



## RESEARCH ARTICLE

### SELECTION OF SUITABLE SITE FOR SHRIMP FARMING IN THE COASTAL AREAS OF TUTICORIN USING REMOTE SENSING AND GIS TECHNIQUES

**\*Dr. Angelina Thanga Ajisha, M., Arasalakshmi, K., Meena, C. and Yesurani, K.**

Department of civil, Francis Xavier Engineering College, Tirunelveli, Tamilnadu, India

Received 17<sup>th</sup> February, 2018; Accepted 05<sup>th</sup> March, 2018; Published 30<sup>th</sup> April, 2018

#### ABSTRACT

To develop a model for Selecting Suitable Site for Shrimp farming in the Coastal areas of Tuticorin Using Remote Sensing and GIS Techniques. The site suitability analysis for shrimp culture delineate with the help of Multi Criteria Evaluation (MCE) technique. Satellite Remote Sensing (RS) and Geographic Information System (GIS) have a decisive role in providing regular, synoptic, multi-spectral coverage of an area. With the launching of the Indian Remote Sensing Satellites (IRS) a wide range of remote sensing data at different Spatial and Spectral resolutions are now available for the monitoring and management of natural resources. GIS technique help in the integration of databases covering a variety of relevant parameters in an efficient manner. At the present, the following parameters are considered in site selection conflicting uses of area, settlements, waste lands, salt pan, pollution, distance from the sea, distance from the land, coastal topography, and water bodies, soil, geology and geomorphology. The main goal of this research is to delineate the suitable area for shrimp farming through the various Image Processing Technique, Field Survey and GIS analysis, using IRS P6 LISS III and various parameters data bases.

**Key words:** Remote Sensing, Geographic Information System, Multi Criteria Evaluation, Image Processing.

**Copyright © 2018, Dr. Angelina Thanga Ajisha et al.** This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Citation:** Dr. Angelina Thanga Ajisha, M., Arasalakshmi, K., Meena, C. and Yesurani, K., 2018. "Selection of suitable site for shrimp farming in the coastal areas of tuticorin using remote sensing and gis techniques" *International Journal of Current Research in Life Sciences*, 7, (04), 1817-1821.

#### INTRODUCTION

Shrimps are crustaceans, which are mostly aquatic animals with a hard skin (an exoskeleton) over a segmented body. Shrimp culture provides economic opportunities, employment and income generation. Shrimp aquaculture requires adequate brackish water supply, pollution free environment, moderate temperature. In our country giant tiger shrimp provides the net profit. Sustainable aquaculture development and planning requires comprehensive data on landuse, water, economic and human resources available in a given area and synoptic integration and analysis of these resources. Remote sensing technique coupled with GIS are gainfully used or such a comprehensive analysis which lead to identification of suitable aquaculture site. So, it is necessary to conduct detailed surveys of the estuaries, brackish water, mangrove and mudflats for developing coastal aquaculture using remote sensing technique. By using remote sensing technique and GIS, the advantage is not only in time and cost effectiveness but also in achieving a more comprehensive and integrated treatment of aquaculture development criteria, which is difficult through conventional techniques alone. Satellite remote sensing technique is being used as a tool to know location, extent and spatial and temporal changes of coastal fisheries, etc.

(Ackleson *et al.*, 1985; Booth, 1998; Dao *et al.*, 2004; Dwivedi and Kandrika, 2005; Killic, 2010; Hopkins *et al.*, 1995 and Jeyanthi, 2010).

**Study Area:** The Tuticorin coastal area falls in the latitudinal and longitudinal extensions of 8° 40' to 8° 55' North and 78° 0' to 78° 15' East on the Tamil Nadu, East Coast of India. The coastline of Tuticorin has a length of about 163.5 km – 25 km wide. An onshore shrimp culture site selection covers 26 coastal villages of tuticorin coast. Shrimp culture is very important and earned a considerable foreign exchange.

**Data Sources:** In the present study various types of data have been used. It includes different satellite data (IRS, thematic maps, field-measured data and other relevant published information etc. The thematic maps on soil, land-use, land capability associations and soil salinity were used for the study. The land-use and land capability information is updated using IRS LISS III data.

**Methodology:** The main methodology of this project is to prepare thematic maps with the application of remote sensing and GIS software. All the thematic maps will prepare at the scale of 1:24000. Various GIS analysis and image processing technique will be followed to identify the suitable site for Shrimp culture.

**\*Corresponding author: Dr. Angelina Thanga Ajisha, M.,**  
Department of civil, Francis Xavier Engineering College, Tirunelveli, Tamilnadu, India.

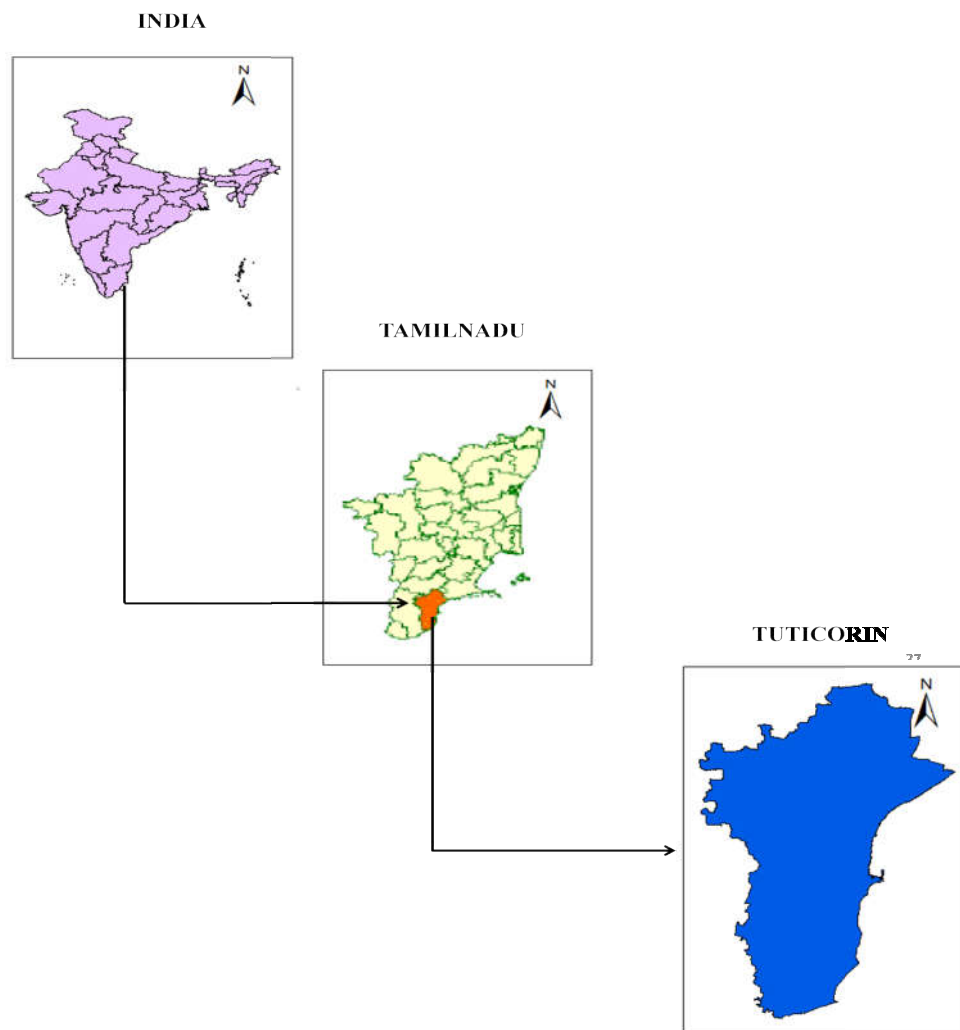


Fig 1. Location Map of Tuticorin

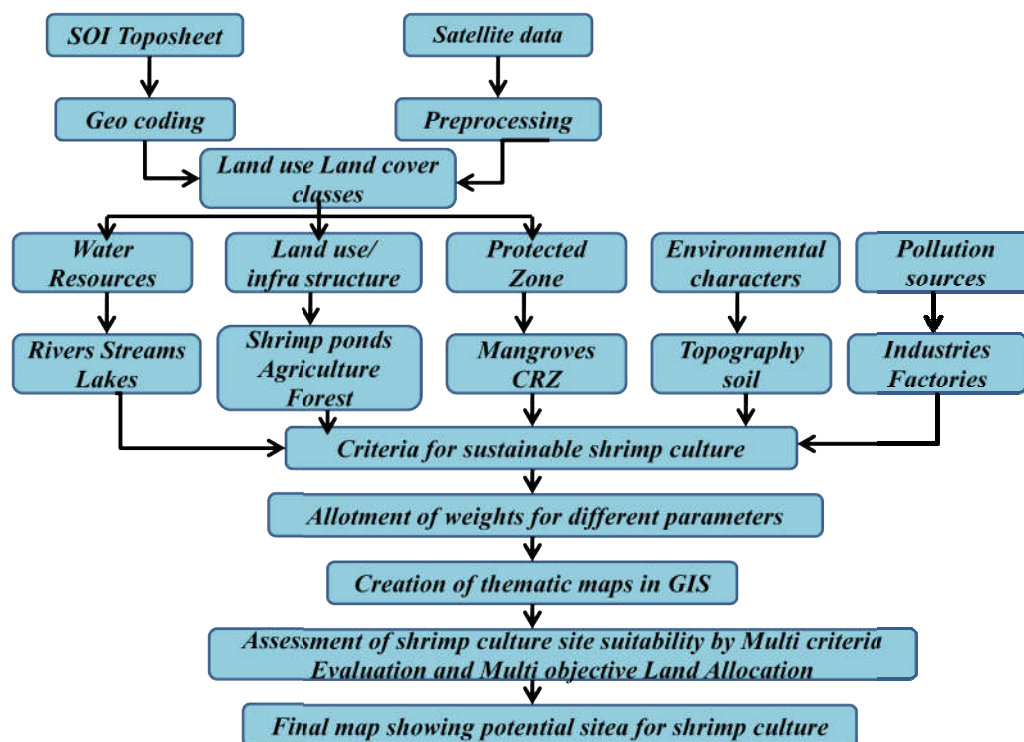


Fig 2. Flowchart for site suitability analysis

## Data Preprocessing

Pre processing has involved scanning and digitization of Survey of India Toposheets at 1:5000 scale to serve as the base map. Scanned maps don't usually contain information as to where the area represented on the map fits on the surface of the earth, for these images have to register coordinates. To establish the relationship between an image (row, column) coordinate system and a map (x, y) coordinate system we need to align or georeference the raster data (image). Processing has involved application of various GIS function and advanced digital image processing technique including contrast manipulation, edge enhancement, and image registered. The images were geometrically rectified and registered to the same projection namely, Transverse Mercator WGS 1984 to lay them over each other.

## Multi Criteria Evaluation Analysis

In that multi criteria analysis system, the comparative evaluation of the alternative scenarios, is taking place in 2 steps: (i) criteria groups are defined, each one consisting of a series of individual criteria and the weight factor of each group is defined based on the experience of the working group, and on any potential data from relevant applications. Based on the defined criteria groups and the relative weight factors, the proper cumulative function is extracted based (ii) the Criteria Groups (CG) are getting extracted into their individual evaluation criteria (IC), where by using the appropriate weight factors, their own relative significance is defined, within each criteria group.

## Generation of Database

The creation of spatial database in accordance with the GIS execution steps designed for the model is an important step for the implementation of the present project. The spatial data has been synthesized from different sources having different resolution, projections and feature types. Due to this, multi-dimensional spatial mismatching has been occurred during the synthesis of the database. In order to minimize these mismatching, a common reference frame was created based on extensive GPS survey in each of the study areas. The reference frame was first used to geometrically correct the land use map. The other maps (soil parameters, elevation, etc.) were then corrected based on the land use map. The databases have been archived as vector layer, and can therefore be produced as map at selectable scale. The geographic and feature accuracy of the databases are high because of the extensive field verifications / surveys using GPS. In the present study the parameters considered for selection of suitable site for shrimp culture are the followings:

**Ecological Parameters:** Water salinity (Attribute) Data, Water pH (Attribute) Data, Water Temperature (Attribute) Data, Soil type (GIS),

**Infrastructure:** Railway/Road network (Distance, GIS), Drainage facilities for Exchange of out Water (GIS), Other facilities

**Demographic parameter:** population data

**Meteorological Parameters:** Annual Rainfall (Attribute), Air temperature (Attribute).

## Field Survey and Ground Truthing

Collection and gathering of information at the local level by conducting primary surveys is called field survey. The primary surveys are also called field surveys. They are an essential component of geographic enquiry. It is carried out through observation, sketching and measurement.

## RESULTS AND DISCUSSION

The different types of maps had been prepared for various analysis and studies such as shrimp culture suitable site map including freshwater shrimp farming site, water bodies map, wasteland map, river map, road map, population map, soil map, geology map, geomorphology map. All the maps prepared in the scale of 1:600,000.

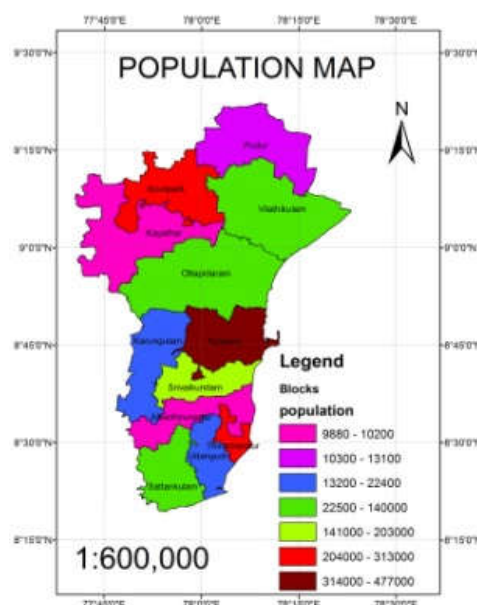


Fig 3. Population map

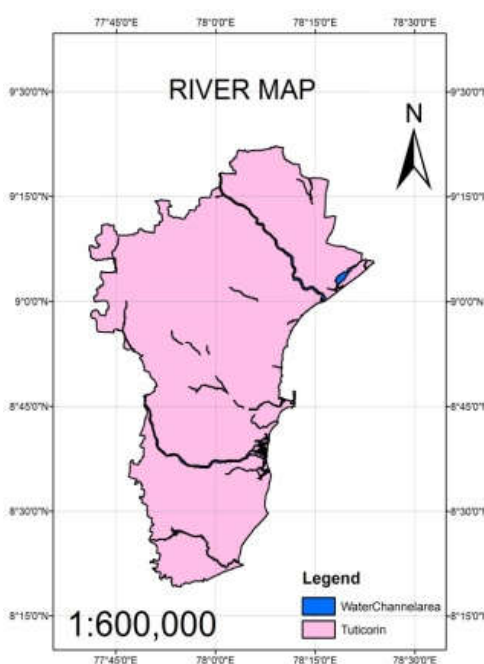


Fig 4. Soil Map

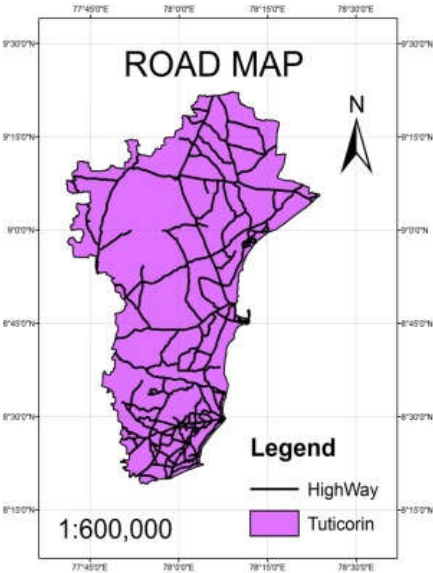


Fig 5. Road Map

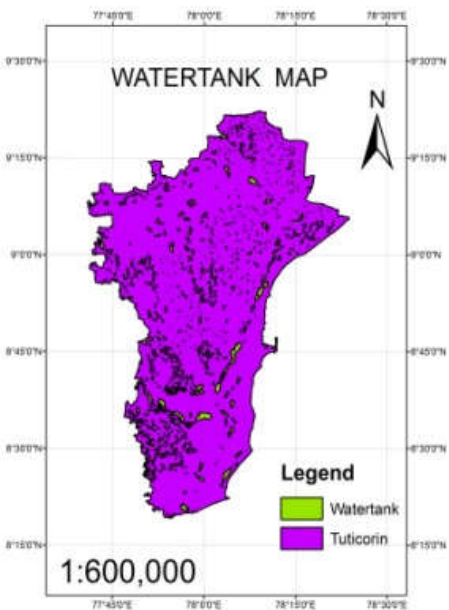


Fig 8. Watertank Map

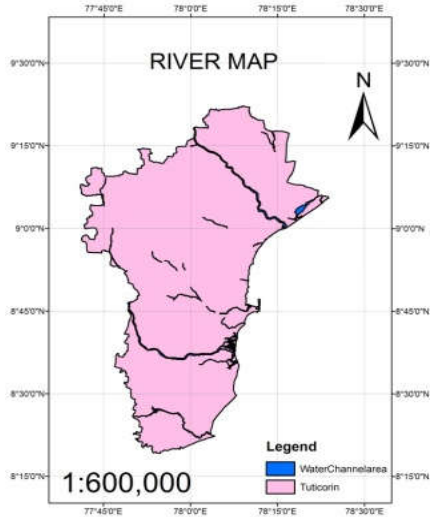


Fig 6 River Map

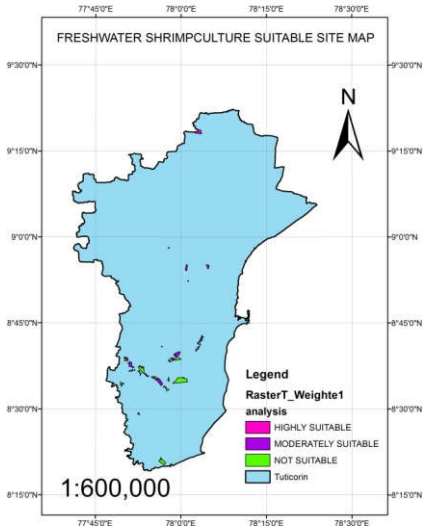


Fig 9 Freshwater Shrimp Culture Suitable Site

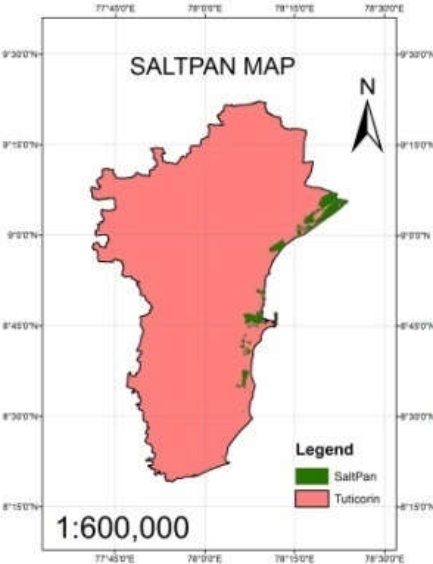


Fig 7. Saltpan Map

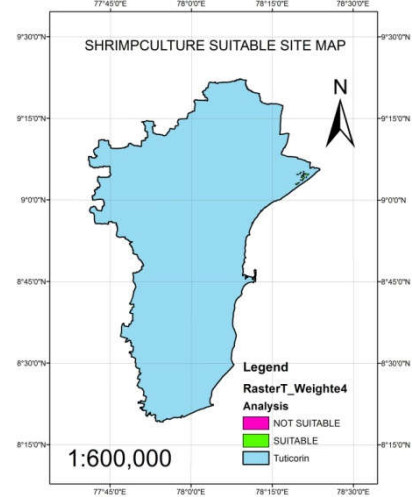


Fig 10. Shrimp culture suitable site

## Conclusion

This project provides information at a regional level that could be used by Coastal aquaculture contributes a small part to the gross domestic product (GDP) of Tamilnadu, its role as foreign exchange earner is of considerable significance. Though coastal aquaculture particularly that of shrimp farming creates job opportunity for rural poor, develops better communication system and brings electricity to remotest part of the country, but it has little to do with supply of animal protein to the vast malnourished population. Tuticorin Districts covers out of 4621 km<sup>2</sup>, among that 161 km<sup>2</sup> are coastal area and out of that the shrimp farming suitable area is about 17.6 km<sup>2</sup>.

## REFERENCES

- Ackleson, S.G., Klemas, V., Makin, H.L. and Merry C.J 1985. 'A comparison of spot simulator data with LANDSAT MSS imagery for delineating water masses in Delaware Bay, Broad kill River and adjacent wetlands', *Photogrammetric Eng. Remote Sensing.*, 51:112-1129.
- Booth, J.A. 1998. 'Spatial analysis of fish distribution and abundance patterns' a GIS approach. Fishery stock assessment models. *American Fisheries Society Fisheries Symposium Series*, 15:719-140.
- Dao, H. G., Yung, Y. and Yakupitivage, A. 2004. 'Remote sensing to assess shrimp farming development in Haiphong of Vietnam', *J.Aquacult.Trop.*, 19:200-214
- Dwivedi, R.S. and Kandrika, S. 2005. 'Delineation and monitoring of aquaculture areas using multi temporal space borne multi spectral data', *Curr Sci.*, 89(8):1414-1421
- Hopkins, J.S., Sandifer, P.A and Brown, M.R. 1995. 'Environmental impacts of shrimp farming with special reference to the situation in the continental United States Estuaries', 18:25-42.
- Jeyanthi, M. 2010. 'Monitor aquaculture development and spatial distribution'. Identification of potential sites for sustainable aquaculture using modern technological tools. *CIBA Annual Repor.*, 18-22.
- Killic, H. 2010. 'Site Selection for aquaculture facilities in turkey' for Ministry of agriculture and rural affairs., 29:349-359.

\*\*\*\*\*