CHAPTER - VI

SUMMARY, FINDINGS AND CONCLUSIONS
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6.0 SUMMARY AND FINDINGS

This chapter contains brief summary of the previous chapters of this thesis. An attempt has been made to incorporate the various suggestions and conclusions that have been arrived at in the course of this research study, in this chapter. This chapter attempts to briefly refer to the cumulative finding as the final outcome of the study and as point of reference for drawing appropriate inferences, conclusions and projections in to the future on the perspective of the critical research of irrigation sociology.

6.1 CHAPTER - I INTRODUCTION

6.1.1 Tanks are considered as assets by the community and as the giver of food and prosperity.

6.1.2 After the advent of British rule in this country the management of the tank system was vested with governmental agency from the community. Adequate funds were not provided for the maintenance of these tanks.

6.1.3 Before the British rule in India farmers and the entire community used to look upon the tanks as their own and carried out the Kudimaramath every year.

6.1.4 The attitudinal change in the community had resulted in the poor maintenance of the tanks, which in many cases fell in to a state of disrepair.

6.1.5 Water is input for agricultural production.

6.1.6 In India agriculture contributes over 40 per cent of national income.

6.1.7 Tamil Nadu is a proud inheritor of more than 39202 tanks. These durable assets of community with immense potential and value can be classified as system and non-system tanks.
6.1.8 Tamil Nadu is one of the water-starved states in India, whose per capita availability is less than the national average.

6.1.9 The projected food requirement of India in 2025 AD will be 345 million tonnes to meet the requirements of about 136 crore citizens.

6.1.10 Agriculture is vital to overcome poverty in the country, by providing food and jobs.

6.1.11 In order to give proper statutory status to the measures for the sustained maintenance of irrigation system and for the enforcement of the participatory irrigation management policy, the legislation of the Tamil Nadu Farmers’ Management of Irrigation system Act was passed in the State.

6.1.12 An effective WUA can play a vital role in managing the dependability and equity in the distribution of irrigation water in a tank irrigation system.

6.1.13 Many modernisation projects have been implemented in the state. They aim at conservation and effective management of water resources through modernisation of the existing systems and improving their efficiency.

6.1.14 The recently launched World Bank funded Water Resources Consolidation Project (WRCP) aims at improving the sustainability and productivity of Tamil Nadu irrigation sector through multi sector water planning, integration of farmers in irrigation management, water resource development, management and planning.

CHAPTER II, 2.0 REVIEW OF LITERATURE

6.2.1 The Review of literature chapter is divided into three parts. First section deals with the structures of tank irrigation system. The second section presents studies on the water management in the tank irrigation system.
The third and last section analyzes the water users' association and its functions.

6.2.2 Extensive literature on scientific aspects of tank irrigation management is available. But very few studies of this type of the present work are available.

6.2.3 I - TANK STRUCTURES AND PHYSICAL PARTICULARS OF THE TANK IRRIGATION SYSTEM

6.2.4 Adequate maintenance and operation of an irrigation system is a prerequisite to irrigation management. Structures of the tank system are to be maintained properly to reap the benefits for long.

6.2.5 Irrigation system maintenance is a continuous process. The irrigation channels are to be maintained season after season so that dependable water supply can be delivered to the command area. (Mohanakrishnan, A. 1999)

6.2.6 In an overview of the IMTI Seminar Proceedings, (1998) in some tank systems, the modernization work has been entrusted to the farmers' organization of the tank.

6.2.7 Dikshit, G.S., et.al. (1993) have concluded in their study that till the middle of the sixteenth century tanks were built and maintained by the people and their rulers satisfactorily.

6.2.8 Government should play a more meaningful and positive role in respect of the construction of field channels.

6.2.9 The following are the measures to reduce the seepage losses, lining channels, proper maintenance of channels, water management practices and awareness to farmers. The water losses in the unlined channel system are usually high. The losses will depend upon sectional area of the channel and its total length.
6.2.10 Appropriate scheduling technique and methods of irrigation have to be followed under efficient canal water management.

6.2.11 The following strategies are grouped for tank modernization, de-silting the tanks, de-silting the supply channel, curtailing encroachment, afforestation programs, tank water management, redefining the water demand, conjunctive use of tank and well water, farmer involvement in tank modernisation, crop management, tank administration etc.

6.2.12 Along with adequate irrigation, farmers should be properly trained to adopt package practice and modern agricultural implements to reap the benefits quickly and continuously (Vasudev Rao. 1987).

6.2.13 All the tanks should be de-silted regularly and the tank bunds strengthened by the silt and planting suitable tree species in the bunds and also in the catchment areas should be done.

6.2.14 The modernization works of the tank system has been carried out successfully with full involvement and co-operation of the members of the association. They have the confidence in the life of the canal structure, since the farmers themselves built it and the quality was ensured. (R. Shankar and K. Viswanathan. 1998 ).

6.2.15 IRRIGATION, WATER MANAGEMENT AND AGRICULTURE IN THE TANK IRRIGATION SYSTEM

6.2.16 Irrigation management is nothing but an artificial supply of water to a plant at a particular place, in a particular quantity and at a particular time.

6.2.17 These neerkattis systematically irrigate the lands according to the needs of the crop stages, since he is considered an expert in irrigation. They are paid according to the land extend they irrigate.

6.2.18 Sivanappan, R.K. (2001) found out that it is estimated that in another 20 years, the allocation of water for irrigation will be reduced from 84 per cent to 71 per cent.
6.1 Photo- silted, damaged and unused channel structures of a Kottaikulam tank system due to poor maintenance. This tank ayacutdars use the tank water mainly to recharge the groundwater than direct irrigation.
6.2.19 In rainfed areas, women play an important role in farming system. They are used to feeding livestock and taking part in agricultural operations such as sowing, weeding, harvesting etc. (Anil Bhardwaj and Narda, N.K. 2001)

6.2.20 Sachindananda. (1972) the author finds in his study that the caste composition, size and type of family, education, occupation, land holding size and socio-economic status, levels of living aspirations differed significantly between the two sets of block.

6.2.21 Irrigation in certain parts of the command area leads to substantial increase in agriculture production, increase in income, employment opportunity, greater division of labour and occupation specilisation. Increasing consumption, improved living conditions, social geographic mobility set in, in an otherwise static society, thus initiating a process of social change.

6.2.22 The small holdings can be the source of a significant proportion of a community's and a country's food production and they can also be more productive and more energy efficient than large holdings. (Peter Fraenkel. 1986).

6.2.23 Sukhadeo Thorat. (1993) the author stated that the apparently small farmers depend more on state owned canals and tanks than do the large farmers. But the position gets reversed in respect of privately owned wells, large farmers irrigate fairly larger proportion of their area through the privately owned wells than do the small farmers, particularly for high value crops.

6.2.24 The groundwater irrigation in the southern states, especially in Tamil Nadu, has certainly promoted the cultivation of non-food grains much more than tanks and canals. (Dhawan, B.D. 1988).
6.2.25 The proportion of small farmers is gradually increasing due to partition of families. Small farmers cannot invest in agricultural or allied pursuits from their family income.

6.2.26 The author found that after the implementation of the irrigation projects and the adoption of improved methods, the annual average income from agriculture has increased from Rs.2,737/- to Rs.4,018/- per family (Ahluwalia, B.K. and Shashi Ahluwalia. 1986).

6.2.27 Palanisami, K. and J.C. Flinn. (1988) came to a conclusion from their study that variation in the rainfall in the Northeast monsoon period heavily influences the tank filling and the tank irrigation.

6.2.28 The farmer’s participation on water management works has deceased in recent past in Indian agriculture. Massive introduction of bore well irrigation reduces the farmers' participation in the tank-related works. (Narayanmoorthy, A. 1993).

6.2.29 The old saying is that "The world will not form without water". Therefore the farmers of Tamil Nadu are well aware of the importance of water. They are also well versed in the technology of collecting, storing, transporting and distribution of water for the irrigation purposes.

6.2.30 The important source of irrigation is rain. Lakes, tanks, dams and channels are the irrigation systems used for collecting, storing and distribution of the rain water. (Balasubramanian, A. 1995).

6.2.31 Kulkarni, A.R. (1992) the author states that there is an increasing awareness to day of the need to involve beneficiaries in water management and distribution for optimum utilisation of the irrigation facilities in all irrigation systems.
6.2.32 WATER USERS' ASSOCIATION (WUA) IN FARMER-MANAGED TANK IRRIGATION SYSTEM

6.2.33 Association here means some kind of socially structured way of working together which is acceptable to almost all water users and supported by them. It may be formal, loose or under agreed local leadership.

6.2.34 Tanks are considered as assets by the community and as the giver of food and prosperity. The kings and Zamindars provided special manyams and grants for the proper upkeep and maintenance of these tanks.

6.2.35 Balasubramanian, C.N. (1993) states in his study that the traditional irrigation institutions gradually vanished due to the changes in the socio-political environment.

6.2.36 The WUA will act as a Liaison between the government and the enormous number of individual farmers. The WUA will be the assisting agency for executing on government policy.

6.2.37 The turning over of maintenance works to the farmers organisations may be increased. The conjunctive use of water should be increased in the fields. (Balasundaram, C. and K. Viswanathan. 1998).

6.2.38 Gomathinayagam, P. (1993) explains in his Joint Management of Irrigation System that the socio-economic, environment backgrounds play an important role in deciding the crop agronomic practices.

6.2.39 The goal of turning over, is not to abandon the systems of irrigation to the farmers but to make efficient use of water with cost-effectiveness as well as efficiency. (Pundarikanthan, N. V. 1993)

6.2.40 Gupta, D.P. and K.K. Shangeri. (1980) the authors state that the irrigation projects with their complex engineering and bureaucratic organisations cannot be successful without the active participation of beneficiary farmers in the management process.
6.2.41 Poddar, R.S. (2000) reports that farmer managed small scale irrigation projects have many advantages like high rates of return, short gestation period, low investments and maintenance cost, suitability to the local conditions, no cost escalations, no silting of reservoir, minimal environmental degradation and human misery in terms of eviction of the native people.

6.2.42 Conflicts are managed more productively in groups. Without co-operation, social organisation and groups of various kinds, humans beings would not survive.

6.2.43 The author points out the works of an irrigated agriculture also. The importance of groups or organisations is realised in WUA. The group concept is clearly shown in water management, water distribution, and conflict settlement.

6.2.44 The cropping pattern is also be decided by the farmers' association based on the availability of tank water. Farmers' participation is the only solution to overcome all problems in the tank irrigated agriculture.

CHAPTER - III, METHODOLOGY OF RESEARCH

6.3. 1. The performance of existing tank irrigation systems in the state is not satisfactory. While understanding the causes of low efficiency, this diagnostic analysis and evaluation of tank irrigation is called for.

6.3.2 The scope of this research study is confined to the farmer-managed tank irrigation system in Tiruchirappalli and Pudukkottai districts of Tamil Nadu. The scope of this study is further confined to farmers' participation, WUA and their socio-economic background in Tiruchirappalli and Pudukkottai districts of Tamil Nadu, (India).
6.3.3 The behavioral aspects as individuals and as group are vital to water management. Hence the movement of Participatory Irrigation Management gains importance.

6.3.4 The main functions of WUA are acquiring water, storing water, and equitably distributing water among all the beneficiaries without any disputes, and to uplift the socio-economic standards of the farmers by providing infrastructure facilities and to uplift the socio-economic standard of the farmers.

6.3.5 In this research study certain farmer managed tank irrigation systems are taken up for a detailed discussions, e.g. water distribution, water market, conflict settlement, Kudimaramath women participation etc.

6.3.6 The main objectives of this research study are to examine the socio-economic background of farmer respondents and their participation in tank irrigation system.

6.3.7 The hypothesis of the study are is that farmer participation and involvement in WUA activities, water market, crop profit, socio-economic background is higher in non-system tanks than in the system tanks.

6.3.8 The primary sources of data collection for this research are the responses collected from sample respondents of farmers and WUA office bearers of the farmer-managed tank irrigation system in Tiruchirappalli and Pudukkottai districts with the help of two sets of interview schedule prepared for the purpose.

6.3.9 The secondary sources of data were collected from the records available in the offices of the various government departments such as Public Works Department, Agriculture, Agriculture Engineering, Statistical Department, VAO and published literature.
6.3.10 The sample frame of the respondents chosen for administering the interview schedule is as follows: totally six tanks were selected from both districts. Three tanks from Tiruchirappalli district and another three tanks were selected from Pudukkottai district.

6.3.11 About 126 farmers are selected as respondents from six tanks, 21 farmer respondents from each tank system. The tank ayacut was also divided as head, middle and tail ends. Equal representation was given to each reach.

6.3.12 The data analysis has been carried out by using basic and advanced statistical procedures in keeping with the nature of the data and objectives of the study.

6.3.13 To verify the hypothesis of the study Pearson's Chi-square significance at 0.05 per cent level has been applied through SPSS.

6.4.0 CHAPTER IV, MACRO LEVEL VIEW OF IRRIGATION AND PROFILE OF STUDY AREA

6.4.1 Tiruchirappalli district is most centrally located in the state of Tamil Nadu. This district is spread over eight taluks with a total geographical extent of 4402.12 sq.km. with the head quarter at Tiruchirappalli. The district comprises eight taluks and has 483 revenue villages.

6.4.2 The predominant communities in the district may be classified into Agricultural Community, Trading Community, Weaving Community, Servicing Community, Village Artisan and Other Communities.

6.4.3 The agricultural communities, which are the dominating communities, are found in almost all taluks of the district. The major communities in this category of people are the Ambalakarars, the Kallars, the Karkatha Vellalars, the Kongu Vellalars, the Muthiraiyars, the Reddiars, the uralis and the Vanniars.
6.4.4 In the caste ridden society, the inter-caste relationship is generally cordial.
6.4.5 Inter-caste marriages in the district, as is elsewhere in the state are not quite common.
6.4.6 The institution of joint family system is fast deteriorating. Soon after the marriage the son or for that matter, the daughter in law, wants to lead a separate life, wants to be separated from his parents.
6.4.7 The people of the district are religious minded. The pilgrim centres in this district are Srirangam, Thiruvanaika, Rockfort temple, Mariamman temple, etc. The Hindus celebrate Pongal, Adi 18, Deepavali, Navarathri etc. with great enthusiasm and in a grand manner.
6.4.8 In towns, several recreation clubs, small and big are functioning where they play carrom board, table tennis, badminton etc. several non-governmental organisations are functioning in the district for the uplift of society.
6.4.9 The chief source of irrigation in Tiruchirappalli district is the river Cauvery.
6.4.10 Rice is the principal crop. Banana, sugarcane, pulses, betel vine, cotton and chillies are grown in part of the Tiruchirappalli district.
6.4.11 There are 1883 tanks in Tiruchirappalli district. Among them 790 are Panchayat union tanks, 160 are PWD tanks and the remaining 933 tanks are Ex-zamin.
6.4.12 Kottaikulam, Suriyur and Mangavanam tanks were selected as study tanks from Tiruchirappalli district.
6.4.13 Pudukkottai district covering the entire princely state of Pudukkottai and the part of area taken from Tanjore and Pudukkottai districts.
6.4.14 Pudukkottai is a drought prone district in Tamil Nadu next to Ramanathapuram district.
6.4.15 The geographical area of the district is 4663.2 sq.km. With the headquarters at Pudukkottai, the district has nine Taluks.
6.4.16 The community wise break up in Pudukkottai is Mukkulathors 17 per cent, Muthurajas 10 per cent, Scheduled castes 17 per cent, Christians 5 per cent, Muslims 8 per cent, Idaiyan/Yadavs and Vellalas around 6 per cent each. Brahmins are also present in some areas.
6.4.17 Main languages spoken in the district are Tamil, Malayalam, Telugu and Urdu.
6.4.18 There are several tourist places in the district such as Government Museum, Sittannavasal, Kudumiyanmalai, Kodumbalur, Viralimalai, Narthamalai, Avadaiyarkoil, etc.
6.4.19 The cattle wealth of a district is important to improve its agricultural resources. The important subsidiary activities carried on by the cultivators and agricultural labourers are dairying, sheep rearing and poultry.
6.4.20 Tanks are the main sources of irrigation in Pudukkottai district, which irrigate more than 77 per cent of the net area. Next to tanks, wells contribute 14 per cent and canals only 8 per cent.
6.4.21 Paddy, vegetables, groundnut and sugarcane are the major crops in the total crop area of the district.
6.4.22 In Pudukkottai district the total number of tanks are 5922. Among them 5334 belong to the Panchayat union, 530 to PWD and the remaining 58 are Ex-zamins.
6.4.23 From Pudukkottai district Parambur tank, Thuvar tank and Miratunilai tank were selected for this study.
6.4 CHAPTER - V, ANALYSIS OF DATA AND INTERPRETATION

6.4.0 PROFILE OF FARMER RESPONDENTS

I- Socio-Economic Background of Respondents

6.5.1 About 39 per cent of farmer respondents are in the age group of 26 to 40 years. Only 1 per cent of the farmer respondents is below 25 years age group and 60 per cent of farmers are in the age group of above 40 years.

6.5.2 While 42 per cent of farmer respondents are small farmers (below 2.5 acres of land) and 23 per cent of farmer respondents are marginal farmers (less than 5.0 acres). About 21 per cent of farmer respondents are large farmers (less than 10.0 acres) and only 14 per cent of farmer respondents are land lords (more than 10.0 acres).

6.5.3 Fifty two per cent of the system tank respondents and 48 per cent of non-system tank respondents have the responsibilities such as Panchayat member, WUA member, contact farmer, political party worker, cooperative society member, temple trustee etc. in the study area.

6.5.4 The experience of the farmer respondents in agriculture does not influence the land holding pattern of the farmer respondents in the ayacut.

6.5.5 The age of the respondents influences the profit in the season I and II crop of the ayacut in both category of the tank systems.

II- Distribution of Respondents by Assets (Movable)

6.5.6 The farmer respondents have assets such as motor cycle, bullock cart, tractor, table, chair, television, telephone, air conditioner, cooking gas etc. About 21 per cent of system tank farmer respondents and 17 per cent of non-system tank farmer respondents have no asset. While 23 per cent of farmer respondents in non-system tank have high assets (more
than Rs.50,000/-), 12 per cent of system tank farmer respondents have the higher valued assets.

6.5.7 While 21 per cent of farmer respondents in the non-system tank have the high valued houses, only 14 per cent of system tank farmer respondents have the higher valued houses. Farmers of non-system tanks have higher valued houses than the system tank farmers.

III - Distribution of Respondents by Money Saving Habits and Loans

6.5.8 About 60 per cent of non-system tank farmer respondents have money saving habits and 51 per cent of farmers in system tank have saving habits.

6.5.9 While 29 per cent of farmer respondents in non-system tanks have bank transactions only 7 per cent of system tank farmers have bank transaction. More saving habits and transactions are found among the non-system tank respondents than the system tank respondents.

6.5.10 While 69 per cent of system tank farmer respondents avail themselves of loans and 51 per cent of non-system tank farmer respondents avail themselves of loans. System tank farmers avail of more loans than the non-system tank respondents do.

6.5.11 About 43 per cent of system tank farmers and 31 per cent of non-system tank farmers avail themselves of loans less than Rs.5000/- and 18 per cent of system tank farmer respondents and 13 per cent of non-system tank respondents have loan less than Rs.10,000/-. Five per cent of farmer respondents have loans less than Rs.30,000/- in both the categories and only 3 per cent of farmer respondents have the higher loans i.e. more than Rs.50,000/- in both categories of tank systems.

6.5.12 Nearly half of the respondent farmers have repaid their loan properly.
6.5.13 About 48 per cent of farmer respondents are depending on their income from agriculture only. More than half of the system tank respondents have additional sources of income other than agriculture.

6.5.14 Nearly 45 per cent of farmer respondents in non-system tanks do not have additional source of income.

6.5.15 While 30 per cent of farmer respondents in non-system tanks have wastelands, in system tank 52 per cent of farmer respondents have wastelands.

6.5.16 The experience of the farmer respondents influence much the loan amount in both the tank systems.

6.5.17 The educational qualification of the farmer respondents influences the loan amount in both categories of tank systems.

IV - Distribution of Respondents based on Domestic Animals

6.5.18 Landlords and large farmers have higher value livestock than the small farmers. Small farmers have animals of less value.

6.5.19 It was observed that in the study area 48 per cent of the farmer respondents are from joint family system and the remaining 52 per cent of them are from nuclear family types.

V - Farmer Participation in Water Management and WUA

6.5.20 About 62 per cent of farmer respondents stated that the inflow water to the tank was reduced during the year 1980-1990. More than 50 per cent of farmer respondents in both tank systems stated that the water inflow to the tanks during the year 1991-2000 has been increased more than the period 1980-1990.

6.5.21 More than half of the respondents stated that the water distribution practices decreased in system and non-system tanks. The water
management and water distribution practices diminished in the tank-irrigated agriculture during the year 1980-1990.

6.5.22 Nearly 70 per cent of farmer respondents stated that the water distribution methods have been improved during the year 1991-2000 in system and non-system tanks. In the tank modernisation projects channels were lined with concrete, bunds were strengthened and sluices were repaired.

6.5.23 Due to tank modernisation, water distribution methods has been improved and water saving and timely irrigation are possible to the fields.

6.5.24 Eighty three per cent of system tank respondents and 62 per cent of non-system tank respondents stated that there are encroachments in the tank system.

6.5.25 Non-system tank farmers have more electric pump sets than the system tank farmers. 54 per cent of respondent farmers have electrical pump set in non-system tank and 45 per cent of respondents have electrical pump set in system tanks.

VI - Water Market in System and Non-System Tanks

6.5.26 About 73 per cent of respondent farmers have the practice of water selling in the ayacut for irrigation purposes.

6.5.27 More than half (55 per cent) of small farmers buy water for their crops and 28 per cent of marginal farmers also buy water for irrigation.

6.5.28 More small farmers buy water for their crops than the large farmers.

VII - Women Participation in Tank Irrigated Agriculture

6.5.29 While 76 per cent of farmer respondents stated that women's participation in agriculture is voluntary, 24 per cent of respondents
stated that women participate under compulsion. Women members have their family works at their homes.

6.5.30 Due to several technological developments and civilization most of the village women spent their times in television watching, books reading, engaging in other entertainment's, etc.,. Hence women members' participation in agricultural work becomes less and under compulsion.

6.5.31 About 96 per cent of respondent farmers stated that women's participation in agriculture is a must and only 4 per cent of the respondents have stated that participation of women is not necessary in tank irrigated agriculture, since most of the works such as transplantation, weeding, harvesting, thrashing, irrigation, etc., in agriculture are carried out by women only.

6.5.32 Ninety three per cent of the respondents stated that women are not involved in WUA activities.

6.5.33 About 74 per cent of farmer respondents stated that necessary steps such as awareness meeting, training, incentives, could improve women's participation.

VIII - Use of Technology and Mass Media in the Study Area

6.5.34 The application of modern technologies like ploughing, seed processing, plant protection, fertilizer application and post harvest techniques are followed equally by the farmer respondents of both the system tank and non-system tank farmers.

6.5.35 The irrigation water management practices are followed more among non-system tank farmer respondents than the system tank farmer respondents. The reason is occurrence of more water scarcity in non-system tanks.

6.5.36 The non-system tank farmers are aware of economic use of water.
6.5.37 The level of using mass media is more among non-system tank farmer respondents among than the system tank respondents.

6.5.38 The availability and use of mass media facilities play an important role in determining the adoption of new technology and crop production. Due to this the agricultural production has increased significantly.

IX - Labour in Irrigated Agriculture

6.5.39 In almost all tank systems, farmers start agricultural works simultaneously and it is found that there is shortage of workers. About 65 per cent of farmer respondents have stated that there is an increase in labour problem in the tank-irrigated agriculture.

6.5.40 About 44 per cent of farmer respondents have stated that agricultural labourers come from outer places.

6.5.41 The marginal farmers, large farmers and landlords are only able to get the labourers timely by paying huge advance amount to the labour contractors.

6.5.42 The labour contractors play a crucial role in the present agricultural labour market.

6.5.43 Labour demand for agricultural works arises because rural masses go to other works for better employment and more wages. The agricultural workers are getting low wages for their work when compared with other works.

6.5.44 About 50 per cent of farmer respondents stated that labour demand arises when the rural people go for other than agricultural works to other places.

6.5.45 The marginal farmers, large farmers and landlords are only able to use agricultural machinery such as harvester, thresher, ploughing machine, etc. in the field.
X - Water Management in the Study Area

6.5.46 Farmers use electric motor and diesel pump sets for pumping of water from their wells.

6.5.47 Non-system tank farmers have more electric pump sets than the system tank farmers.

6.5.48 There is not much difference in water selling among the small, marginal and large farmers of the ayacut.

6.5.49 There is a difference in water buying among the small, marginal, and large farmers.

6.5.50 About 56 per cent of farmer respondents get water from both sources such as tank and well.

6.5.51 Since most of the farmers depend on wells to get irrigation water, their participation in the tank maintenance is reduced significantly.

6.5.52 There exists a much difference in using tank and well water for irrigation among the ayacutdars. Small farmers are unable to use more groundwater due to their economic condition. Tail end farmers use minimum tank water when compared to head reach farmers.

6.5.53 Among the tank water users, 51 per cent belong to small farmers.

6.5.54 Landlords and large farmers use more groundwater than the small farmers. Small farmers are more in number and their lands are smaller in size and their economic condition is also poor to dig borewells. Hence small farmers buy more water from well owners.

6.5.55 Among the six study tanks the Suriyur tank (non-system) respondents have more (95 per cent) practice of conjunctive use of water.

6.5.56 In Mangavanam tank (system tank) 10 per cent of the farmers only use the groundwater for agricultural purposes.
In Kottaikulam tank (non-system) only 33 per cent of farmer respondents depend on tank water.

In Parambur tank (non-system) 67 per cent of farmer respondents have the practice of conjunctive use of irrigation water.

In Thuvar tank (non-system) 48 per cent of farmers have the practice of using tank and well water.

In Mirattunilai (system tank) 86 per cent of the respondent farmer's use both tank and well water.

Chances of occurring conflicts are less in Parambur tank system.

Parambur tank system WUA is functioning effectively. The ayacutdars share the available tank water equally under the decision of WUA.

In Mangavanam tank 70 per cent of respondents stated that the problems occur with the other village farmer groups.

In Mirattunilai tank system 48 per cent of respondents stated that the problems occur among the single and double crop cultivating farmers.

About 95 per cent of Suriyur tank respondents stated that there is no problem among the farmers regarding water sharing.

In Thuvar tank system 10 per cent of respondent farmers stated that the problems occur among the bore well and non-bore well owners.

The problems among the head and tail end ayacut farmers of the study tanks differ significantly.

The Suriyur tank farmer respondents have the least problem among the head and tail enders.

About 52 per cent of Parambur tank system respondents do not have problem among the head and tail end ayacut farmers.
6.5.70 While 57 per cent of Mirattunilai respondents stated that they have problem among the head and tail enders.
6.5.71 The maximum level of (80 per cent) Mangavanam, Kottaikulam and Thuvar tank respondents stated that the problem occurs among the ayacutdars during the water scarcity periods only.
6.5.72 Almost all the farmer respondents in the study area solve their problems, conflicts, etc. through village Panchayat or WUA itself.
6.5.73 System tank farmers have more problems during the water scarcity periods.
6.5.74 The problem in allocation of water among the head and tail end farmers is a little less among non-system tank farmers than among the system tank farmers.
6.5.75 The WUAs in non-system tanks are functioning very efficiently.
6.5.76 The system tank farmers work more independently than the non-system tank farmers.
6.5.77 Due to encroachment the flow of rainwater in to the tank system.
6.5.78 Conflicts occur with other village farmer groups due to encroachments in the tank system is obstructed.
6.5.79 About 25 per cent of non-system tank respondents and 10 per cent of system tank respondents stated that the problems are brought to the police station for settlement.
6.5.80 While 76 per cent of system tank respondents and 48 per cent of non-system tank respondents stated that the problems are settled in the village Panchayat itself.
6.5.81 About 29 per cent of non-system tank and 14 per cent of system tank respondents stated that the problems are settled in the WUA itself.
6.5.82 The severity of disputes is more in non-system tank farmers than in the system tank farmers.

6.5.83 About 68 per cent of non-system tank farmers and 47 per cent of system tank farmers get additional water for irrigation from the wells.

XII - Profit from the Crop in the System and Non-System Tanks

6.5.84 The profit in season II crop is a little less than the profit in season I crop.

6.5.85 The head reach farmers in the system tank and non-system tank in season I crop get almost equal profit.

6.5.86 The head reach farmers of non-system tank respondents are getting equal amount of profit in both seasons.

6.5.87 There is a reasonable reduction in the profit of the middle reach farmers of the ayacut in both system and non-system tank ayacuts between the season I and season II.

6.5.88 The middle reach farmers of the system tank get less profit when compared with middle reach farmers of the non-system tanks.

6.5.89 It is confirmed that the tail end ayacut farmers get less profit than the head reach farmers do in both tank systems.

XIII - Farmers Participation in Kudimaramath Works

6.5.90 Kudimaramath – the age-old traditional and conventional practice of maintaining irrigation systems by the farmers is followed partially in the study area tank systems.

6.5.91 In system tanks farmers do the Kudimaramath in a better manner than in the non-system tanks.

6.5.92 About 73 per cent of the respondents attend the Kudimaramath works yearly once in system tanks and 19 per cent of respondents do the works twice in a year in non-system tanks.
6.5.93 In the Kudimaramath works the farmers do the works such as cleaning of inlet channel, tank bund, distribution channel, etc.

XIV - Water Distribution Methods in Tank Irrigation System

6.5.94 Water distribution methods are not properly followed in both categories of tanks. The ayacutdars individually engage some persons to irrigate the fields.

6.5.95 The duty of Neerkatti is equally irrigating the fields depending upon the availability and requirement of water. They also safeguard the crop and tanks from other disturbances.

6.5.96 Majority of farmer respondents in both categories of tank systems pay cash and kind (from the portion of the harvested material) to the Neerkatti as their emoluments.

XV - Multi Purpose Uses of Tank

6.5.97 The tanks are used by society for several other purposes such as fisheries, washing, bathing, drinking, duck rearing, livestock grazing, livestock drinking, tree crops, brick making, temple/religious purpose, tank bund as roads, tank bed cultivation and social forestry, etc.

6.5.98 The people have several other uses of tanks, apart from the major use of irrigation to the fields. Therefore their performance cannot be limited exclusively to the production of crops.

In Kottaikulam tank almost all farmers use only the groundwater. The tank water is mainly used to recharge the groundwater. In addition to this the tank water used for fisheries and drinking purposes. Due to this, the ayacutdars care on the tank maintenance reduced hugely. In this tank ayacut most of the farmers are rich and engage labourers for all kind of farm works. Here, every one depend on labourers. Due to the
labour and water scarcity almost all farmers change their crop pattern from paddy to cash crops.

In *Mangavanam tank* ayacut there is only one bore well available. The groundwater use also very poor in this tank system. Hence the farmers cultivating only one crop (Paddy) with the available tank water. The ayacut farmers are unable to dig a own bore well in the ayacut due to their economical conditions.

In *Suriyur tank* the ayacutdars practise the conjunctive use of water. Both well and tank water used for cultivation. In addition to Paddy all ayacutdars cultivating cash crops in the season II. Most of the farmers have own bore well and the ayacutdars are socially and economically improved than other tank ayacutdars.

The *Parambur tank* ayacutdars use more groundwater to their cultivation. Water market practised in this tank system to a great extent. Part of the farmers buy irrigation water to their crops during the scarcity periods. The ayacutdars cultivating Paddy in addition to cash crops. The WUA in the tank system controls the ayacutdars and properly, equally distribute the available tank water to the fields. Due to the development of small scale industries in the village, the farmers feel difficult to engage labourers to their farm works. The socio-economic condition of this village farmers have been improved than other tank system farmers due to economic use of water.

The *Mirattunilai tank* has a large ayacut compared to other study tanks. Hence frequent conflicts occurred among the head and tail end farmers in sharing of irrigation water. The tail enders feel very difficult to get the irrigation water during the scarcity periods. Here also part of the farmers use ground water. Groundwater market also practised to some
6.2 Photo – *waterspread area* of the Kottaikulam tank. The tank water also used for *drinking purpose* to the villagers.
extent in this tank system. The ayacutdars cultivate vegetable crops in their fields in addition to Paddy due to scarcity of water. The *Thuvar tank* farmers have the practise to use a little groundwater potential than other tanks. The ayacutdars only depend on tank water. The farmers cultivate only one crop (Paddy) in their fields.

### 6.5.0 CONCLUSIONS

#### 6.5.1 WATER USERS' ASSOCIATION

The participation of all the ayacutdars is essential for effective functioning of the association. The WUA organised and formed by the WRO of PWD, in many tank systems in the study area are partially functioning. The office bearers of the association are not fully involved in the activities of the association. These registered associations should be properly watched and motivated for effective functioning. The WUA organised and formed by the WRO of PWD, in many tank systems in the study area have been improving at slow pace. Hence the government should take necessary steps to the effective functioning of the already registered Water Users’ Associations by proper training and necessary legal supports.

#### 6.5.2 WASTELAND CULTIVATION

Half of the system tank respondents have wastelands. One fourth of non-system tank respondents have wastelands due to several reasons such as scarcity of water, labour problem, soil problem, want of money, etc. government should initiate steps to put into use the wastelands under green cover.
6.5.3 POST HARVEST TECHNOLOGY
Most of the farmers are not aware of the post harvest technologies and facilities for their harvested agricultural produce. Necessary awareness and facilities should be created among the farming community.

6.5.4 ADOPTING MODERN TECHNOLOGIES
Half of the respondent farmers are in the position of adopting the modern technologies. Government should take necessary steps to adopt the modern technologies by all types of farmers in the field through that we can increase agricultural production.

6.5.5 MONEY SAVING PRACTICE
Half of the farmer respondents do not have the practice of saving money in the banks, post office, Life Insurance Corporation of India (LIC), etc. Since, most of the private finance companies were closed due to several reasons, the depositors suffer much to get their deposited money from the company. To avoid such incidents, the farmers and other depositors should come forward to save their money in the nationalised banks. Necessary motivation and facilities should be given to the farming community to save their money in nationalised banks.

6.5.6 WOMEN PARTICIPATION IN WUA
Women participation in WUA is very poor. Necessary steps and priorities should be given by the government, non-government organisation (NGO) and WUA to the women members to participate in the organisational activities also.

6.5.7 EVACUATION OF ENCROACHMENTS
Most of the tank systems are encroached by the people. Due to this water inflow to the tank system and the storage level of the tank system also are reduced heavily. In addition to this frequent conflicts occur between the two village farmer groups. To avoid such incidents and water losses the government
should take immediate steps to evacuate the encroachments in all tank systems with the involvement of inter-departments, Panchayat and Farmers’ movement.

6.5.8 TANK SILTS AND WATER PLANTS

Most of the tank systems get silted and filled with water plants. Due to this the storage capacity is reduced drastically and water losses also increased considerably. These unwanted things in the storage should be cleared immediately with the involvement of farmers in all the tank systems. By this way we can increase the storage capacity, groundwater level and agricultural production in the tank systems.

6.5.9 LABOUR DEMAND

The farmers have fragment of lands in the tank system and economically they are not able to use new machinery and equipment in their field. A large number of farmers depend on labourers for their agricultural works. The increasing labour demand in the rural areas for agricultural works should be monitored and necessary alternative arrangement should be made for this increasing problem.

6.5.10 ECONOMICAL USE OF GROUNDWATER

Since most of the farmers get water from wells, their participation in the tank maintenance is also reduced significantly. Landlord and large farmers use more groundwater than the small farmers. Since the government gives free electricity for farm works, farmers use excess groundwater for irrigation. The government should fix some tariff for the electricity consumption to the irrigation pump set for the economical use of groundwater.

6.5.11 IRRIGATION / WATER MANAGEMENT

In the tanks under study the water management practices are followed only partially by the farmers. Disparities in the availability of water between the head and tail farms and between small and big farms are taking place in almost all tank systems. Efficiency of utilisation of irrigation water should be
optimised and an awareness of water as a scarce resource should be fostered. Conservation consciousness should be promoted through education, regulation, and incentives.

6.5.12 FARMERS' PARTICIPATION

Farmers' Participation in the FMIS is becoming less when compared with previous years. Their involvement in the management and maintenance part are partly reduced due to different socio-economic reasons. We should improve this condition by involving not only the various governmental agencies but also the users and other stakeholders, in an effective and decisive manner, in various aspects of planning, design, development and management of the water resources schemes.

This study concludes that the system tank farmers have comparatively less profit in agriculture, poor socio-economic condition than the non-system tank farmers. Hence the researcher suggested that an in depth study may be conducted among system tanks to find out further reasons and remedies for the above.

6.6.0 SUGGESTIONS

This study compared a few selected farmer-managed tank irrigation systems in Tiruchirappalli and Pudukkottai districts of Tamil Nadu. The results indicate that Parambur and Suriyur farmer-managed tank irrigation systems are functioning more effectively than other study tanks. The functioning of WUA in most of the tank systems is to be improved through awareness campaign apart from what the state government is attempting at present like modernisation of tanks, training for officials and farmers, etc.
The office bearers of WUA's should realise their responsibilities and role in maintaining their own WUA's. For effective functioning of the WUA and proper maintenance of the irrigation system the present Tamil Nadu Farmer-managed Irrigation System Act should be implemented in all irrigation systems especially on the aspects like structural modernisation, conducting elections, turning over the system to the WUA, etc., The following suggestions are made by the researcher for an effective functioning of FMIS in Tamil Nadu.

Formation of WUA with authority and responsibility should be encouraged to facilitate the management including maintenance of irrigation system in a time bound manner.

Measures like issuing of new modern agricultural implements like thresher, tractor, power tiller, through bank loans, and selective linings in the conveyance system, modernisation and rehabilitation of existing tank system adoption of new techniques like drip and sprinkler may be promoted, where ever feasible.

Tank structures and systems created through massive investments should be properly maintained in good condition. There should be a regular monitoring of structures and systems and necessary rehabilitation and modernisation programmes should be undertaken.

Groundwater recharge projects should be developed and implemented for improving the groundwater resources. Integrated and coordinated development of surface water and groundwater resources and their conjunctive use, should be envisaged.

Water allocation in an irrigation system should be done with due regard to equity and social justice. Disparities in the availability of water between the head-reach and tail-end farms and between large and small farms should be
obviated by adoption of rotational water distribution system and supply of water on a volumetric basis subject to certain ceilings.

The training should extend to all the categories of personnel involved in these activities and also to the farmers.

Water should be made available to water shortage areas by transfer from other areas including transfers from one river basin to another, based on a national perspective after taking into account the requirements of the areas.

WUA and local bodies such as Village Pachayats should particularly be involved in the operation, maintenance and management of water infrastructures at appropriate levels progressively, with a view to transfer the management of such facilities to the user groups.

Increasing importance of water for agriculture, human and animal life, for maintaining ecological balance and for economic development of all kinds should be realized. Considering its increasing scarcity, optimal, economical and equitable use of tank water has become a matter of top most priority.

In continuation of this research, further studies may be conducted at different geographical locations among the farmers of different socio-economic conditions.