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Livelihood Security *Vis-a-Vis* Extension Needs of the Fishers Inhabiting around Rudrasagar Lake, Tripura

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ABSTRACT

Tripura is blessed with an important wetland *i.e.* 'Rudrasagar lake, declared as National Lake No. 13 and International Lake numbered 1572 as a Ramsar site. The lake is an important source of fish production and fish biodiversity of the state. However, the lake at present is under threat from a variety of human induced changes to their hydrology. In this study, 140 fishers were selected by simple random sampling method in the vicinity of the lake, who are believed to be vulnerable as the resource base on which their livelihood depends (*i.e.* the Rudrasagar lake) is in peril. Livelihood security index of active fishers was found 76.21 as against the seasonal fishers (62.18). Among the active fishers, majority of them (59.26%) were placed at medium level of livelihood security index. Social security index of all the two classes were found to be highest among the livelihood security components. Environmental security as well as habitat security had a comparatively lower index value for both the classes. Most relevant extension needs of the fishers were alternative income generation and self-employment needs like initiation and development of different enterprises (Coefficient of relevance 0.88) followed by proper land use pattern in the vicinity of the lake (Coefficient of relevance 0.86) and conservation management of the lake (Coefficient of relevance 0.74). Skill development towards non-farm sector and sound availability of financial capital will motivate the fishers to diversify their livelihood to invest in other sector, expand their activities and smooth functioning of business. Making use of local knowledge in natural resource management, encouraging the use of more selective and environmentally friendly fishing methods, stimulating income diversification towards non-fishing activities, stimulating the development of microenterprises and offering microfinance support to the fishers are some of the other suggestions of the study.

Key words: Extension need fishers; livelihood security, rudrasagar lake

INTRODUCTION

Fisheries and aquaculture are an important economic activity in Tripura, both from an economic and a nutritional point of view, providing income, employment and food security to the people. The state is holding first rank in per capita fish consumption as inland state in the country. Moreover, Tripura reported to be highest in number of households (per thousands) consuming fish and in connection with price it has been shown that the state experienced highest retail price of fish per kg. in India. Around 1.25 lakh people depend on fisheries for their livelihood. The existing total aquatic resources of the state estimated to be 21,169 ha. However, current level of fish produced in the state is not able to meet the burgeoning demand and hence large amount of fish is being brought from the mainland state i.e; West Bengal, Andhra Pradesh, Bihar and even from the country Bangladesh. The scope for horizontal

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expansion in aquaculture is limited in the state due to hilly topography as well as wide coverage of forest area. Therefore, to secure the livelihood of the people and to reduce the gap between demand and supply through achieving fish self-sufficiency in the state, utmost importance need to be given to explore the vertical expansion in fish production.

Wetlands play vital role in ensuring fish production, income and nutritional security of the fishers depends on the lake. The state is blessed with an important Lake *i.e.* 'Rudrasagar' covering 365.61 ha water area with annual fish production of 41,683kg (2006-07) (Upadhyay and Singh, 2010). Rudrasagar Lake is declared as National Lake No. 13 and also is declared as an International Lake numbered 1572 as a Ramsar site. The lake situated between latitude 23°29´ N and longitude 90°01´ E, with water depth varies from 2 to 9 m. The lake supports the livelihood of 73,264 fishers population (Anon, 2002). This lake has the perennial connection with one of the major rivers (Gomati) of the state facilitating the natural breeding ground of the valuable indigenous endemic fishes. The lake is abundant in commercially important freshwater fishes like *Botia spp, Notopterus chitala, Mystus spp., Ompok pabda, Labeo bata, Mystus aor, Wallago attu, Heterophneutes fossilis* and freshwater scampi, and is also an ideal habitat for IUCN Redlisted Three-striped Roof Turtle (*Kachuga dhongka*). Apart from these species other important fish species are: *Puntius sophore, Esomus danrica, Chanda ranga, Nandus nandus, Anabus testudeneus, Colisa fasciatus, Notopterus notopterus, Cirrhinus reba, Mastacembelus pancalus, Channa punctata,, Macrognathus siamensis, Gudusia chapra, Cylonia spp, Labeo rohita, Mystus gulio, Ompak pabda, Channa marulius etc*. (Ramsar Convention of Wetland, 2005). Fishing and other activities in this Lake are solely controlled by Rudrasagar Fishermen Cooperative Society which earns a revenue of around Rs. 13 Lakh annually from it. Altogether, 1996 fishermen families belonging to 15 fishermen villages are earning their livelihood through fishing in this lake. However, the lake at present is under threat from a variety of human induced changes to their hydrology. The Rudrasagar Lake has now shrunk to around 100.46 hectares from 365.61 hectares due to encroachments and significant portion of the Lake has turned into paddy fields. Moreover, rising pollution levels and unbalancing of ecology are threatening the livelihood of around two thousand fisher families around the lake.

If policy-makers are to provide better support to secure the livelihood of the vulnerable fishers with the aim of increasing incomes and broadening welfare, they need to understand how the household maintain and improve their way of living. In these circumstances, the work of social scientists should not cease by mere presentation of a good account of success or failure cases in diversified ventures but go beyond x-raying the profile of the fishers and the socio-economic and psychological context in which they operate so as to highlight the factors leading to livelihood strategies. Therefore, it was considered worthwhile to study the existing level of livelihood security as well as perceived extension needs of the fishers to secure their livelihood.

METHODOLOGY

The *ex-post facto* research design is resorted in the study under cross sectional approach. From 15 fishers' villages, which are mainly dependent on fishing in Rudrasagar Lake, 7 villages were randomly selected by using simple random sampling method. Then twenty fishers were selected randomly from each village. Thus, altogether 140 fishers were included for the study. Both secondary and primary data were used for the study. A semi-structured interview schedule was developed based upon the information acquired during the explorative research phase, and pre-tested and adapted prior to the survey. The interview schedule was composed of open and closed questions and involved rating and ranking procedures also. Data were analysed with the suitable statistical tools. In order to measure the livelihood security of rural households, a Livelihood Security Index (LSI) was developed in the line of Baby (2005). The Normalised Rank Method suggested by Guilford

(1954) was used for determining the scale values of the components in LSI. Seven different components of livelihood security of fishers were taken. The components of LSI were operationalized as given below:

(a) Food security: It was operationalized as availability and access to balanced food at household level.

(b) Occupational security: It was operationalized as the access to a regular and satisfied employment.

(c) Habitat security: It included housing with basic amenities.

(d) Educational security: It included the educational level of the family and access to educational facilities including higher education.

(e) Health security: It included the health status of the family and access to health care facilities.

(f) Social security: It involved social participation and social status of the family

(g) Environmental security: It included a pollution free environment, access to water resources, eco-friendly farm management practices and protection from flood or drought conditions.

The extension needs of the respondents were obtained through the interview schedule. The response to each items were obtained on a 3-point continuum: 'most needed', 'needed' and 'not needed', with weights assigned 2, 1 and 0 respectively as per judges' opinion. Relevancy coefficients were obtained for each item by dividing the actual score obtained with the maximum possible score and based on these values, the needs were ranked.

RESULTS AND DISCUSSION

Livelihood security of the fishers in the vicinity of Rudrasagar lake

A large number of fishers are engaged in fish catching in Rudrasagar lake throughout the year. They are depended on fishing as a source of income and nutrition with different abilities and motivations. The distributions of fishers by category over the seasons observed in the study area are shown in Table 1. Professional fishers/Active fishers, who depend on fishing almost year-round for their livelihood comprised 38.57 per cent whereas, seasonal fishermen who only fishing during a part of the year as income earning comprises 61.43 per cent of the total sample studied.

Table 1: Distribution of fishers as per their Nature of Fishing

Nature of fishers	Frequency	Percentage
Active fishers	54	38.57
Seasonal fishers	86	61.43

The livelihood security of fishers' households was measured using a Livelihood Security Index (LSI). The average LSI was calculated separately for the two livelihood classes, the active fishers and seasonal fishers. Table 2 presents the livelihood security index of active fishers is 76.21 which is quiet higher than seasonal fishers (62.18).

Table 2: Livelihood Security Index (LSI) of active fishers and seasonal fishers

Category	Mean LSI	S.D
Seasonal fishers	62.18	8.04
Active fishers	76.21	7.50

Dimensions of livelihood security of rural households

The present research study has adopted a multi-dimensional approach in understanding the livelihood security of rural people and could come out with seven different dimensions of livelihood security of rural households, identified as the components of Household Livelihood Security Index developed in the study. Thus, the seven components of the LSI included food security, occupational security, habitat security, educational security, social security, health security and environmental security. These components were measured separately using suitable indicators and expressed as component indices of the LSI for the two livelihood classes. Table -3 presents the component wise data analysed for livelihood security of active and seasonal fishers

Table 3: Components of Livelihood Security Index (LSI) of seasonal and active fishers with Mean Index

Components	Mean Index		't' - Value
	Seasonal fishers	Active fishers	
Food security	0.66	0.82	7.54*
Occupational security	0.41	0.71	6.86*
Habitat security	0.62	0.69	1.87
Educational security	0.44	0.68	5.65*
Social security	0.81	0.86	2.25
Health security	0.55	0.61	1.84
Environmental security	0.59	0.62	2.68
Mean LSI	62.18	76.21	9.87*

*Significant at 0.05 level

A perusal of the Table 3 brings to focus the status of active fishers and seasonal fishers, with respect to various dimensions of livelihood security. It could be concluded from the table that the social security index of all the two classes were found to be highest among all the components. It represents that social support, integration and social cohesion among the community is at higher level. Social bonds and social norms are an important part of basis for livelihoods. There is growing interest in the "social capital" concepts and its ramifications for community well-being and public policy. Although there are many different descriptions of social capital, the major three central elements of social capital are social network, norm and trust (Productivity Commission, 2003). Health security index is lower in both the classes. This indicates the lower level of health standards among fishers irrespective of their socio-economic condition in the study area and also their lower access to health care facilities. Environmental security as well as habitat security is another component, which has a comparatively lower index value for both the classes. It means that the shelter with basic amenities like access to drinking water, electricity and transport facilities for fishers in the vicinity of Rudrasagar lake was not up to the mark. Environmental security is the relative public safety from environmental dangers caused by natural or human processes due to ignorance, accident, mismanagement. Rudrasagar is a wetland of national importance identified by the Ministry of Environment and Forest, Government of India, considering its ecological and socio-economic significance. It is a floodplain wetland within Gomti River basin which periodically used to get inundated leading to sustainable fisheries and agriculture development. The drastic reduction of forest cover in the catchment and hydrological intervention by construction of a channel connecting it with Gomti river led to shrinkage of the wetland area from 1000 ha prior to 1950s to less than 100 ha. at present. Concomitant was the rapid development of agriculture which the lake which led to shrinkage of its area and degradation of its bioresources. The decline of fisheries over a period of time due to degradation of the lake enhanced encroachments in the lake for agriculture development. Presently, more than half of the lake area has been reclaimed for cultivation of food crops and vegetables. Construction of bunds and embankments within and around the wetland has totally altered its natural hydrological regimes. Increasing population within the wetland catchments has accelerated the process of catchment degradation leading to soil erosion and consequently enhanced lake siltation. These factors have led to overall loss of benefits naturally accrued from natural functioning of wetland ecosystem. Overall there is very little understanding of the nature of wetland ecosystems and the need for its conservation and maintenance of overall ecosystem integrity.

An analysis of distribution of respondents based on LSI and its various components followed below may be helpful to get a clearer picture regarding these findings. It is also important to note that the significance differences have been found in food security, occupational security and educational security between both classes. The mean index of all the components of LSI of active fishers is significantly higher than the seasonal fishers. Hence, it can be safely concluded that the livelihood security of active fishers is significantly higher than that of seasonal fishers. The income from fishing is definitely a reason for such results.

Distribution of respondents according to LSI

The distribution of the two livelihood classes viz. active fishers and seasonal fishers based on LSI is presented in Table 4. A cursory glance of the values shown in the table reveals the percentage of rural households under each livelihood class could attain a moderate level of livelihood security. Among the active fishers, majority of them (59.26%) were placed at medium level of livelihood security index followed by 22.23 per cent were under high level of livelihood security classes. While most of the seasonal fishers (59.31%) belonged to the medium level category followed by 37.20 per cent were under low level of livelihood security classes. Only 3.49 per cent of seasonal fishers had high level of livelihood security.

It is found that the seasonal fishers were more vulnerable as about 37.20 per cent of the households in this category were having low level of livelihood security.

Table 4: Distribution of respondents according to LSI

Category of respondents	Category of LSI		Frequency	Percentage
Seasonal fishers (n=86)	Low	(<50)	32	37.20
	Medium	(50-80)	51	59.31
	High	(>80)	3	3.49
Active fishers (n=54)	Low	(<50)	10	18.51
	Medium	(50-80)	32	59.26
	High	(>80)	12	22.23

Extension needs in achieving rural livelihood security as perceived by the fishers

The extension needs of fishers to achieve livelihood security were explored in the study, the results of which are discussed below. A cursory glance of the data in the Table-5 revealed that the most relevant extension needs of fishers were alternative income generation and self-employment needs like initiation and development of different enterprises.

Proper land use pattern in the vicinity of the lake was also an important need as perceived by the fishers. Presently, the areas which retain water throughout the years are used for fishery purpose, partly silted land used for seasonal paddy cultivation with uncertain fate due to flood. The surrounding plain areas are used for paddy cultivation, whereas, the uplands in catchment area are used for horticulture and agro-forestry and habitation purposes. Continuous siltation in the lake is causing loss of water area every year, increased use for human habitation, intensified deforestation, increased agricultural use of land has caused higher rate of siltation. A micro level planning and effective policy measure in connection with land use pattern is utmost important.

The purpose of any fishery regulation from a strictly conservation point of view is to provide a more bountiful harvest of fish either volume or net volume.

Table 5: Extension needs of fishers

(n= 140)

Extension needs	Coefficient of relevance	Rank
Conservation management of the lake	0.74	III
Developing capabilities for alternative income generation and self employment	0.88	I
Efficient community based fisheries management	0.71	IV
Effective land use pattern	0.86	II
Self-help groups management	0.60	VIII
Knowledge about eco-friendly farm management	0.65	VI
Marketing management	0.38	X
Maintenance of fishing gears	0.58	IX
Value addition of products	0.34	XI
Fish production improvement	0.68	V
Management of Pollution	0.63	VII

In this study, it was observed that, fishers have lack of training from any institution. If they got training from any institution, they will aware for protecting their own resources. Because of their unconsciousness they often break the rules and regulations such as, use of illegal fishing gear like current jal, catch of undersize and brood fish. So the implementation of rules and regulation should be strict by Government and make the fishers aware of sustainable yield and conserving ecosystem.

The lake is rich in its fisheries biodiversity but due to environmental degradation and human disturbance some common species become eroded from the wetland, which indicate gradual decline of fisheries biodiversity. Fish sanctuary may be developed to conserve the species. Fish sanctuary means to establish and maintain a particular demarcated protected area in the water body as a permanent shelter for the protection of fish for natural propagation, where targeted fish will not be disturbed or captured. Establishing of aquatic sanctuary is one of the effective tools for conserving fish stock, preserving biodiversity and increasing fish production. In some cases restoration as well as conservation of habitat may be possible by establishing aquatic sanctuary. Fisheries congregate in the sanctuaries for shelter, lead peaceful life without any disturbance and can move independently towards the feeding and breeding grounds. Therefore, impact of fish sanctuaries might be positive in almost all cases of fish production, biodiversity and socio-economic condition of the fishing community.

Fishing and other activities in this Lake are solely monitored by Rudrasagar Fishermen Cooperative Society. However, it is reported that the society has been suffering from many problems. Therefore, an efficient policy regarding the community based fisheries management is required with active participation of all the stakeholders. The Community-Based Fisheries Management (CBFM) approach in any water body management is meant to pursue a management of development activities in the water resources that is based on a people-oriented concept and holistic approach. This approach is applied in order to get results better than those of government dominated management. It can be defined as a community-based approach in water resources as "a process by which residents of a community are provided the opportunity and responsibility to manage their own resources, define their needs, goals and aspirations, and make decisions and take actions affecting their well-being." An effective CBFM needs to develop and implement new practices of sustainable fisheries management that are responsible to the scale of communities, their fisheries, and their social and economic structures and dynamics. CBFM is that kind of management where a community or most of the people of a community or the actual fishermen of a community of the adjacent area of a water body are engaged for resource management.

Pollution alters the natural habitat. Water pollution especially injurious to the biotic components of aquatic ecosystem. Agricultural runoff, oil spillage from mechanized boat, human waste, domestic garbage is the main causes of water pollution of the Lake. Toxic waste entering the water bodies, disturb the food chain and so the aquatic ecosystem. Insecticides, pesticides, sulfur and nitrogen oxide affect adversely the aquatic biodiversity. Pollution of river water coming through three perennial streams: the Noacherra, Durlavanarayacherra and Kemtalicherra in the lake is the threat to the ecosystem of the Rudrasagar Lake and it is one of the main causes of losing fisheries biodiversity. Public awareness especially fishers and streamside people should be developed on pollution control and fisheries biodiversity enhancement.

A perusal of the Table 5 also revealed that there was location specific extension needs for fishers as some needs like self-help groups management and eco-friendly farm management were found to be relevant. The soil and water conservation practices, especially micro-technologies for water harvesting is increasingly demanded due to the water shortage in summer months. The need for eco-friendly farm management practices indicated that the farmers cum

fishers were aware about the environmental problems caused by use of higher amount of pesticides and chemicals in crop production. The importance of organic farming was acknowledged by farmers especially the small farming community. It is important to note that eco-friendly farming like organic farming is highly suitable for the homestead farming systems where the objective is to optimize production without depleting its rich biodiversity. Hence, the diffusion of eco-friendly farming technologies like use of bio-control agents to manage pests and diseases as well as the use of biopesticides, vermicompost and vermiwash etc. is an important extension need to increase the environmental security of fishing community in the vicinity of Rudrasagar lake.

CONCLUSION

The study reveals that a host of factors are responsible for fisheries degradation in the lake including over-fishing, use of destructive gears, water pollution, siltation, environmental degradation and rapid urbanisation. Poor livelihood assets and vulnerability to shocks, stress and seasonality have also been identified as livelihood constraints of the fishers. As a consequence, the livelihood outcomes of the fishers are not up to the mark. However, the livelihood profile of professional/active fishers are still better than seasonal fishers as many of the artisanal fishers who have traditionally used the different traditional fishing traps, spears and hooks were impacted negatively due to depletion of fisheries resources coupled with increase of *kharbel and jak* fishing methods in the lake through out the season by the professional fishers.

In order to secure livelihoods of the fishers, it is important to manage the water body and conservation of fish biodiversity. Establishment of fish sanctuaries with community-based fisheries management is one of the most effective conservation measures of fish biodiversity. Restriction on fishing in the sanctuaries through efficient community based fisheries management may help conservation of resident species. Therefore, we propose an adoption of the socio-ecological systems approach to manage the fisheries resources of the Rudrasagar lake as this would allow identification of the core systems as well as subsystems and their interactions that could promote positive livelihood outcomes. However, implementing a socio-ecological system of resource management is more challenging compared with traditional fisheries management. Therefore, collaboration amongst relevant stakeholders including government and NGOs and active community participation in the management of the fisheries resources and the lake ecosystems are essential.

Most important extension needs as perceived by the fishers was alternative income generation and self-employment needs. Skill development towards non-farm sector and sound availability of financial capital will motivate the hopeless fishers to diversify their livelihood to invest in other sector, expand their activities and smooth functioning of business. Awareness and proper training is an effective means of achieving success in the livelihood diversification strategies, as it relaxes the entry barriers to different remunerative nonfarm activities. Targeting of behavioural change by the means of non-formal education and micro-entrepreneurship development training towards poor households in the rural areas will have a substantial reward on their ability to diversify livelihood options. Development of rural infrastructure is of utmost importance and efforts should be made to make remunerative non-farm opportunities accessible to the rural households. Policy-makers need to devise different livelihood strategy for different groups and gender of society. They must be governed with ‘one size does not fit all’ philosophy. Making use of local knowledge in natural resource management, encouraging the use of more selective and environmentally friendly fishing methods, stimulating income diversification towards non-fishing activities, stimulating the development of microenterprises and offering microfinance support to the fishers are some of the other suggestions of the study.

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