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Investigating demand pattern and consumer's willingness to pay for shrimps in Odisha

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Abstract
The present study's particular objectives were to identify consumers socioeconomic profile and their income and expenditure pattern, to analyze consumers consumption pattern and estimation of willingness to pay for shrimps and to find out constraints in consumption of shrimps and recommendations. Data was collected from 240 consumer and analysed using logit model and garret ranking method. The independent variables are age, income, family size, education, proximity to buying source, price of fish and substitute. taste and preference and nutrition are major cause of consumption. major constraints in consumption are high price, lack of quality shrimp etc. willingness to pay has positive relation with age, income, price of substitute, education and negative relation with price of shrimp, proximity to buying source, family size.

Keywords: logit model, garret ranking, willingness to pay, shrimps, consumption pattern

1. Introduction
Since the beginning of the last two decades, shrimp, a premium commodity, has contributed 35–40% of overall export revenues (Salim *et al*., 2004) [8]. Shrimps typically sell for high prices on the domestic market because they are primarily an export item. As a result, there have been concerns that domestic consumers won't be able to buy shrimp. Additionally, it is believed that exporters are reluctant to sell the premium shrimp on the domestic market because they want to take advantage of the export economies of scale. (Salim and Biradar, 2009) [7]. Due to their low fat content (4–8% on a dry matter basis), shrimp are favoured as a dietary source over chicken (6–23%) and mutton (8–11%) (Ackman, 1967; Cowey and Sargent, 1977) [3, 4]. Shrimps are likewise more expensive than chicken but less expensive than mutton. Over the past few years, the rural markets have emerged as one of the most lucrative markets for Indian companies. In the recent past, many organizations have forayed into rural areas and this has proved fruitful and beneficial for them. The Indian rural markets provide abundant opportunities for organizations to enter and operate profitably (Joshi, S. K.; Pant, S.C.) [9]. The purpose of this study was to determine Odiaha residents' preference for eating shrimp and were to identify consumers socioeconomic profile and their income and expenditure pattern, to analyze consumers consumption pattern and estimation of willingness to pay for shrimps and to find out constraints in consumption of shrimps and recommendations. The independent variables are age, income, family size, education, proximity to buying source, price of fish and substitute.

2. Sampling methodology
The primary data were gathered from 240 customer households in Bhubaneswar in order to explore consumer preferences for fish and willingness to pay (WTP) for shrimp and their deciding factors. The information on the general particulars, such as age, education, income, spending habits, fish consumption, purchasing behaviour, restrictions on the consumption of high-value fish, and WTP for high-value fishes, was gathered. The information was gathered between 2021 and 2022. Data was collected in form of questionnaire and secondary data was collected from journals, website etc.
Willingness to pay (WTP) is the price that someone is willing to give up or pay to acquire a good or service. It could be defined as the maximum amount of money that may be contributed by an individual to equalize a utility change. The WTP function identifies that the price an individual is willing to pay for a given level of quality as given specific levels of price (P) and utility (U) (Lusk and Hudson, 2004) [6].

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The Logit model assumes that the random variable Z_i predicts the log of the odds ratio of consumers' willingness to pay for more (LWTP). Thus, LWTP $= Z_i = \ln(P_i / 1-P_i)$ $= b_0 + b_1 A + b_2 E + b_3 F + b_4 Y + b_5 D + b_6 P_f + b_7 P_s + b_8 T$ where, LWTP = Log odds ratio of the WTP, Z_i = the log of the odds ratio, $P_i / 1-P_i$ = the odds ratio, A = age in years of the head of the household, E = education level of the head of the household, F= family size in numbers, Y = monthly income in rupees, D = proximity to buying source (km), P_f = price of fish in rupees, P_s = price of substitutes (meat – weighted average) in rupees, T = preferences (Ranks weighing from 1-5).

The probability of consumers' WTP for shrimps is modelled as a function of various individual consumers and household level factor. The model is represented as follows

$$P_i = eZ_i / (1 + eZ_i)$$

Where, P_i = the probability of the ith consumers' willingness to pay more.

The dependent variable is the consumer's decision on willingness to pay (WTP) for the high value fishes. It assumes 1 if the consumer is willing to pay more for high value fishes and 0 otherwise. Logit model was used to describe the consumer's decision on whether or not they agreed to pay for existing supply available or for increased supply available. The Garette Ranking Technique (Garrett, 1969) [11] was employed to rank the problems in fish consumption as expressed by the consumers. The different problems in fish consumption as perceived by the consumers were derived based on the reconnaissance study. The order of merit given by the consumers was transmitted into scores. For converting the scores assigned by the consumers towards the particular problem, percent position was worked out using the formula-

Percentage position = 100 * (Rij-0.5)/Nj

Where,
Rij = Rank given for ith constraint by jth individual.
Nj = Number of constraints ranked by jth individual.

The percentage position of each rank was converted into scores referring to the table given by Garrett and Woodworth (1969) [11].

Results and Discussion
Socio-economic profile of shrimp consumers
1. Age-wise distribution of shrimp consumers
The results indicated that 69.12% of the respondents in the study area came under the age group of 30-60, followed by a total of 20.42% coming under age the group of 30 and 10.46% under age group above 60 who consumes shrimp.

Table 1: Age-wise distribution of shrimp consumers

	Age of shrimp consumer	No of respondent	percentage
T1	Below 30 years	49	20.42
T2	Between 30-60 years	166	69.12
T3	Above 60 years	25	10.46
	Total	240	

2. Educational status of consumers
It showed that among the respondents 40.42% possessed college education followed by secondary education (35.42%). High school level education was possessed by

19.58% of respondents while 4.58% had only primary education

Table 2: Educational status of consumers

	Education	No of respondent	Percentage
T1	Primary	11	4.58
T2	Highschool	47	19.58
T3	Higher Secondary	85	35.42
T4	College education	97	40.42
	Total	240	

3. Access to selling point of shrimps from household
The analysis showed that 41.25% had close access to fish selling points with in a kilometer. A total of 28.75% and 45 respondents 18.75% had access to fish selling points within 1-2 km and 2-3 km respectively. For 11.25% of the respondent selling point was situated >3 km away.

Table 3: Access to the selling point of shrimps from household

	Access to selling points of shrimps from household	No of respondent	Percentage
T1	<1 km	99	41.25
T2	1-2 km	69	28.75
T3	2-3 km	45	18.75
T4	>3 km	27	11.25
	Total	240	

4. Income and expenditure
The mean level of household income amongst the respondents indicated that a total of 35% of the respondents possessing an income between less than ₹25000,27.5% of the respondents possessing income ₹25000-50000 and 25.42% of the respondents had an income in the range of ₹50000-100000 followed by 12.08% having income level > ₹1 lakh. The mean income was registered with households in Bhubaneswar (₹54870.84). The mean monthly expenditure pattern of respondents in selected cities is furnished in Table 4. It was found that majority of their income is spent on food items. A total of 24.89% (₹8432.5) is spent for food items. A comparatively higher amount of ₹20.21% (₹6845) was being spent for educational purposes. Monthly expenditure on social expenditure is registered in 17.19% (5822.5). An amount of 13.73% ₹4652.5 (₹4652.5) was being spent for shelter purposes. A significant amount of 12.11% (4102.5) is spent on health care. Least amount is spent on clothing 11.87% (4021.25). The mean monthly expenditure of household in Bhubaneswar is 33876.25.

Table 4: Mean monthly income level of household

	Income (₹)	No of respondent	Percentage
T1	<25000	84	35
T2	25000-50000	66	27.5
T3	50000-100000	61	25.42
T4	>100000	29	12.08
	Average income	50166.67	

Table 5: Average monthly expenditure pattern of household

	Expenditure pattern	Amount	Percentage
T1	Food	8432.5	24.89
T2	Clothing	4021.25	11.87
T3	Shelter	4652.5	13.73
T4	Healthcare	4102.5	12.11
T5	Education	6845	20.21
T6	Social expenses	5822.5	17.19
	Total	33876.25	

5. Mean monthly expenditure on food

The mean monthly expenditure on various food items is depicted in Table 6. The mean expenditure was incurred for cereals across all other food items (₹1520.77 i.e. 18.04%). The expenditure on pulses is (1093.39 i.e.12.97%). The expenditure on fruits and vegetables is (925.99 i.e. 10.98%). The expenditure on milk and beverages is (760.59 i.e.9.02%). Meat and meat product expenditure is (1603.46 i.e.19.02) The mean monthly expenditure incurred for fish and fish products was highest (1772.08 i.e. 21.06%). Lowest expenditure is on other food products (756.43 I.e. 8.97%).

Table 6: Average monthly expenditure on food

	Average monthly expenditure on food	Amount	Percentage
T1	Cereals	1520.77	18.03
T2	Pulses	1093.31	12.97
T3	Fruits and vegetables	925.91	10.98
T4	Milk and beverages	760.59	9.02
T5	Meat and meat products	1603.43	19.01
T6	Fish and fish products	1772.08	21.01
T7	Others	756.43	8.98
	Total	8432.50	

Consumption pattern

7. Mean monthly consumption of meat and fish product

which showed that the mean monthly consumption of low value fishes was found to be the highest. The average low value fish consumption was 4.10 kg whereas the average high value fish consumption was found to be 2.43 kg across the study areas**.** The average chicken consumption is 1.52 kg and mutton is 0.63 kg.

Table 7: Mean monthly consumption of meat and fish product

	Mean monthly consumption of meat and fish product	Amount(kg)
T1	Chicken	1.52
T2	Mutton	0.63
T3	Other meat product	0.24
T4	Low value fishes	4.10
T5	High value fishes	2.43
	Total	8.92

8. Mean monthly consumption of different types of fishes (kg)

Among the low value fishes, consumption of anchovies was found to be the highest in Bhubaneswar with 1.30 kg (the highest) followed by mackerels with 1.17 kg. and sardines 0.93 kg. Consumption of other low value fishes is very less 0.70 kg. Among the high value fishes, consumption of shrimps was found to be the highest with 1.09 kg (the highest) followed by pomfrets 0.92 kg and other high value fishes 0.28 kg. the lowest consumption in high value fish is cephalopods 0.14 kg. the average consumption of all the fishes in house hold is 6.39 kg.

Table 8: Mean monthly consumption of different types of fishes (kg)

	Species	Amount (kg)
T1	Sardines	0.93
T2	Mackerels	1.17
T3	Anchovies	1.30
T4	Other low value fishes	0.70
T5	Shrimps	1.09
T6	Cephalopods	0.14
T7	Pomfrets	0.92
T8	Other high value fishes	0.28
	Total mean monthly consumption of different fish(kg)	6.39 kg

Determinants and constraints in Shrimps consumption
9. Constraints in Shrimps consumption

The major constraint observed in Bhubaneswar was high price (56.38), followed by, lack of quality fresh shrimps (52.50), access to source of purchase (51.13), consumers also faced little constraints of socio-cultural limitations (41.94) and difficulty in preparation and cooking (47.75). these shows the major problems faced by the consumers.

Table 9: Constraints in shrimp consumption

	Constraints in shrimp consumption	Score	Rank
T1	Lack of quality fresh shrimps	52.50	II
T2	High price	56.38	I
T3	Access to the source of purchase	51.13	III
T4	Socio-cultural constraints	41.94	V
T5	Difficulty in preparation and cooking	47.75	IV

10. Determinants of shrimp consumption

The factor 'taste and preference' as the most preferred determinant for buying shrimp (63.17) second factor for shrimp purchase was its nutrition (low fat content) (59.50) followed by proximity to buying source (53.75), relative lower price than substitute (41.25) and familiarity of shop impact the least (28.43).

Table 10: Determinants in shrimp consumption

	Determinants of shrimp consumption	Score	Rank
T1	Taste and preference	63.17	I
T2	Relative lower price than substitute	41.25	IV
T3	Nutrition (low fat)	59.50	II
T4	Proximity to buying source	53.75	III
T5	Familiarity of shop	28.43	V

Awareness on the consumption of shrimps (% of respondent)

A total of 77.08% of consumers from Bhubaneswar were unaware of the relatively low export prices of shrimp. From the table 10 it can be concluded that 40.42 percent of consumers prefer to eat shrimp once in every month followed by 32.50 percent twice per month,17.92 percent once in every three month,7.92 percent. It showed that shrimp is consumed frequently in Odisha. 62.92 percent consumers were willing to buy shrimps over other fish if available in market. Consumers awareness and attitude towards the shrimp consumption showed that there is demand for shrimps in domestic market.

Table 11: Awareness on the consumption of shrimps (% of respondent)

Parameter	No of respondent	Percentage
T1 Awareness on export prices of shrimps		
Yes	55	22.92
No	185	77.08
Total	240	
T2 Frequency of shrimp consumption		
Once in every three months	43	17.92
Once in every month	97	40.42
Twice per month	78	32.50
Three times in a month	19	7.92
More than three times in a month	3	1.25
Total	240	
T4 Willingness to purchase shrimp over other fish ?		
(yes)	151	62.92

Willingness to pay - Logit functions

The willingness to pay for Shrimps was calculated by a WTP function.

LWTP $= Z_i = \ln(P_i/1-P_i) = \beta_0 + \beta_1 A + \beta_2 E + \beta_3 F + \beta_4 Y + \beta_5 D + \beta_6 P_f + \beta_7 P_s + \beta_8 R$

where, LWTP = Log odds ratio of the willingness to pay;

Z_i = log of Odds ratio; $P_i / 1-P_i$ = Odds ratio;

The willingness to pay model was estimated for study areas and the functional form is

WTP = f (age, education, family size, income, proximity to source of purchase, price of shrimps, price of substitute, taste and preference)

WTP = f $(A, E, F, Y, D, P_f, P_s, T)$

The likelihood of consumers' willingness to pay for shrimps is empirically assessed as a function of various individual consumers and household level factor.

The model can be represented as: $P_i = e^{Z_i} / (1 + e^{Z_i})$

WTP = 0.390+(0.158)A + (0.163)E – (0.201)F +(0.105)Y – (0.121)D – (0.211) P_f + (0.232) Ps + (0.182) T

The outcome indicated that the willingness to pay for fish registered positive relationship with age, education, income, price of substitutes and taste and preferences. The willingness to pay was negatively affected by family size, proximity to the buying source and price of fish. It was found that for every 10% increase in the family size, the willingness to pay decreases by 2.01% from the mean level. It can be concluded that for every 10% increase in proximity to buying source of shrimps lead to decrease in 1.21% of its demand The analysis also revealed that every 10% increase in the price of shrimp leads to an decreased demand for shrimps by 2.11% from the mean level. However, with increasing price of substitutes for every 10% increase would lead to a surge in demand for shrimps by 2.32% from the mean level. With increasing income for every 10% increase would lead to a surge in demand for shrimps by 1.05% from the mean level.

Export price of shrimp per kg vis-à-vis domestic price realization- A comparison

Table 12: Export price of shrimp per kg vis-à-vis domestic price realization- A comparison

Year exchange rate	Export price per kg	Domestic price per kg
1997-1998	292	195
2007-2008	297	242
2014-2015	442	370
2019-2020	558	400

The price comparison of high value species like shrimps indicated that the domestic price is had increased due to relatively high export prices. The price of shrimp in export market is increased very slowly in comparison to the domestic market where the price has soared up very fast. It indicates that margin of profit has been decreased. This is mainly because of the fact that high value fishes do not cater to the domestic market on account of low and inconsistent demand and depreciation of rupee against dollar which have promoted export more. The exporters in order to reap the export economies of scale tend to export more quantity of

fish at lower price margins. The revenue gains are contributed mostly by quantity effect rather than the price effect (Shyam, 2013) [10]. The irony of trading sizeable quantum at a lesser export price together with alerted threats and refused exports call for tapping the domestic markets so that the shrimps is available across India. Although, the exports received worthwhile earnings, supply of high value fish like shrimp for the domestic consumer would be under threat. All these pose threats to availability and cost-effectiveness of high value fishes in domestic markets.

Summary and Conclusion
In A total of 77.08 percent of consumers were not aware of the shrimp's comparatively low export prices. It is clear that 40.42 percent of consumers like to eat shrimp once a month, followed by 32.50 percent who eat it twice a month, 17.92 percent who eat it once every three months, and 7.92 percent who do it every other month. It demonstrated how commonplace shrimp consumption is in Odisha. Age, education, family size, income, distance from source of purchase, price of shrimps, price of substitution, taste, and preference were all found to have an impact on willingness to pay. The results showed that age, education, income, the cost of replacements, taste preferences, and willingness to pay for fish all showed positive correlations. Family size, distance from the source of the purchase, and fish price all had a negative impact on willingness to pay.
It was discovered that the willingness to pay decreased by 2.01 percent from the mean level for every 10% increase in family size. Shrimp demand decreases by 1.21 percent for every 10 percent increase in distance from the source of the purchase. The data also showed that the demand for shrimp decreases by 2.11 percent from the mean level for every 10% rise in price. But for every 10% increase in the price of substitute, demand for shrimp would grow by 2.32 percent above the mean level. Shrimp demand would increase by 1.05 percent from the average level with rising income for every 10% increase.

Suggestions
1. Establishing cold storage facilities at the chosen shrimp landing centres would aid in maintaining shrimp quality and controlling supply.
2. The promotion of shrimp consumption and diversification would be aided by raising awareness of the consumption of shrimp and its products through the media.
3. The design of effective strategies to enhance shrimp consumption, product development, and marketing would benefit from studies on shrimp consumption patterns in the key shrimp consumption centres.
4. Municipalities should conduct daily quality checks on shrimp to prevent the sale of rotten and low-quality shrimp.
5. The shrimp must be refrigerated after purchase until cooking time. Rarely are such pricey amenities accessible to all homes. It is necessary to recommend less expensive ways to keep the shrimp purchased until it is cooked.

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