ABSTRACT

Shrimp farming (*Penaeus monodon, Litopenaeus vannamei*) plays a major important role in Indian economy for earning huge foreign currency. In international market India leads as one of the most active countries in shrimp farming sector for exporting large quantity of shrimp. Although shrimp farming is an appreciable income generation method at a short time but now a days it creates some adverse environmental degradation which may be very dangerous in future scenario. Looking at the serious matter of environmental affect, an attempt has been made to study the rapid growth of commercial shrimp farming in major five coastal blocks of Purba Medinipur, West Bengal, India to focus on its positive and negative impacts on the biophysical and socio-economic environment.

Several types of research on shrimp farming has been done in the last few decades and different types of approaches has been introduce to properly study on it. But in recent trends Remote Sensing (RS) and Geographical Information System (GIS) is considered to be most accurate and reliable approach to study the shrimp farming as a birds eye. So in this study RS and GIS techniques were used to hind cast assessment of previous years shrimp farming areas in retrospective manner, as well as to generate a micro level spatial database of shrimp farming. To quantify the changing pattern of shrimp farming from the past years (2008, 2012 and 2016) at Block, Gram Panchayet and Plot level, change detection method was used and the future scenario of year 2030 was also present by using the Markov Chain method. In hind cast assessment shrimp farming area was drastically increased from 2008 (4234.13 ha) to 2016 (5895.40 ha) whereas 1542.83 ha (3.22%) area of agricultural land was converted to brackish water tanks/ponds. According to future scenario study shrimp farming area will increase up to 8528.62 ha in 2030 from 5895.40 ha of 2016 (i.e. it will increase by 2634.22 ha) and agricultural land will be decreased to 43084.29 ha where as in 2016 it was 46045.25 ha. The chapter on 'Land use and Land cover change detection' covers the topic of changes of Land use and Land cover in this study area due to shrimp farming. This topic attains the first two objectives of the study which are generation of a micro level spatial database on inland waterbodies of coastal blocks of Purba Medinipur District, West Bengal to develop aquaculture/fisheries information system by using Remote Sensing and Geographic Information System and identification, quantification and prediction of the Land use and Land cover changes with a special focus on shrimp culture development.

The rapid decrease of agricultural land and increase of shrimp farming not only affect the agriculture sector but it also affects directly or indirectly on biophysical and socio-economic environment. As a result of shrimp farming, salinity level of soil was increased and soil pH was also changed. Due to the seepage and leakage of brackish water to the nearest agricultural land, the production of rice was hampered. The Land use and Land cover change trajectories analysis, soil and water sample test, information gathering from farmers, local people by using the preplanned questionaries' were done and intensity of impacts was also analysed by using the Leopold Matrix. As a result, it is clearly seen that the salinity and pH are high within 10 meter radius of shrimp pond which cover to approximate 1185 ha area of agricultural land which was solely used for rice production. Beside those, from the year of 2008 to 2016 total 31.45 ha vegetation cover, 26.29 ha river/stream/canal, 18.09 ha freshwater tanks/ponds and 17.25 ha scrub land was also affected as well as converted to brackish water tanks/ponds. On the other hand on the perspective of income generation, shrimp farming was found as the most profitable activities, which was found approximate 12^{th} time more profitable than rice cultivation. Affect of shrimp farming on biophysical and socio-economic environment in the study area is discussed in the chapter 'Environmental Impacts' which fulfills the objective of pointing out the socio-economic as well as environmental impacts of shrimp farming area' in the present study.

Though it is a most profitable business strategy but it gradually hampered our environment. So potentially shrimp farming site selection is essential to maintain both shrimp farming as well as sustainable management of environment. On this study potential shrimp farming site identification and prioritization are done on the basis of the analytical hierarchy approach. It is observed that approximately 4% of the study area that is 3289.8 ha is suitable for shrimp culture without having any issues. This 4% area is, particularly within the coastal region. The highest potential area is detected in the Desopran block that is 1175.29 ha. It constitutes almost 6.4% area of the block. The potential site selection for shrimp farming has been discussed in the chapter 'Identification of potential sites for shrimp culture'. This topic attains the objective of identification and prioritization of the potential sites for sustainable shrimp culture using Remote Sensing and GIS techniques in this study.

The changes of the Land use and Land cover detected due to shrimp farming revealed that there is an appreciable development due to coastal shrimp culture. However, it is

not a sustainable development undoubtedly. The information and collected data point directly to the future threat of shrimp farming on the physical environment. Now the burning question is that whether to focus on economic growth with shrimp farming or to save our environment by taking some suitable measures to control the future environmental degradation.

Keywords: Agricultural Land, Environmental Impact, GIS, Land use and Land cover change, Remote Sensing, Shrimp Farming, Sustainable Development.