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Consumers' Preferences for Different Fish Groups in Tripura, India

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Abstract

Consumers' preference for fish in Tripura is facing an interesting dynamism where consumers are supplied with variety of fish species or groups. Preferences for different fish depend on the relative importance given to various attributes of fish and the utility received from it. This paper aims at finding the consumers' preferences towards various consumption attributes for different fish groups in Tripura. The study was conducted for five selected fish groups across five selected consumption attributes for rural and urban Tripura separately. Local carps, inter-state carps, local non-carps, inter-state non-carps and small weed fish were the five major fish groups identified in fish markets of Tripura. Conjoint analysis of consumption attributes showed 34.08% (for rural Tripura) and 29.72% (for urban Tripura) of relative importance to 'price' among five selected attributes (price, taste, availability, freshness and source). 'Freshness of fish' was found to be the important consumption attribute for inter-state carps and non-carps. Utility profile was found to be the highest for small weed fish (total utility = 31.06) in rural and for local carps (total utility = 35.08) in urban Tripura among five selected Choice Fish Groups. The difference in utility profile between rural and urban may be due to the combination of different factors like higher average income in urban area and greater availability of small weed fish in rural water resources. High income urban consumers have higher purchase power to buy high priced local carps. Boosting up local fish production to reduce the price of fish using 'principle of supply' is one of the major strategic options suggested in this study.

Keywords: Consumers' preferences, fish consumption, conjoint analysis, fish consumption attributes

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Introduction

People of land-locked North East (NE) India have very high preference for animal protein in general, and fish in particular. Unlike many of the Indian states, freshwater aquaculture in North East India has a long tradition and is an important component of fisheries. The hilly state of Tripura is one of the seven sister states of NE India. Tripura is landlocked by international border from three sides. Tripura is connected with the rest of the country by only the National Highway 44, which runs through the hills to Cachar district in Assam. Most parts of the state are rural and about 83% of state's population lives in these areas (Anon, 2009). People of the state consider fish as one of the preferable food items where rice and fish form the basic diet. The per capita fish availability target of Tripura was estimated at 13 $kg^{-1}year^{-1}$ assuming that 95% of population as fish consumers (Anon, 2008). This projection was based on nutritional requirement and is simply a crude estimation, whereas the actual fish demand in Tripura and the consumer's preferences is a matter of research interest. The gap in supply and demand for fish in Tripura attracted fish producers and fish traders of other states like Andhra Pradesh and West Bengal and the neighbouring country, Bangladesh (Nandeesha, 2008). The local fish producers have comparative advantage in terms of marketing as well as better prices for fresh fish. On the other hand, the outside producers have the advantage of higher productivity at low cost due to economies of scale (Upadhyay, 2008).

The existing fish marketing and consumption situation in Tripura is facing an interesting dynamism where fish consumers are supplied with variety of fish species or groups. Locally produced carps, non-carps, small weed fish from culture and capture source, inter-state carps and non-carps from states like Andhra Pradesh and West Bengal, and

neighbouring country, Bangladesh make the fish markets of Tripura highly heterogeneous with plethora of fish. According to the data provided by National Sample Survey Organization (NSSO), 98.6% rural and 95.8% urban households consume fish and this is the highest among all the NE States in 2004 – 05 (NSSO, 2007). It is therefore required to consider consumer's preferences, their perception and constraints regarding the consumption of different types of fish for more accurate estimation of the requirement of fish from consumers' perspective. With this background, this study aims to achieve the objective of analysing consumers' preference towards different fish groups in Tripura.

Materials and Methods

The data for this study was based on cross sectional data collected through primary survey during February to June, 2010. Data was collected covering four districts *viz.,* West Tripura, North Tripura, South Tripura and Dhalai Tripura. The heterogeneous fish varieties of Tripura were clubbed under four categories or fish groups based on two criteria *viz.,* source of supply (local or inter-state) and type of species (carps or non-carps). Another fish group, small weed fish (may be carps or non-carps) which has separate market was categorized as separate fish group. Finally, five Choice Fish Groups (CFGs) were formed *viz.,* Local Carps (LC), Local Non-Carps (LNC), Inter-state Carps (IC), Inter-state Non-Carps (INC) and Small Weed Fish (SWF). List of species under each CFG is given in Table 1. These CFGs were framed during pilot survey and personal discussion with fisheries experts from Department of Fisheries, Government of Tripura and other fisheries scientific community under the Indian Council of Agricultural Research, Tripura Centre and College of Fisheries (Central Agricultural University), Tripura. Consumer's interview schedule was prepared and pretested to overcome the ambiguities and redundancies. On the basis of information obtained through pretesting, required modifications were made to make the schedule complete and unambiguous. For studying the consumer's preference, different sample size was covered under rural and urban categories. Four towns from the four districts *viz.,* Sadar from West Tripura district, Dharmanagar from North Tripura district, Ambasa from Dhalai Tripura district and Santirbazar from South Tripura district were selected for sample survey. Twelve randomly selected fish consuming households were surveyed using interview schedule from each town. Similarly, for rural Tripura, eight villages from four districts *viz.,* two from each district were selected for sample survey. Fifteen randomly selected fish consuming households were surveyed using interview schedule from each village. Out of the total 48 urban and 120 rural consumer samples, three samples from urban and seven samples from rural Tripura were excluded due to inadequate data. Finally, the sample size for urban Tripura was 45 and for rural Tripura, it was 113. More coverage of samples from rural Tripura was designed intentionally as rural population forms about 81% of total population of the state (Department of Economics and Statistics, 2009).

Conjoint analysis is based on the premise that consumers evaluate the value *viz.,* utility of a product by combining the separate amounts of value produced by each attribute of a product (Louviere, 1991). Five important attributes affecting the consumer's preference for fish were identified by a pilot survey for conducting conjoint analysis of rank. These are price, taste, availability, freshness and source explained in three levels for former four attributes and two levels for the attribute 'source'.

Conjoint analysis was used to determine consumer's preferences of fish in which marginal utility (part-worth) for each attribute was generated. The method was also used to establish relative importance of fish attributes, to determine the profile of different CFGs using total utility approach. The additive effect model of the composition rule was applied to explain how consumers combine part-worth values to form total utility (Harrison et al., 1997; Louviere, 1991; Green & Srinivasan, 1978; Green & Rao, 1971; Dawes & Corrigan, 1974). In the additive rule, each respondent's total utility is the sum of the part worth utilities of each attribute. Therefore, the attribute's impact on utility is independent of levels of other attributes. The main effect model was specified as:

$$U_j = a + \sum_{i=1}^{N} \sum_{p=1}^{3} b_{ip}\ r_{ip} + \varepsilon_i \quad \text{..... (1)}$$

Where, U_j is the overall utility measure of the j^{th} category/ variety/ type, a is an additive constant, r_{ip} is the perception (i.e., defined in terms of 3 levels of p) of the variety attribute i and the b_{ip}'s are the part-worth utilities for the three levels (p's) of each of different attributes (i's) of the j^{th} variety and ε_i

is a normally distributed error term. Consumer adds the individual part-worth utilities to evaluate the overall utility of each CFGs. In practice, U_j is unobservable, we only observe respondent's evaluation through rating (ranking), and thus the empirical model is:

$$R_j = a_0 + \sum_{i=1}^{N} \sum_{p=1}^{n} b_{ip}\, r_{ip} + \varepsilon_i \quad \text{..... (2)}$$

Where, R_j is the ranking evaluation of the respondent consumer for a CFGs j with consumption characteristics (attributes) i, a_0 is the additive constant, r_{ip} is the perception (i.e., defined in terms of n levels of p) of the variety attribute i, the b_{ip}s are the part-worth utilities for the n levels (p's) of each of different attributes (i's) of the jth fish type and ε_i is a normally distributed error term. Five attributes were considered out of which four attributes were defined in terms of three levels of p and the rest of the attributes in terms of two levels of p.

This evaluation suggests that respondent consumer's ratings are an additive function of the 'true' but unknown part-worth utilities. The model uses the Ordinary Least Squares (OLS) regression to solve for utilities using rating scales as independent variables. 'SAS 9.1' software was used to run the conjoint analysis. Each independent variable indicates the rating of a particular attribute level by the respondent while the dependent variable is the respondent's overall ranking of fish variety described by the independent variables. In addition, profile utilities for each CFG were constructed using the frequencies of each attribute levels. The attribute level with the highest frequency was selected to describe the dominant level of that attribute in the profile for that particular CFG. Then total utility values of each profile of CFG were computed by adding together the intercept (from Equation 3) and part-worth (*viz.*, marginal utility or estimated coefficients) of the selected attribute levels in the profile. CFG with the highest total utility value was considered to be the most preferred, and vice-versa.

Results and Discussion

The results of conjoint analysis based on part-worth utilities and relative importance of consumption attributes for fish in rural and urban Tripura are depicted in Table 2. The coefficient is negative for 'high' price, 'poor' taste, 'rare' availability, 'poor' freshness and 'inter-state' source of fish (Table 2).

'Price' as an attribute showed the highest relative importance for both urban and rural consumers. However, it was more important for rural consumer (34.08%) as compared to urban (29.72%) consumers. This may be due to the fact that urban Tripura people have more per capita income than the people of rural Tripura. Debnath (2011) reported the average per capita annual income of urban and rural consumers of Tripura as Rs. 30 344 and Rs. 21 976. Urban consumers with higher average income have relatively more purchase power to buy preferred fish like local carps which are reported to have

Table 1. Fish species under different categories used in consumer study

Choice Fish Groups	Fish species
Local carps (LC)	Catla (*Catla catla*), Rohu (*Labeo rohita*), Mrigal (*Cirrhinus mrigala*), Silver carp (*Hypophthalmichthys molitrix*), Grass carp (*Ctenopharyngodon idella*), Common carp (*Cyprinus carpio*), Bata (*Labeo bata*), Gonius (*Labeo gonius*), Calabasu (*Labeo calbasu*) Reba (*Cirrhinus reba*) and Big head (*Aristichthysnobillis nobilis*)
Inter-state carps (IC)	Mainly Rohu and Catla and other Inter-state carps
Local non-carps (LNC)	Magur (*Clarias batrachus*), Singhi (*Heteropneustes fossilis*), Koi (*Anabas testudineus*), Pangus (*Pangasius* sp.), Prawn (*Macrobrachium rosenbergii*), Pabda (*Ompok* sp.), Pacu (*Piaractus brachypomum*), Boal (*Wallago attu*), Tilapia (*Oreochromis mossambicus*) and Kuichya (*Amphipnous cuchia*)
Inter-state non-carps (INC)	Ilish (*Tenualosa ilisha*), Pangus (*Pangasius* sp.), Pacu (*Piaractus brachypomum*), Tilapia (*Oreochromis mossambicus*) and other marine fish
Small weed fish (SWF)	Moca (*Amblypharyngodon mola*), Tangra (*Mystus* sp.), Puti (*Puntius* sp.), Dharkina (*Esomus danricus*), Chela (*Oxygusterba caila*) and Butum (*Noemacheilus aurius*)

Table 2. Conjoint analysis based on part-worth utilities and relative importance of consumption attributes for fish in Tripura

Variable	Levels	Rural Consumer (n = 113)			Urban Consumer (n = 45)		
		Utility	SE	Relative Importance	Utility	SE	Relative Importance
Intercept		22.6859**	1.34187		22.3653**	1.27441	
Price	Low	4.9374**	1.90556	34.078	4.9778*	2.07935	29.718
	Medium	3.8959#	2.05659		1.6363	1.78958	
	High	-8.8333**	1.94034		-6.6141**	1.96061	
Taste	Good	3.6781#	1.94383	22.797	3.1314	2.03927	23.353
	Moderate	1.8556	2.06849		2.8464	1.98577	
	Poor	-5.5337**	1.96653		-5.9778**	2.09401	
Availability	Often	1.9175	1.91072	11.738	2.0849	1.83730	14.966
	Occasional	0.9079	1.92340		1.6681	1.78266	
	Rare	-2.8255	1.90158		-3.7530#	2.21299	
Freshness	Good	4.1871	1.90549	25.154	4.5105*	1.79462	25.038
	Moderate	1.7906	2.13052		0.7455	1.73288	
	Poor	-5.9776	1.89812		-5.2561**	1.84818	
Source	Local	1.2593**	1.35310	6.233	1.3506	1.27066	6.925
	Inter-state	-1.2593	1.35310		-1.3506	1.27066	

R^2 = 0.7157, Adjusted R^2 = 0.6426 (for Urban) and R^2 = 0.6519, Adjusted R^2 = 0.5624 (for Rural)

*Significant at 5% level, **Significant at 1% level, #Significant at 10% level

higher market price and receive highest utility for that. On the other hand, rural consumers with relatively lower average income receive more utility from small weed fish which is readily available in rural water resources and cost is also relatively less in rural fish markets.

'Freshness' and 'taste' were other important attributes after 'price' for both rural and urban consumers. 'Availability' of fish was found to be more important to urban consumers than the rural. It may be because of less availability of fish in urban areas as compared to rural consumers who could get the regular supply of fish from own source of production.

A profile utility for each CFG has been depicted across rural and urban areas of Tripura (Table 3 & 4). The attribute level with the highest frequency was selected to describe the dominant level of that attribute in the profile for that particular type of CFG. Using the equation (2), the total utility values of each profile of CFG were computed by adding together the intercept and part-worth utilities (*viz.*, marginal utility or estimated co-efficient) of the selected attribute level in the profile.

It was observed from the analysis that the profile utility for different CFGs was not similar for urban and rural consumers. While considering the selected attributes of the study, rural consumers received the highest utilities from small weed fish, followed by inter-state carps, local carps, inter-state non-carps, and least utility from local non-carps. Urban consumers received the highest utilities from local carps, followed by small weed fish, inter-state carps, inter-state non-carps, and least utilities from local non-carps. It is necessary to note that profile utilities with the highest or the lowest value do not necessarily indicate the acceptance or rejection of a CFG. It indicates the relative consumer's preference estimated through attribute based utility co-efficient to describe the present level of preference for different CFGs by rural and urban consumers of Tripura.

Analysis of urban consumer behaviour for fish in Tripura conducted by Upadhyay & Pandey (2009) focused on the family income and expenditure pattern in relation to fish expenditure in Agartala city of west Tripura. They reported that the major carps (rohu, mrigal, catla, silver carp and grass carp) were easily available, less expensive, and compara-

Table 3. Utility profile of different CFGs based on consumer preferences in rural Tripura

CFGs	Price	Taste	Availability	Freshness	Source	Profile utility
LC	High	Good	Often	Good	Local	24.8946
IC	Medium	Moderate	Occasional	Moderate	Inter-state	29.8766
LNC	High	Good	Rare	Good	Local	20.1516
INC	Medium*	Moderate	Occasional	Poor	Inter-state	22.1084
SWF	Medium	Moderate	Rare	Good	Local	31.0583

* Medium/ low prices were reported for this CFG except for 'Hilsa' which reported high market price

CFG: Choice Fish Groups; LC: Local Carps; IC: Inter-state Carps; LNC: Local Non-Carps; INC: Inter-state Non-Carps; SWF: Small Weed Fish

Table 4. Utility profile of different CFGs based on consumer preferences in urban Tripura

CFGs	Price	Taste	Availability	Freshness	Source	Profile utility
LC	Medium	Good	Often	Good	Local	35.0790
IC	Low	Poor	Occasional	Moderate	Inter-state	22.4283
LNC	High	Good	Rare	Good	Local	20.9907
INC	Medium*	Moderate	Occasional	Poor	Inter-state	21.9094
SWF	Medium	Moderate	Rare	Good	Local	28.9561

* Medium/ low prices were reported for this CFG except for 'Hilsa' which reported high market price

CFG: Choice Fish Groups; LC: Local Carps; IC: Inter-state Carps; LNC: Local Non-Carps; INC: Inter-state Non-Carps; SWF: Small Weed Fish

tively less tasty but were popular among the consumers. On the other hand, pabda and koi (local non-carps) were considered tasty but expensive and scarce in the market. The present study supplemented the previous observation of Uadhyay & Pandey (2009) in terms of total profile utility of different fish groups in urban Tripura. Another urban based fish consumption profile study of Cochin households conducted by Nikita & Annamalai (2001) showed that fish occupied a place next to staple food in households of Cochin area. It showed a positive relation with household income. However, study by Nikita & Nair (2004) showed fish consumption expenditure in peri-urban areas of Cochin increasing with increasing household income but was less than that spent on other animal products. Income did not influence the expenditure on fish in peri-urban areas. The present study showed that the consumers from rural Tripura with lesser average family income received the highest utility from locally available small weed fish.

This study on consumer's preference revealed that among the five selected attributes, price was the most important attribute for rural and urban consumers. Besides, freshness and taste of fish were found to be other two important attributes which affected the consumer's preference for fish. The profile utility of different CFGs across rural and urban consumers revealed that rural consumers received the highest utilities from small weed fish and urban consumers received the same from local carps. The reasons were predicted to be the differences in average income between urban and rural consumers.

Findings regarding the preferences for fish may be utilized to increase fish consumption in Tripura by increasing supply of local fresh fish to the market. Fish being a perishable food item, its freshness may be ensured through increasing local fish production which can be supplied to local consumers in the shortest possible time span. The total utility profile of inter-state carps and non-carps categories for both

rural and urban fish consumers found to be affected by 'freshness' and hence suitable strategies are to be developed to ensure the freshness and quality maintenance of inter-state fish. The method of preservation and packaging aspects including time span during transportation of fish from outside the state need to be studied to ensure better freshness and quality of inter-state fish.

The study identified the major consumption attributes and their relative importance for rural and urban consumers. It brought out the importance of boosting up local production, ensuring freshness of inter-state fish and production of local non-carps including small weed fish in Tripura state.

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