Chapter 9

SUMMARY AND CONCLUSIONS

In last few decades shrimp culture has come up globally as a huge industry which influencing country's economy to the growth. The impacts of shrimp farming or coastal aquaculture are also strongly noticed in different parameters such as environment, society, etc. Along with the tremendous positive growth in the economy, shrimp farming or coastal aquaculture has many adverse effects on the environment. A project or phenomenon which does not take care of its surrounding environment and causes continuous harm to the environment cannot be considered as a successful project even if it has a positive impact on the economy. The success of coastal aquaculture is going to face a major threat if it does not take care of its environmental conditions and just focus on money. In case of coastal society, both positive and negative impacts are experienced from shrimp culture, the people are earning more and hence their lifestyle has changed, transportation and education options are also improved a lot but on the other hand due to environmental degradation they are unable to live a healthy life despite of having money. Hence to keep all these parameters (economy, environment and society) at a balanced condition, sustainable development of coastal aquaculture is required. Hence to bring out a solution for sustainable development many researchers have invested enough time in the research of coastal aquaculture and have collected various data to contribute in this domain. The major step of sustainable development of shrimp farming is to identify and prioritize the potential sites of shrimp culture. In this present research work the potential site of aquaculture are identified based on availability of water, soil condition, nature of agricultural land, forest covered areas, coastal settlement areas etc. The technique used in this investigation is the Remote Sensing and GIS technique which is considered as one of the most reliable, accurate and updated data base on land and water resources. The information or data collected through this technique is completely unbiased and is accepted globally. With the help of Remote Sensing and GIS the data collected for Land use and Land cover has been done even to the plot level. Considering this information, a relevant plan of action could be configured which would definitely help the coastal shrimp farming and proceed as a strong step towards sustainable development maintaining a perfect balance between the economy, environment and the society. This approach of data collection and research

would not only be beneficial for the particular area of study of West Bengal, but also for all the shrimp farming areas of the world. The major findings of this research work are summarized below:

1. In year 2008, the total shrimp farming area was 4234.13 ha (in study area) which has increased to 5895.40 ha in the year 2016. The total number of brackish water tanks/ponds was 11216 in year 2008 and in 2016 it has increased to 21104. In this timespan not only shrimp farming area has increased but also a rise in fresh water tanks/ponds has noticed. The fresh water tanks/ponds covered 3675.18 ha area in 2008 and in 2016 it has increased to 3795.21 ha. Hence from year 2008 to 2016 it is seen that people are doing more and more aquaculture activities in coastal areas. Rapid change in study area has been noticed in between 2012 to 2016.

2. Mostly the agricultural lands are converted into brackish water tanks/ ponds. 1542.83 ha (3.21%) of agricultural land has been converted to brackish water tanks/ponds from the year 2008 to 2016.

3. The Land use and land cover change prediction made with the help of Markov chain for year 2030, has also pointed the same tradition of increase in aquaculture land and settlement area and a decrease in agricultural land area. This LU and LC distribution prediction shows that the shrimp culture area will increase 5895.40 ha in 2016 to 8528.62 ha in 2030 and the agricultural land will decrease from 46045.25 ha to 43084.29 ha in 2030.

4. Due to seepage, leakage and poor farm management water reaches the nearby agriculture lands and affects the soil properties. The increase in pH and salinity level has an adverse effect on the productivity of agriculture (rice field) of that area. Near about 1185 ha agricultural land of the study area is affected due to increase of soil salinity.

5. Illegal shrimp farming on the river banks are contributed to the change of the flow of the rivers and its flow direction. The banks have already destroyed and

converted to shrimp farming sites and the use of different chemicals in the farming has made the water so polluted that it has disturbed the natural bio-diversity. The embankments are also destroyed because of setting up the diesel engines. According to the data total 26.28 ha of riverbed has been converted to shrimp farming area from 2008 to 2016.

6. Analyzing the data of change detection matrix it is seen that from the year 2008 to 2016, approximately 31.35 ha of vegetation cover area are destroyed (decreased) only due to shrimp farming. The value indicates a decrease of 2.45% of the total vegetation cover area of the study area. From the year 2008 to 2012 the decrease in vegetation area is recorded as 12.57 ha and from 2012 to 2016 it is recorded as 18.78 ha.

7. The results of composite analysis of different criteria, as well as the constraints for the selection of potential site for shrimp culture, show that 4.13% (3289.8 ha) of the total area is very suitable for shrimp culture development without any issues of land-use conflicts. The most potential area for shrimp culture is available in Desopran Block which is 1175.29 ha. 6.39% of the total block area is the potential zone. In Contai-I the potential area is 889.67 ha (5.19%), in Ramnagar-I 834.19 ha (5.97%) and in Ramnagar-II the potential area is 358.44 ha (2.57%), whereas in Contai-III it is the lowest which is 32.21 ha (0.20%) that means Contai-III block is not suitable for shrimp farming. Majilapur, Nyapur, Sabajput of Contai-I; Bamunia, Dariyapur of Desopran block, Digha, Gobra, Haldia I, Padima I & II, Talgachari I & II of Ramnagar-I; Balisai, Kalindi, Satilapur of Ramnagar-II block of the study area show the high sustainable potential development of coastal shrimp farming.

Future scope

No research is actually successful if it does not have any benefit to a specific cause or the society. The data collected through this research has the potential of contributing towards the sustainable development of coastal aquaculture. Future scope of this research work can be finding out a solution for the betterment of fishery infrastructure

utilizing the GIS data base. A better fishery infrastructure may help in achieving an improved fisheries management planning. Fish market, Link road, hatcheries, fish feed plant, ice plant etc. are important factors for the development of fish production and distribution in the state. To establish new improved fishery infrastructure, suitable site selection is an unavoidable factor and data collected through GIS techniques could really contribute to find out the potential sites. Another future work scope of this research includes focus towards those areas where the environmental conditions are at its worst state and also to find out a solution for the betterment of this situation or to stop further destruction. This would indirectly help the physical health of the local people of the coastal areas. An advanced level of spatial monitoring can be developed with the use of this GIS based approach. Further the research data can be used to create an elaborated transparent web database for better management of the situation which would be easily accessible to all. This would help the administration to keep a strict eye on the illegal shrimp culture and to monitor the condition of the forest and the other environment condition. An effective as well as faster decision making may be achieved with the help of the GIS database and the study. This database may further work as input of advanced Remote Sensing and GIS based analysis on improvement of fishery infrastructure of the study area. The data collected in this research could also contribute in the future research related to the economic and social development of the coastal areas and in a wider aspect it can contribute to maintain the balance between all three major factors of sustainable development which are- environment, economy, and social life.