

# Segmentation of Inland fish consumer in Anand District, Gujarat

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## Abstract

**Objective:** Segmentation of the market is the need of the hour as producer is always searching best consumer for its product. That incorporates here as objectives of study.

**Methods/Statistical Analysis:** Three hundred consumers have been selected from different major market destination of Anand district. Income of the consumer, household size, distance from the market, prefer day of consumption and per quantity purchase were the variables that considered for market segmentation determination. Cluster analysis technique has been used here, where both hierarchical cluster and k mean cluster were applied. Significance of different variables was considered through Analysis of Variance procedure.

**Findings:** There are three clusters formed in this study. Consumers of higher cluster are one and half times more than the small cluster. Each cluster compiles variables like household Size (demographic variable), Purchase quantity in kg and Prefer day of purchase (Behavioural variable) and Distance from market (Geographic variable). Here income of consumer has no significance in cluster formation. Distance from the market is a major variable that makes the market in to different segment in a significant way. From the different higher household consumer travels more distance for purchasing of Inland fish. Second and third cluster consumers purchase Inland fish in early part of week; preferably Sunday and Monday, whereas first cluster consumers purchase the same in last part of the week; preferably Friday and Saturday. It shows Inland fish market concentrates only for four days majorly in study area. These findings are different as it is segmented the market through different clusters. Findings though 5% Level of significance erase any biasness and sample findings resemblance with population parameters and result generalize the findings. Cluster analysis is a data reduction, exploratory based multivariate techniques. It improves the validity of results.

**Application/Improvements:** Designing market segmentation with effective tools and technique will find the best consumer for the best product of the poor producers that shape the market a new shape.

**Keywords:** Segmentation, Inland fish, Consumption variables, Cluster Analysis, Consumer.

## 1. Introduction

Gujarat is bestowed with ample water resources of 3865km of rivers and canals, 3.48 lakh hectares of reservoirs, 0.22 lakh hectares of tanks, lakes and ponds, 0.12 lakh hectares of flood plain lakes and derelict water, 3.76 lakh hectares of brackish water [1]. At another side, Gujarat produces only 94.93 thousand tonnes of Inland fishery which is one eleventh of its total fish production in spite of number one in marine fish production in India [1]. A statement of former DDG, ICAR, and Dr. Meenakumari came in 2012 that Gujarat has the potential to feed fish food to entire country. Though this statement more suits to marine fish production but its internal resources for Inland fish production and its subsequent consumption cannot be ignored. Gujarat remained consistently at the bottom for fish consumption both over time and across sectors [2]. In between that, there is a ray of optimism where cosmopolitan cities of Anand and its nearest areas show some interest for fish consumption. Gradually there is an awareness of people for fish consumption as perception of fish as a healthy food with high levels of digestible protein, PUFA and cholesterol- lowering capability is also a major factor for its increased consumption. Anand is number of district in Inland fish production (35%) though ponds and tanks in Gujarat and presence of ICAR-CIFA (Indian Council of Agricultural Research- Central Institute of Freshwater Aquaculture) regional centre and KVK (Krishi Vigyan Kendra) Devataj of Anand Agricultural University, Anand have been giving a momentum on Inland fishery production and then subsequent consumption.

Fish consumption depends on many factors such as increasing population along with sufficient supply of fish and fish products, demand, income, education level, consumer preference and fish prices [3]. There are also anomalies in Inland fish consumption in various groups. The share of fish protein in total animal protein expenditure is higher for lower income groups, demonstrating their dependence on fish as a source of animal protein. Poor people consume mostly low-price fish and rich people spend a significant portion of their fish budget on expensive fish. Per capita fish consumption is substantially higher in rural areas than in urban areas [4]. The regional tastes and preferences of fish eating population of the country and the frequency of fish consumption also exert substantial influence on the fish market [5].

Although per capita expenditure on fish increased with the rise in income but it was reverse in the case of percentage of income spent on fish [6]. The consumption of fish has grown faster than that of any other animal product in India. During 1980 to 2000, the per capita consumption of milk increased from 43 kg to 63 kg, of fish from 3.5 kg to 5.8 kg, and of meat and poultry from 5 kg to 6.8 kg [7]. Looking all above facts and figures, market segments have been put forth for Inland fish stakeholders by looking in to key variables of fish consumers from the market yards as shown in Figure 1.

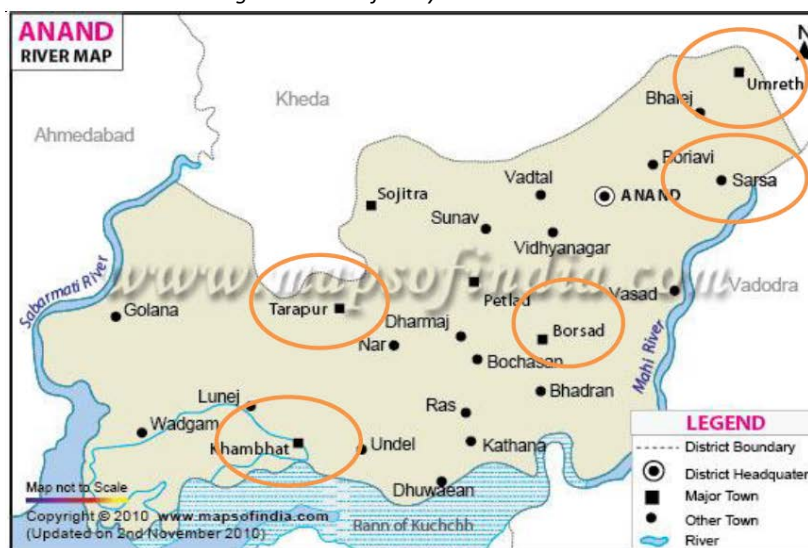
## 2. Materials and Methods

Three hundred customers were selected purposively from six major fish market areas like Station Bajar and Samarkha Bazar (Anandtaluka), Tarapur market area (Tarapur Taluka), Bandhani Chowkdi (Petlad Taluka), Near Gopal talkies (Khambat Municipalities Area) and Umredh Chowkdi (Umredh Taluka). Customers were selected during purchasing of inland fish at the site of market area. Five major fishes like Rohu, Catla, Mrigal (Local name Nagri), Pungacious group fish (Local name Surmai fish) and Bighead fish were identified by looking into their abundant presence in the market area and those consumers were considered as respondents who were consuming these particular varieties of fish only. Here different market segment of consumer have been identified and discussed vividly. Segmentation is a marketing concept where we make the market more homogenous by considering their uniform demand and preferences. Cluster analysis is a multivariate technique that helps to do the same through statistical software. Here data have been analyzed through advanced statistical technique that is SPSS. Both Hierarchical cluster and K-mean clusters have been considered for getting a meaningful market segment of Inland fish consumer. Besides that ward's linkage procedure, one way ANOVA, Posthoc analysis (Scheffe method) have also been used during the analysis.

Hierarchical cluster analysis is a technique that helps to find the number of cluster. The study prefers agglomeration method for getting its preferred cluster. Through wards procedure, means of all the variables are computed for getting subsequent cluster identification. K mean cluster is a non-hierarchical cluster technique. It works well in large sample (here it is 300). K mean cluster helps to determine the number of variable that is significant for grouping the population in different segment and helps in identifying numbers of population in each segment. Relationship of different clusters with cluster relationship are identified through one way ANOVA (Analysis of Variance) technique and then further post hoc analysis [8].

In this study, market segments of consumers have been determined by taking household size, income distribution, and distance from the fish market, prefer day of purchasing and quantity of purchase of Inland fish in detail. From the review, it has been assumed that income and family size has a distinct feature in inland fish consumption. Gujarat is a vegetarian state where fish consumers travel a distance due to specific area of market operation. Prefer day of purchase is very relevant here for understanding pattern of fish consumption. Both income distribution and prefer day of purchasing were categorical data and other three variables were metric one in nature. Income of consumers have been categorized as 0—5000, 5000-10000, 10000-25000, 25000-50000 and 50000-1,00,000 rupees per month. Prefer day of purchasing of fish have been categorized as Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday.

Figure 1. Area of study in Anand District

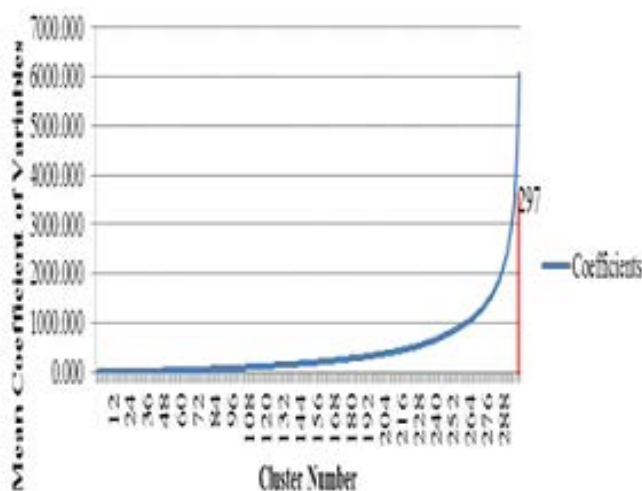


Source: www.mapsofindia.com

### 3. Results and Discussion

It was very essential to find the accurate number of clusters formed through hierarchical cluster method. From the Figure 2, it has been observed that at the point of 297, there is a sharp increase of the line in the graph. So, according to the researcher, there may be three clusters formed which accounts the entire inland fish consumer in different segments. It was a little bit trial and error methods, but at the end, as a researcher, segment should be very equal to each other in number. Here in table, it has been found that cluster 1 carries 80 persons, cluster 2 carries 121 persons and cluster 3 carries 99 persons that subsides any further sub cluster formation in each segments.

Figure 2. Cluster – Coefficient Line Diagram



Source: Primary work

When variables were analyzed through cluster analysis, it has been observed that income was insignificant ( $p > 0.05$ ) here to form any cluster (Table 1). That’s why; it has been rooted out in further analysis. From the Table 1, it may be assumed that cluster 1 were included those persons who were high income bracket, eat fish at the end of the week by travelling a higher distance.

Second and third clusters formed comparatively less wealthy person but they preferred early days of week for consuming fish. But it was not sufficient to come in to a conclusion, as income was insignificant here in cluster formation though house hold size, preferred day of eating fish, purchase quantity of fish and distance from the market were showing significant impact on cluster formation. Here three clusters were formed as all the clusters were substantially equal number in cases. Further analysis was necessary to understand between and within group variance through one way ANOVA and post hoc analysis among variables with cluster memberships (Independent Variable).

Table 1. Number of cluster and cases in each cluster

Final cluster centers				ANOVA		Number of cases in each Cluster	
	Cluster						
Household size	4.58	3.36	4.95	Household size	.000	1	80.000
Income	3.20	2.88	2.94	Income	.130	Cluster 2	121.000
Preferred Day of purchase	5.89	1.71	1.51	Preferred Day of purchase	.000	3	99.000
Purchas quantity	1.21	1.09	1.39	Purchase quantity	.013	Valid	300.000
Distance from Market	4.13	2.35	6.37	Distance from Market	.000	Missing	.000

NB: Three clusters with their determining variables for forming a meaningful cluster in the study area

Table 2 shows, inter and intra cluster variability. It has been observed that there is a significant difference between cluster 1-2 and 2-3 in household size number but cluster 1-3 are insignificant. Similarly, cluster2-3 are significant for purchase quantity of fish, cluster 1-2 and cluster 1-3 are significant for prefer day of purchase of Inland fish. It has been observed that distance from the market is significant in all the cluster formation. It may be due to very specific area of operation of fish market in the study area. These things are also clearly understood from the Table 3 as well.

Table 2. Multiple comparisons between variables in each clusters

Dependent Variable	(I) Cluster number of case	(J) Cluster number of case	Scheffe				95% Confidence interval	
			Mean difference (I-J)	Std. Error	Sig.	Lower bound	Upper bound	
Household size	1	2	1.21136*	.25421	.000	.5860	1.8368	
		3	-.37449	.26521	.370	-1.0270	.2780	
	2	1	-1.21136*	.25421	.000	-1.8368	-.5860	
		3	-1.58586*	.23907	.000	-2.1740	-.9977	
	3	1	.37449	.26521	.370	-.2780	1.0270	
		2	1.58586*	.23907	.000	.9977	2.1740	
Purchase quantity	1	2	.11494	.10619	.557	-.1463	.3762	
		3	-.18139	.11079	.263	-.4539	.0912	
	2	1	-.11494	.10619	.557	-.3762	.1463	
		3	-.29633*	.09987	.013	-.5420	-.0506	
	3	1	.18139	.11079	.263	-.0912	.4539	
		2	.29633*	.09987	.013	.0506	.5420	
Distance from market	1	2	1.78414*	.24212	.000	1.1885	2.3798	
		3	-2.24249*	.25260	.000	-2.8639	-1.6211	
	2	1	-1.78414*	.24212	.000	-2.3798	-1.1885	
		3	-4.02663*	.22770	.000	-4.5868	-3.4665	
	3	1	2.24249*	.25260	.000	1.6211	2.8639	
		2	4.02663*	.22770	.000	3.4665	4.5868	
Preferred day of purchase	1	2	4.17676*	.16075	.000	3.7813	4.5722	
		3	4.38245*	.16771	.000	3.9699	4.7950	
	2	1	-4.17676*	.16075	.000	-4.5722	-3.7813	
		3	.20569	.15118	.397	-.1662	.5776	
	3	1	-4.38245*	.16771	.000	-4.7950	-3.9699	
		2	-.20569	.15118	.397	-.5776	.1662	

\*The mean difference is significant at the 0.05 level

From Table 3, it has been observed that first and third cluster include higher family member in comparison to second cluster. Family members were even higher in third cluster than the first cluster segments. Similarly third cluster consumer had consumed comparatively more fish than first cluster consumer and first cluster consumers had consumed comparatively more than the second cluster consumer in the study area. Here third cluster consumer had travelled more than the first cluster consumer and first cluster consumer had also covered distance more than the second cluster consumer.

Similarly, first cluster consumer had preferred Inland fish at the end of the week whereas second and third cluster consumer had preferred at the first part of the week.

Table 3. Comparison within each variable in three clusters

Household size				Purchase quantity				
Cluster Number of Case	N	Subset for alpha = 0.05		Cluster Number of Case	N	Subset for alpha = 0.05		
		1	2			1	2	
2	121	3.3636		2	121	1.0926		
1	80		4.5750	1	80		1.2075	
3	99		4.9495	3	99		1.3889	
Sig.		1.000		.336	Sig.		.554	.231

Distance of market					Preferred day for eat fish				
Cluster Number of Case	N	Subset for alpha = 0.05			Cluster Number of Case	N	Subset for alpha = 0.05		
		1	2	3			1	2	
2	121	2.3471			3	99	1.5051		
1	80		4.1313		2	121	1.7107		
3	99			6.3737	1	80	5.8875		
Sig.		1.000			1.000	1.000	.439		1.000

#### 4. Conclusion

There are three clusters formed in this study. Consumers of higher cluster are one and half times more than the small cluster. Each cluster compiles variables like household Size (demographic variable), Purchase quantity in kg and Prefer day of purchase (Behavioural variable) and Distance from market (Geographic variable). Here income of consumer has no significance in cluster formation. Segment wise, the third cluster is very nearer to first one in household size number and purchase in quantity; whereas third cluster is nearer to second cluster in prefer day of purchase of Inland fish.

Distance from the market is a major variable that makes the market in to different segment in a significant way. From the different segments, it is concluded that increase in household size increases the inland fish consumption. In this parameter, cluster 3 proceeded by cluster 1 and then clusters 2 respectively. This pattern is also seen for distance from the market area as well. It puts a signal that higher household consumer travels more distance for purchasing of Inland fish. It means market is divided geographically further to satisfy the inland fish consumer' demand in future.

Second and third cluster consumers purchase Inland fish in early part of week; preferably Sunday and Monday, whereas first cluster consumers purchase the same in last part of the week; preferably Friday and Saturday. It shows Inland fish market concentrates only for four days majorly in the study area.

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The Publication fee is defrayed by Indian Society for Education and Environment ([www.iseeadyar.org](http://www.iseeadyar.org))

**Cite this article as:**

Shakti Ranjan Panigrahy, Dilip Vahoniya. Segmentation of Inland fish consumer in Anand District, Gujarat. *Indian Journal of Economics and Development*. Vol 6 (9), September 2018.