CHAPTER : SIX

CONCLUSIONS AND POLICY IMPLICATIONS

This chapter presents the concluding observations emanating from the whole study along with the important policy implications emerging therefrom. The observations are noted under the following heads.

I. Importance of water management.

II. The different water management practices including the Warabandhi system of water management.

III. The nature of the use of water in the State of Gujarat as a whole including the districtwise irrigation projects of Gujarat State for the period of 1973-74 to 1982-83.

IV. The different forces responsible for the under-utilisation of irrigation in Gujarat.

V. The impact of the working of Warabandhi system at farm level.

VI. Attitudes and opinions:
The qualitative informations in terms of attitudes and opinions of the users of water at farm level.

VII. Emerging policy implications.
I. IMPORTANCE OF WATER MANAGEMENT

The important points of observations are put up as under:

I.1 India, where the proportion of land under cultivation of the total geographical area is one of the highest in the world and since the scope for further increase in the cultivable land is limited, intensive agricultural cultivation is the only way to raise agricultural productivity and production through the use of modern strategic inputs. This in turn requires assured water supply through irrigation.

I.2 With limited water resources, their conservation is the only way out and it can be made possible through scientific water management. Further water management is becoming an increasing need of the time because rainfall is unevenly distributed amongst the different regions of the country. To avoid the problems of famine at the interval of every 3 to 5 years (rainfall cycle) the need for water management through scientific method is a must.

I.3 The present command areas of almost all irrigation projects in India suffer from a number
of serious problems of water logging, salinity, over use of water than actually required, non-availability of water in time and adequate available quantity, non-availability or low and uncertain availability of water in the lower reaches etc. These problems in turn have raised other serious problems in the command areas. An appropriate policy frame of water management is the only way to come out from the situation so developed in India.

1.4 Increasing water supply for rapid industrialization and urbanization can be well satisfied with appropriate water management policy.

1.5 Further, an appropriate water management policy would lead to substantial economy of water which in turn would save the country from the problem of satisfying the continuing additional but new demand for water.

II. OBSERVATION ON THE DIFFERENT WATER MANAGEMENT PRACTICES ARE AS FOLLOWS:

II.1 The recent development in irrigation technology brought about by what is called sprinkler and
drip irrigation can prove to be of vital importance in saving substantial quantity of scarce water resources. In many countries of the world like the U.S.A., Australia, Israel, France and European countries sprinkler and drip irrigation system are very popular.

II.2 The merits in respect of sprinkler and drip system of irrigation can be seen from the following description:

II.2(a) In sprinkler irrigation it is possible to apply water uniformly to all spots of a farm. The problem of soil erosion does not arise under this type of irrigation. Even on uneven lands the sprinkler sets make irrigation possible.

II.2(b) The runoff losses can be eliminated through the sprinkler irrigation system, because water under this system can apply at a rate which is less than the infiltration rate of the soil.

II.2(c) Sprinkler irrigation system enables to mix fertilizers and pesticides to mix with water, while the application thus made helps improve
the efficiency of these inputs for crop production.

II.2(d) Generally sprinkler irrigation is considered to be more suitable for closely spaced crops like cotton, groundnut, sugarcane, millets, pulses etc.

II.2(e) The analysis of the benefits of sprinkler and flow irrigation by tubewells reveals that after the installation of sprinkler sets the efficiency of irrigation has increased.

II.2(f) The another important method is drip irrigation that makes small measured amount of water available to the rootzone of plant at regular intervals in optimum quantities. Even when the ground surface is steep or uneven, water is scarce and saline and where crops are widely spaced as in orchards, vineyards etc, with specially designed drippers, water and fertilizers can be supplied up to the direct absorption point of the rootzone.

II.2(g) Drip irrigation saves time, saves fertilizers and water and increases yields.
II.2(h) By adopting drip irrigation method the use of water can be economised through close monitoring of water supply, depending on the quantity and timing. Consequently more area can be irrigated by a unit volume of water.

II.2(i) The drip irrigation is considered to be more suitable for widely spaced high value crops like coconut, banana, grapes, lime, orange etc.

II.2(j) To yield under drip irrigation is more profitable than that to yield under traditional irrigation system.

II.3 Observation on the warabandhi system of water management are as under:

II.3.1 In India, as a system of water distribution and management, warabandhi has been practised for over a century. However its spread was quite limited. Besides, the system has been in a crude form. In this method of distribution a certain rate of flow is allocated to each unit of culturable command area. In warabandhi system, after considering the
factors like rainfall, soil, the water requirements of cropping pattern and sub-soil water level at the time of preparation of the project, the rate of flow per unit and of land/its frequency are judiciously determined.

II.3.2 A pre-requisite for a successful 'warabandhi' is based on an adequate communication facilities alongwith the water control and measurement devices at the appropriate locations which control and measure the flow of water into and along the main canal, the branches, the minors, the distributaries etc.

II.3.3 The irrigation system of 'warabandhi' occupies an important place which can be seen from the following description:

(1) The dependability of the total delivery of water to the farmers is based on factors like, (a) discharge in the watercourse, (b) duration for which he receives it and (c) the frequency at which he receives it.
(2) There has been an improvement in the overall position of tailenders due to the warabandhi system.

(3) In the development of any project, watercourses occupy a key position. Amongst the different instruments employed in scientific experiments, the construction of water courses is an important one, which farmers construct at their own cost.

(4) In India the size of an average holding is small and for efficient irrigation, farmers are required to be clubbed together to share the minimum water which can be permitted in a water-course. Such practices may end in conflicts, which can be minimised in this system.

(5) Whenever the supply of water falls short of the demand due to non-availability in adequate quantity, rationing of water can be resorted to in warabandhi with least resistance.
(6) Lastly, with the efficient working of warabandhi system, the farmers at the tail end receive water in adequate quantity as also at the nick of time.

II.3.4 Thus, the implementation of warabandhi system endeavours insured and maintains the participation and co-operation of the beneficiaries. It also maintains self-discipline in water sharing, maintenance of on-farm distribution network and adoption of better water management.

III. THE OBSERVATIONS ON THE NATURE OF THE USE OF WATER FOR THE STATE OF GUJARAT AS A WHOLE AREA PUT UP AS UNDER:

III.1 The economy of Gujarat State rests significantly on agricultural sector. A rapid and well generated process of economic development of the agricultural sector, therefore, is essential. For this purpose irrigation facilities and their highest utilisation are essential for an important input like irrigation. The productivity of land and its growth basically depend to
a large extent upon the creation of water resources and their utilisation through scientific water management practices.

III.2 In the State, the availability of water through rainfall varies widely both year to year and quantum-wise.

III.3 At the all India level, the development of irrigation has been sluggish. However, the extent of sluggishness is found to be higher in Gujarat than that at the all India level as also in many other States.

III.4 In Gujarat, irrigation facilities are available mainly through tube-wells, other wells, canals, tanks and other sources. In 1980-81, for the state as a whole in total the net irrigated area the contribution of wells and tube-wells, canals, tanks and other sources worked out to 79.32 per cent, 18.32 per cent, 2.04 per cent and 0.32 per cent respectively.

III.5 In the State, at the district level, the development of irrigation is found to be
uneven. The estimate of gross irrigation ratio for the triennium-1980-83 reveals that the development seemed to be fairly good in Kheda, Mehasana and Sabarkantha, followed by Surat and Jamnagar. All these districts enjoyed the above average of the State position, while the ratio was very low in the districts of Panchmahals, Bharuch, Surendranagar, Kutch followed by the districts of Amreli, Ahmedabad, Bhavnagar and Junagadh.

III.6 The availability of irrigation facilities by different sources also reveals the wide variations in the nature of facilities available at the district level in the State.

III.7 On the State irrigation potential and the utilisation the observations are laid down as under:

The underutilisation of the created irrigation potential has remained one of the major problems, which is particularly more severe in respect of medium and major irrigation projects.
III.7.1 In the year 1984-85 the utilisation ratio worked out to 62.49 per cent in respect of medium and major irrigation projects.

III.7.2 In respect of minor irrigation projects the utilisation ratio has remained substantially high. It fluctuated between 72 and 86 per cent. However it did not show any improvement in the trend over the period.

III.7.3 For the major irrigation projects of the state, viz., Kakarapar, Mahi, Dantiwada, Shetrunji (Palitana) and Ukai irrigation projects put together the percentage of utilisation worked out to 63.93 per cent in 1982-83 which was 49.81 per cent in 1973-74. Thus, the utilisation ratio in respect of all the major irrigation projects taken together increased over time. However, the full utilisation has yet to travel a longway.
III.7.4 Utilisation the district level position:

The important observations are:

III.7.4(a) Surat is the only district receiving rainfall above 1000 m.m. Here the percentage of irrigation utilisation was 55.52 in 1982-83.

III.7.4(b) In the districts of Vadodara, Panchmahals, Kheda and Ahmedabad which receive the rainfall between 800 m.m. and 1000 m.m., the percentage of irrigation utilisation was found to be 76.05 per cent, 41.02 per cent, 67 per cent and 169.23 per cent respectively in the year 1982-83.

III.7.4(c) In the districts receiving rainfall between 400 m.m. and 800 m.m. districts of Saurashtra, Kutchchh, Banaskantha and Sabarkantha, the percentage of irrigation utilisation was
found to be 78.71 per cent, 71.38 per cent and 71.50 per cent respectively in the year 1982-83.

III.7.4(d) In the State of Gujarat as a whole 609.66 thousand hectares of irrigation potential have been created through major and medium irrigation projects in 1973-74, which increased to 945.30 thousand hectares in 1982-83. As against this the actual utilisation was 49.85 per cent in 1973-74 while in 1982-83 it increased to 55.40 per cent.

IV. THE OBSERVATIONS ON THE UNDERUTILISATION OF IRRIGATION—THE RESPONSIBLE FORCES:

In almost all the major canal projects of India and Gujarat, underutilisation is found to be a pervasive phenomenon.

IV.1 Huge waste of water taking place at the farm level is an important cause of underutilisation appearing in India. In the canal command areas throughout India,
there is a common feeling about the waste of water. In this regard the position in Gujarat is not different. In the different canal command areas, respondent irrigator farmers reported the wastage of water taking place.

IV.2 The absence of knowledge of scientific use of water on the part of farmers results into the waste of water. Besides the reasons like, (i) overuse of water by farmers due to uncertainty in the supply of water, (ii) poor maintenance of watercourses, (iii) direct use of water from canal by intercepting the watercourses or through breakage in the canal etc are responsible for the waste of water.

IV.3 The two important natural sources viz, evaporation of water and percolation of water into the soil are also responsible, for the lower area under irrigation and hence the underutilisation of the created irrigation potential.

IV.4 The problem of coastal saline land (3.64 lakh hectares of land in Gujarat) and the salinity are also responsible for the underutilisation of water.
IV.5 Surveys of a number of reservoirs have revealed that sediments have encroached upon the live storage. Consequently, the total utilisable storage provided for in a project get reduced by siltation, ultimately leading to a fall in the irrigated area. In respect of Gujarat recently the impact has begun to be realised.

IV.6 The poor operation and maintenance of irrigation and drainage systems is observed to be one of the important causes of under utilisation of created irrigation potential. This is basically due to inadequate financial provision made to meet the minimum expenditure required to maintain the irrigation systems in good working order with proper maintenance and administration. In Gujarat, it has been estimated that for the operation and maintenance an amount of Rs. 240 to Rs. 250 per hectare is required. In practice hardly 50 per cent of this amount is actually spent on these works. The problem gets further aggravated due to the poor quality of the construction work right from the main canals to the watercourses.

V. THE IMPACT OF THE WORKING OF WARABANDHI SYSTEM AT FARM LEVEL:

V.1 The micro study at farm level in connection with inquiring into the economics of water
management system attempted in the study is based on the average of two years data viz., 1983-84 and 1984-85. The study makes a comparison between the economics of farm enterprise of two areas (i) water management area (WMA) and (ii) non-water management area (NWMA). The important observations of this comparison are shown in table 6.1.

VI. ATTITUDES AND OPINIONS—THE QUALITATIVE INFORMATION
IN TERMS OF ATTITUDES AND OPINIONS OF THE USERS OF WATER AT FARM LEVEL

VI.1 To inquire into the working of any system in practice, field level observations are pertinent. These observations constitute an important plank of a micro study. The observations to be obtained can broadly be classified into two categories, one consisting of quantitative informations from the field, while the other consisting of qualitative informations. Although both the types of informations are important for policy implications the qualitative informations are of immense value.
### TABLE 6.1

**COMPARATIVE POSITION OF WMA AND NWMA WITH RESPECT TO SOME IMPORTANT AGRICULTURAL DEVELOPMENT INDICATORS**

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>FEATURE</th>
<th>WATER MANAGEMENT AREA (WMA)</th>
<th>NON-WATER MANAGEMENT AREA (NWMA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operational holding (in hectare)</td>
<td>2.46</td>
<td>2.46</td>
</tr>
<tr>
<td>2</td>
<td>Irrigable area as per cent of net cropped area (better - position)</td>
<td>93.34</td>
<td>76.50</td>
</tr>
<tr>
<td>3</td>
<td>Utilisation Ratio (per cent) (Slightly - better)</td>
<td>77.1</td>
<td>75.30</td>
</tr>
<tr>
<td>4</td>
<td>Per cent of NIA to NCA (Higher) (Lower)</td>
<td>71.87</td>
<td>57.60</td>
</tr>
<tr>
<td>5</td>
<td>Cropping intensity index (Better) (not so better)</td>
<td>153.53</td>
<td>147.94</td>
</tr>
<tr>
<td>6</td>
<td>Crop pattern (i) Introduction (i) These crops of some new non-foodgrain crops were introduced afterwards in the first found in NWMA.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WMA.
(ii) Rabi and Summer Cropping better in terms of non-food grain crops.

<table>
<thead>
<tr>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii) Share of modern inputs in total input expenses (in per cent)</td>
<td>24.95</td>
<td>24.53</td>
<td></td>
</tr>
<tr>
<td>(iii) Share of hired human labour in total input expenses (in percent)</td>
<td>18.12</td>
<td>14.28</td>
<td></td>
</tr>
</tbody>
</table>

8. Productivity performance

Overall position better than that in NWMA.

Overall position not so good as in WMA.
VI.2 In the Rabi season of 1981-83 for the first time the rotational water delivery was put into practice for the minors 5/R and 6/L having the culturable command area (CCA) of 145 hectares. Gradually this area was extended to the minot 1/R, 2/R, 4/L, 5/R, 6/L, 7/R, 8/R and 9/L covering the total CCA of 695 hectares.

VI.3 With a view to providing some useful details on the working of the irrigation system, all the three villages viz., Morva, Gokalpura and Ujada under water management pilot area were taken up for this study. The total number of benefited farmers comes to 617 in Morva and Gokalpura villages and 76 in the village Ujada, which is at the middle reach of the Morva distributory. The attitudes and opinion on different aspects of irrigation administration as viewed by the sample farmers were gathered from the selected farmers in these villages. The important observations are as under:

VI.3(a) In comparision to the middle reach, the irrigation facilities were found
to be better in the upper reach. At the upper reach 51.25 per cent of the farmers were found to have all their plots under canal irrigation. A detailed inquiry into this position reveals that (i) plots located outside the command area, (ii) uneven level of land, (iii) location of the plots at the higher level than that of the canal, (iv) lack of lining of field channels and (v) no water supply in the minor 25-2-R were found to be the reasons for non-availability of water to all plots. Among these reasons the first three were found to be the most important reasons in the upper reach, while the first, second and fifth ones were found to be the most important reasons for the farmers of the middle reach.

VI.3(b) In the area under study well irrigation continued to be practised even after the introduction of
the canal irrigation. In this context the inquiry made indicates that due to peculiar problems of canal irrigation a good number of farmers have shown their preference for well irrigation.

Farmers who have shown preferences either for canal or well water have also reported their reasons for such preferences. It may be noted here that among the different reasons (i) Better management, (ii) Assurance of water in adequate quantity and (iii) Suitability to crop were found to be relatively more important for the preference towards well rather than that for canal. Thus, despite warabandhi system these three explanations were found to have an edge in favour of wells. This shows that the warabandhi system as it operates at present needs improvement in such a way that it brings
(i) assured water supply at the nick of time, (ii) better management of water supply and (iii) suitability to soil.

VI.3(c) With the introduction of warabandhi system, normally the problem of inadequacy of water as also its supply in time are expected to be overcome. However, in the area under study, as regard the nature of supply of water, out of 120 sample farmers 69 or 57.5 per cent found it adequate, while 51 or 42.5 per cent found it inadequate. With the introduction of warabandhi system, the situation so obtained is alarming. Between the two reaches the problem was more serious for the middle reach, where in as many as 30 or 75 per cent farmers were found to have felt inadequacy of water supply. The problem was relatively less serious for the upper reach where 21 or 26.25 per cent farmers felt the inadequacy of supply of water.
VI.3(d) In the absence of adequate knowledge about water requirements of different crops and of certainty of water supply, farmers in the canal command areas are found using larger amount of water than the specific crop water requirement. Such a situation is found to be most common in the upper reach of the canal command area.

VI.3(e) Waste of canal water other than that through overuse of water is also most commonly confronted problem in the canal command area. For the area under study as many as 80 farmers or 66.67 per cent expressed their opinion on the prevalence of waste of water. To reduce the wastage of canal water four different measures were
suggested by the respondent farmers. They are (i) lining of field channels, (ii) cleaning of the canal and field channels at regular intervals, (iii) required distribution of water to farmers and (iv) repairing works in time (v) siltation and weed growth should be avoided.

VI.3(f) In respect of irrigation service, because of its nature and importance at farm level, some conflicts were found between farmers as the users and the organiser administrators as its suppliers. The conflicts were generally with respect to delivery time, duration and flow of water; 10 to 12 per cent of the selected farmers have reported such confrontation.

VI.3(g) All the farmers reported that canal water rates are very low and the majority of them showed their readiness to pay higher water rates with
the condition that water should be available in time and in adequate quantity.

VI.3(h) For the effective and efficient utilisation of water through warabandhi system the respondent farmers suggested that water should be supplied as per crop requirements and mal-practices should be avoided through administrative checks and proper distributive machinery and the supervision machinery for the regular distribution and maintenance of the flow of water.

VII. POLICY IMPLICATIONS:

VII.1 The analysis attempted in the study clearly pinpoints the crucial need of scientific water management of canal irrigation in India. There are two major aspects which need to be taken care of in any properly framed water management system. They are: (i) equity in use made by the farmers belonging to all the three reaches of each minor and outlet and
among farmers covered under each reach, and (ii) efficiency in use, which means minimum waste of water and elimination of the problem like water logging, salinity etc.

A solution to the above indicated basic problem of equity and efficiency of water use lies in a properly constituted distribution system. The introduction of warabandhi system of water distribution is considered to be the most appropriate system of distribution in the present situation. The warabandhi system of distribution of canal water as it operates in some parts of Gujarat suffers from a number of drawbacks. To overcome the defects and put the system on scientific lines, it needs following for its appropriate working.

VII.1(a) The system needs to be operated with water distribution commencing from the end or lower reach and may be subsequently supplied to the area of the upper reach.

VII.1(b) While fixing the period of watering the distance of a plot from an outlet should be properly taken care of.
VII.1(c) Water supply should be made dependable in terms of adequacy and time-liness by fixed discharge outlets on the minor flowing at full supply level as per pre-determined time schedule.

VII.1(d) Equitable distribution of the available water to farmers in relation to the area of their holdings should be arranged.

VII.1(e) For the effective working of the system while its operation in general may be left in the hands of irrigation administration, its actual implementation may be left to the groups of farmers framed for each outlet. In the initial stages, the groups thus framed may be allowed to work as informal associations while after sometime they may be formally converted into farmers' associations. The farmers' associations thus formed may be assigned the following functions:

(i) determining the schedule of the internal distribution of canal water
amongst farmers (ii) the maintenance of water courses and field channels (iii) the collection of water charges.

VII.2 CONJUNCTIVE USE OF WATER:

The concept of conjunctive use of water, i.e. using canal and well water jointly for a given plot of land is another important factor for a good water distribution system. This can work efficiently with the warabandhi system of canal water distribution. Such a use would lead to (i) the most efficient use of canal water with an extension of area under canal irrigation, (ii) substantial reduction in the waste of canal water, (iii) better financial returns with the expansion in the actual canal irrigated area and (iv) optimum exploitation of ground water in the canal command area. This would help solve the problems of water logging and salinity and consequent adverse effects.

VII.3 NEW IRRIGATION METHODS:

Along with the operation of warabandhi system of water distribution the new methods of irrigation, viz., drip and sprinkler ones, need to be introduced in the canal command areas. The introduction of these methods in respect of well
irrigation water is observed in some parts of Gujarat. However, the possibilities should be explored in respect of canal water. This would lead to an immense expansion of irrigated area and would solve the problems of many drought prone areas in the country which otherwise would be without irrigation facilities due to inadequacy of irrigation water.