Chapter 5: Summary and Conclusions

5.1 Introduction

Throughout the chapters the study has analysed the importance of Tank irrigation, and why the tank irrigation in dry zones is necessary and why these water bodies like pond khal, beal plays a significant contribution in irrigation system in saline zone and why the salinity problem is one of the major problem in terms of ground water usage. These analysis and presentation have given some results on different aspects. In this last chapter we now present the total outline of this research followed by some policy prescription. The findings of the study are presented in the next section. The main objective of this chapter is to present the summary of major findings of this research, conclusion and important policy implications of the study.

Tank irrigation is one of the processes of Indian irrigation system. There are so many methodologies for the evaluation of tank irrigation and those were already discussed in the previous chapters. From the literature survey we have seen that these methods have already applied in different research study in different States of India. But in practical sense the application these methodologies for the establishment of efficient tanks are very rare. Till now the Indian government has not applied officially the procedure of evaluation and efficiency enhancement of tank irrigation for the improvement of agricultural productivity. There is very little evidence has been found in governmental planning or development agencies that have successfully incorporated the results of these studies in their decision-making procedure. But from the previous studies it is seen that the importance, productivity Performance and efficiency of tank

essentially depends upon the institutional structure at the central, State level or local level. Efficiency of the tanks is also backed by transparent organizational structure and good management. Now we summarize the major issues which have been discussed in this research.

It is clear from the analysis of this research that the irrigation capacities of West Bengal are not efficiently utilized. In the study area it has been seen that at present, about 9% areas is using the tank irrigation of total irrigation potential in South 24 Parganas. In this context, it is seen that the spatial dimension of irrigated area in West Bengal still remains insignificant. In south 24 Parganas most of the people are using deep tube well and shallow tube well for irrigation.

According to Chapter 1 it cannot be said that the State irrigation facilities are totally unsuccessful to regenerate the agricultural and other allied sectors of economy of West Bengal. We cannot deny the potentials of irrigation and induced beneficial changes in rural agrarian economy of West Bengal. It has been seen that semi –arid districts of West Bengal have been earned some tangible benefits from the irrigation facilities.

According to the literature it has been seen that potential of tank irrigation facilities in terms of growth of production is not clearly understood. Apart from the success stories of few semi-arid districts of west Bengal, the potential of tank irrigation in South 24 Parganas has not been utilized efficiently. The picture of few less efficient existing tank irrigation systems in South 24 Parganas as well as in West Bengal may become the resultant of irregular rainfall or rainfall deficit in West Bengal. A future research is required to clarify this paradoxical situation.

The major reason of inefficient use of water resources is the inadequate initiative of the government. According to the last ten years irrigation data

of South 24 Parganas, it has been seen that there is no change in terms of number of tanks using for irrigation but the percentage of tank irrigated is decreasing. These mean that required water for tank irrigation is not available in the tanks allowed for irrigation, so a rejuvenation activity is required for these tanks. This is in general but there may be some other factors for declining the use of tank irrigation facility. To introduce effective irrigation system in the wetlands of the State for better performance in the agricultural sector, the government has to consider the ecological balance during implementation of irrigation projects. It has also been found that people of South 24 Parganas are mainly dependent on the rain fed and deep tube well irrigation for farming and vey less interested in tank irrigation farming. Some of the people prefer to follow the traditional irrigation technology. Inadequate technology circulation and knowledge has created the difference between the governance and the rural community. Absence of adequate technological diffusion has resulted in a perception gap between the bureaucracy and rural community.

On these backdrops, it is very much necessary to classify the specific problems to expose the future prospects of tank irrigation agriculture in South 24 Parganas and West Bengal. The origin of such faulty irrigation system in West Bengal may be described in terms of ecological in nature.

5.2 Ecological Problems

During planning of full utilization of tank irrigation System, the location specific character of irrigation should be kept in mind. This is one of the main reasons for various constraints enforced by the physical environment and this is the major reason of faulty management system.

5.2.1 Much Dependency on Rain Water

Due to low rainfall/ rainfall fluctuation in the monsoon creates annual and seasonal variations of the tank water levels and as a consequence there is seen a significant reduction of supply of water during summer and winter. The reduced water supply is restricting the double and multi cropping activity in South 24 Parganas. So when the farmers required water for their farming they are not getting adequate supply from the nearby tank and they have to be dependent on ground water and canal water. In the use of groundwater, such types of fluctuations are very rare but some minor fluctuations are happening in the dry spell years. As a result of less water supply from both the sources, the crop yields are drastically reduced. During this period the farmers have to deeper digging and placing the pumps at lower levels, this will increase the cost of production.

5.2.2 Siltation of Tank Beds

Due to high deforestation rate and less plantation in the tank bunds, the soil erosion from the tank bunds is increasing. This soil erosion is reducing the water storage capacity of the tank. During monsoon it will increase the probability of floods along the lower extents and this will create a waterlogging situation in the areas. These water logged areas will

emerged as breeding grounds of mosquitoes and increase the vector borne diseases in the low-lying areas.

5.2.3 Water Quality Criteria

This is one of the major problems of South 24 Parganas as well as other coastal districts of West Bengal. Surface and ground water salinity along with soil salinity are not a friendly situation of irrigated agriculture. Very recently the farmers are farming salt resistant mono-cropping rice. The double crop depends on the residual moisture. Normally tank irrigation system is practicing at the local level but now a days people are also using deep tube well irrigation but due to over utilization there is chance of penetration of saline water. Some of the villages in south 24 Parganas, bordering by tidal rivers and frequent inundation by the tidal rivers is the major cause of gradually increasing the salinity in the deep tube well water.

5.3 Major Findings

1) The survey reveals that after the renovation of water bodies, the area of cultivation in the command area and value of production will be significantly changed in the study area. The growth rate of production, before and after the renovation of water bodies will be more than 100%.

2) Rain is the main source of water for all water bodies. During rainy season, 96 percent of total water spread area is filled with rain water, and it is very low during summer (50%).

3) The efficiency of all water bodies has been measured by the value of production per acre of irrigated area, known as tank

productivity. The average irrigated area and production value are 44.51 acres and INR 44, 934 respectively. It is understood that this productivity is related to many aspects of cultivation.

4) This study aims at the empirical assessment of the impact of tank irrigation on Indian agrarian economy. It finds that the tank irrigation has the potential to boost the contribution of agriculture in GDP of Indian economy.

5) From the secondary data used in this research it is found that in India, most of the people depend on natural resources to support their livelihood. The absence of these livelihood support and services create two types of poverty: Absolute Poverty and Relative Poverty. According to 2011 Agricultural Census of India, 61.5% of the total population is engaged in agriculture and in South 24 Parganas more than 70% people depend on agriculture, fishing and fisheries. Lack of electricity accessibility in many areas is one of the major reasons behind the failure of minor irrigation facilities in the Study area. So, if the government does not provide any alternatives to the rural population, there is no scope to increase the agricultural production in the study area.

6) From the literature survey it can be concluded that the tank irrigation system is the most appropriate one for the irrigation purpose. But the infrastructure is not same for all the State even all the districts of West Bengal and it can also be mentioned that different State or Districts have significant geographical features. So, the question is: is it possible to implement the same irrigation system for different geographical area? The coastal areas have problem of soil salinity and tidal inundation. These problems

significantly affect the use of tank irrigation and deep tube well irrigation system for agriculture in the coastal areas.

7) In South 24 Parganas, due to poverty and low awareness of the people, the estimates about WTP for irrigation water are mostly under estimates. Moreover, due to the existence of sharp inequality (which is also increasing during the last 20 years due to the Localizations, Privatizations and globalization (LPG) strategy of economic reforms), such estimates vary widely due to the increase in inequality within the society. Even the WTP is hindered by the extreme poverty of the people living in the areas, which are not suitable for human habitation because of less employment opportunity and income generation. In this study the results show that distance and family income are significant variables in the analysis. This means that the farmers with higher annual income have high interest to pay for irrigation water.

8) Being developing low-income countries, the awareness about environmental benefit and cost came late in these countries. At the official level also adequate steps were not taken to properly estimate the changes and to keep the records. The official policies in these countries are also mostly indifferent to scientific valuation technique developed during the last few decades. As a result, the applicability of such techniques is severely limited for lack of data. The uses of different techniques are based on empirical information about the variables used by a technique. But, unfortunately at the official level no policy has been adopted to collect data appropriately.

9) The situation in West Bengal is not different from other States of India as here also the same sources of irrigation activities is taking and over use of water giving its toll in various directions in a variety of ways, be it in the form of arsenic pollution due to overuse of ground water to produce multiple crops, or in the form of destruction of wetlands in the name of urbanization and in many other ways. The negligence in the proper implementation of irrigation projects creates malfunctioning of the facilities.

10) From the survey it is found that to provide for a sustainable livelihood security of the population it is not enough to stop only at the ecological sustainability of the water use in the irrigation system. It is also essential to provide the population, especially the lower strata, with alternative sources of irrigation system and technical information of the irrigation system,

11) For the study area the government can utilize the potentiality of agriculture technologist for technological up gradation and better utilization of irrigation systems. Through organizing training programmes as well as awareness programme the government can trained the local people for taking up various vocations related to Agricultural Development.

12) Till now employment in the agricultural sector is decreasing in the study area. If we properly utilize the irrigation system through the development of tank irrigation and efficient management procedure then it will generate income and employment in the agricultural sector of the district.

13) Central Government as well as State government can take any viable irrigation process as an option for agricultural development

and if the government initiated efficient irrigation system and managed by government departments then it is expected that it will be quite well managed, and it will be quite efficient and well run. By this system government will generate more contribution in District GDP from the Agriculture sector.

14) From the survey result of the area under Sundarban, it is estimated that 1781 km ^{2} is under water while 4225 km ^{2} is covered under reserved forest .Most of the rivers, which generally flow from the north to south, are influenced by tide from the Bay of Bengal. Very recently the characteristic of the area under Sundarban abruptly changed due to

   - ❖ Increase of human settlement and agricultural activities leading to reduction in the forest land, which caused an imbalance in the ecology.
   - ❖ Increasing population in this area due to illegal migration from neighbouring Bangladesh.
   - ❖ Increase in the population below poverty line leading to decline in the economic situation of this area.

15) The empirical results in this study are both comparable and distinct as compared to other studies in the literature. However, this study has obtained comparable results under different empirical analysis in regard to specifications of variables, data used etc. as compared to the other studies.

16) Finally, a few words about the problems that our country faces to run the process of irrigation facility in an official manner.

5.4 Limitations of water irrigation valuation methodology:

- The economic valuation of irrigation water cannot be feasible in real terms. There are different types of costs for different uses of the water resources in different blocks and villages as well as in different districts.
- The people cannot act accordingly to their opinions as expressed in their responses to questionnaire regarding the willingness to pay.

5.5 Conclusions

This study has focused on the analysis of the importance of Tank irrigation, and why these water bodies like pond khal, beal play a significant contribution in irrigation system in saline zone and why the salinity problem is one of the major problem in terms of tank water irrigation in South 24 Parganas. Several useful policy prescriptions are recommended from the major descriptive and empirical findings of the study. The recommendations are summarized below:

1) In spite of some steps taken by the government, adequate practical implementation is yet to be developed. There is required a dedicated wing for the implementation of efficient irrigation system and proper irrigation management system in the water department in Government of India as well as Government of West Bengal.
2) It has been seen that the productivity is significantly increasing due to proper renovation of the water bodies in the South 24 Parganas, which is not getting in the government websites and reports. So, simplification of getting data support from the

website of Department of water resources, Government of India and as well as Government of West Bengal is necessary. Reformulation of government rules and regulation is necessary.

3) A detail land use plan is also necessary for the Sundarban area as, the most important constraint for developing the region is the absence of an effective ecologically based land use policy. The role of the irrigation system in agriculture and the importance of maintaining a sustainable relationship between water use and agriculture is essential to address the future developmental plans.

4) It has been suggested that the seed bank consisting of salt tolerant paddy and other crops needs to be established in Sundarban region. A survey of different parts of Sundarban is immediately necessary for having a complete knowledge for future agriculture plan of actions. It is also necessary to prepare a long term plan for the protection of embankment as well as mangrove forest on the basis of modern technology including the preparation of a disaster management plan both on regular and emergency basis. The engineering and administrative efficiency is urgently required to implement the agriculture action plans with the help of the local bodies, State Government, Planning Commission in an integrated manner.

5) Awareness of the people and their responsibility in the irrigation system is crucial for a long term solution of the problems, where the individual interest may have to be sacrificed for the overall development plan of the region. It may also be mentioned that an appropriate policy for improvement of agricultural production and

use of newly created land is also extremely important in this context.

6) Ecological sustainability of irrigation system is more important and it can be achieved through grass root level plans and programmes. The study also reveals that the average value of WTP for the tank irrigation water is found to be considerably less than the opportunity cost of the irrigation water which is indicating the unsustainable use of irrigation water from the tank system at present. Therefore it can be said that for both farmers' and government perspectives, sustainability of irrigation systems is very important in the present days. A district level water use policy is needed for better utilization of water resources. The objective of the government has to be to produce more food with sustainable utilization of water resources. The developmental plans should be with long term objectives rather than short term objectives and immediate benefits.

7) According to the result it has been seen that tank condition is one of the major determining factor for crop production. Hence, it may be said that some other factors (physical and institutional) have also major influence on crop production. Finally in this study Data Envelopment Analysis has been employed to measure the relative efficiency of the tanks. Out of 65 water bodies, 7 water bodies have the efficiency score 1 and ranked 1. It has also been seen that efficient tanks can produce more corps than the other tanks. So, to improve the efficiency the village level institution can impose a user fees for the farmers. As a user fee a green tax can be imposed on all depletive users of water resources to cover the social cost of the reduced ecological damage. Such a tax can be used to create an

ecological fund to be used for developed an efficient irrigation system and also to improve GDP. There is needed to take concrete steps to ensure the sustainable management of the water resources in agriculture in West Bengal as well as in India. Given the economic and ecological significance of water resources, there is a need for a careful study in order to identify the issues involved in ecological sustainability of water resources. From a system's point of view the sustainable development will be one that improves the quality of life while living within the carrying capacity of supporting ecosystem. The process of realization of tax should be simple and transparent.

8) This research has already examined the importance of Tank irrigation, and why the tank irrigation is necessary and why these water bodies like pond khal, beal plays a significant contribution in irrigation system in saline zone and why the salinity problem is one of the major problem in terms of tank irrigation and ground water usage in South 24 Parganas. According to the literature survey and USSL classifications of Irrigation water based on salinity and sodium hazards we have seen that to which extent of saline water is suitable for irrigation. These classifications provide lessons for future irrigation strategies, as well as new policies at the district level for every State of India.

9) A number of tank irrigation studies are available but these studies cannot cover all the aspects of tank irrigation especially for coastal districts. This study has attempted to analyze the impact of salinity in terms of tank irrigation. For this reason broad based studies are required and the data must be collected throughout the country from all types of irrigation system in all geographical zones. This

is however, a huge task but for coordinating the task NGOs must be engaged and special funds are needed.

10) For decision making, simple and less costly approaches will meet the needs of the planners as well as relevant, timely, accurate and usable information are also needed. This study will help to the policy makers to develop an implementable, efficient and district level policy for irrigation activities.