CHAPTER VIII

SUMMARY AND CONCLUSIONS
Every drop of water should be judiciously utilized and its reckless wastage is to be eliminated. Human intervention is called for halting wastage water and harness the surplus water to benefit the water-stress regions. Unless water problem is adequately addressed with sufficient planning and care, the living beings may be threatened in the years to come.

Tunga Anicut is having two canals, Tunga Right Bank Canal (TRBC) with a length of 52 kms and Tunga Left Bank Canal (TLBC) having a length of length of 100 kms with 62 distributaries with a command area of 147.9 Sq.Km. The cropping pattern under the TLBC for kharif and rabi crops are 7047 ha and 4490 ha respectively (Table 6.2). The Left Bank Canal has been designed to carry a maximum water discharge of 540 cusecs benefiting 40 villages of Shimoga and Honnali taluks. Distributaries and their individual command area has been delineated (Table 3.1) using the sophisticated technologies like Remote Sensing and Geographic Information System (GIS) using software’s like ERDAS Imagine 9.1, PCI Geomatica 10, ArcGIS 9.2 and MapInfo 8.5.

The elicited information and its analysis revealed that the water societies of the TLBC has engaged in sharing the canal irrigation water and even during the crisis without having their own organizational structure and resources. The societies thus used only discussions cum persuasion techniques with fellow stakeholders located along the distributaries to share the canal irrigation water, among head, middle and tail end regions but they did not involve in maintenance, monitoring and management of canal. Thus these organizations were stressed only on social sustainability but not on technical and economic sustainability. Efforts should be made to involve farmers progressively in various aspects of management of irrigation systems, particularly in water distribution and assistance of voluntary agencies should be enlisted in educating the farmers in efficient water-use and water management.

There are 26 tanks present in the study area (Fig 3.6) out of which 4 tanks completely extinct. Nearly 5 tanks which are got dried-up due to excessive silt deposition, namely Urmundinakere of Hole Madapura village, Kadada kattekere of Kadadakatte village, Dodderikere of Dodderi village, Chikkere of Shimoga and Jodikatte of Honnapura village. The details of the remaining 17 tanks and their water samples were collected and their physico-chemical parameters were analyzed with regarding suitability for irrigation suitability.

72 samples from surface as well as ground water were collected during pre-monsoon and post-monsoon seasons following the standard guidelines (Hem 1985; APHA 1980; Trivedy and Goel, 1984) and analyzed for various chemical parameters (Table 2.2).
These parameters include hydrogen ion concentration (pH), electrical conductivity (EC), turbidity, total hardness (TH), total alkalinity (TA), total dissolved solids (TDS) and important cations such as calcium (Ca²⁺), magnesium (Mg²⁺), sodium (Na⁺), potassium (K⁺) and iron (Fe²⁺) as well as anions such as carbonates (CO₃²⁻), bicarbonates (HCO₃⁻), chlorides (Cl⁻), nitrates (NO₃⁻), Phosphate (PO₄³⁻) and sulphates (SO₄²⁻). Results of these analysis show that the water quality is suitable for agriculture purpose.

The soil in the TLBC area is predominately made up of 93 % red soil and 7.0 % of black soil. 33 representative soil samples were collected during pre-monsoon season (April 2007) and their locations are as shown in Fig 4.9. These soil samples were analyzed for physico-chemical parameters such as available Nitrogen, Phosphorous, Potassium and micronutrients such as Iron, Manganese, Zinc and Copper by standard analytical techniques. The soil samples in the TLBC area are suitable for irrigation purpose.

**Baseline Information**

The whole Tunga command does not have reliable baseline information and whatever little is available seems to be either not updated or not at one place. The parcel level wise information on the crop localization, individual holdings and their utilization status, detailed soil information, actual flow or water release statistics or utilization data are the important inputs to any in-depth attempt oriented towards rectifying the problems, there has no spatial information available on the existing land use for the TLBC. The present work has generated certain spatial information required for understanding the problems in the irrigation process, which need to be continued.

**Crop violation aspect**

The Tunga irrigation project is with crop localization but the crop violation is the accepted fact. The planning seasonal flows, based on crops grown in the previous season are being considered but official targets are not used ignoring the standard procedures for canal operations. The net result is excess withdrawal of water in the head and middle reaches of the command and tail end farmers do not get water properly for even one crop. Modernization of entire canal system (Table 7.4) can solve the problems of the tail end region farmers, the future constraints, such as salinization, water logging and excess sediment entry into the canal system should be taken care.
Institution- Farmer co-ordination, training, awareness

The co-ordination between the institution managing the canal operations and the farmers seem to be lacking. The institutions need to play role of facilitators. Training on standard procedures and agricultural extension, democratic and participatory planning for both the facilitators and farmers and implementation of participatory irrigation management (PIM) seems to be the only hope for the future, educating the farmers about the relative advantages and disadvantages of water use and cropping pattern with respect to specific soil system and the water crop soil compatibility, such knowledge is lacking among the farmers irrespective of head and tail end region, awareness campaign for managing the irrigation system, intervention of NGO’s, congenial political environment with proper policy guidelines and support are found be necessary.

Based on the irrigation scenarios with respect to the physical system and the role to be played by the farmers and the facilitators, a futuristic model for the water resources management has been evolved (Fig 7.2), which tries to address the various issues like implementing a sound spatial information system, disseminating the much required data to the farming community and vice versa and linking the whole irrigated command with a centralized command area system (CAIS).

Conclusions

The cultivation of paddy and other crops has violated the entire command area thus increasing the demand for water. The Government has notified an area of 6281 ha of paddy to be grown in the TLBC in kharif season and 3751 ha in rabi season (Table 6.2) but as per the findings thorough Remote sensing and GIS techniques from this study it has been found that 8543 ha paddy is grown in kharif and 5767 ha rabi seasons respectively. Therefore there is an increase of 26.47 % and 34% of crop growth in these seasons. Water supply in the entire command has been categorized into head, middle and tail-end regions in which head reaches having 26 distributaries with sufficient and surplus supply of water. Middle region having an average supply of water has 20 distributaries, where as the tail end region, there is very limited supply of water having 16 distributaries. Head region has the crops like paddy, sugarcane, arecanut which consumes large quantity of water and the surplus water is drained in to the river therefore proper management of water as per the requirement for the entire cropping season has to be regulated by adopting suitable controlling structures.
The middle and tail end regions have moderate and limited supply of water, whereas the demand is high, since these regions also cultivate paddy during both rabi and kharif seasons, wherein, the water is allowed in channels for irrigation for the full command for kharif crops only. For summer crops water is supplied in is drawn to the maximum by the head reach regions creating deficiency in the middle and tail end regions. Hence to overcome the above problem in the TLBC are the following recommendations are suggested.

The modernization of irrigation systems is essential to improve system performance. Institutional development i.e., knowledge and skills of the users should be advanced along with physical improvement to make the improvement sustainable and lasting.

By modernizing the 26 tanks present TLBC area to hold more water and the same can be used during Rabi seasons for agriculture purpose. The water quality of the study area is suitable for irrigation purpose, which may be helpful in Rabi season for agriculture purpose.

The problems faced in operational water management are relatively well known and various tools can be designed to assist managers of irrigation systems. Technical improvements have to be introduced with a full awareness of the existing management context.

The Water societies in the command should be given more responsibility in maintenance and management of the available water resources in a better way.

Tunga Command Area Information Centre is required, where the entire database related to the command should be available. Wireless system for communication has to be provided, which is a major cause for hindrance in the water management and resulting in short fall of development in the command.