains are as follows:

i) Main canals and branches - 17 per cent
ii) Distributaries - 8 per cent
iii) Water courses - 20 per cent
It means that 45 per cent of the total water entering into the canal head is lost in transit. Thus, only 55 per cent water is available for field where about 17 per cent of canal head discharge is again lost. Taken together the total losses are more than 70 per cent of canal head discharge. It has been observed that the losses are heavier on new canals in the initial stages. By the passage of time, these losses are reduced as the soil pores get sealed with finer material.

Transit Losses in Maharashtra

The total losses reported can be brought in short as follows:

i) Lake to Pick-up Weir - 4.00 per cent
ii) Losses in the Main Canals - 30.00 per cent
iii) Losses in distributaries - 12.00 per cent
iv) Losses in Outlet Channels - 6.00 per cent

Total Transit Losses : 52.00 per cent

Thus only 48.00 per cent of the gross storage is being utilized.

It is noteworthy that these losses are estimated for "Perennial Canal Zones" where the water is supplied continuously during the year. And, hence, in this zone the losses are comparatively less.
In the "Non-perennial Canal Zones" transit losses are more owing to little silt formation and the canal being run for few days in rotation with lower discharge. The transit losses in this section are about 15 to 20 per cent higher than those in perennial section. In other words, transit losses in non-perennial canal zone would vary between 67 to 72 per cent of the discharge at the canal head.

Measures to Check Transit Losses

1) Transit Losses in Canal

Transit losses in unlined canal are normally assumed at 8 cusecs per million square feet area of canal section up to full supply depth.

Lining of Canals - Savings in Terms of Water

It has been established that the lining of canals is the best and the only remedy to minimise the transit losses. If the canals are lined these losses are reduced, on an average, to 1 cusec per million square feet area of the canal section. It means that lining saves 7 cusecs of water per MCft. An annual savings on a perennial factors like discharge, water level, etc. An importance of this benefit increases due to shortage of surface water resources available for irrigation.
Savings in Terms of Cost

It has been pointed out by the Maharashtra State Irrigation Commission, 1962, that the lining is beneficial as it provides additional water at a cheaper rate. The Commission has assumed the cost of lining at a rate of Rs.100 per 100 square feet. Thus, total cost of additional water saved would be Rs.5,700 per MCft. While, the cost of additional water made available through fresh storages would be not less than Rs.7,500* per MCft. (Sum-at-charge). This alone justifies that the lining is beneficial.

Savings in Terms of Additional Area brought under Irrigation

Since, due to lining transit losses of canals would be brought down considerably, an additional area of about 15 lakh acres** would be brought under irrigation in the State.

Other Benefits

These are: (i) The lining stops percolation, and hence, damage to lands is checked. (ii) The lined canals do not require wide beds to achieve stability. They have three-times more velocities than unlined canals. This saves the land cost and earth work. (iii) Lined

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** Ibid, p.51.
canals are easier and cheaper to maintain. (iv) In case of lined canals problem of weed growth does not arise.

Other Aspects of Canal Lining

The following aspects of canal lining also need proper attention.

1) Reduction in Water Levels of Wells due to prevention of seepage from lined canal.

2) Lining is costly and, hence, is not favourably considered.

3) Lining is justified where channels run through soils with low permeability.

4) Water Shortage

The lining is desirable where water resources are scarce and inadequate and percolated water cannot be retrieved or when retrieved is unfit for use.

D. Field Losses

Field losses are all those losses of water which result in the field due to methods of application of water to crops and non-preparation of land for irrigation. These losses can certainly be controlled and eliminated if proper steps are taken. About one-third of the quantity of water supplied in the field is enough to rear or to bring up the crop. In other words about two-thirds of
water is lost in the field. It gives an indication of the magnitude of losses of water incurred in fields.

This waste of water can certainly be minimised if transition takes place from conventional methods to modern methods of irrigation and if land is prepared properly to receive irrigation. But these losses cannot be properly estimated.

Supply of Water on Volumetric Basis

It is one of the best and effective measures which can be used to check an excessive supply of water. This system has not been established in spite of serious efforts made, on account of the following reasons:

1) Farmers fear that they would get less water and, hence they resist this scheme.

2) Farmers wrongly hold that crops would yield more if these are applied more water. This ignorance induces them to resist the system.

3) Even at present suitable water meters are not available in sufficient quantity. Again the complicated process of operation of meters has to be simplified.

4) It is complained that beneficiary farmers tamper with the operations of meters and thus, wrong measurements are recorded.
v) If irrigator experiences a water shortage he would steal the water by adopting unethical practices. It causes the failure of this system.

Advantages of the System

i) It would reduce the work load of canal administration.

ii) Various benefits

If only necessary quantity of water is applied to crops, wastage of water is also avoided and thereby lands and crops would also be protected. The total yield and area under irrigation would also increase.

Conclusions

i) Establishing Water Requirements of Crops

Before undertaking introduction of this system, it is necessary to undertake an extensive study of water requirements of crops under different agro-climatic regions. Unless quantity of water required for bringing up of crop is fixed, the quantity of water to be supplied to the farmer(s) cannot be decided.

ii) Educating Cultivators

Farmers need to be educated about the bad effects of use of excessive water. They should be convinced that only necessary quantity, if applied, would be more beneficial for both land and crops. This can be done with the help
of model demonstration farms. Experiments on these farms would encourage farmers to adopt this system.

iii) Making Available Suitable Meters

Irrigation research engineers should invent suitable meters, which cannot be easily tampered with, taking into consideration different conditions prevailing in various agro-climatic regions.

iv) Establishment of a Separate Squad

It has been complained that meters are tampered with and dishonest practices increase. And, hence, a suggestion can be made to establish a separate squad. It would help irrigators to install, maintain and repair meters. Such squad should have a jurisdiction over three to four sub-divisions. The squad should find out unauthorised irrigation by surprise visits to areas where meters have already been fitted. It would serve as an effective check over unauthorised irrigation.

E. Cost of Irrigation Benefits Lost

In this connection primarily losses incurred due to an excess application of water to sugarcane fields and areas rendered unfit due to waterlogging would be considered.

1) Excess Application of Water to Sugarcane Fields

According to a systematic study carried out by the various Agricultural Research Stations all over the
State, it has been revealed that the sugarcane, during its eighteen months of life, requires only 120 inches of depth of water. But the observations have revealed that in anticipation of more yields the cultivators concerned apply at least 150 inches of water; i.e., 25 per cent more than required. This excess water, to the extent of 30 inches does not yield any more return and is, thus, simply wasted and, hence, lost.

Cost of Water Lost

The cost of water, thus lost in sugarcane fields, has the following two aspects.

1) Loss of Irrigation Revenue

The canal water is supplied to sugarcane at a rate of Rs.450 per acre per year. Thus, the total revenue would Rs.675/- for eighteen months. The rate of water charge has been based on the assumption that the cultivators use only 120 inches of water. But in practice, they use more water at least to the extent of 30 inches per acre.

For the use of such excess water, the cultivators do not obtain any kind of permission from any authority. This unauthorised use is a kind of water theft. The cultivators do not pay anything for the use of such water. And, hence, it is a clear cut loss to the Government so far as irrigation revenue is concerned. It amounts to Rs.168.75 per acre of sugarcane field.
ii) **Loss of Crops**

The water to the extent of 30 inches per acre of sugarcane field is being lost during the period of eighteen months i.e., period of maturity. If this water can be conserved and applied to food crops it would bring additional area under cultivation and additional income from food crops. The following table No. 5 would indicate which various crops can be grown by supplying the water thus saved, (i.e., 30 inches of water only) and the net gains that can certainly be earned. Again, the sugarcane requires 18-months for maturity. And, hence, this period has also been considered while deciding the following combinations of the crops. No set of crops requires a period more than eighteen months and water more than 30 inches.

From the table of combinations of Irrigated crops (Table No. 5) it would be clear that the minimum net gain comes to Rs. 2,900 while the maximum net gain amounts to Rs. 5,400 per acre and the average of these combinations comes to Rs. 3,800 per acre for a maximum period of 300 days.

Now we can assume that the loss would be at least Rs. 3,800/- per acre of sugarcane. Thus, it is a loss to the society due to non-utilization of irrigation benefits 30 acre inches for a period of eighteen months.
Table No.5: Combinations of Irrigated Crops.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Life in days</th>
<th>Water required in inches</th>
<th>Yield (per Acre)</th>
<th>Total Income (Rs.)</th>
<th>Expenditure (Rs.)</th>
<th>Net Gain (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabi - Potato</td>
<td>110</td>
<td>26</td>
<td>90.00</td>
<td>5,400</td>
<td>2,500</td>
<td>2,900</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>2,900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rabi - Wheat</td>
<td>100</td>
<td>16</td>
<td>12 Qnt. 3,000</td>
<td>600</td>
<td>2,400</td>
<td></td>
</tr>
<tr>
<td>Mug</td>
<td>80</td>
<td>12</td>
<td>6 Qnt. 1,020</td>
<td>300</td>
<td>720</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>28</td>
<td></td>
<td>3,100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kharif - Bajari</td>
<td>100</td>
<td>8</td>
<td>15 Qnt. 3,000</td>
<td>900</td>
<td>2,100</td>
<td></td>
</tr>
<tr>
<td>Kharif - Groundnut</td>
<td>100</td>
<td>4</td>
<td>6 Qnt. 1,500</td>
<td>600</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>Rabi - Wheat</td>
<td>100</td>
<td>16</td>
<td>12 Qnt. 3,000</td>
<td>600</td>
<td>2,400</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>300</td>
<td>28</td>
<td></td>
<td>5,400</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Loss per Acre of Sugarcane Field

The total of loss of irrigation revenue (viz. Rs.168.75) and loss of crops (viz. Rs.3,800) comes to Rs.3,968.75 per acre for a period of eighteen months.

Total Loss Due to Sugarcane Fields in State

According to the Season and Crop Report, 1969-70, (latest available) the total area under sugarcane in the
State is 5,54,500 acres. The total loss @ Rs.3,988.75 per acre would amount to Rs.220 crores. Out of which the loss of irrigation revenue would be about Rs.9.43 crores. It is a direct loss to the State treasury. The remaining loss is indirect loss to the Society. But, thereby, the agricultural income of the State is reduced affecting adversely the level of standard of living of the people in the State.

Likely Loss due to Cultivation of Sugarcane

The sugarcane is supposed to be the cash crop. But it is not true always. Its net gain may be less than net gains likely to be resulted on the cultivation of food crops. The following two tables would support the conclusion.

<table>
<thead>
<tr>
<th>Table No.6 : Net gains of Sugarcane. Cultivation per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
</tr>
<tr>
<td>Expenditure (Rs.)</td>
</tr>
</tbody>
</table>

It includes the costs of water received, fertilizer, cultivation and ploughing charges. Generally, the yield is 50 tons per acre. The market price is Rs.150 per ton. The net gain is calculated as follows:

\[ B - A = 3,000 \]

\[ - \text{Rs. 4,500} \quad \text{Total = Rs.7,500} \quad = \text{3,000} \]

During the same period of eighteen months, and consuming the same quantity of 120 inches of water, the following food crops can be taken.
Table No. 7: Combination of Food Crops

<table>
<thead>
<tr>
<th>Crop</th>
<th>Water</th>
<th>Life</th>
<th>Income Rs.</th>
<th>Expenditure Rs.</th>
<th>Net gain Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bajari</td>
<td>8 inches</td>
<td>100 days</td>
<td>3,000</td>
<td>900</td>
<td>2,100</td>
</tr>
<tr>
<td>Wheat</td>
<td>16 inches</td>
<td>100 days</td>
<td>3,000</td>
<td>600</td>
<td>2,400</td>
</tr>
<tr>
<td>Mug</td>
<td>12 inches</td>
<td>80 days</td>
<td>1,020</td>
<td>300</td>
<td>720</td>
</tr>
<tr>
<td>Jowar</td>
<td>10 inches</td>
<td>120 days</td>
<td>2,000</td>
<td>500</td>
<td>1,500</td>
</tr>
<tr>
<td>Total</td>
<td>46 inches</td>
<td>400 days</td>
<td>9,020</td>
<td>2,300</td>
<td>6,720</td>
</tr>
</tbody>
</table>

Even if these estimates (Table No. 7) are optimistic at least half of the net gain i.e. Rs. 3,360/- is certain.

It leads to the conclusion that the sugarcane as a crop would be beneficial only if its yield is NOT less than 50 tons per acre. Otherwise its cultivation would not be beneficial. Even with these calculations the loss of income would amount to Rs. 360/- per acre. In addition to this, the State has to import the food grains. These losses can be avoided if the cultivators are properly educated on this issue and if they are encouraged to adopt the food crop pattern as far as possible.

2) Waterlogged Areas

The causes of waterlogging have been discussed earlier in this chapter. Now an attempt would be made to evaluate the losses caused by it. These can be studied under the following heads:

i) Loss of Capital Cost.

ii) Expenditure for reclamation of land.

iii) Loss of Irrigation Revenue.
i) Loss of Capital or Investment

Most of the waterlogging has taken place in the command areas of major and medium irrigation projects. As a result, when waterlogging develops it can be treated as a straight loss of the capital invested in the construction of projects.

The cost of construction of a project, including the canals, varies according to the type of construction and topography. But there are some figures available from the project reports published by the Department of Agriculture, Government of Maharashtra. These reveal that the overall maximum cost per hectare irrigated is Rs.5,989/- for the PUS Project located in Yeotmal district. The minimum cost is Rs.1,815/- for Gangapur Project, near Nasik. Average cost of ten major and medium projects, for which the project reports are available, comes to Rs.2,440/- per hectare i.e., Rs.976/- per acre.

This capital investment has been completely locked up. Its interest @ 10 per cent per annum comes to Rs.97.60. It is a recurring loss per acre of waterlogged area.

ii) Reclamation Expenditure

The waterlogged lands need to be reclaimed. The Government of Maharashtra has established a separate Irrigation Research and Development Division for this purpose. It has also laid down the economic yardsticks
for undertaking the drainage project to reclaim the waterlogged leads. Accordingly, the Government spends Rs.500/- per hectare of the damaged land, i.e., Rs.200/- per acre. At this rate the Government would incur the expenditure for reclaiming the entire waterlogged land. It is also loss to the State.

iii) Loss of Irrigation Revenue

Prior to waterlogging the area was under the sugarcane. Now due to waterlogging, area has been put out of cultivation. As a result, the irrigation revenue has been reduced to that extent, which is at present rate is Rs.450/- per acre per year. Thus, it is a loss to the State treasury.

| Total per Acre Loss : Per Year |
|-----------------------------|---|
| i) Loss of interest        | 97-60 |
| ii) Reclamation Expenditure| 200-00 |
| iii) Loss of Revenue       | 450-00 |
| Total                      | 747.60 |

It is a recurring loss per year.

The total waterlogged area in the State is approximately 78,000 acres. And, hence, the total loss would be Rs.5.63 crores.

These losses have to be eliminated, at least minimised, otherwise the irrigated agriculture would be a curse to the State.