Evolving fisheries business in India with GIS

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As the demand for fish consumption increases in India, an understanding of fish demand, supply and consumption based on GIS can be a useful tool for fisheries scientists, aquatic resource managers and policy planners in evolving a future strategy for fisheries business in the country.
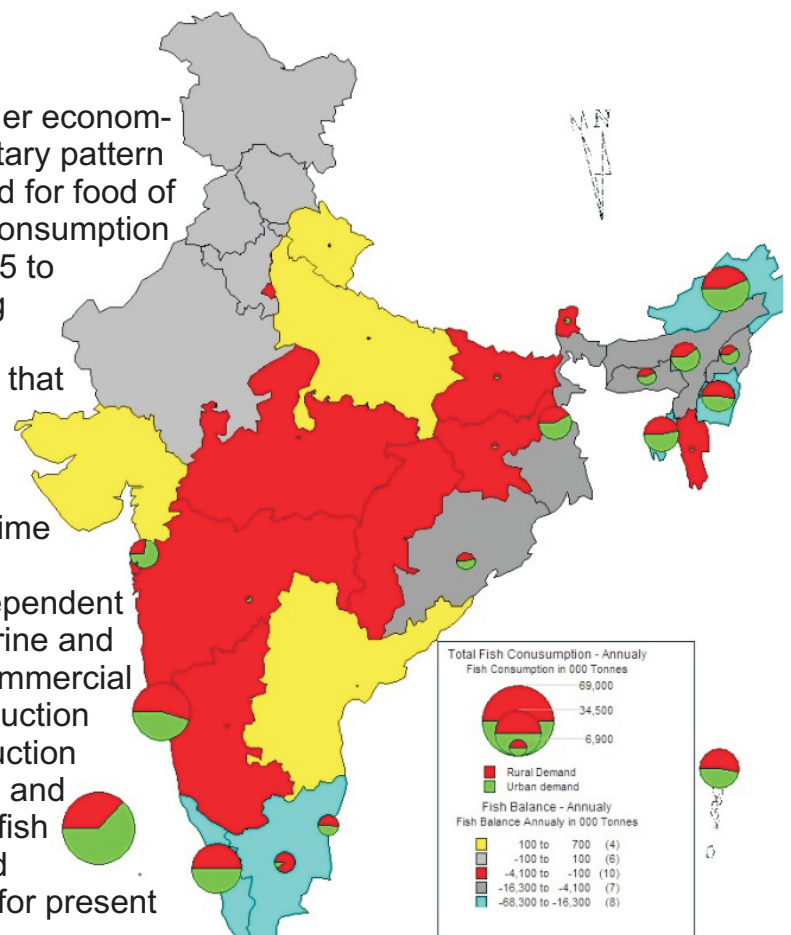
GIS plays a pivotal role in visualising spatial data and understanding relationships between specific locations which helps policy planners and organizations to make more strategic business decisions. In this study, state level fish production and consumption data (collected through secondary sources) was used for the analysis and to harness the potential of demand and supply of fish at state level in India, with main focus on state-wise surplus and deficit position of fish supply which will make a para digm shift in near future, through GIS. As per previous studies, demand for fish in the next decade is expected to increase due to the awareness about the nutritive value of fish. The existing per capita availability of fish is 6.5 kg and is expected to reach 9.0 kg by 2030. On the bases of demand and supply of fish across the states, a business map is prepared through GIS which will reveal the availability of fish, its demand and supply to needy locations through shortest route. Accordingly, this paper comprises one thematic map containing multiple layers, namely, first layer indicates fish production in lakh tones and second layer indicates fish consumption pattern at rural and urban levels. To generate thematic maps, India's state-wise data was brought in tabular form through Microsoft Excel and then joined to Arc Info GIS software (version 8.0) with digitised map of India for further analysis. This location based study is a part of intelligence GIS which is expected to be a useful tool for fisheries scientists, aquatic resource managers and policy planners in the developing countries and for evolving future strategy for fisheries business in the country.

Introduction:

The emerging production technologies for higher economic growth, population explosion and shift in dietary pattern are the driving force for rapid growth in demand for food of animal origins. During 1980-2000, per capita consumption of milk increased from 43 to 63 kg, fish from 3.5 to 5.8 kg and of meat and poultry from 5 to 6.8 kg (Paroda and Kumar 2000).

The consumption of fish has grown faster than that of any other animal product. Disparities in fish consumption pattern exists widely across the income groups depending on location of the households (rural, urban costal, etc.) and regime (Kumar and Dev, 2004).

Fish production and consumption in India is dependent on a large number of species coming from marine and inland resources. Each species varies in its commercial value which is governed by the catch and production pattern, consumer taste and preference. Production requirements depend on consumer preference and demand elasticity may vary across sources of fish and its species. A description of actual demand and supply analysis of fish is essential to plan for present and future population.

Total Fish Conusumption - Annualy
Fish Consumption in 000 Tonnes
69,000
34,500
6,900
Rural Demand
Urban demand
Fish Balance - Annualy
Fish Balance Annualy in 000 Tonnes
100 to   700   (4)
-100 to   100   (6)
-4,100 to   -100 (10)
-16,300 to -4,100 (7)
-68,300 to -16,300 (8)

Quantitative analysis of supply, demand and trade of fish is very useful for evaluating development strategies and options for disaggregated fish types, production categories, and gratewise requirements. With detailed analysis in this paper, one can identify priorities in terms of technologies for dissemination, research problems to be addressed, focus on investments, and the groups of fish that contribute most to food security of the poor. Rate of fish consumption in the coastal regions as well as in north-east states of India is increasing. The consumption rate in north-eastern states is especially increasing in both urban and rural consumers.

Geospatial mapping is a location based study and it is a part of intelligence GIS which is expected to be useful tool for fisheries scientists, aquatic resource managers and policy planners in developing countries. It is being interestingly used as a decision support system for management of fisheries and aquaculture. In this context, the present study reveals information based on the secondary data at state level of India. GIS functionality for marketing of all the business goods is perhaps one of the most obvious and important tool. In general, marketing is a question of demand (customers) and supply (retail outlets, shopping centers). Both demand and supply are easy to pinpoint to a geographical location. Therefore, it is interesting to analyse these factors with the help of GIS. The field has developed a new approach to marketing analysis imperative. It also reveals the importance of geo-demographic research to marketing. All kinds of market segmentation techniques have been developed to define more precisely the target group of customers. There is a growing interest in the capabilities of GIS for marketing analysis. It should be noted, however, that this interest is not focused on GIS per se. Instead, people see GIS as a way to handle spatial information (Beaumont, 1991). This paper describes the various kinds of GIS applications for marketing research.

Materials and Methodology

For the study of demand and supply potential of fisheries in India at state level, data was used from Handbook Fisheries Statistics 2005 which is published by Ministry of Agriculture, Govt. of India. These are the secondary data of fish production at state level. For the determination of number of household of urban and rural areas at state level census data 2001 was used which is published by Census Department, Ministry of Home, Government of India. The number of persons per family in one household in urban and rural areas has been taken based on Census Department, Govt. of India 2001.

For the analysis of data, Microsoft Excel software was used. Each urban and rural household at the state level is directly indicated by the number of persons of each state household.

Results and Discussion

According to map 1, five states - Kerala, Tripura, Arunachal Pradesh, Delhi and Nagaland, have high demand of fish. These states showed more consumption capacity in comparison to local fish production. Kerala needed 0.57 lakh tonne, followed by Tripura (0.13 lakh tonnes), Arunachal Pradesh (0.13 lakh tonnes), Delhi (0.01 lakh tone) and Nagaland (0.01 lakh tonne) of annual fish supply. In urban areas of Kerala and Arunachal Pradesh, people consume more fish in comparison to rural area. People of Arunachal Pradesh consume more fish in comparison to other north-eastern states. Kerala's fish requirement is met from neighboring states like Karnataka, Tamil Nadu and Andhra Pradesh which have excess of fish production. From fisheries trade point of view, Kerala is the nearest market centre for Karnataka and Tamil Nadu. Andhra Pradesh, which is the leading fish producing state in India, has annual excess fish production to the tune of 9.33 lakh tonnes. After feeding the state's population, it supplies fish to Maharashtra, especially Mumbai, and north-eastern states. Gujarat has annual surplus fish production of 6.53 lakh tonnes and exports maximum fish to foreign countries, thus earning valuable foreign exchange. In the domestic market, it supplies fish to the states of Delhi, Maharashtra especially Mumbai, and Goa.

Punjab and Haryana, two northern states, have surplus fish production. Punjab has 0.84 lakh tonnes and Haryana has 0.07 lakh tonnes of excess fish production. These two states supply inland fish to market centres in Delhi which is the major fish consuming state in the northern India. West Bengal and Bihar have sufficient fish production to meet the demand of their own population. West Bengal has 6.08 lakh tonne annual and nearby state Odisha has 2.45 lakh tonnes annual surplus fish production. There is a big demand of fish in north-eastern states like Arunachal Pradesh, Assam, Tripura, Manipur, Meghalaya and Nagaland. These north-eastern states are fulfilling their fish requirement from West Bengal, Odisha, Andhra Pradesh and Bihar. West Bengal supplies some quantity of fish to Andaman Nicobar Islands, especially to Port Blair.

Fish demand in India

Tripura and Lakshadweep have been identified as maximum fish consuming states in India. These are followed by other states like Goa, Arunachal Pradesh, Kerala, Andaman Nicobar and Dadra & Nagar Haveli. In Arunachal Pradesh, rural consumption (2.18kg per person) is more than urban consumption (1.119 kg per person).

In northern India, fish consumption is very low as compared to southern and north-eastern regions. Punjab and Haryana have taken lead in inland fish production with a maximum yield of 48,000 kg/ha/yr. The trend in Punjab and Haryana has changed to a greater extent in recent years where farmers have adopted pisciculture instead of agriculture. It has no seasonal constraint and is economically more beneficial in comparison to other occupations and Indian Government is providing good support to the farmers for aquaculture.

In West Bengal, fish consumption in urban areas is higher than rural areas, whereas in Goa, it is the reverse. In Rajasthan, Punjab, Haryana and Jammu & Kashmir, only inland fish production activities are progressing well and fish production is more than its consumption. In Andhra Pradesh, fish production is equal to fish consumption and provides fish to the neighboring states like Maharashtra, West Bengal and some other north-eastern states where fish consumption is higher than production. In Kerala, fish consumption is higher in urban areas than rural areas. The state plays important contribution to marine fish production. During the last decade, marine fishers are showing keen interest in adopting inland fish culture. In north-eastern regions of the country, Tripura is leading in fish consumption followed by Arunachal Pradesh. Thus, study of the Indian fisheries reveals that the states like Tripura, Lakshadweep, Goa, Kerala, Arunachal Pradesh and Andaman Nicobar Islands are the major fish consuming states.

Assam, with a predominantly fish eating population, has vast potential for development of fisheries but at present its demand outweighs supply, leading to huge import from outside the state. The present annual fish production from all the sources is about 1.6 lakh tonnes against a demand of 2.05 lakh tonnes, according to a status report prepared by the state fisheries department. Due to lack of proper technical education, demonstration and research facilities in fisheries sector, intending aquaculturists are unable to contribute much in fish production of the state. The state Government has, however, realised the vast potential of natural water resources and is currently implementing a comprehensive package with funding from the World Bank to develop sustainable fisheries in the Assam.

Fish consumption

Thematic map in the present study also includes pie charts, representing state wise fish consumption in rural and urban areas. According to map, Tripura and Lakshadweep have been identified as maximum fish consuming state with monthly fish consumption being 8.50 kg per person in rural areas and 2.39 kg per person in urban areas of Tripura and 4.04 kg per person in Lakshadweep. These are followed by other states like Goa, Arunachal Pradesh, Kerala, Andaman & Nicobar Islands and Dadra & Nagar Haveli. In Arunachal Pradesh, rural consumption (2.18 kg per person) is more than urban consumption (1.19 kg per person).

In Northern India, fish consumption is very low as compared to southern and north-eastern regions. In West Bengal, fish consumption in urban areas is higher compared to rural areas, whereas in Goa, it is just the reverse i.e. fish consumption is higher in rural areas than in urban areas.

Conclusion

It can be seen through GIS that there are some states in India where fish consumption is less but production is very high. On teh other hand there are states, specially in North Eastern region, where fish consumption is much higher than production. In such regions, if the government adopts new fishing policy and technology, then production can be increased. The paper contains a thematic map, which is a very useful tool for planners, researchers, and people who are directly involved in fish business. The thematic map is a significant tool which directly explains the real scenario of fish production and consumption at state level.

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